



DRAFT Design Concept Report

Kolb Road: Sabino Canyon Road to Sunrise Drive



Pima County Department of Transportation

Pima County Project Number 4KSCSD | 06.28.17

DRAFT DESIGN CONCEPT REPORT
KOLB RD.: SABINO CANYON TO SUNRISE DR.

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EXECUTIVE SUMMARY

The Kolb Road, Sabino Canyon Road to Sunrise Drive project (4KSCSD) is located in eastern Pima County, within Sections 17, 18 and 20 of Township 13 South, Range 15 East. The project lies entirely within the jurisdiction of unincorporated Pima County. Figure 1-1, on page 1, shows the project location.

The project consists of widening approximately 1.9 miles of Kolb Road from an existing two-lane roadway to a three-lane (one through lane in each direction and a two-way left turn lane) roadway. At the south end, the project will tie into the Sabino Canyon Road/Kolb Road intersection, which was improved in 2000 (4TSCKR). The north end of the project will tie into the Sunrise Drive intersection, which was improved in 2009 (4SRCRA).

Design Year – 2040

Estimated Construction Cost – \$10,342,000

Funding - \$16,027,000 (includes design and construction engineering, right-of-way, utilities, public art)

Funding Source – Federal (STP) Funds, Pima County Bonds and Tucson Water Contribution

Within the project limits, a length of 1.9 miles from Sabino Canyon Road to Sunrise Drive, Kolb Road has several operational deficiencies due to the lack of turning lanes for the many driveways and side streets, no paved shoulders for motorist or bicycle use, and limited facilities (multi-use path or sidewalks) for pedestrians. One segment of Kolb Road, from Territory Drive to Sunrise Drive experiences a higher than average crash rate due to shopping center access points. The proposed project is needed to increase safety and improve multi-modal connectivity to respond to these deficiencies that exist along Kolb Road.

The purpose of this project is to improve operational conditions and safety through the addition of a center 12-foot two-way left turn lane for motorists. The project will also improve safety and reduce delays by controlling access between Territory Drive and Sunrise Drive and providing a roundabout at the intersection of Territory Drive and Kolb Road. The project will also improve pedestrian mobility, with the addition of sidewalks or pathways and access ramps that meet ADA requirements, and bicycle mobility, through the inclusion of bike lanes/paved shoulders/multi-use lanes. These improvements and features are consistent with the Northeast Area Arterial Study completed in February 2004 for the County by Catalina Engineering.

The design concept development process and alternatives analysis resulted in the following recommendations:

- Reconstruction of the roadway to provide a three lane (one 11-foot through lane in each direction and a 12-foot two-way left turn lane) roadway with six-foot paved shoulders suitable for multiple uses including bicycle use and an automobile emergency area use in each direction
- Addition of retaining walls as needed
- Replacement of guardrails as needed
- Construction of pedestrian facilities
- Construction of drainage improvements (including channels, culverts, stormdrain catch basins and scuppers)
- Reconstruction of the traffic signal at Kolb Road and Snyder Road
- Addition of a single-lane roundabout at Kolb Road and Territory Drive

- Addition or improvement of street lighting
 - from Sunrise Drive to Territory Drive
 - at the Kolb Road and Snyder Road intersection
 - at the Rural Metro Fire Station
- Addition of landscape features, including restorative plantings and irrigation
- Evaluation of noise mitigation
- Evaluation of geotechnical conditions
- Potholing for utilities
- Relocation of utilities as needed

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ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
AB	Aggregate Base
AC	Asphaltic Concrete
ADA	Americans with Disabilities Act
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
AGFD	Arizona Game and Fish Department
APE	Area of Potential Effect
BE	Biological Evaluation
CAC	Community Advisory Committee
CMAR	Construction Manager at Risk
CMP	Corrugated Metal Pipe
CMU	Concrete Masonry Unit
County	Pima County
CWA	Clean Water Act
DCR	Design Concept Report
EAMR	Environmental Assessment and Mitigation Report
EPA	Environmental Protection Agency
ESR	Environmentally Sensitive Roadway
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
HAWK	High Intensity Activated Crosswalk
HERCP	Horizontal Elliptical Reinforced Concrete Pipe
LED	Light Emitting Diode
LOS	Level of service
MBTA	Migratory Bird Treaty Act
MSE	Mechanically Stabilized Earth
MUTCD	Manual on Uniform Traffic Control Devices for Streets and Highways
NCHRP	National Cooperative Highway Research Program
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWP	Nationwide Permit
PAG	Pima Association of Governments
PCDOT	Pima County Department of Transportation
PISA	Preliminary Initial Site Assessment
RCBC	Reinforced Concrete Box Culvert
RCP	Reinforced Concrete Pipe
RDM	Roadway Design Manual
ROW	Right-of-way
RRH	Regulatory Riparian Habitat
SMDDFM	Standards Manual for Drainage Design and Floodplain Management
STP	Surface Transportation Program
SWPPP	Storm Water Pollution Prevention Plans
TIP	Transportation Improvement Program
USFWS	U.S. Fish and Wildlife Service
Waters	Waters of the United States

