Casper Area Metropolitan Planning Organization

WESTWINDS LAND USE AND EXTENSION STUDY

PREPARED BY
Ardurra

502 33rd Street
Cody, WY 82414

CASPER AREA METROPOLITAN PLANNING ORGANIZATION
Casper - Mills - Evansville - Bar Nunn - Natrona County

ARDURRA

U.S. Department of Transportation
Federal Highway Administration

WYOMING TRANSPORTATION DEPARTMENT

Executive Summary

The Casper Area Metropolitan Planning Organization commissioned the *Westwinds Road Land Use and Extension Study* to determine whether advancing a minor arterial between U.S. 20-26 and I-25 would promote the safe and practical movement of people and goods in accordance with the goals identified with Connecting Crossroads, The Regional Long-Range Transportation Plan. Specifically, this Study was meant to assess the following in-line with Transportation Plan goals:

1. Will the extension of Westwinds Road provide mobility benefit for Natrona County, Casper-Natrona International Airport, and Bar Nunn?
2. Will the Westwinds corridor benefit freight mobility and related economics?
3. Will the Westwinds corridor provide a helpful degree of access to future/potential development areas, promoting employment opportunity and economic growth?

Per the Regional Transportation Plan, Westwinds Road would be extended as a two-lane, 55-mph rural connector route between U.S. 20-26, with adjacent Casper/Natrona County International Airport, and I-25, and the adjacent Town of Bar Nunn. The 5-miles (+/-) road would be constructed with a surfacing section sufficient for heavy trucks, developed with shoulders wide enough for bicycles; alternatively, a path could be developed with the road to support bike/pedestrian activity.

Through an agency and community engagement vetting process, two alternatives were identified as preferred by this study out of eight options. Each alternative was advanced to have two design options, one option with an at-grade crossing at a Burlington Northern Santa Fe (BNSF) rail line and the other grade separated. Each of the preferred alternatives would provide just over 5-miles of distance saved and 7-minutes of travel time saved. A travel forecasting process notes this route would divert 1,115 passenger vehicles and light-trucks with an additional 200 daily heavy trucks a year 2048 design volume of 1,315 Average Annual Daily Traffic (AADT). This would reduce travel demands on highways like existing U.S. 20-26, I-25, and Salt Creek Highway.

Table A. Route Distance and Travel Time Savings, Preferred Alternatives

Alternative	Total Distance	Travel Time
Existing, via I-25, U.S. 20-26 Bypass, and U.S. 20-26	12.00-miles	15 min, 30 sec
Alternative 3 with grade separated railroad crossing *(Travel Distance/Time Saved)*	6.75-Miles *(5.25-miles)*	8 min, 40 sec *(6 min, 50 sec)*
Alternative 4 with at-grade railroad crossing *(Travel Distance/Time Saved)*	6.65-Miles *(5.35-miles)*	8 min, 30 sec *(7 min, 00 sec)*

The route would access future land use developments, including commercial/industrially assigned areas of the County, Airport, and Bar Nunn. An immediate example is the road would help access a 3,600-acre solar farm being developed in the County west of the Town of Bar Nunn.

The most notable drawback to developing this corridor is cost. Given design assumptions specified by this report, the existing cost of the project would range between $23,432,000 to $42,955,000 of the four scenarios presented by the body of this study, $46,735,000 to $85,673,000 million in year

2048 costs (with inflation). With that said, this study estimates that nearly $75,000,000 of operational costs could be saved over 25-years (to 2048) with project development. A basic benefit-cost analysis developed based on maintenance and operational costs saved indicates the following about the preferred alternatives/scenarios:

- **Alternative 3:** The 5.05-mile alternative intersecting with Commerce Drive would have a future cost of $71,081,000 with bridge crossings at Casper Creek and BNSF. A longer route eliminates the BNSF bridge in favor of an at-grade crossing but results in a higher construction cost of $85,673,000. The B-C analysis indicates the first alternative and option is advisable as construction costs are justified via savings, but the higher cost option would be too expensive.
- **Alternative 4.** A 4.92-mile alternative intersecting with Commerce Drive would have a shorter route but traverse more difficult terrain. A Creek crossing and grade separation of BNSF would result in year 2048 construction costs of $52,030,000. An at-grade crossing of BNSF is estimated at $46,735,000. The savings offered by Westwinds Road would justify costs associated with expenditures forecast with construction for both options with the alternative. This alternative has the best benefit-cost ratio of preferred options reviewed for this study.

Table A. Future Costs & Benefit-Cost Ratio, Westwinds Road Preferred Alternatives

Alternative / Option	Total Estimated Project Cost		Benefit Ratio ($74,924,110) vs. 2045 Costs
	Year 2023	Year 2048	
Alternative 3 with grade separated railroad crossing	$35,639,000	$71,081,000	1.05
Alternative 3 with at-grade railroad crossing	$42,955,000	$85,673,000	0.87
Alternative 4 with grade separated railroad crossing	$26,087,000	$52,030,000	1.44
Alternative 4 with at-grade railroad crossing	$23,432,000	$46,735,000	1.60

Recommendation. The study concludes Westwinds Road will provide benefit to the region, justifying construction costs for three of four preferred alternatives reviewed. Of these, Alternative 4 "at-grade" results in the most cost-effective improvement of the options considered and is very viable.

BNSF has policies that restrict new at-grade crossings on their system; also, an at-grade crossing can delay commute and freight movements along the road, pending the frequency of trains noted to use this line in the future. For this reason, the Alternative 4 with BNSF grade separation is recommended by this study at a current concept level construction cost of $26.067 million. The quick execution of construction would reduce a year 2048 cost of what could be estimated as high as $52,030,000. If at grade crossings are desired within the region, coordination with BNSF should occur to affirm whether they will support the proposal before any real due diligence occurs on such a project.

With this improvement, the 1,315 AADT roadway would be of benefit to the region by:

- ✓ Westwinds Road will benefit commuter traffic activity for Natrona County, the Airport, and Bar Nunn by saving operations cost and 7-minutes of travel time.
- ✓ Westwinds Road will support up 200 daily trucks, freight mobility/operations costs and reduce freight impact on the U.S. 20-26 bypass, improving local economics.

- ✓ Westwinds Road will provide access to 10-square miles of future development areas within the region, promoting employment and economic growth.

An added consideration includes use of a dedicated pathway to promote pedestrians and bicycle activities. Though this may increase maintenance costs, this will be a 55-mph roadway. Separation between multimodal users and moving traffic establishes a roadway with safety performance considered for all users.

The volumes forecast by year 2048 for the corridor do not dictate an apparent need for controlled intersections (i.e., signals or roundabouts). Exceptions could include the terminus intersections of Commerce Drive and Salt Creek Highway with Westwinds Road. However, this study recommends this determination be made based on prevailing traffic information/counts in the future as opening year volumes should be moderate. Thus, the decision can be made in the future as development occurs along the corridor.

Finally, environmental review was not performed by this Study, this is a process that should be considered before selecting a formal alternative for pursuit of funding.

Disclaimer: *Preparation of this report has been financed in part through grant[s] from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation, under the State Planning and Research Program, Section 505 [or Metropolitan Planning Program, Section 104(f)] of Title 23, U.S. Code. The contents of this report do not necessarily reflect the official views or policy of the US Department of Transportation, Federal Highway Administration (FHWA), or Wyoming Department of Transportation (WYDOT).*

Contents

Figures:

Tables:

Appendix A: Preferred Alternative Alignments

Chapter 1 Introduction

Assuring the safe and practical movement of people and goods is a priority of the Casper Area Metropolitan Planning Organization for its member agencies, Natrona County, and the municipalities of Bar Nunn, Mills, Evansville, and Casper. Two of the five goals highlighted for Connecting Crossroads, The Regional Long-Range Transportation Plan (Casper Area Metropolitan Planning Organization, 2020), identify mobility choice and regional economics as emphases:

- Increase Transportation Options for All Modes
- Support the Region's Diversifying Economy

The extension of Westwinds Road is an articulation of these goals. As identified with the Long-Range Transportation Plan, this would be established as a high-speed, urban minor arterial, the new road would be used for commuter and freight travel between U.S. Highway 20-26 (U.S. 20-26), with adjacent Casper/Natrona County International Airport, and Interstate 25 (I-25), with the adjacent Town of Bar Nunn. The two-lane connector would extend about 5-miles (+/-), as constructed with a surfacing section sufficient for travel by heavy trucks. Though maintained by Natrona County, this would be designated by Casper Area Metropolitan Planning Organization and the Wyoming Department of Transportation (WYDOT) as a bypass and connector between U.S. 20-26 and I-25. Shoulders would be wide enough for bicycles. Alternatively, a walk/bike path is desired by the community and could be developed with the road.

The route would provide 7-minutes of saved travel-time, also reducing demands on highways like U.S. 20-26, I-25, and Salt Creek Highway by up to 1,315 average annual daily trips (2048 AADT). The route would access future land use development sites, including commercial/industrially assigned areas of the County, Airport, and Bar Nunn. An immediate example is the road would help provide access to a 3,600-acre solar farm being developed in the County west of Bar Nunn.

The most notable drawback to developing this corridor is cost. The lowest cost option considered for this study is $23 million for roadway planning, design, and construction ranging up to nearly $43 million for options, including grade separation of Burlington Northern Santa Fe (BNSF) rail and/or Casper Creek. This is a substantial cost for the advancement of a roadway that will support up to 1,315 AADT.

The purpose of the *Westwinds Road, Land Use and Extension Study* is to review concept- level design alternatives for establishing the corridor and providing key information upon which the Casper Area Metropolitan Planning Organization and its member agencies can use to make decisions about the corridor. To that end, this Study was prepared to address the following considerations/metrics in alignment with the goals of the Long-Range Transportation Plan:

1 Will the extension of Westwinds Road provide mobility benefit for the Natrona County, Casper-Natrona International Airport, and Bar Nunn?

2 Will the Westwinds corridor benefit freight mobility and related economics?

3 Will the Westwinds corridor provide a helpful degree of access to future/potential development areas, promoting employment opportunity and economic growth?

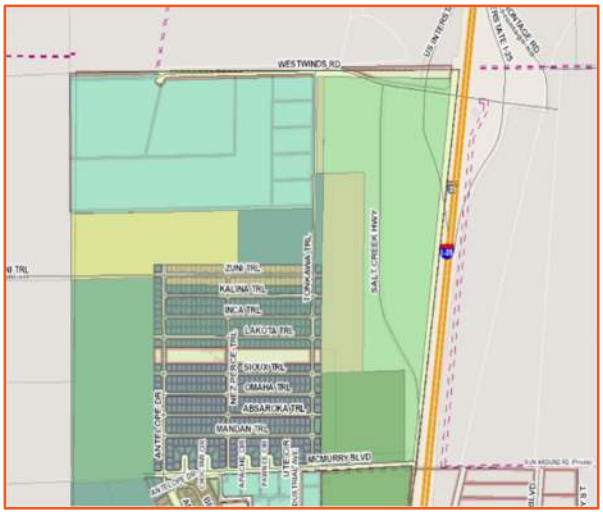
1.1 Project Description

Existing Westwinds Road extends from a terminus 0.45-miles west of Salt Creek Highway, which runs south from a "tee" intersection, to connect with a new WYDOT diamond interchange with I-25, an additional 0.35-miles further east of Salt Creek Highway. With the west limits currently ending in a cul-de-sac, this is a three-lane minor arterial that presently supports up to 1,060 AADT (east of Salt Creek Route/Highway).

The project would be a 2-lane, 55-mph, minor arterial extending from the current Westwinds Road terminus (cul-de-sac) on the east to an alternate terminus with Six Mile Road (Route 119) on the west, connecting in the vicinity of the Casper/Natrona County International Airport. Pending the chosen alternatives, the corridor would extend 5-miles (+/-) through grassland (predominantly), which is currently used (and zoned by the County) for agriculture purposes. The roadway would have 5-foot shoulders or may have a 10-foot multimodal pathway to accommodate pedestrian, and bicycle movements, pending ultimate design decisions. The alignment would fall roughly 4-miles north of the U.S. 20-26 bypass along the north boundary of Casper. It is important to note the Westwinds Project has already been documented as a priority by the Long-Range Transportation Plan. **Figure 1** provides a vicinity map of the Westwinds Road study area.

1.2 Background and Land Use

According to U.S. Census Data, the **Town of Bar Nunn** had a population of 2,897 persons living in 879 households in 2020, contained in an area of 2.1 square-miles. Per the 2010 Census, the population was 2,213 persons with 748 households in approximately the same area. The population of the municipality has grown 30.91% over 10-years (2.73% annually); one of the more rapidly growing communities in Wyoming on a percentage basis. Comparatively, housing has increased by a total of 17.51%. The density per household has elevated slightly over the 10-year period, suggesting more families have moved to Bar Nunn and/or that more adults are sharing homes; a trend evolving in the Country over the last decade.



Landside Layout Map
(Source: Natrona County Regional Geospatial Web)

PROJECT VICINITY

DATE: OCTOBER 2023

LEGEND

Casper Base Layers
- Downtown Casper
- Parks
- Pathways
- Municipal Boundaries
- Roadways
- Study Area

1 INCH = 7,574 FEET

0 0.65 1.3 1.95 Miles

N

COORDINATE SYSTEM: NAD 1983 2011 StatePlane Wyoming W Central FIPS 4903 Ft US

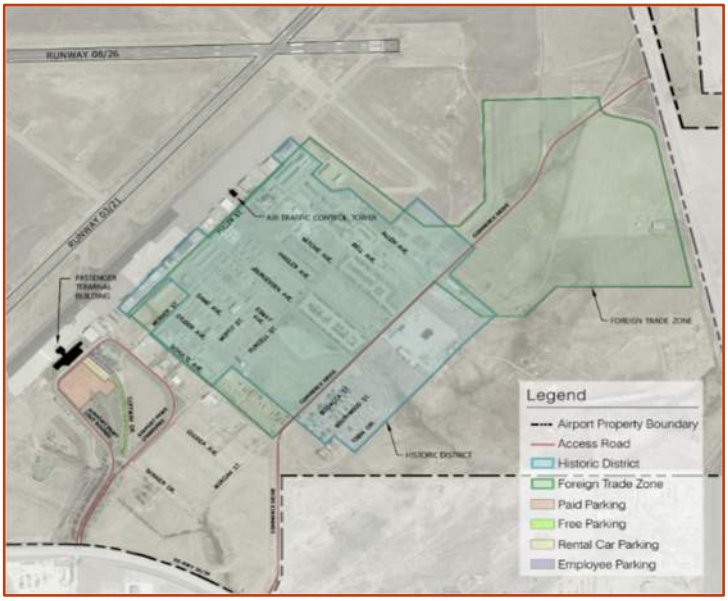
PROJECT NUMBER	DRAWN BY	APPROVED BY
220629	CT	BW

ARDURRA

1717 RUSTLE ST, SUITE 201,
SPOKANE, WA 99224

At the northern boundary of Bar Nunn, the existing Westwinds Road provides direct access to a 31-acre manufacturing site and establishes direct and future access to over 275-acres zoned for I-1 (light industrial) and I-2 industrial (general industrial) development north of McMurry Boulevard. The road is a part of the network intersecting with an adjacent, new I-25 interchange that serves the northern half of Bar Nunn. This north area includes R-2 to R-3 (moderate-to-mid density) residential, R-4 (high-density) residential, and B-1 general business. About 65% of the area is undeveloped between Westwinds Road and McMurry Boulevard. The operations of north Bar Nunn businesses would benefit from Westwinds Road and the network evolving to/from the route. Overall, the entire Town would save on travel time to/from the Airport and Salt Creek Highway,

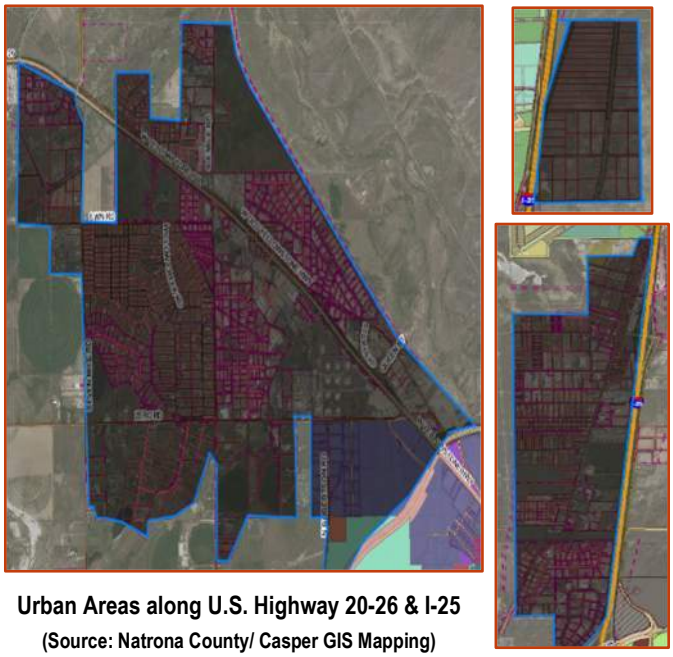
Casper/Natrona County International Airport occupies 8.02-square miles with two active and two decommissioned runways. The Airfield has flights to/from the hubs of Denver and Salt Lake with the terminal and aircraft facilities occupying most of the site. Access between the terminal side and Yellowstone Highway (U.S. 20-26) is secured using Airport Parkway and the Airport business park using Commerce Drive. There is a network of 20 roads that provide access throughout Airport properties. The source of this and following data is from the *Casper/Natrona County International Airport Master Plan* (RS&H, 2016).



Landside Layout Map
(Source: C/NCIA Master Plan)

The "Landside Project" or Airport business park occupies nearly 200-acres east and northeast of the terminal area and is largely occupied with commercial/light industrial facilities. An additional 200-acres are situated east of current facilities, poised for future development. The undeveloped area is situated along Six-Mile Road about adjacent to where the new Westwinds Road would tie into Commerce Drive. This alignment supports the notion that Westwinds Road could be used as a commercial route connecting I-25 with the commercial-industrial areas of Bar Nunn, as well as being a commuter route for Airport patrons and staff. The Airport Foreign Trade Zone is an extension of the business park where merchandise may be processed without the expense of Customs duties or taxes. The potential for this area to develop for international trade has not yet materialized; suffice to say it is an area of the Airport where employment could occur with commuters that might use Westwinds Road. The accessibility of the Airport to I-25 would increase notably with the extension of Westwinds Road, reducing freight costs for all areas of the Airport. A commute route would be established for Bar Nunn and those living on I-25 north of Casper.

There are urbanized areas in **Natrona County** that are aligned north of Casper along Yellowstone Highway (U.S. 20-26) and I-25. These appear to be platted as commercial, industrial, and residential lots with some developed, but there are many lots (and areas) which appear to be undeveloped. Along Salt Creek Highway north of Casper, there is roughly over five square-miles of urbanized area that appears to be about 50% developed (occupied) with homes and businesses. These areas are known as the Air Base and Mountain View districts, largely zoned for light industrial (LI), heavy industrial (HI), suburban residential-1 (SR-1), and urban residential (UR) development. The use of Six-Mile Road to/from Westwinds Road and I-25 north may be an alternate route of travel for those in this region compared with the current U.S. 20-26 bypass route. Travel time savings is questionable, depending on where the home or business is located along the Highway, but certainly this would be an alternate travel route for commuters, freight, and emergency services.



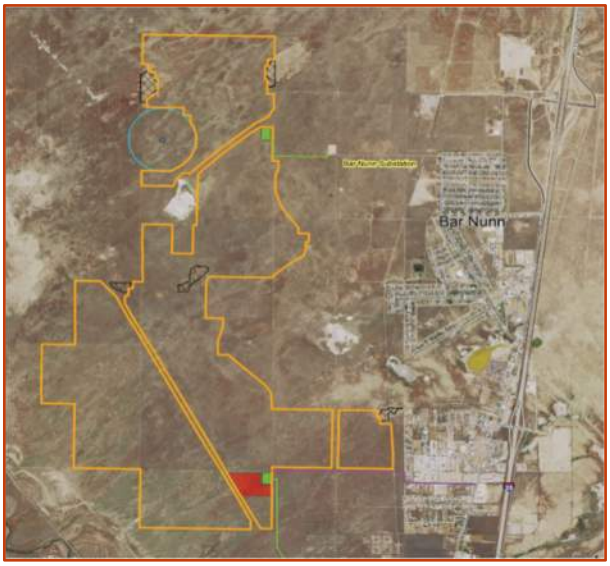
Urban Areas along U.S. Highway 20-26 & I-25
(Source: Natrona County/ Casper GIS Mapping)

There are three areas that appear to be platted for development along I-25 in the County, totaling over two square-miles. Generally, these are the Hartrandt, Richardson, and Wheeler Blvd areas; also, largely zoned for light industrial (LI), heavy industrial (HI), suburban residential-1 (SR-1), and urban residential (UR) development. Collectively, these lots/areas also appear to be about 50% developed. As with the opposite urban area, use of I-25 to Westwinds Road and then Six-Mile Road could provide an alternative to/from the U.S. 20-26 bypass, though travel time savings would depend on location in context to the route.

Urbanized Areas along U.S. Highway 20-26 & I-25
(Source: Google Earth Mapping)

Lastly, Westwinds Road extends 5-miles through a rural region of **Natrona County** that is largely used for agricultural purposes, mostly zoned urban agriculture (UA) with some commercial planned unit development (PUD) designations within about ½-mile east of Six-Mile Road to the BNSF rail line. Per guidelines such as the Access Management Manual (TRB, 2014) and the WYDOT Access manual (2014), the spacing of a minor arterial to another major access, such as another minor arterial, should be no less than ½ mile in urbanized areas. Through rural and sometimes suburban areas, this spacing can extend 1 to 2- miles.

Assuming Westwinds Road will be the singular route of access between U.S. 20-26 and I-25, it is assumed the route would establish access to properties within about a mile of its alignment. This represents access to approximately 10-plus square miles of Natrona County. To be clear, zoning designations are not yet in place to support commercial, industrial, or residential development. Also, there appears to be enough surplus properties within Bar Nunn, the Airport boundary, along Salt Creek Highway and I-25. Thus, it is anticipated any development of this area would be opportunistic, meaning a prospective developer would intentionally target this area and secure the zoning from the County, extending infrastructure for development.



Dinosolar Site (Orange Are Fence, Green Red Facilities)
(Source: Dinosolar website www.dinosolarproject.com)

As a specific example of how this would occur, a large power utility project owned by Dinosolar has been proposed on 3,600 acres north of Casper, about a mile west of Bar Nunn within the UA zone noted above. This solar powered generation farm would be a part of the Rocky Mountain Power grid and provide employment within the County, both during construction and then ultimately in operation. The solar farm would front up to a mile of Westwinds Road, providing access to the northern quarter to a third of this project.

1.3 Study Process

Chapter 1 was developed to present the project and highlight the general benefits of Westwinds Road to the County, Airport, and Town of Bar Nunn. Chapter 2 establishes transportation conditions in terms of the existing and forecasted networks along the corridor. Chapter 3 presents the eight initial alternatives, refined to two alternatives (each with two design options), resulting in a final Chapter 4 summary and conclusions.

Chapter 2 Transportation Conditions

This section provides a summary of transportation conditions associated with the project, for existing without project and future with project extension of Westwinds Road.

2.1 Transportation System/Network

Section 1.1. describes current Westwinds Road conditions and the general design proposal for a new-extended corridor. In terms of the remaining roadways primarily effected by this project, the following paved roads would see a change in traffic or freight impacts as a result of the project.

Interstate 25 (I-25). Known as the "Pan-American Freeway," I-25 extends nearly 1,062-miles from Buffalo, Wyoming to Las Cruces, New Mexico, ending short of the U.S. and Mexico border. Through the Town of Bar Nunn, the City of Casper, and Natrona County, this is a four-lane, divided Interstate with interchange access to the communities. As previously mentioned, there is a diamond interchange between I-25 and Westwinds Road with another interchange aligned 3.0-miles to the north with SH 70SW and 2.6-miles to the south with SH 254/Howard Street. The posted speed limit ranges between 60 to 80 mph, depending on location.

U.S. Highway 20-26 (U.S. 20-26). Extending as Yellowstone Highway through Natrona County, U.S. 20-26 is a designation shared by two U.S. highways. U.S. 26 runs 1,485-miles from Seaside, Oregon to Ogalala, Nebraska and U.S. 20 runs 3,365-miles from Newport, Oregon to Boston, Massachusetts. Within the County, this is a shared alignment for 80-miles that runs adjacent to the Airport, cuts to I-25 via a "bypass" of Casper, sharing an alignment with I-25 for 3-miles from West Belt Loop to U.S. 87, then diverges and shares an alignment with U.S. 84 to leave the County. In the Westwinds Road impact area, this is a four-lane, 40 to 55-mph principal arterial with at-grade intersections near the Airport, or a divided, four lane and 65-mph highway in the bypass area with interchanges to U.S. 87.

Six-Mile Road. As inferred by the name, this road extends just over 6-miles from a starting point directly northeast of the Airport, extending past Commerce Drive and U.S. 20-26, to a terminus about a mile south of Zero Road. Adjacent to the Airport, specifically at Commerce Drive, this is a two-lane local road with minimal shoulders and a posted speed limit of 40-mph. Towards the southeastern boundary of the Airport, the speed drops to 30-mph and the road converts to the functional classification of major collector, but with a similar cross-section as noted at Commerce Drive. The junction of Six-Mile Drive with U.S. 20-26 is aligned two-miles south of the Commerce Drive intersection.

Commerce Drive. The roadway extends west from Six-Mile Road about 1.8-miles, prior to a redesignation to Seven-Mile Drive south of U.S. 20-26. The road is classified as a major collector from U.S. 20-26 to the southwest boundary of the Airport, where it then becomes a local road. The road has a consistent two-lane cross section with 1 to 2-foot paved shoulders for its entire length with a posted speed limit of 30-mph. Indicated above, there is a 1.8-mile roadway length between U.S. 20-26 and the "tee" with a stop-control at Six-Mile Road.

Salt Creek Highway. This minor arterial extends about 6.6-miles from existing Westwinds Road through Bar Nunn, the Hartrandt area, the Richardson area, an interchange with the U.S. 20-26 bypass, and a commercial district of Casper before terminating at a U.S. 20-26 Business loop (loop not highlighted by report as it is too far-removed). This is a two-lane, 40 mph roadway extending south from Bar Nunn with deceleration lanes at major intersections. The roadway widens to five-lanes just north of Revenue Avenue, with this cross-section and 40-mph speed limit maintained into the City of Casper.

The Casper Area Long-Range Transportation Plan: Connecting Crossroads notes planned improvements that would change capacities on some of the routes previously noted. A summary of these improvements with a brief project description includes:

- **Westwinds Road.** Medium-term (8-13-year) improvement from existing Westwinds Road in Bar Nunn to CR 119 (5.15 mi.), a project cost of $21,099,000.
- **Salt Creek Highway.** Medium-term (8-13-year) widening project on an existing route from Howard Street to Antelope Drive (0.67-mi.) with a project cost of $2,235,000.
- **Polaris Drive.** Long-term (14-28-year) new minor arterial from Westwinds Road to Salt Creek Highway (4.14 miles), a project cost of $36,004,000.

The improvements to Salt Creek Highway and extension of Polaris Drive would improve capacities for north-south travel in the area, but they do not offer travel distance or time savings between U.S. 20-26 and I-25, nor the Airport area and Bar Nunn. To that end, these routes would help feed traffic to/from Westwinds Road, in addition to providing access to developing sites, but they should not divert much traffic to/from the U.S. 20-26 Bypass. However, Westwinds Road is confirmed in the Plan as a priority of the Casper Area Metropolitan Planning Organization, and this would divert U.S. 20-26 Bypass traffic as travelers look to shorten their travel times.

2.2 Existing AADT and StreetLight

Current traffic volume data was obtained from the WYDOT Interactive Transportation System Map/GIS data base and the Casper Area Metropolitan Planning Organization (MPO) count database. WYDOT traffic count data was collected in 2021 and provides corresponding truck volumes. MPO counts were collected from 2021 to 2023 and were noted below if the vehicle volumes were noted to exceed WYDOT's counts. A summary of average annual daily traffic counts (AADT) between resources for roadways of project influence include:

- **Interstate 25 (I-25).** I-25 supports about 6,100 AADT at the Westwinds Road interchange with 22% truck traffic (2,600 daily trucks) ranging to 15,300 AADT through Casper with 17% trucks (2,600 daily trucks). The MPO relies on WYDOT counts for I-25.
- **U.S. Highway 20-26 (U.S. 20-26).** The route supports about 4,600 AADT with about 8% truck traffic (365 daily trucks) near the Airport with a count of near 5,800 AADT with about 14% truck traffic (840 daily trucks) through the bypass. The WYDOT counts were higher than the MPO counts for the highway.
- **Six-Mile Road.** North of U.S. 20-26, the roadway supports nearly 2,400 AADT with 9% truck traffic (213 daily trucks). WYDOT counts exceeded MPO data for the road.

- **Commerce Drive.** The roadway supports nearly 1,100 AADT with 2% truck traffic (186 daily trucks) north of U.S. 20-26. The MPO has a 2023 vehicle count of 1,360 AADT at the same location.
- **Salt Creek Highway.** The roadway supports just over 6,400 AADT with 8% trucks (512 daily trucks) at Bar Nunn, with just over 7,300 AADT and 6% trucks (465 daily trucks) at the U.S. 20-26 bypass interchange. The MPO has a 2023 vehicle count of 7,400 AADT near the same location.
- **Westwinds Road.** The count for the existing road section was 183 AADT by WYDOT with 3% trucks (5 daily trucks). The 2023 count from the MPO was 1,060 AADT west of Salt Creek Highway.

A conclusion from review of count data is that the density of truck activity occurring on the roads and Highways is most influenced by the travel changes associated with Westwinds Road. Of most relevance, the U.S. 20-26 bypass as the route shares the traffic characteristics most like Westwinds Road, as it serves as the existing connector between U.S. 20-26 and I-25 with the corresponding commercial centers of the Airport and Bar Nunn. With that perspective, it can be assumed that this corridor would support comparable ranges of truck traffic within the range of 10% to 15% of AADT.