**CHAPTER 1
PROJECT OVERVIEW**

The Kolb Road, Sabino Canyon Road to Sunrise Drive project (4KSCSD) is located in eastern Pima County, within Sections 17, 18 and 20 of Township 13 South, Range 15 East. The project lies within the jurisdiction of unincorporated Pima County. Figure 1-1 shows the project location.

The project consists of widening Kolb Road from two to three lanes between the intersections of Sabino Canyon Road and Sunrise Drive. The project will also include the addition of bike lanes/paved shoulders/multi-use lanes, sidewalks or pathways for pedestrian use and improvements to drainage. Restorative landscape will also be included in the project.

The project is a part of the PAG 2017-2021 TIP. The TIP ID for this project is 787.00, with funding as follows:

2017 PC Bonds (Design)	\$1,233,000
2018 PC Bonds (Design)	\$1,812,000
2019 PC Bonds (Construction)	\$3,982,000
2019 STP (Construction)	<u>\$8,500,000</u>
Total	\$15,527,000

An additional \$500,000 contribution from Tucson Water is anticipated bringing the total funding to **\$16,027,000**. The project is anticipated to begin construction in Fiscal Year 2019.

Within the project limits, a length of 1.9 miles from Sabino Canyon Road to Sunrise Drive, Kolb Road has several operational deficiencies due to the lack of turning lanes for the many driveways and side streets, no paved shoulders for motorist or bicycle use, and limited facilities (multi-use path or sidewalks) for pedestrians. One segment of Kolb Road, from Territory Drive to Sunrise Drive experiences a higher than average crash rate due to shopping center access points. The proposed project is needed to increase safety and improve multi-modal connectivity to respond to these deficiencies that exist along Kolb Road.

The purpose of this project is to improve operational conditions and safety through the addition of a center 12-foot two-way left turn lane for motorists. The project will also improve safety and reduce delays by controlling access between Territory Drive and Sunrise Drive and providing a roundabout at the intersection of Territory Drive and Kolb Road. The project will also improve pedestrian mobility, with the addition of sidewalks or pathways and access ramps that meet ADA requirements; and bicycle mobility, through the inclusion of bike lanes/paved shoulders/multi-use lanes. These improvements and features are consistent with the Northeast Area Arterial Study completed in February 2004 for the County by Catalina Engineering.