The number of truck trips is most relevant in the estimation of construction costs, as heavy vehicles are primarily what drives the depth of roadway cross-sections (depth of pavement and foundational materials). For the most part, this information does not have much bearing on planning elements of the project.

StreetLight Data. In addition to traffic counts, StreetLight Data was used to help establish how many vehicles travel between the Airport and Bar Nunn. StreetLight is a transportation logistics software that uses smart phone and GPS navigation signals to track the movement of cars and trucks between geographic zones. This project used 10 different zones for tracking vehicle movements, 4-zones situated in Bar Nunn and 6 that include and surround the Airport.

Ardurra analyzed five StreetLight scenarios for the Westwinds area: three including general analyses of origin-destination travel for zones for years 2019, 2021, and 2022. The others reflected origin-destination travel for trucks in year 2021 and 2022. Origin-destination is as simple as it seems, relating to where trip travel begins and ends within geographic areas. For this study that is between the 6-zones of the Airport geographic area and the 4- relating to Bar Nunn.

StreetLight Zones
(Source: Streetlight Viz3 Diagnostics)

The first review included assessment of the total vehicle origin-destination trip pairs between the geographic zones that represented the Airport area and Bar Nunn, respectively. Vehicle pairs mean vehicle leaving origins in one geographic location, the zones associated with the Airport for instance, with arrivals to zones in the other geographic area, the Bar Nunn area for instance, and vise-versa. Streetlight indicated the following vehicle pairs occurred between geographic areas 1,392 in year 2019 and 1,922 pairs in 2021.

- 1,392 vehicle pairs occurred during a sample week of January 2019,
- 1,922 vehicle pairs occurred during a sample week of January 2021, and
- 3,200 pairs occurred during a sample week of January 2022.

There was a high variability of vehicle paring sets between 2019, 2021, and 2022. Explanations for this include the improvement of Streetlight deployment devices used to track smart phone and GPS navigation signals over time. COVID-19 impacted travel throughout the U.S. in late 2019 through early 2021. For those reasons, and to assure design decisions were made on a conservative travel demand forecast year 2022 Streetlight data was used for reviewing conditions with this report.

This means that 3,200 base trip ends were used as the existing conditions sample base for this study. As indicated, travel pairs refer to the departure of trips in one area to the arrival of these trips in another, so 3,200 pairs refer to 1,600 total trips occurring between geographic areas within the span of a week. Of these trips, StreetLight data indicated that weekday trips tended to be 6.8% higher than weekend day trips. Thus, the weekend trip average fell around 220 trips daily, Friday to Sunday, with weekday at 235 trips per day, Monday through Thursday. Therefore, Westwinds Road would be the most direct route between Bar Nunn and the Airport area, with the corresponding least travel time. It is assumed this entirety of this existing, raw count volume would divert from the U.S. 20-26 bypass to the new route.

Seasonal Adjustment. Average monthly counts were reviewed from the WYDOT Transportation Surveys office to confirm whether a summer adjustment was needed as StreetLight analyses were collected/reviewed for the month of January. Years 2022 and 2023 average daily volumes were

reviewed at automated counter stations #18, U.S. 20/26 Powdered River East, which is just north of the Airport, and #30, I-25 North of Casper, which is actually adjacent to Bar Nunn.

The month of January was compared with the available WYDOT data collected in June and July. As indicated, two sets of counts were reviewed for months in 2022 and 2023, and it was confirmed that there was a wide seasonal variation in traffic between winter in January and the noted summer months, a weighted average increase of 84% (1.84 factor). It is necessary that volume demands reflect peak conditions especially from a design perspective. To that end, an 84% increase of the raw volume was assumed, again with up to 15% trucks as discussed prior. Note it was determined with the Casper Area Metropolitan Planning Organization during the scope process that WYDOT seasonal adjustments could be used for count revisions, instead of delaying this project until the summer season when additional Streetlight data could be extrapolated.

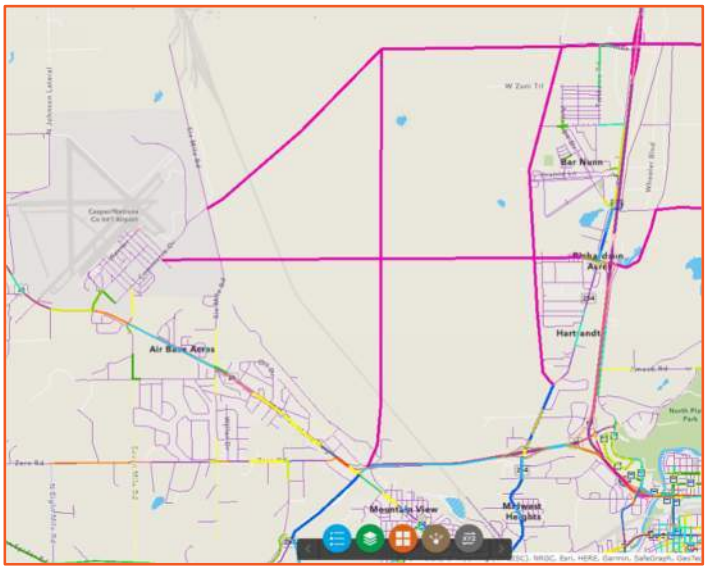
Based on discussion to this point, the adjusted volume that would travel Westwinds Road if the route were opened today is 435 AADT including up to 65 heavy trucks.

2.3 Travel Demand Forecasts and Future AADT

The Casper Area Metropolitan Planning Organization has developed and maintains a TransCAD regional travel demand model which was provided for use on the Westwinds Corridor Study. TransCAD, developed by the Caliper Corporation, is a travel forecasting tool designed for integration/application with GIS road and intersection networks. The year 2048 model uses socioeconomic and land use forecasts, trip generation rates for various commute types and travel modes, and a dynamic trip assignment (gravity-model processing) to generate volumes on the coded GIS network that dictates travel times based on factors like road capacity (number of lanes), speed, and the impediments associated with control devices such as traffic signals and stop signs. The GIS network can represent existing conditions or vet proposed improvement scenarios. The outcomes are information such as traffic volumes and various performance analyses factors such as volume-to-capacity, levels-of-service, travel times, and other corridor, network, and intersection metrics.

The volume outputs for the Casper region can be generated for the AM peak hour, midday peak, PM peak, or weekday. As indicated prior, the target for this study is generating AADT for analyses. The model was reviewed for a condition that reflects improvements recommended with the Regional Transportation Plan through year 2048, including Westwinds Road. Ardurra ran permutations of the travel demand model to reflect various alignments of Westwinds Road. However, these models showed only negligible variations in volume, as the different alignments did not present much change in travel time within the context of the bypass between U.S. 20-26 near the Airport and I-25 near Bar Nunn.

Travel demand models are initially established to represent the highways, arterials, collectors, and major local roads of a street network, with corresponding intersection controls. The technician works to calibrate the model to existing traffic counts. With that said, it is not typical to present model volumes directly; rather, the typical process is to “post-process” information, so forecasts are based on real time count information.



TransCAD Network w/Westwinds Road
(Source: Casper Area Metropolitan Planning Organization TransCAD Model)

For Westwinds post-processing, there was no existing roadway from which to factor volumes. However, as indicated, StreetLight data provided a reliable basis for estimating the seasonally adjusted traffic volumes. Existing Westwinds Road (directly west of I-25) did support about 635 AADT at the time volumes the travel demand model was developed and calibrated. A year 2048 forecast of about 1,920 was generated at the same location (at Salt Creek Highway), representing 202% increase over existing (3.02 factor). This growth rate was applied to the estimated, existing new Westwinds Road volume to generate a design-year forecast for automobiles and heavy trucks.

Based on the travel demand model and post-processing, a 2048-design year volume of 1,315 AADT would travel Westwinds Road including up to 200 heavy trucks.

Prior discussion presents how existing and forecasted AADT were developed for Westwinds Road. Subsequent **Table 1** reiterates this information for convenient review/confirmation.

Table 1. Current and Forecasted Traffic for Westwinds Road

Source Data, Factoring Process, Methodology	Volume-Factors
StreetLight Data: Existing volume assumed to divert from SR 20-26 Bypass	235 AADT
Seasonal Adjustments: January StreetLight data to June/July per WYDOT data for U.S. 20-26 and I-25 (84% increase). Adjusted, existing volume.	* 1.84 435 AADT
Forecast Volumes: Year 2019 to 2048 growth factor (3.02) developed based on current volumes compared with model forecasts for existing Westwinds.	* 3.02 1,315 AADT
Truck Volumes: Existing and forecast truck volumes estimated from truck count data noted from U.S> 20-26 and I-25 (up 15% of AADT).	65 AADT[1] 200 AADT[1]

1. Existing and Forecast Year 2048 Truck Volumes

From the travel demand model, forecasts from the existing section of Westwinds Road, it was determined that 16.8% of AADT would occur during the AM peak hour, 26.1% during a midday peak hour, and 12.3% during the PM peak hour. Using these percentages for the new section, from a forecast of 1,315 AADT, a summary of peak hour volumes include:

- AM Peak Hour, 220 trips
- Midday Peak, 345 trips
- PM Peak Hour, 160 trips

Chapter 3 Alternatives

Westwinds Road would be a two-lane, 55-mph urban minor arterial constructed with a surface section sufficient for heavy vehicles. Shoulders would be wide enough for bike travel. Alternatively, a walk/bike path could be developed with the road design. **Table 2** summarizes roadway design assumptions used in the development of alternatives from transportation and cost perspectives. Summary guides used in identifying these assumptions are as follows:

- WYDOT Road Design Manual & Standard Plans (Updated Jan 2022)
- County Road Fund Manual (WYDOT & Federal Programs, 2011)
- A Policy on Geometric Design of Highways and Streets (AASHTO, 2018)

Table 2. Summary of Concept Design Assumptions for Westwinds Road

Criteria	Value	Notes
Functional Classification	Minor Arterial	Matches WYDOT classification
Design Speed	60 mph	Assumes posted speed of 55 mph
Lane Width	12 ft	Per CRFM*
Shoulder Width	6 ft	Per CRFM
Min. Horizontal Curve Radius	1,330 ft	Per AASHTO**
Superelevation Rate	6%	Per CRFM and AASHTO
Stopping Sight Distance	570 ft	Per AASHTO
Maximum Grade	6%	CRFM allows 7-9% on rolling terrain
Cross Slope	2%	Per AASHTO
Vertical Clearance	23.5 ft	Per CRFM* & BNSF railroad standards

* County Road Fund Manual
** American Association of State and Highway Transportation Officials

3.1 Initial Alternatives

Although the eastern tie/terminus of the corridor is established, extending west from existing Westwinds Road, there are several potential alignments that can occur towards the center and west ends prior to intersecting with Six Mile Road. The variability of alignments has to do with differences in terrain, which changes in elevation from 5,385-feet (above sea level) at Westwinds Road, decreasing over 4.65-miles west and south to a low point of 5,210-feet along the banks of Casper Creek, at a center point of Six Mile Draw. Although this grade change is not substantial over distance, the terrain is uneven with various low and high points throughout, dictating alignment variations.

More notably the alignment is influenced by crossings of Casper Creek and the Burlington Northern Santa Fe rail aligned parallel to the eastern end of the study area through a ravine, just east of (within 0.5 to 0.65-miles of) Six-Mile Road. This longitudinal depression from north to south has a few flat points for an at-grade crossing of rail. However, the Creek will have to be bridged in all scenarios. To that end, eight alignment alternatives were explored, reflecting various crossings of the Creek and BNSF rail.

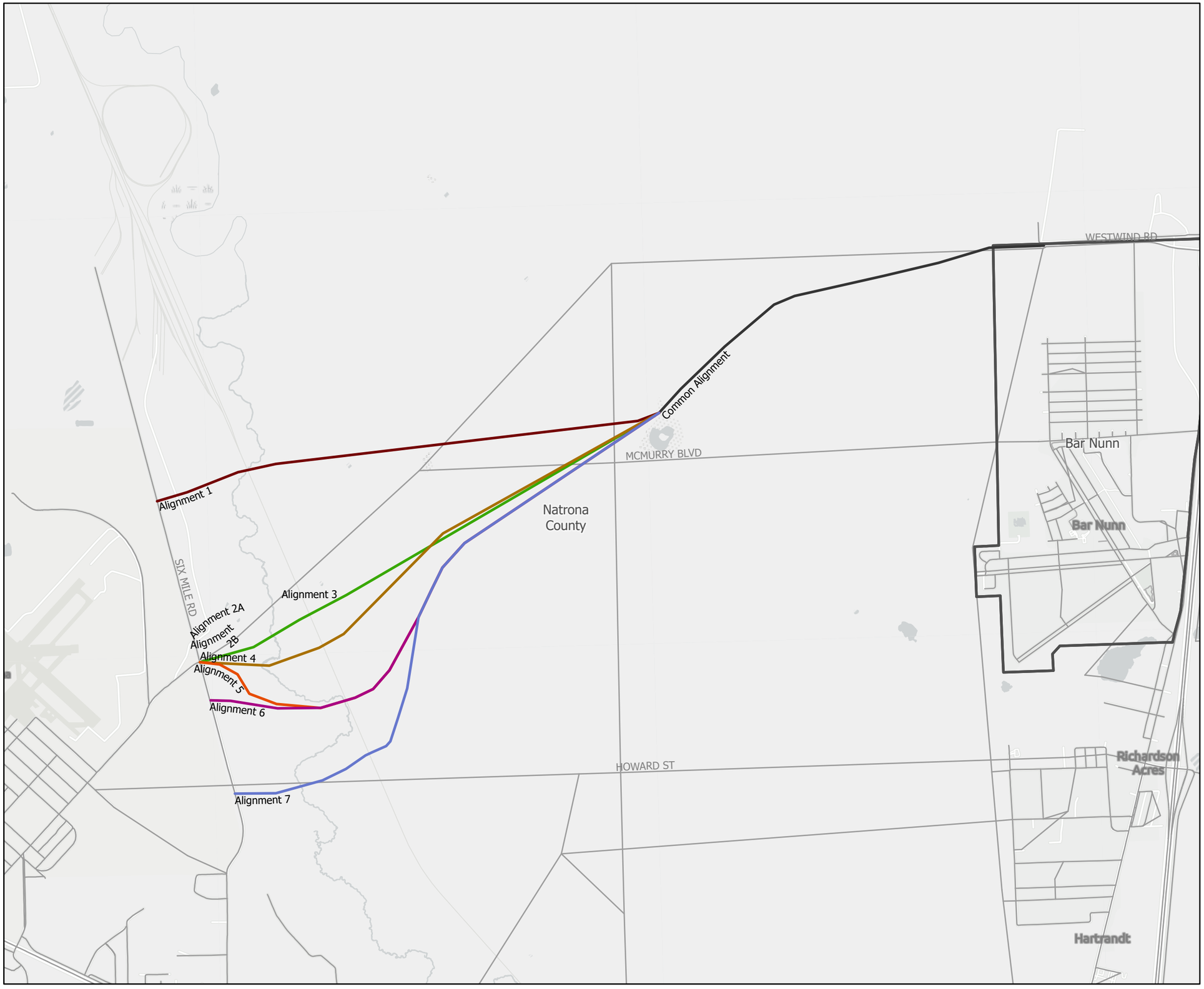
Figure 2 shows the initial alternatives reviewed. The context initial means there were eight options discussed originally with Casper Area Metropolitan Planning Organization, the community, and local agencies. Six were eliminated qualitatively (based on review with agencies and the community), leaving two alternatives to push forward for further analysis. In terms of the initial eight, the first 2-miles (approximate) west of current Westwinds Road (and I-25) have been generally solidified. The west 3-miles (approximate) differ due to constraints noted above. A summary of these alternatives is described from north to south as follows:

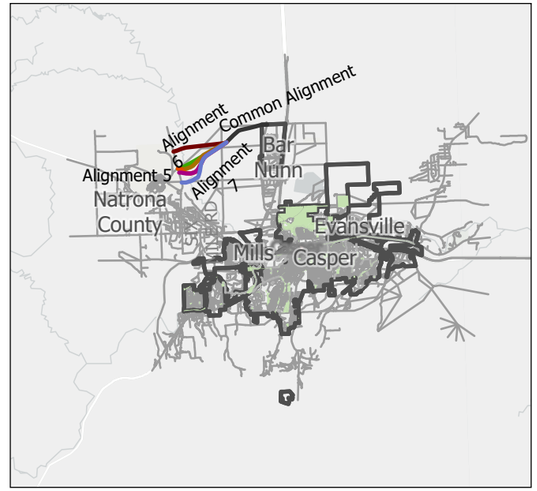
- **Alternative 1:** Intersects with Six Mile Road about 0.85 mile north of Commerce Drive in a tee intersection. This would span (via bridge) both the Creek and BNSF rail together as they converge at this location (rail crosses creek).
- **Alternative 2:** Intersects with Six Mile Road 0.10 miles north of Commerce Drive in a tee intersection. Occurring on the alignment of an existing, gravel road, this would have an at-grade crossing with BNSF with an improved bridge of Casper Creek.
- **Alternatives 3:** Similar to #2 but departs west of Casper Creek to intersect with Six Mile Road directly at Commerce Drive in a four-leg intersection. Thus, this reflects an at-grade crossing of BNSF with a bridge at Casper Creek. A bridge could be used to span BNSF rail, given cost reasons described later in this study.
- **Alternative 4.** Shortest path option but includes challenging terrain. Must cross both Casper Creek and a tributary of the Creek via bridges, alternatives could include a bridge or at-grade crossing of BNSF prior to intersecting with Six Mile Road at Commerce Drive directly through a four-leg intersection.
- **Alternative 5.** This deflects south from option 4 to avoid the terrain, reducing one creek crossing, but adding length to the route. A bridge or at-grade crossing can be used prior to joining Six Mile Road at Commerce Drive in a four-leg intersection.
- **Alternative 6.** This deflects further south from option 5 to traverse flatter terrain with one Casper Creek bridge crossing and another bridge of BNSF rail. This option intersects with Six Mile Road at Commerce Drive directly in a four-leg intersection.
- **Alternative 7.** This is in alignment 6 for most of its extent, diverging from a horizonal curve to intersect directly with Six Mile Road 0.15-miles south of Commerce Drive in a tee intersection. There is a bridge crossing of Casper Creek, and a bridge or at-grade crossing of BNSF.
- **Alternative 8.** This route follows the flattest terrain but results in the lengthiest route. This would have an at-grade crossing, but still with a bridge crossing of Casper Creek. Connects with Six-Mile Road about 0.70-miles south of Commerce Drive with a tee intersection alignment.

Table 3 provides summary information of the alternatives, as described above. Added is the length of the route with a description. For the alternatives that do not intersect directly with the intersection, this adds the distance in parentheses (Westwinds Road at Six-Mile Drive, back to Commerce Drive).

ALTERNATIVE ROUTES - CONCEPTUAL ALIGNMENTS

DATE: OCTOBER 2023





LEGEND

Casper Base Layers
- Downtown Casper
- Parks
- Pathways
- Municipal Boundaries
- Roadways
- Study Area

Name
- Alignment 1
- Alignment 2
- Alignment 4
- Alignment 5
- Alignment 6
- Alignment 7
- Alignment 8
- Alignment 8
- Common Alignment

1 INCH = 2,519 FEET

0 0.2 0.4 0.6 Miles

N

COORDINATE SYSTEM: NAD 1983 2011 StatePlane Wyoming W Central FIPS 4903 Ft US

PROJECT NUMBER	DRAWN BY	APPROVED BY
220629	CT	BW

ARDURRA

1717 RUSTLE ST, SUITE 201,
SPOKANE, WA 99224

Table 3. Summary Description of Initial Westwinds Road Alternatives

Alt. #	Length	Alternative Description
1	4.78-mi (0.85-mi)	Crossing Casper Creek and BNSF at one converged location with a bridge, connects w/Six-Mile north of Commerce Dr.
2	4.97-mi (0.10-mi)	Follows gravel road, improve bridge of Casper Creek, at grade crossing BNSF, connects w/Six-Mile north of Commerce Dr.
3	5.05-mi	Follows gravel road, improve bridge of Casper Creek, at grade or bridge crossing BNSF, connects w/Six-Mile at Commerce Dr.
4	4.84-mi	Most direct but must bridge Casper Creek & a tributary, with bridge or at-grade crossing of BNSF, connecting w/Six-Mile at Commerce Dr.
5	4.92-mi	Directs #4 from tributary, reduces bridge but adds length. Bridge of Creek & bridge or at-grade w/BNSF. Connects w/Six-Mile at Commerce Dr.
6	5.20-mi	Directs #5 to flat terrain, adds distance in connecting w/Six-Mile Road at Commerce Dr. Requires bridge of Creek & bridge or at-grade of BNSF.
7	5.09-mi (0.15-mi)	Pathway of #6 but directs to Six Mile Road south of Commerce Dr. Adds distance w/bridge of Creek & bridge or at-grade of BNSF.
8	5.32-mi (0.15-mi)	Longest route to follow flattest terrain, connects w/Six Mile Road south of Commerce Dr. At grade crossing w/BNSF & bridge over Creek.

As shown, alternatives 2 to 7 have travel times under 6 minutes with alternatives 4 and 5 having the shortest duration. Alternatives 1 and 8 have longest travel times, primarily due to traveling back to the Six Mile Road/Westwinds intersection to access the Airport Area.

3.2 Public Meeting #1

The first public meeting was held on March 29, 2023, from 4:30 to 6:00 PM, at the Casper/Natrona County International Airport. The meeting went over the traffic analysis, a summary of the alternatives, travel time savings, and railroad grade separation considerations. In addition, a project website was established for viewing which includes the project timeline, project goals, and alternatives. The public also had the option to take a feedback survey located on the website presented at the public meetings.

The survey serves to ask about which aspects of the Westwinds Road extension is important, preference for an at-grade or a grade separated crossing for the railroad, and preference for accommodating non-motorized users. Of the public who took this survey, 44% wanted to maximize access to developable land while 55% wanted to provide direct access to the airport by connecting Westwinds Road with Commerce Drive. 44% of respondents want grade separation at the crossing, 33% having no preference, and 22% wanted at-grade crossing. 66% of respondents wanted a separated shared-use path for non-motorized users while 33% wanted sidewalks and on-street bike lanes.

Through community feedback and coordination with the Casper Area Metropolitan Planning Organization's agencies, the eight alternatives were narrowed to Alternative 3 and 4. Two design options were developed for each, one with an at-grade railroad crossing and the other grade-separated.

3.3 Preferred Alternatives

As indicated, the two preferred alternatives were refined into sub-options, with and without grade separation for the BNSF rail line. The following sections highlight cost information, and cost benefit analyses developed to review these alternatives and options to help the Casper Area Metropolitan Planning Organization and its members make decisions for the corridor.

MicroStation is a design software used to create precise 2D and 3D drawings, in this case, the alignment of the preferred alternatives. Information also presented included the factors above such as route length, river/rail crossing possibilities, route travel time, and general topographic discussions.

As all alternatives met the goals stated earlier, mobility, land use access, and economics, the Casper Area Metropolitan Planning Organization directed that the alternatives be narrowed based on the perspectives gathered from the stakeholder and community engagement process. To that end, the engagement process resulted in the following conclusions via stakeholder and community polling.

- Top priorities for Westwinds Road included:
  - Providing direct access to the airport via Commerce Drive was desired over the offset intersection options.
  - Maximizing access to developable land was a priority.
- A grade-separated railroad crossing was slightly preferred over at-grade crossings, but a third of respondents had no preference.
- If multimodal were to be developed, a shared-use pathway was preferred by a 2 to 1 margin compared to sidewalks and bike lanes or shoulders.
- Traditional intersections (stop controls or signals, as needed) were preferred by a 2 to 1 margin compared to less traditional intersections such as roundabouts.
- Alignment options 3 and 4 were directly favored in public comments.

Stakeholder and community considerations led the Casper Area Metropolitan Planning Organization to direct further review of alternatives 3 and 4, as described subsequently. These were selected due to shorter alignments, as compared with most alternatives, which results in reduced linear costs. Both connect directly with Commerce Drive and have capacity to consider grade-separated or at-grade BNSF crossing options.

The following MicoStation renderings (next page) show the preferred alternatives with the non-grade and grade-separated options. The alignment of these preferred alternatives is shown with approximate stationing with Appendix A.

Alternative 3 with At-Grade Crossing
(Source: MicroStation Rendering)

Alternative 3 w/Grade-Separated Crossing
(Source: MicroStation Rendering)

Alternative 4 with Grade-Separated Crossing
(Source: MicroStation Rendering)

Alternative 4 with At-Grade Crossing
(Source: MicroStation Rendering)

3.4 Utilities/Railroad Grade Separation

Along Westwinds Road are main waterlines, that then cross into town in Casper, with Commerce Drive having existing main waterlines, and Six Mile Road having both water and sewer lines parallel to the roadway. Along with water and sewer lines, in the southeast corner of Commerce Drive and Six Mile Road is a gas line.

East of Commerce Drive about 0.6 mile away is a railroad owned by BNSF. The railroad is part of the CTran Industrial Rail Yard which was purchased in 2019 by Big Horn Divide & Wyoming Railroad who also purchased Granite Peak Company and the Rail Yard in 2015. The Rail Yard serves as a transloading and or rail services for customers. Due to being a transloading area it is assumed there is potential for vehicles to be on the tracks for numerous hours. Due to this the two alternatives were explored with on grade and grade separated intersections.

3.5 Travel Time Analysis

An assessment was performed to determine the travel time savings posted by extending Westwinds Road. The analysis was performed by calculation/review of posted speeds versus route distance using I-25, the U.S. 20-26 bypass, and U.S. 20-26, as compared with one of the two preferred alternatives. In terms of options, there was no practical difference between the grade and at-grade design options. Thus, travel times were the function of distance versus posted speeds that range between 35 to 80 mph.

The analysis was conducted from two different points, in Bar Nunn extending at the Westwinds Road / Salt Creek Highway intersection and the Airport business park. For the business park, the west point of entry was assumed at the Commerce Drive/Schulte Avenue intersection. This resulted in a total travel distance of 12.00 miles with speeds that range from 35 to 80 mph. Note that Salt Creek Highway and Six Mile Road also provide routes to/from these noted points, but travel on highways was still assumed as: 1) they are the designated route of travel that people understand with commutes and 2) the routes offer moderately reduced speeds as they more reflect local infrastructure.

From the west, via Westwinds Road, the point of entry was assumed to be the Commerce Drive / Allen Avenue intersection. This direct route presented a travel distance of 6.65 to 6.75-miles, depending on the terminus, with speeds ranging from 40 to 55 mph.

A summary of the travel time analysis is presented in **Table 4**. Note that a 5% factor of safety was used to account for variables such as intersection delay, ramp acceleration and deceleration speeds, and other minor impediments to normal operating speed.

Table 4. Route Distance and Travel Time Savings, Preferred Alternatives

Alternative	Total Distance	Travel Time
Existing, via I-25, U.S. 20-26 Bypass, and U.S. 20-26	12.00-miles	15 min, 30 sec
Alternative 3 with grade separated railroad crossing *(Travel Distance/Time Saved)*	6.75-Miles *(5.25-miles)*	8 min, 40 sec *(6 min, 50 sec)*
Alternative 4 with at-grade railroad crossing *(Travel Distance/Time Saved)*	6.65-Miles *(5.35-miles)*	8 min, 30 sec *(7 min, 00 sec)*

As shown, the Westwinds Road options result in travel of around 8-minutes and 30 to 40 seconds, pending alternative. In comparison, the existing route via WYDOT highways falls round 15-minutes and 30 seconds. Westwinds Road offers an approximate 7-minute savings in travel time over the current route, a reduced distance of just over 5-miles.

3.6 Concept Construction Costs

High-level planning construction cost estimates were developed for all four alternatives. Costs were developed based on application of WYDOT and Casper Area Metropolitan Planning Organization historical unit costs for major construction items such as road excavation, fill, asphalt, concrete, and high-level structure assumptions. These were then compared with quantities for each alternative. Quantities were developed from the cross-sections identified in Table 1 versus the Alternatives 3 and 4 alignment details of Table 2, adding in the at-grade and grade separated options. Markups were used to address non-specified construction/quantity items, drainage, environmental compliances, design, and 20% contingency. Options include a right-of-way acquisition estimate and all costs have been presented based on current (2023-dollar amount).

A summary of the resulting construction costs is provided in **Table 5**. The difference in cost between Alternatives 3 and 4 is due to the terrain, length of the alternative, and the difference in structures. Alternative 3 has a gulley approximately ½-mile from Commerce Drive, which would result in more construction time, material cost, and overall, a higher price. This is noted in the at-grade alternative as additional distance is needed for the roadway alignment, which is why this option exceeds the cost with a separated structure. Alternative 4 does not have a direct connection with Commerce Drive, and the terrain does not require as many materials and construction, resulting in a lower cost.

Table 5. Concept Construction Costs, Westwinds Road Preferred Alternatives

Alternative / Option	Total Estimated Project Cost
Alternative 3 with grade separated railroad crossing	$35,639,000
Alternative 3 with at-grade railroad crossing	$42,955,000
Alternative 4 with grade separated railroad crossing	$26,087,000
Alternative 4 with at-grade railroad crossing	$23,432,000

According to resources such as Engineering News Record (ENR)*, the price of construction materials has consistently increased in the range of 2.6% to 3.0% annually since 1996. This includes the high inflation rates that occurred in 2020 through 2022 after COVID. Estimating future costs would be determined by compounding an average 2.8% annual growth rate to the future year of cost estimation, then multiplying it times the construction cost. For instance, the calculation for year 2033 construction costs for Alternative 4 with at-grade crossing would be:

- Equation: Inflated Cost = Current Construction Cost * (1 + Inflation in Decimal)^Years
- Results: $30,884,500 = $23,432,000 * (1+0.028)^10

Thus, with 2.8% inflation over 10-years the construction cost of the above alternative would fall in the range of $30,884,500, a gain of nearly $7.5 million. The point of this exercise is to demonstrate that the costs of Westwinds Road will increase quickly. Thus, if the roadway is to be constructed, rapid execution is warranted before the roadway becomes impractical from a benefit-cost perspective.