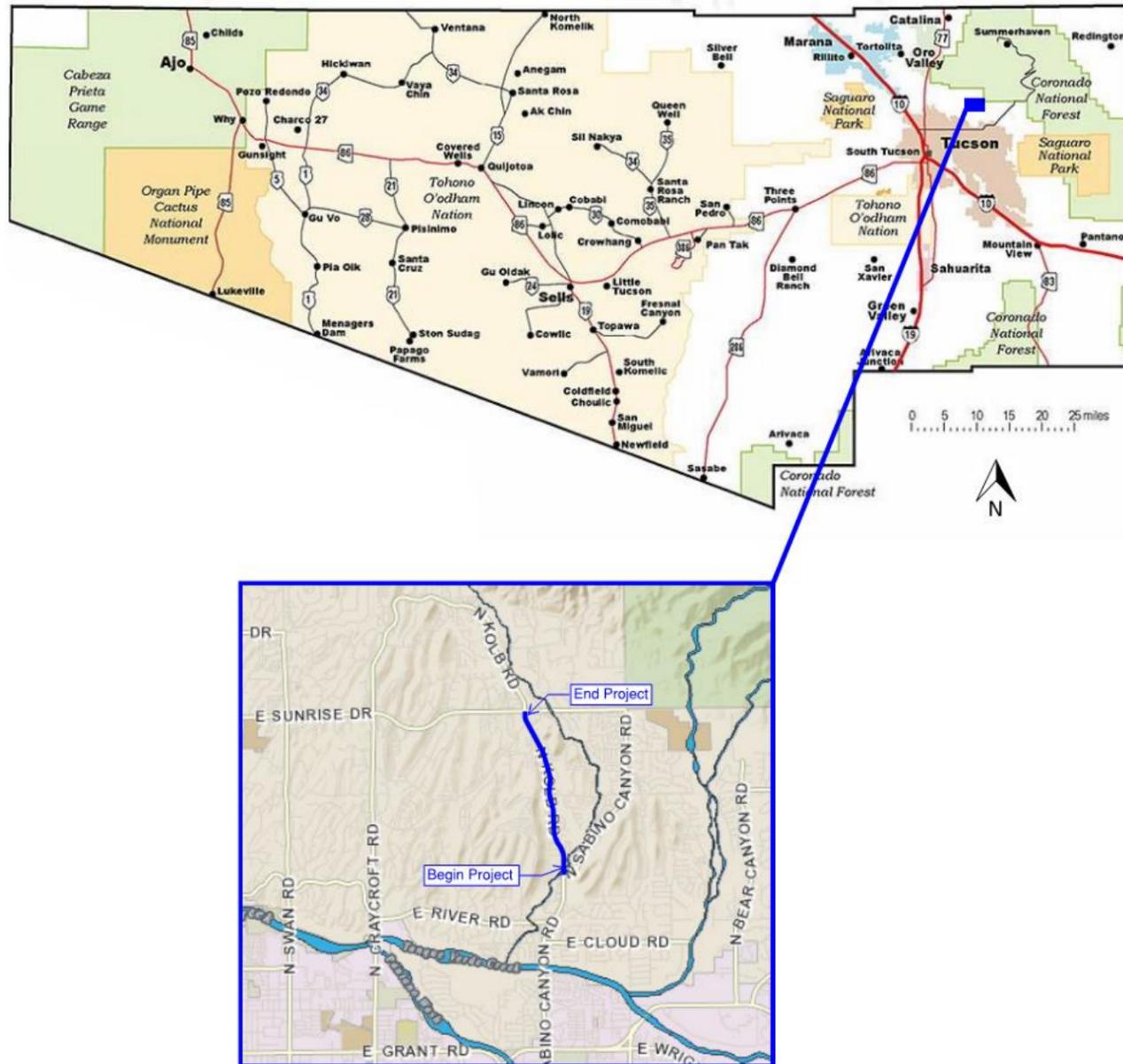


Figure 1-1 – Project Location

**CHAPTER 2
PROJECT DESCRIPTION**

2.1 Project Type, Termini, and Length

This project consists of the widening of the approximately 1.9 miles of Kolb Road between Sabino Canyon Road and Sunrise Drive. The project will widen the existing two lanes to three lanes, and include bike lanes/paved shoulders/multi-use lanes, pedestrian facilities, drainage, restorative landscape, and noise mitigation (if warranted). The project is located in eastern Pima County, in the Northeast corner of the Tucson Metropolitan Area. Figure 1-1 shows the project location.

2.2 Design and Posted Speeds

The design speed for Kolb Road will be 40 mph, with a posted speed of 35 mph.

2.3 Nominal Right-of-Way Width

Kolb Road ROW varies in width; however, it is generally 90 feet wide. There is an existing 35-foot wide utility and slope easement on the east and west sides of Kolb Road for the majority of the corridor. North of Territory Drive, the ROW width is 150 feet. At the south end of the of the project, the Kolb Road ROW width is 150 feet, tapering to 90 feet in width near Clayridge Drive.

The existing ROW along Snyder Road varies between 90 and 145 feet wide to the west of the intersection with Kolb Road and is 150 feet wide to the east of Kolb Road.

No additional new ROW is anticipated as part of the proposed project.

2.4 Roadway Section

The proposed project roadway section will include a three-lane roadway (two lanes in each direction) with a two-way left turn lane, bike lanes/paved shoulders/multi-use lanes and pedestrian facilities. Appendix A-1 shows the proposed typical cross sections for the project.

2.5 Drainage Improvements

Fifteen cross culverts exist which convey stormwater runoff from west to east under Kolb Road. Another eight culverts are located beneath driveways and cross streets which convey flows to the north or south parallel to Kolb Road. The size of these crossings range from a single barrel 24-inch culvert to a three barrel 48-inch culvert and are made of either CMP or RCP. At grade crossings exist near Stations 110+00 and 112+50 and outfall onto private property on the east side of Kolb Road. All other locations where concentrated flows reach Kolb Road are conveyed along the west side of Kolb Road until reaching a culvert crossing. To alleviate at grade crossings, roadside channels will be utilized to convey the flows to the existing cross culvert location near Station 111+00, which discharges onto the Quail Canyon Homeowners Association property currently used for drainage.

Eleven of the existing culverts, including cross culverts and driveway culverts, are inadequately sized to convey the 100-year storm event peak discharge without overtopping onto Kolb Road. Overtopping flows continue to be conveyed downstream across either Kolb Road or the driveway and continue to flow in the same direction. Proposed improvements generally replace CMP with RCP except at two locations where extensions are provided. Improved culverts will provide 100-year capacity under the Kolb Road and its driveways. Existing and proposed culvert locations are summarized in Table 2-1, reflecting culvert sizes and material types. All culvert inlet and outlets will be evaluated for erosion potential and protection provided where necessary.

Roadside channels will be provided to capture and convey flows to nearby crossings where none currently exist to prevent offsite runoff from flowing within the roadway. All channels will be evaluated for erosion potential and protection provided where necessary.

Ventana Canyon Wash is located just south of the project limits and was recently upsized as part of the Sabino Canyon Road (4TSCKR) intersection improvements such that 100-year conveyance is provided beneath Kolb Road in the box culverts. No improvements are proposed at the Ventana Canyon Wash culvert crossing.

Curb and sidewalk or pathways are proposed along much of the project. As a result, stormwater runoff must be captured and conveyed off the roadway at locations where spread limits are exceeded and at superelevation transitions and low points in the roadway profile. Scuppers are proposed along the west side of the roadway where roadside channels are available. Along the east side of the roadway, catch basins and short segments of storm drain discharging to nearby cross culverts are necessary to prevent concentrated discharges onto private properties.

Table 2-1 – Existing and Proposed Culvert Sizes and Material Types

Station	Existing Culvert	Proposed Culvert	Culvert Location
57+75	1-24" RCP	1-24" RCP	Driveway West Side of Kolb Road
59+00	1-24" RCP	1-36" RCP	Driveway West Side of Kolb Road
61+00	N/A	1-19"x30" HERCP	Clayridge Drive
70+00	2-36" CMP	1-10'x4' RCBC	Gambel Circle
74+00	N/A	1-10'x3' RCBC	Pintail Drive
80+45	3-48" CMP	3-48" RCP	Kolb Road
86+52	1-24" CMP	1-24" RCP	Kolb Road
90+00	2-24" CMP	Pipe ext. (Upstream)	Kolb Road
100+50	1-36" CMP	1-36" RCP	Kolb Road
107+25	2-24" CMP	Pipe Ext (upstream)	Kolb Road
111+00	1-36" CMP	3-24" RCP	Kolb Road
114+00	1-36" CMP	1-36" RCP	Kolb Road
115+60	N/A	1-19"x30" HERCP	Driveway West Side of Kolb Road
116+68	N/A	1-19"x30" HERCP	Driveway West Side of Kolb Road
117+50	1-36" CMP	1-36" RCP	Rainbow Canyon Drive
118+00	1-36" CMP	1-36" RCP	Kolb Road
119+38	N/A	1-19"x30" HERCP	Driveway West Side of Kolb Road
120+51	N/A	1-24" RCP	Driveway West Side of Kolb Road
123+00	1-24" CMP	1-24" RCP	Kolb Road
127+00	1-36" CMP	1-24" RCP	Kolb Road
129+50	2-24" CMP	2-24" RCP	Kolb Road
130+27	N/A	1-19"x30" HERCP	Driveway West Side of Kolb Road
131+20	2-24" CMP	2-24" RCP	Kolb Road
133+50	1-24" CMP	1-24" RCP	Kolb Road
135+00	1-24" CMP	2-30" RCP	Driveway East Side of Kolb Road
138+25	N/A	1-19"x30" HERCP	Driveway East Side of Kolb Road
144+25	2-30" CMP	Remain in Place	Driveway West Side of Kolb Road
147+27	2-42" RCP	Remain in Place	Kolb Road
150+00	3-36" CMP	Pipe ext. (upstream)	Kolb Road
151+00	2-30" RCP	Pipe ext. (upstream)	Driveway West Side of Kolb Road
51+50	1-30" CMP	1-19"x30" HERCP	Driveway North Side of Snyder Road