Cost Savings. A rough estimate of annual savings was performed to help Casper Area Metropolitan Planning Organization and its member agencies determine if the annual cost benefits of the project outweighed construction cost. This is a basic analysis developed based on the time and fuel savings of extending the corridor.

According to the *Bureau of Transportation Statistics*[1], it costs the typical commuter $0.72 per mile to operate passenger cars and light trucks within the U.S. This includes the price of fuel, maintenance, and time. Per *An Analysis of the Operational Costs of Trucking*[2], the average cost to operate a heavy truck is $1.65 per mile. As indicated in Table 1, there would be 435 AADT using Westwinds Road, if the route were opened today, with a breakdown of 370 AADT in terms of passenger vehicles and light trucks with 65 heavy trucks daily. This would range up to 1,115 passenger vehicles and light trucks with 200 heavy trucks daily, a total of 1,315 AADT.

1. https://data.bts.gov/stories/s/bzt6-t8cd
2. https://truckingresearch.org/wp-content/uploads/2021/11/ATRI-Operational-Cost-of-Trucking-2021-FINAL.pdf

The application of the operating costs noted above factored with volume data provided in Table 1 and the travel distance savings of 7-miles, multiplied by 365-days for the year, results in an annual estimate of operation savings with the extension of Westwinds Road. This is represented by the following calculations as based on existing conditions:

	370 vehicles * 7.0-miles of travel * $0.72 saved per mile * 365 days =	$680,652
+	65 vehicles * 7.0-miles of travel * $1.65 saved per mile * 365 days =	$274,024
	Total Cost Savings, Current Conditions =	**$954,678**

The economic benefits of vehicle operations in year 2023 is estimated at $954,678, as shown above. However, as with construction costs, inflation will have a bearing on these costs. Traffic is forecasted to elevate over time in response to development within the area (growth of the County, Cities, and Town), peaking at the design volume of 1,315 AADT by year 2048 (1,115 vehicles & 200 trucks). The construction inflation factor of 2.8% annual was applied to the operations costs above to year 2048, using the inflation factor noted previously, to generate operations costs of $1.44 per mile for passenger vehicles and light trucks and $3.29 for heavy trucks after 25-years of inflation. The calculation for year 2048, similar to the existing condition, would then be as follows:

	1,115 vehicles * 7.0-miles of travel * $1.44 saved per mile * 365 days =	$4,102,308
+	200 vehicles * 7.0-miles of travel * $3.29 saved per mile * 365 days =	$1,681,190
	Total Cost Savings, Current Conditions =	**$5,783,498**

Thus, the year 2048 economic benefits would be about $5,783,498 given the progression of inflation and gain of traffic over time. With that said, this represents just a single year of savings over the 25-year period. A true benefit-cost must factor in total costs savings over an analysis period versus cost. Thus, if this inflation and traffic gain factor was repeated from years 2023 to 2048, the total savings over 25-years is $74,924,110.

A comparison is then made to assess whether the benefits of the project are reasonable within the context of costs. For this comparison, the construction costs noted in Table 4 were elevated to year 2048 using the 2.8% annual inflation rate. The savings or benefit was then divided by future construction costs to develop a benefit-to-cost ratio. If shown as a 1.0 or higher, the theoretical savings of a project justify the cost. The higher the ratio, the greater the benefit within context to future costs. A summary of calculated future costs and the benefit-cost (B-C) ratio is provided in **Table 6**.

Table 6. Future Costs & Benefit-Cost Ratio, Westwinds Road Preferred Alternatives

Alternative / Option	Total Estimated Project Cost		Benefit Ratio ($74,924,110) vs. 2048 Costs
	Year 2023	Year 2048	
Alternative 3 with grade separated railroad crossing	$35,639,000	$71,081,000	1.05
Alternative 3 with at-grade railroad crossing	$42,955,000	$85,673,000	0.87
Alternative 4 with grade separated railroad crossing	$26,087,000	$52,030,000	1.44
Alternative 4 with at-grade railroad crossing	$23,432,000	$46,735,000	1.60

Alternative 3 with the longer road length has the greatest future cost which results in a B-C ratio below 1.0, inferring this is not an alternative and option that should be explored. The remaining three scenarios shown with Table 6 have B-C ratios that all exceed 1.0, meaning the savings to the community theoretically justifies costs. Alterative 4 with an at-grade crossing has the highest B-C of 1.6. This is the most feasible project.

Note that this is a preliminary B-C analysis. A true B-C analysis, such as the one used in Federal grants, has many additional factors that go into the calculations. Elements such as savings on CO2 emissions, roadway maintenance costs (for existing and proposed routes), societal impacts, safety performance, multimodal savings, and fiscal gains from land use development are factors that influence a true B-C (Federal BCA) analysis. What is shown with Table 6 is a guide only, a formal update is needed if this information was ever to be used in a funding grant.

3.7 Public Meeting #2

The second Public Involvement meeting was held on June 1, 2023, at the Hangar Bar and Grill from 5:00-6:30PM. The meeting went over Alternatives 3 and 4, both with and without grade separation as well of the cost estimates of all four options. An important part of the meeting was going over the Westwinds Road design criteria.

The conclusions from this meeting were not as specific as the prior meeting, as supported by the website and survey. This was more of a reporting of the preferred alternatives with the community just reasserting they wanted a direct route with provision of a ped/bike pathway along the route, as

feasible. It is fair to say that, while a path was not specifically reflected in estimates, the costs of Table 5 reflect wide shoulders and a contingency that could be used for multimodal facilities if this were determined as an option for the road.

3.8 Intersection Considerations

As indicated, the opening volume of Westwinds Road is forecast at 435 AADT (with up to 65 heavy trucks), increasing to 1,315 AADT by year 2048 (with up to 200 heavy trucks). This occurs with the initial diversions forecast from the U.S. 20-26 bypass with traffic gains occurring due to development throughout the region, the areas specified with Section 3.2, and with the large-scale developments that may occur along the corridor itself.

The need for a traffic signal is typically confirmed based on two evaluations.

1) An intersection level-of-service analysis documented under the guidelines of the *Highway Capacity Manual* (T.R.B., 6th Edition, 2016).
2) A review of signal warrants outlined by the MUTCD, the *Manual on Uniform Traffic Control Devices* (F.H.W.A, 2009).

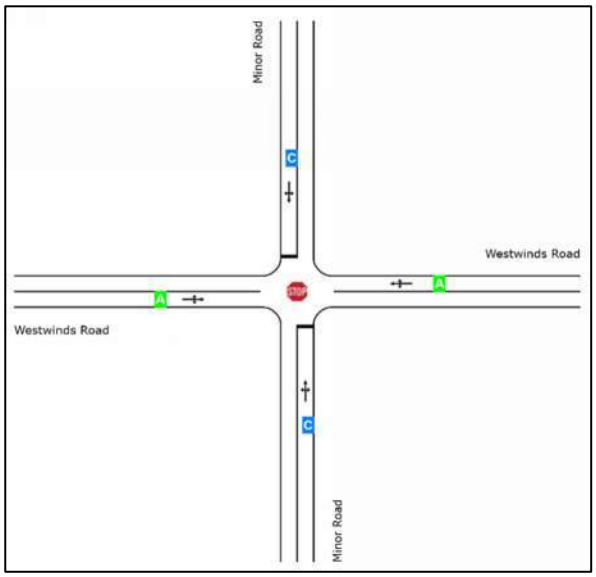
Inclusion of a roundabout in a design is discussed later. The installation of either traffic control device is based on the primary measure of mobility performance deterioration, as noted below.

Levels-of-Service. In terms of levels-of-service (LOS), agencies will set a mobility standard that represents a region's tolerance for congestion and vehicle delay at intersections during a period such as a peak/commute rush hour. For this area, the Casper Area Metropolitan Planning Organization, WYDOT, and local jurisdictions employ a LOS C standard as the balance between community expectation versus demand for excessive road/street infrastructure (i.e., construction of improvements that do not yield satisfactory benefits in context to dollars spent). This standard applies to roadways, but within the context of this section, the standard also applies to the performance of intersections.

The scope of this study did not include network planning tasks such as intersection LOS review. It is presumed the network and land use access needs would be addressed by developers through traffic impact studies required as a function of various entitlement processes.

However, qualitatively, with assumption of 15% design hour traffic from 2048 AADT, up to 200-vehicles may travel Westwinds Road during a peak 60-minutes (i.e., a design hour). A relative LOS threshold can be developed using the basic intersection with:

- Four legs: east-west and north-south,
- Single entry and exit lanes, all approaches (two lane road intersecting two lane road),
- Uncontrolled (non-stop) movements east and west on Westwinds Road,
- Controlled (with stop) movements north and south on minor street,
- Up to 200 east-west PM peak hour vehicles, mainline traffic with 50/50 directional split, and
- Up to 125 north-south peak hour vehicles, approach traffic.



Example Westwinds Two-Way Stop
(Source: AASIDRA LOS Software)

To conclude, about 125 entering approach vehicles could intersect with 200 free-flow mainline volumes while preserving a LOS C using 2048 horizon assumptions. There is variability in the volumes which could raise or lower LOS from baseline assumption. However, geometric improvements could preserve LOS further than minimum assumptions above, prior to control devices being needed. Thus, the 200 versus 125 hourly vehicle thresholds establishes a reasonable target for the LOS C standard of Westwinds Road.

It should be noted that volume forecasts do not currently dictate the need for either device by 2048 along Westwinds Road, at least preliminarily.

MUTCD. The MUTCD provides nine warrants that, if any are met, justify signal construction from the viewpoint of the Federal Government; this is particularly important as State and Federal grant agents often use this criteria as one basis for issuing funds. In the case of a route such as Westwinds Road, warrants would be driven primarily by volume data, which are highlighted with MUTCD Warrants One to Three.

The approximate threshold for mainline traffic is about 500-vehicles and minor approach 80-vehicles per hour for eight hours for a weekday, as described by the *Warrant One: Eight Hour Vehicle Volume* warrant. This assessment uses the consecutive 70% factor for population areas under 10,000 with speeds over 40 mph, with the Warrant Two: Four Hour Vehicle Volumes having approximate, albeit a bit higher, thresholds for four hours of the weekday. Thus, after the LOS C threshold is surpassed, the next target would be to review MUTCD criteria as volumes approach these thresholds as a basis for assessing the need for a traffic signal.

From the cursory evaluation performed here, meeting the criteria for MUTCD warrants could be difficult based on forecast traffic densities.

Roundabouts. There are currently no MUTCD warrants that affirm the need for a roundabout or signals. For this reason, and as they arguably provide capacities similar to signals with documented

safety benefit, granting agencies have tended to be flexible in funding these traffic control devices. For that reason, LOS performance failures or safety issues (as manifested by recurring intersection collisions) can be the thresholds for recommending a roundabout (whereas above the MUTCD provides a second hurdle for signals).

The cost of a roundabout would likely be higher than that of a traffic signal due to the Westwinds Road speed limit of 55 mph. Extensive chicanes would be needed to slow traffic in advance of the intersections, dictating widening that drives a higher cost. This and driver expectation are often the reason why there is hesitancy to employ high-speed roundabouts along corridors such as this.

Again, year 2048 volumes forecast with this report do not dictate need for control devices to be planned into the corridor, as LOS falls within the planning level thresholds noted prior. This discussion has been provided for context but is considered a moot point given this conclusion. It is again assumed private development traffic studies would review/calibrate this assessment, with appropriate determinations and any improvements required at the time of land use project development.

Chapter 4 Conclusions

The Casper Area Metropolitan Planning Organization is reviewing whether an extension of Westwinds Road will promote the safe and practical movement of people and goods for Natrona County, the Town of Bar Nunn, and the Casper/Natrona County International Airport. This report, through an engagement process, reviewed and reduced eight total alternatives to two preferred alternatives, each with two options. These core alternatives would extend a two-lane urban minor arterial from the Airport, intersecting Six-Mile Drive at Commerce Drive, to the existing terminus in Bar Nunn.

The 5-mile road connection would present a 6.65 to 6.75-mile route between destinations, shorter by just over 5-miles versus use of the existing 12-mile route of U.S. 20-26, the bypass, and I-25. This results in a travel time savings of 7-minutes. A travel forecasting process notes this route would support 1,115 passenger vehicles and light-trucks with an additional 200 daily heavy trucks, a year 2048 design volume of 1,315 AADT.

Given high truck percentages, the roadway would be constructed with a surfacing section sufficient for travel by semi-trucks, which was reflected in concept construction cost estimates. Given the requests of the community, who were instrumental in helping to identify preferred alternatives, the need for wide-shoulders or a walk/bike path was reflected in cost estimates.

Given design assumptions specified by this report, the existing cost of the project would range between $23,432,000 to $42,955,000 of the four scenarios presented by the body of this study, $46,735,000 to $85,673,000 in year 2048 costs. Constructing this roadway would help direct access to growth areas of Natrona County, developing areas of Bar Nunn, and commercial areas of the Airport; specifically, “landside” areas related to Airport business, including a foreign trade zone.

This study estimates that $74,924,110 of operational costs would be saved by the project over 25-years (to 2048). The B-C analysis performed with these benefits versus future costs for Westwinds Road indicates the following about the preferred alternatives/scenarios:

- **Alternatives 3:** The 5.05-mile alternative intersects directly with Commerce Drive. A future cost of $71,081,000 includes bridge crossings of Casper Creek and a tributary with a bridge crossing of the BNSF Railroad. A longer travel route eliminates the BNSF bridge in favor of an at-grade crossing but results in a higher construction cost of $85,673,000. The B-C analysis indicates the first alternative and option is advisable as construction costs are justified via savings, but the higher cost option would be too expensive and should be eliminated.
- **Alternative 4.** A 4.92-mile alternative also intersects with Commerce Drive. This is a shorter route, but traverses more difficult terrain. However, this scenario only requires one creek bridge, either with a grade-separated crossing of BNSF, resulting in a year 2048 construction cost of $52,030,000 or at-grade with a construction cost of $46,735,000. The savings offered by Westwinds Road would justify costs associated with the expenditures forecast with construction with both options. This alternative with an at-grade crossing has the best B-C of preferred options revised for this study.

Recommendation. The study concludes Westwinds Road will provide benefit to the region justifying construction costs for three of four preferred alternatives reviewed. Of these, Alternative 4 "at-grade" results in the most cost-effective improvement of the options considered and is very viable.

However, BNSF has policies that restrict new at-grade crossings on their system; also, an at-grade crossing can delay commute and freight movements along the road, pending the frequency of trains noted to use this line in the future. For this reason, the Alternative 4 with BNSF grade separation is recommended by this study at a current concept level construction cost of $26.067 million. The quick execution of construction would reduce a future year 2048 cost of what is estimated at $52,030,000. If at grade crossings are desired within the region, coordination with BNSF should occur to affirm whether they will support the proposal before any real due diligence occurs on such a project.