2.6 Utility Impacts

There are numerous utilities running through the project corridor, including sanitary sewer, cable, gas, electric, telephone, water, fiber optic cable and private landscaping irrigation. Most utilities fall within the existing roadway ROW, and as a result may fall beneath the proposed roadway. Utilities will be evaluated for conflicts during design to determine if relocations are necessary.

2.7 Access Control

Access to Kolb Road will be controlled by Pima County permit. No changes to this access control are anticipated as part of the proposed project.

2.8 Proposed Striping, Marking and Signing

Proposed pavement markings and signing will follow the PCDOT and City of Tucson Department of Transportation *Pavement Marking Design Manual* (Second Edition, August 2008), the PCDOT and City of Tucson Department of Transportation *Signing Manual* (2002) and the *MUTCD* (FHWA, 2009 Edition). Roundabout pavement markings and signing will follow the *Roundabouts: An Informational Guide* (NCHRP Report 672, Second Edition) guidelines.

2.9 Signalization and Lighting

There are three existing traffic signals within the project limits, found at the intersections of Kolb Road and Sabino Canyon, Kolb Road and Snyder, and Kolb Road and Sunrise Drive. The signals at Sabino Canyon Road and Sunrise Drive will not be altered due to the project. The signal at Kolb Road and Snyder Road will be modified to fit the proposed geometry and intersection improvements.

The recommended improvements to existing lighting in this project are as follows:

Kolb Road from Sunrise Drive to Territory Drive

New light poles with LED luminaires are proposed to be added to illuminate the roadway and proposed roundabout at the intersection of Kolb Road and Territory Drive. Poles will be in a staggered arrangement, and pole spacing will vary from 120 feet, where the road is 89 feet wide, to 240 feet, where the road is 36 feet wide.

Kolb Road and Snyder Road Intersection

Replace the 250W HPS luminaires on the signal poles with LED luminaires. Consider adding approach lighting by putting a smaller LED luminaire on a light pole on each leg of the intersection, to aid adaptation of drivers' vision.

Kolb Road at the Rural Metro Fire Station

Consider adding LED luminaires on two light poles, one on each side of the fire station driveway. As an alternative, consider adding LED luminaires on two HAWK-style fire station flasher poles.



Existing Kolb Road at Snyder Road

2.10 Landscape

Landscape improvements for this project will consist of irrigated plantings, non-irrigated cacti, native seed mix and inorganic groundcover based on Appendix 4D of the ESR Design Guidelines. Landscape improvements are done for the purpose of native plant mitigation, screening, slope revegetation and/or stabilization and viewshed enhancement. Protected native plants within the ROW have been inventoried and mitigation calculations will proceed as the disturbance footprint is finalized. Mitigation plantings will be used strategically to screen views to the roadway from adjacent residences and enhance significant views of the mountains to the north and south. The landscape palette will include mitigation species, native plant species observed to grow within or near the site and drought tolerant species chosen to complement existing private landscapes within the corridor. The project team will coordinate with the Pima County Native Plant Nursery to salvage cacti within the disturbance limits. Significant quantities of cut slopes are anticipated on the western side of the roadway and slope revegetation will be an important feature of the landscape strategy. The project team will coordinate efforts to employ proven slope revegetation and/or stabilization strategies to ensure timely and aesthetically pleasing results.

In coordination with the Pima County Landscape Architect, all buffelgrass and other invasive plants will be eradicated prior to utility work and construction. Locations of known buffelgrass plants have been documented and will be provided to the Pima County Landscape Architect.

2.11 Public Art

The County is in the process of selecting an artist to complete the public art component of this project. The design team will coordinate with the artist during the development of the project construction documents to incorporate the artwork into the plans.

2.12 Intersection Improvements

The intersection of Kolb Road and Snyder Road will be modified to fit the new roadway geometry; however, the function of the intersection will remain as existing with one lane and a left turn lane in each direction on Kolb Road and one combined through/turn lane in each direction on Snyder Road. Based on the projected volumes, a northbound right turn lane is warranted at the Kolb Road and Snyder Road intersection. However, there are geometric and physical constraints that prohibit the inclusion of a fully developed, standard right turn lane. Traffic analyses show that the intersection will operate efficiently with or without the right turn lane (see Chapter 4).

To potentially help improve safety in the area between Territory Drive and Sunrise Drive, the following improvements are proposed:

- Paved shoulders will be improved by widening.
- Street lighting will be added throughout this segment to improve nighttime visibility.
- A right turn lane and separated bike lane will be provided into the main shopping center driveway (west side) to further delineate traffic ingress and egress at this location.
- The shopping center driveway (west side) access will be restricted to right-in, right-out only; with a raised pork chop median to prohibit left turn movements out of the driveway and to eliminate the left turn conflicts with northbound through traffic on Kolb Road. Drivers wishing to travel north will likely divert to Territory Drive; however, they can also access Sunrise Drive directly. The southern driveway to the businesses on the east side of Kolb Road will operate with a right-in, right-out, left-out configuration.
- The raised median on Kolb Road will be extended past the shopping center driveways to a single-lane roundabout constructed at the intersection of Kolb Road and Territory Drive. The roundabout is proposed based on an anticipated increase in traffic volumes on Territory Drive, which will likely create the need (warrant) for a traffic signal in the future; however, because of the proximity to the signalized intersection of Kolb Road and Sunrise Drive (800 feet north), construction of a traffic signal is not recommended. The roundabout will also slow traffic through the area, and could act as a visual separation between the commercial area near Sunrise Drive and the residential areas to the south.

2.13 Safety Upgrades

There are several safety improvements planned as part of the proposed project. A key goal of the project is to improve operational conditions and safety through the additions of a center two-way left turn lane for motorists, paved shoulders suitable for multiple uses including bicycle use and an automobile emergency area, and sidewalk or pathways for pedestrian use. In addition, the Kolb Road segment between Territory Drive and Sunrise Drive has a crash rate three times higher than the County's average rate (see discussion in Chapter 4). This will be mitigated by implementing the improvements discussed in Section 2.12. Finally, existing guardrail within the project limits will be replaced with new where necessary, and the new guardrail will be designed and specified to meet the latest guidance and standards from the *Manual for Assessing Safety Hardware* (AASHTO, 2nd Edition, 2016).

CHAPTER 3 PROJECT AREA CHARACTERISTICS

3.1 Surrounding Topography and Terrain

Kolb Road skirts the lower slopes of a prominent foothill landform throughout most of the corridor and the terrain in the project area generally slopes from northeast to southwest towards Ventana Canyon Wash. The high point is at the northwest portion of the project at Sunrise Drive. The low point is at the southern end of the project at Ventana Canyon Wash. Intermediate high points are located just north of the intersection of Kolb Road and Snyder Road and at the intersection of Kolb Road and Gate Ridge Road.

3.2 Existing Roadway

The existing intersection of Kolb Road and Sabino Canyon Road consists of two through lanes and a left turn lane in the southbound direction and two through lanes and a u-turn lane in the northbound direction. Sabino Canyon Road has one right turn lane in the northbound direction, where Sabino Canyon Road forks away from Kolb Road. Sabino Canyon Road consists of two left turn lanes and one right turn lane in the westbound direction.

North of the Kolb Road and Sabino Canyon Road intersection, Kolb Road transitions from four lanes to two lanes. There is one left turn bay in the northbound direction onto Little Savannah Lane. The section of Kolb Road between Sabino Canyon Road and Snyder Road has no shoulder once the transition is complete.

The existing intersection of Kolb Road and Snyder Road consists of one through lane in the north and south directions, and one combined through/turn lane in the east and west directions. There are also left turn lanes in the north and south directions.

The existing intersection of Kolb Road and Sunrise Drive consists of one through lane, one left turn lane, one right turn lane, and one bicycle lane in each of the four directions.

The posted speed limit is 35 mph.