With this improvement, the 1,315 AADT roadway would be of benefit to the region by:

- ✓ Westwinds Road will benefit commuter activity for Natrona County, the Airport, and Bar Nunn by saving operations cost and 7-minutes of travel time.
- ✓ Westwinds Road will support up 200 daily trucks, freight mobility/operations costs and reduce freight impact on the U.S. 20-26 bypass, improving local economics.
- ✓ Westwinds Road will provide access to 10-square miles of future development areas within the region, promoting employment and economic growth.

An added recommendation includes a dedicated path to promote alternative modes of transportation. Though increasing maintenance costs, this will be a 55-mph roadway. Separation between multimodal users and moving traffic incorporates consideration of safety performance for all users.

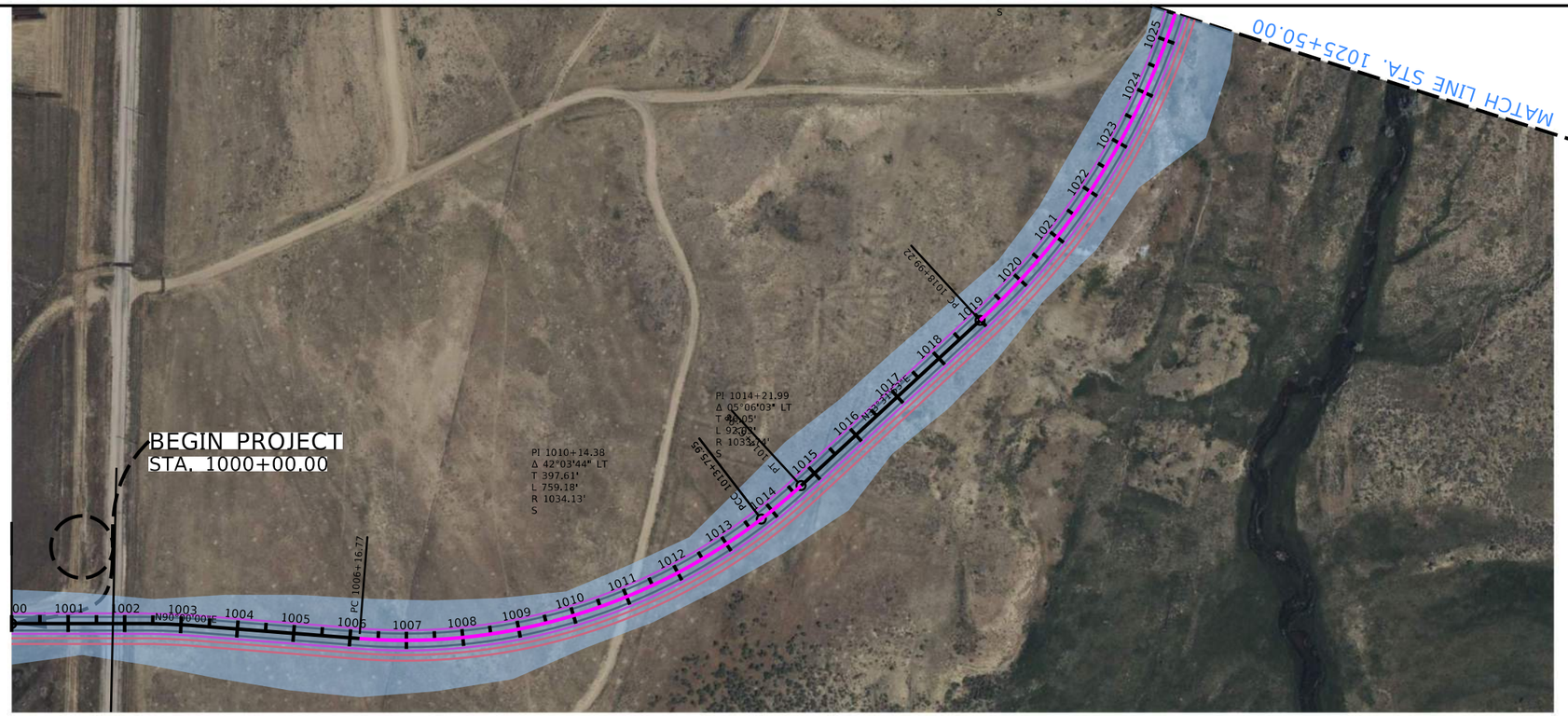
The need for intersection traffic control devices beyond stop-controls on minor approaches were not apparent with the perfunctory analysis performed by this Study. Thus, there were no signals or roundabouts forecast in travel time analyses, or construction costs. With that said, intersection controls are a key factor of corridor design. It is recommended private development confirm intersection needs through traffic impact studies required as a function of County/agency entitlement processes. An element should include review of improvement alternatives from the perspective of LOS, WYDOT lane warrants, safety, and costs as a basis for the decision process.

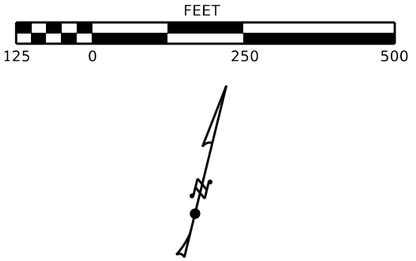
Finally, environmental review was not performed by this Study, this is a process that should be considered before selecting a formal alternative for pursuit of funding.

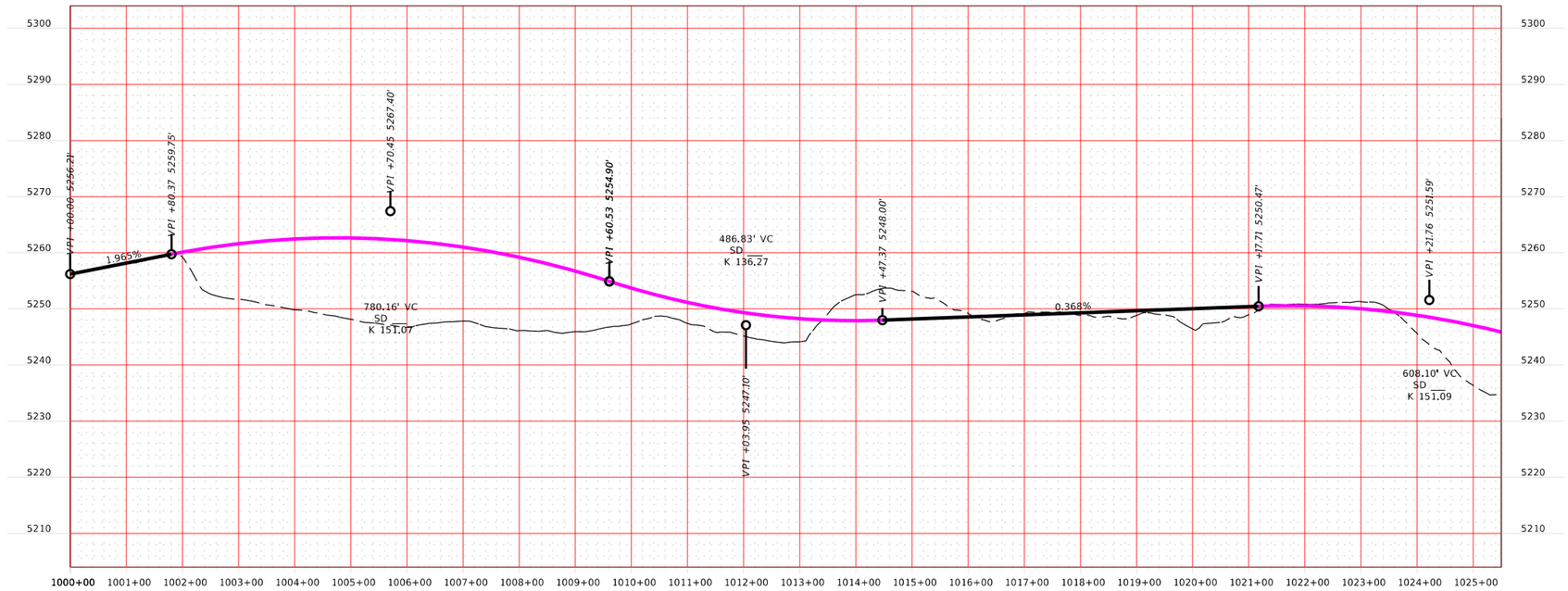
Technical Appendix A

Preferred Alternatives 3 & 4,

Conceptual Alignments

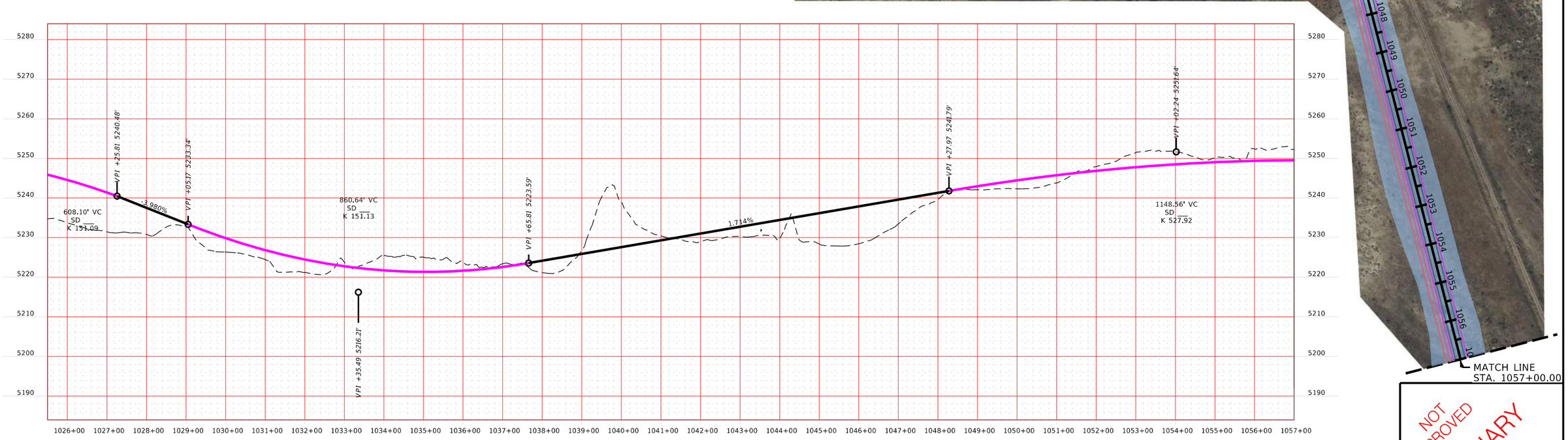






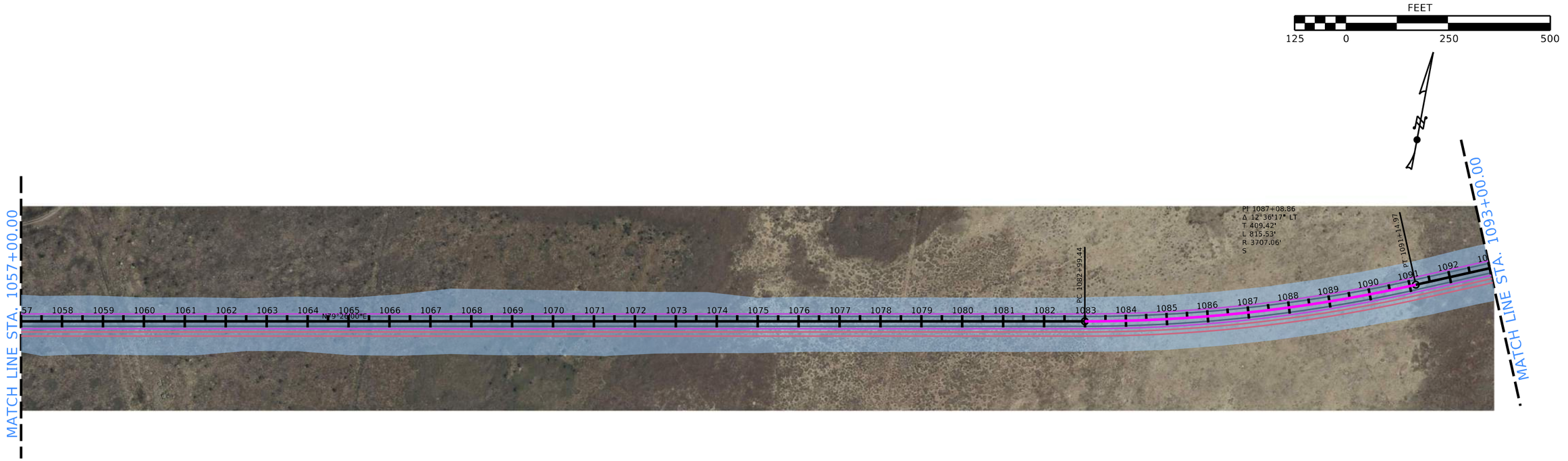
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	WESTWINDS ROAD EXTENSION STUDY	PROJECT NO.		English
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED			220629	OPTION 3	COUNTY
				DETAILED	CADD FILE NAME				KEY NUMBER
				DRAWING CHECKED	DRAWING DATE:				SHEET OF

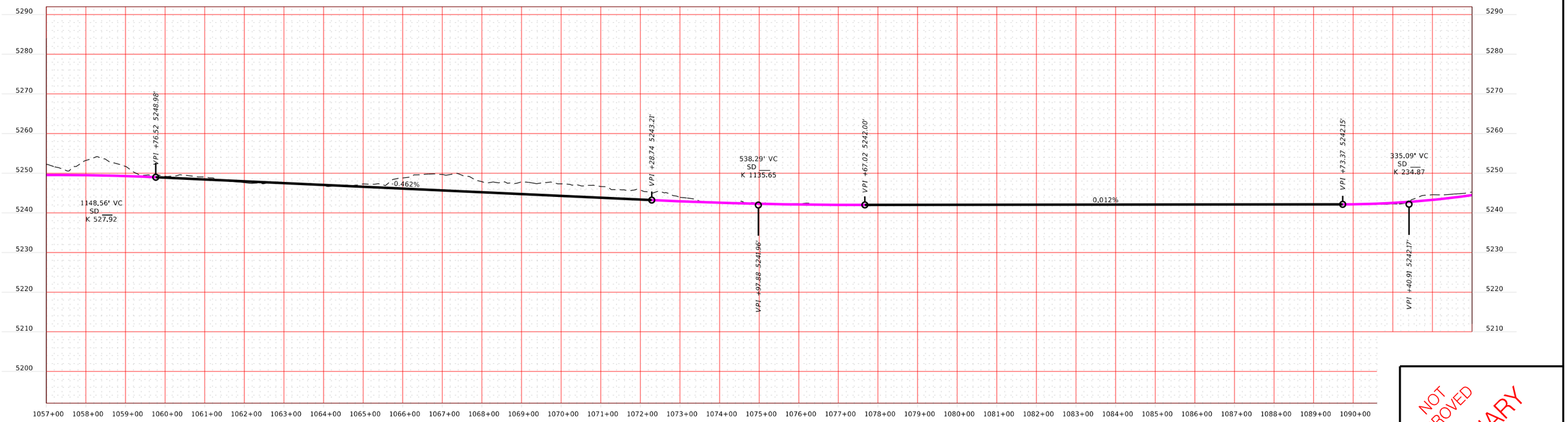
NOT APPROVED
PRELIMINARY
FOR CONSTRUCTION



REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	WESTWINDS ROAD EXTENSION STUDY	PROJECT NO.		English
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED			220629	OPTION 3	COUNTY
				DETAILED	CADD FILE NAME				KEY NUMBER
				DRAWING CHECKED	DRAWING DATE:				SHEET OF

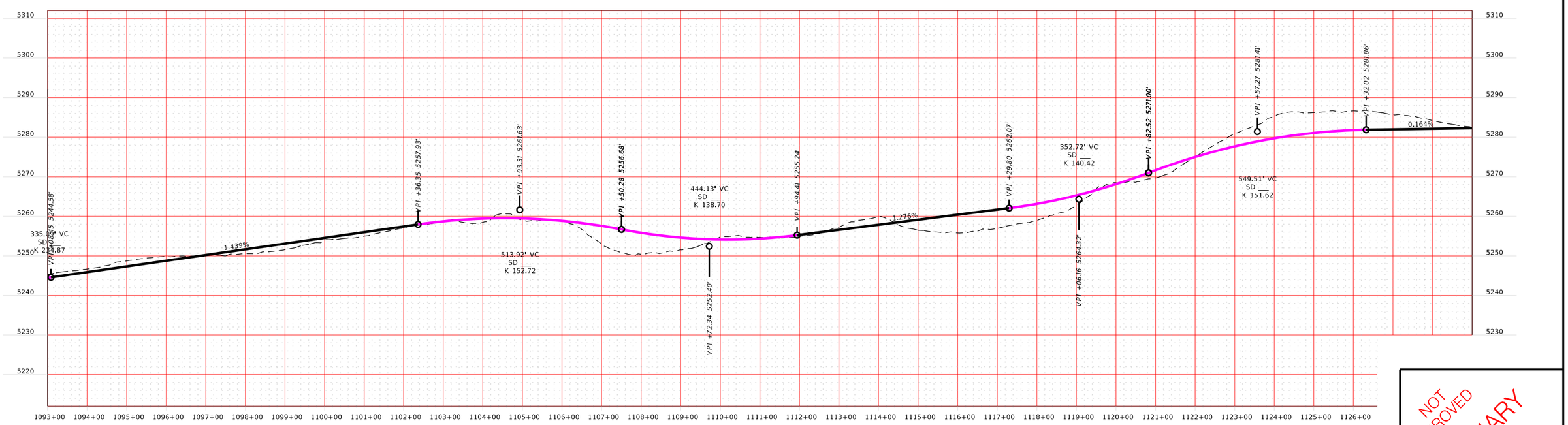
NOT APPROVED
PRELIMINARY
FOR CONSTRUCTION





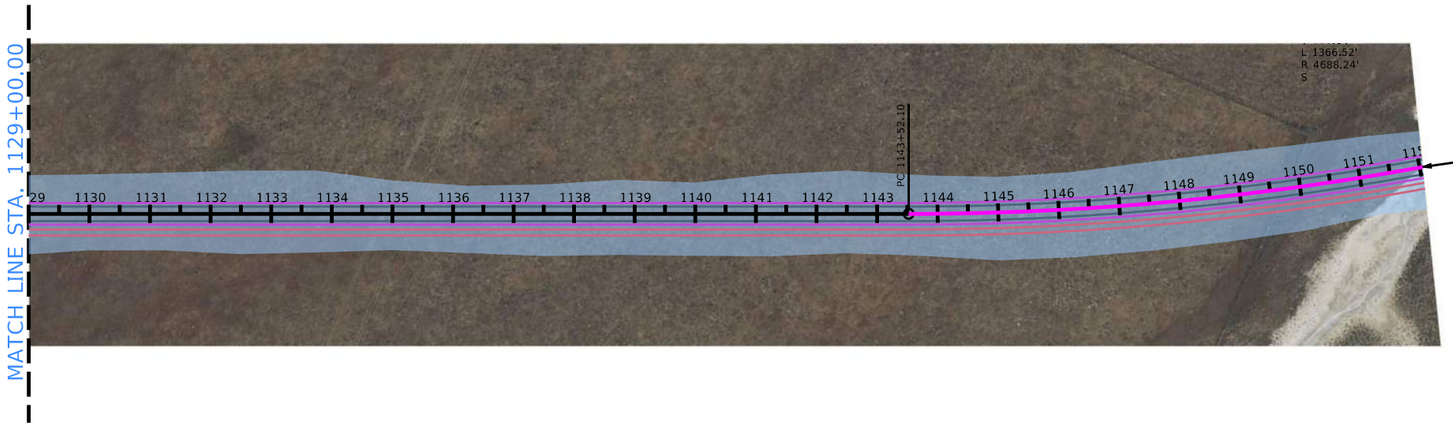
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	WESTWINDS ROAD EXTENSION STUDY	PROJECT NO.		English
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED			220629	OPTION 3	COUNTY
				DETAILED	CADD FILE NAME				KEY NUMBER
				DRAWING CHECKED	DRAWING DATE:				SHEET OF

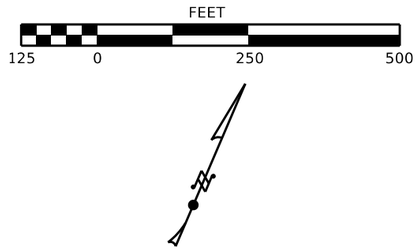
NOT APPROVED
PRELIMINARY
FOR CONSTRUCTION

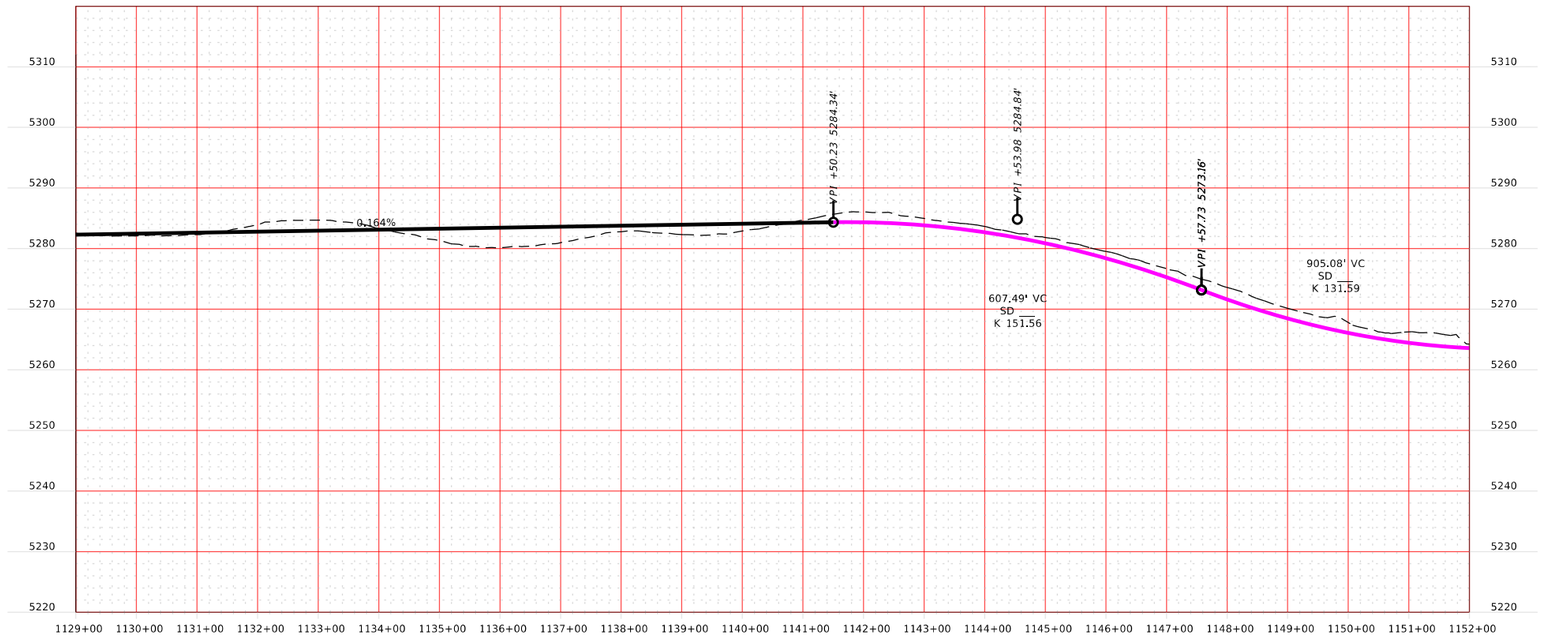


REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	WESTWINDS ROAD EXTENSION STUDY	PROJECT NO.		English
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED			220629	OPTION 3	COUNTY
				DETAILED	CADD FILE NAME				KEY NUMBER
				DRAWING CHECKED	DRAWING DATE:				SHEET OF

NOT APPROVED
PRELIMINARY
FOR CONSTRUCTION

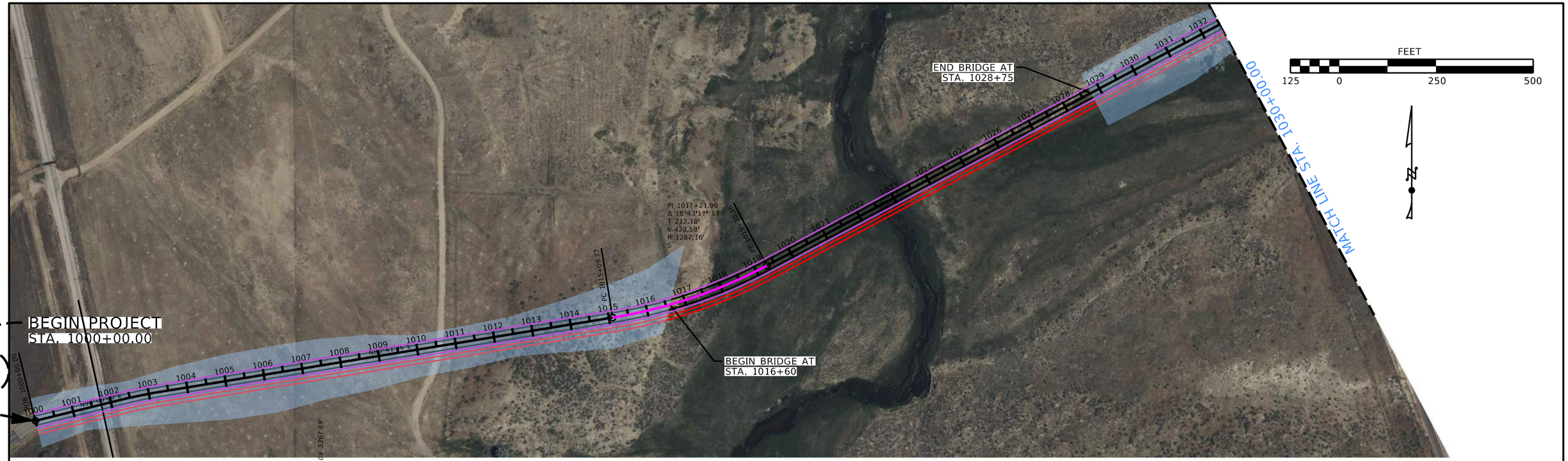


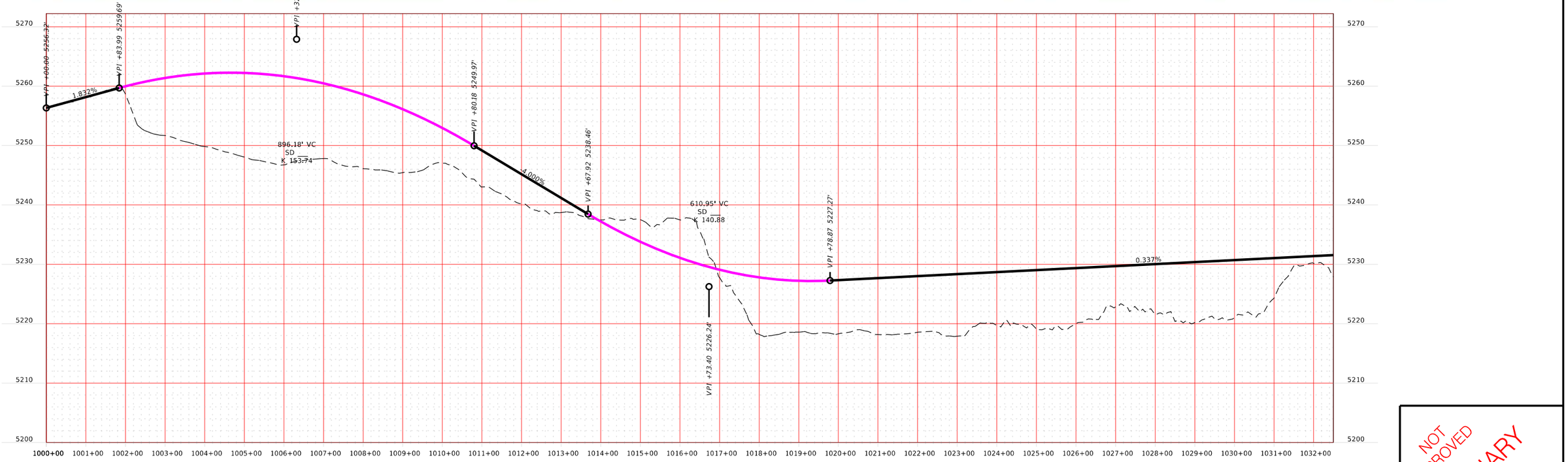




REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	WESTWINDS ROAD EXTENSION STUDY	PROJECT NO.		English
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED			220629	OPTION 3	COUNTY
				DETAILED	CADD FILE NAME				KEY NUMBER
				DRAWING CHECKED	DRAWING DATE:				SHEET OF

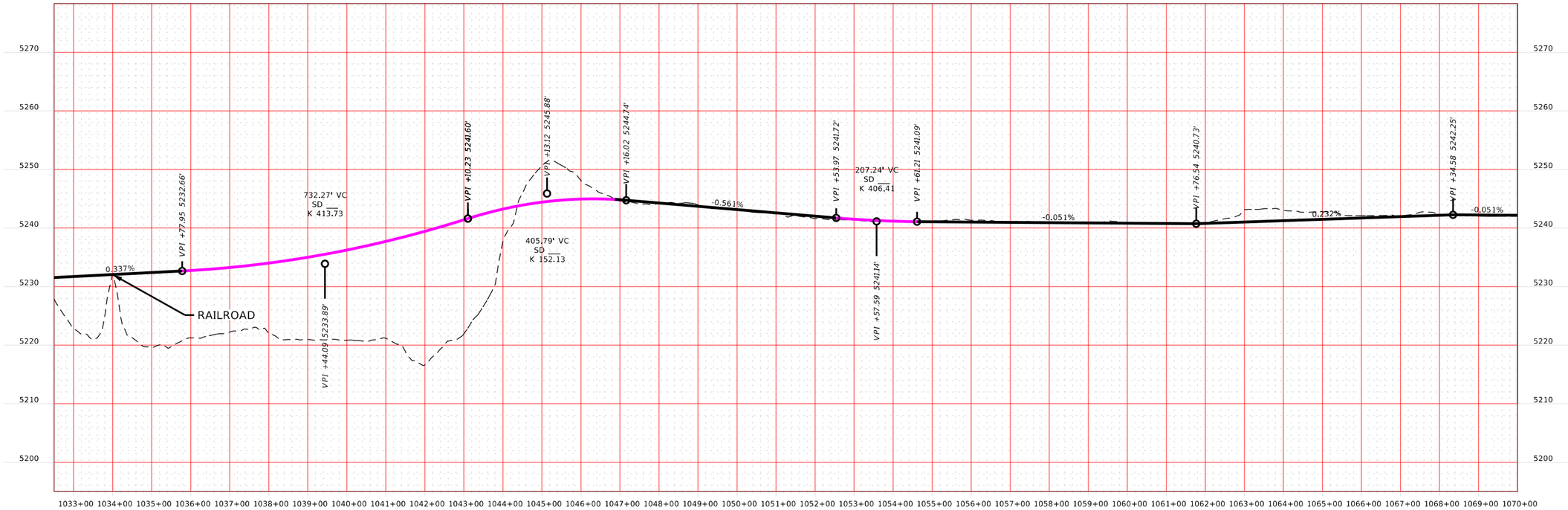
NOT APPROVED
PRELIMINARY
FOR CONSTRUCTION





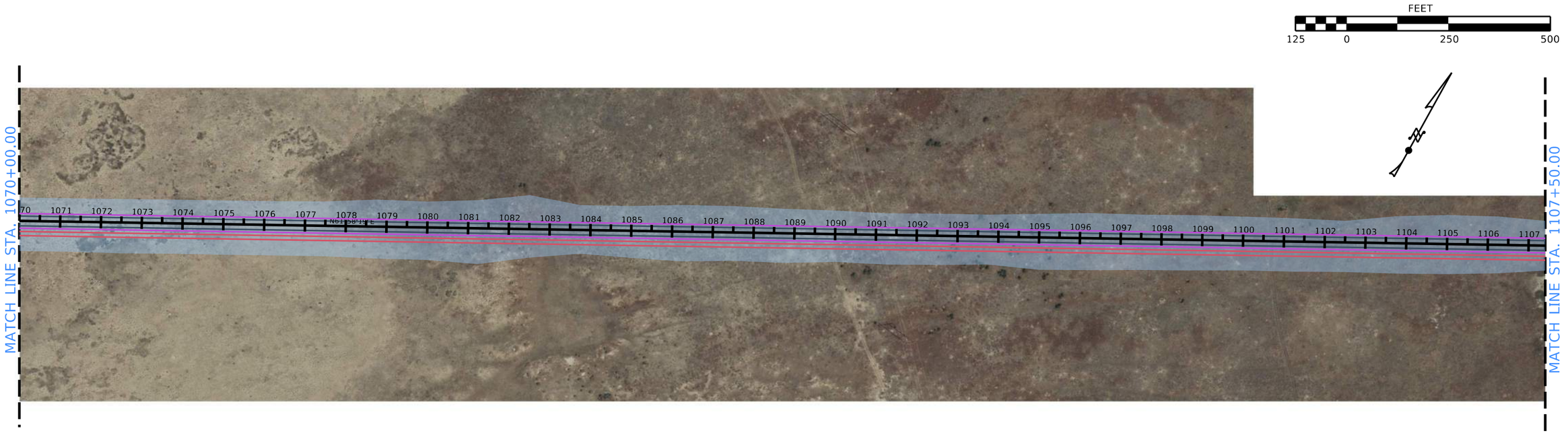
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	WESTWINDS ROAD EXTENSION STUDY	PROJECT NO.		English
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED			220629	OPTION 4	COUNTY
				DETAILED	CADD FILE NAME				KEY NUMBER
				DRAWING CHECKED	DRAWING DATE:				SHEET OF

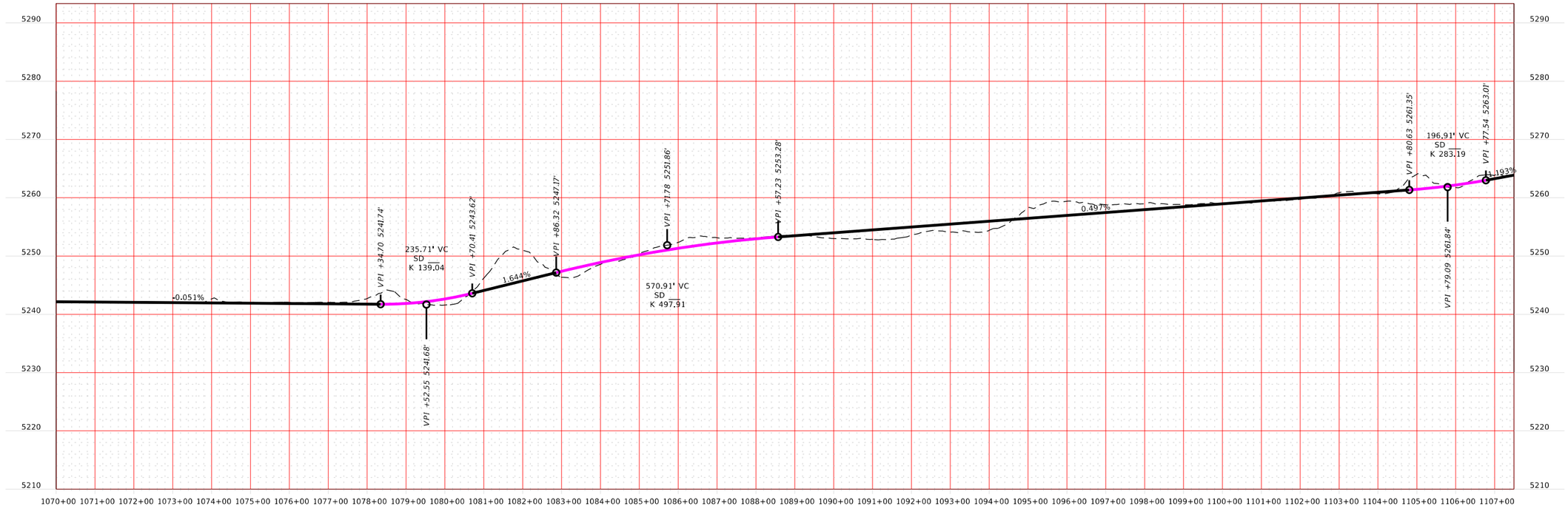
NOT APPROVED
PRELIMINARY
FOR CONSTRUCTION



REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	WESTWINDS ROAD EXTENSION STUDY	PROJECT NO.		English
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED			220629	OPTION 4	COUNTY
				DETAILED	CADD FILE NAME				KEY NUMBER
				DRAWING CHECKED	DRAWING DATE:				SHEET OF

NOT APPROVED
PRELIMINARY
FOR CONSTRUCTION



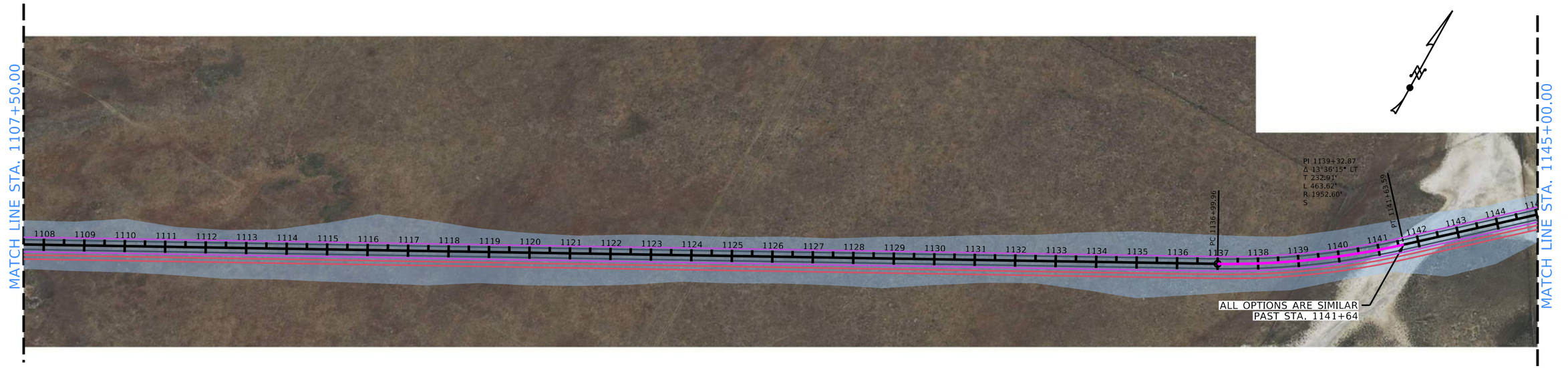


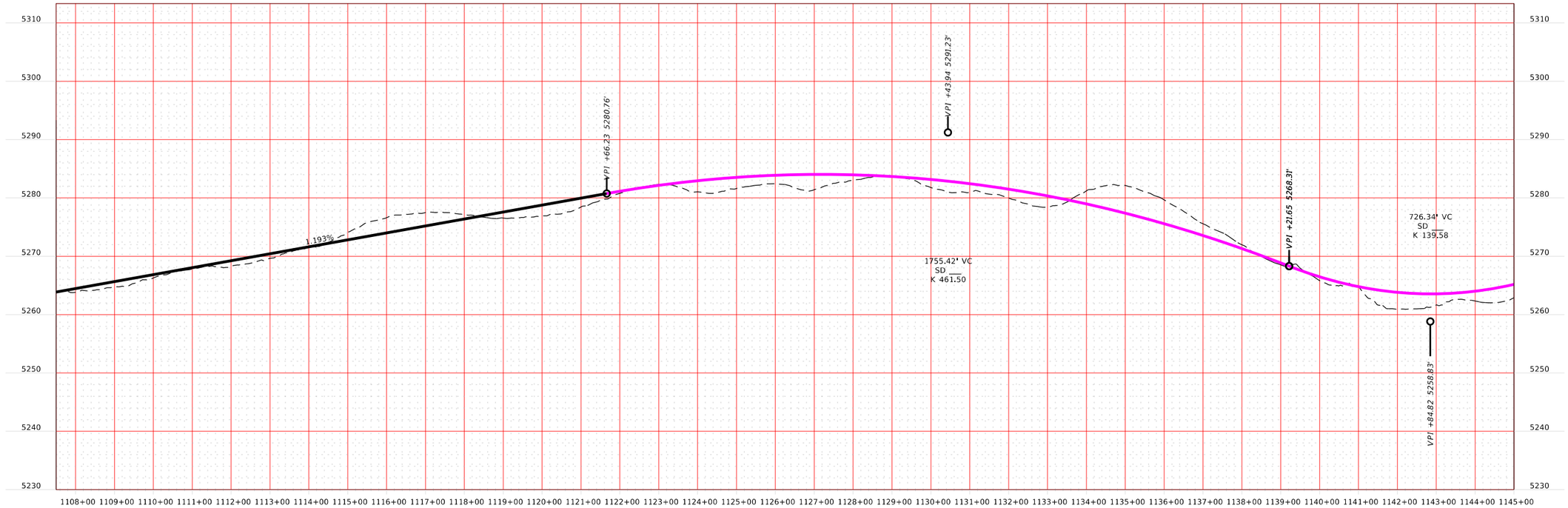
REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	WESTWINDS ROAD EXTENSION STUDY	PROJECT NO.		English
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED			220629	OPTION 4	COUNTY
				DETAILED	CADD FILE NAME				KEY NUMBER
				DRAWING CHECKED	DRAWING DATE:				SHEET OF

NOT APPROVED
PRELIMINARY
FOR CONSTRUCTION

FEET

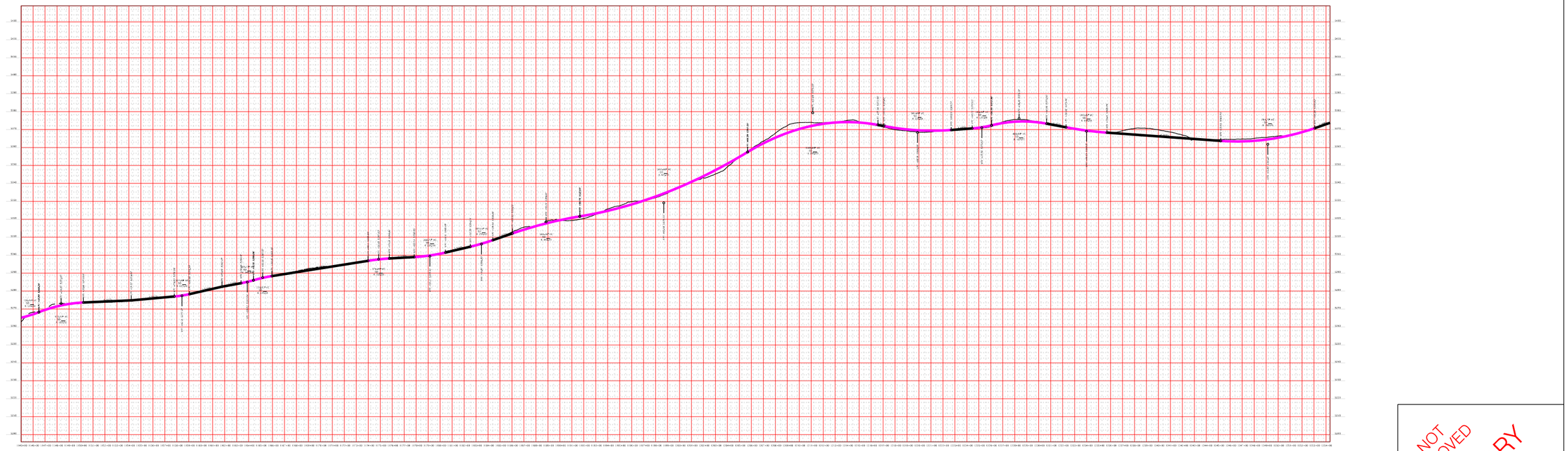
125 0 250 500





REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	WESTWINDS ROAD EXTENSION STUDY	PROJECT NO.		English
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED			220629	OPTION 4	COUNTY
				DETAILED	CADD FILE NAME				KEY NUMBER
				DRAWING CHECKED	DRAWING DATE:				SHEET OF

NOT APPROVED
PRELIMINARY
FOR CONSTRUCTION



REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY	WESTWINDS ROAD EXTENSION STUDY	PROJECT NO.		English
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED			220629	EAST PORTION	COUNTY
				DETAILED	CADD FILE NAME				KEY NUMBER
				DRAWING CHECKED	DRAWING DATE:				SHEET OF

NOT APPROVED
PRELIMINARY
FOR CONSTRUCTION