There are existing weight restrictions on Kolb Road, signed as follows:

- Sabino Canyon to Snyder Road – No thru commercial vehicles over 18 tons (36,000 lbs)
- Northbound Snyder Road to Sunrise Drive – No thru commercial vehicles over 9 tons (18,000 lbs)
- Southbound Snyder Road to Sunrise Drive – No thru commercial vehicles over 6 tons (12,000 lbs)

There is no backup documentation provided in the ordinances pertaining to the weight restrictions; however, the Pima County Board of Supervisors provided “in the interest of public safety” as reason for the weight restrictions.

3.3 Roadway Geometric Deficiencies

Historical plans and records for the existing geometrics for Kolb Road are either limited or non-existent. As a result, an effort was made to recreate the existing roadway centerline using the collected field survey data. This exercise revealed that the majority of the horizontal curves for the existing roadway do not meet current AASHTO standards with respect to superelevation rates.

3.4 Other Existing Roadway Features

The project area is fully developed and consists primarily of privately owned single family residential homes east and west of Kolb Road. There are multi-family residential units located east of Kolb Road, north and south of Snyder Road and east of Kolb Road as it approaches Sunrise Drive. There are also businesses at the north end of the project as Kolb Road approaches Sunrise Drive. At the south end of the project, there is a fire station (Rural Metro Fire Station 73) east of Kolb Road near Cripple Creek Drive. The numerous intersecting streets, residential and commercial driveways result in more than 50 access points directly to Kolb Road between Sunrise Drive and Sabino Canyon Road.



Rural Metro Fire Station 73

3.5 Existing Right-of-Way

Kolb Road ROW varies in width; however, it is generally 90 feet wide. There is an existing 35-foot wide utility and slope easement that is located on the east and west sides of Kolb Road for the majority of the corridor. North of Territory Drive, the ROW width is 150 feet. At the south end of the of the project, the Kolb Road ROW width is 150 feet, tapering to 90 feet in width near Clayridge Drive.

The existing ROW along Snyder Road varies between 90 and 145 feet wide to the west of the intersection with Kolb Road and is 150 feet wide to the east of Kolb Road. Refer to Appendix A-1 for existing ROW and easement boundaries.

3.6 Drainage Characteristics, Structures and Known Drainage Problems

Stormwater runoff generally originates along the hillsides west of Kolb Road and is conveyed as sheet flow down the slopes. As runoff approaches the roadway, at a few locations, incised channels have formed perpendicular to and along the roadway, which direct flows to nearby cross culverts. Two at grade crossings exist which discharge onto private property near Stations 110+00 and 112+50. Flows will be collected and conveyed to an existing cross culvert located between them that discharges onto Quail Canyon Homeowners Association property.

Near the Arboretum Apartment complex, significant sheet flow off the hillsides north and south of the Snyder Road intersection occurs and is conveyed along the shoulder to nearby cross culverts. The flows in this area are subject to breaking over the roadway and subsequently flow along the east side of the road. Ultimately, any break over flows will reach the same location on the east side of the road as they would have if the flows had remained on the west side and had reached the nearest cross culvert. A particular culvert crossing of interest in this area,

located near Station 90+00, outfalls within the apartment complex. The Kolb Road crossing consists of 2-24" CMPs that appear to extend to a junction structure, identified by a standpipe on Arboretum property, and outfall in a landscaped area to the east. The outfall pipes are partially full of sediment, though should be able to convey the peak 100-year discharge given the available head difference between the inlet and outlet. Peak flows and drainage area shown on the Arboretum Development Plan are similar to the peak flows calculated for this culvert crossing, though the flows calculated for the culvert crossing do not include any stormwater runoff from the apartment complex itself. Additionally, one of the two pipes crossing Kolb Road appears to be intentionally and completely blocked at the inlet. Regardless of potential conflicting discharges and drainage areas shown on plans, the historical flow path is proposed to be maintained pending further discussions with the County.

All stormwater runoff is ultimately conveyed to the Ventana Canyon Wash. The Ventana Canyon Wash flows in a southwesterly direction, crossing under Kolb Road just south of the project limits via a 14 cell box culvert.

Existing cross culverts are primarily corrugated metal pipe and generally in good shape, free of debris and do not have significant sediment deposition. A few crossings however, are damaged or have had significant sediment deposition, limiting their capacity.



Existing Culvert Sedimentation

The Ventana Canyon Wash parallels the corridor to the east of Kolb Road, outside of the defined project area and passes under Kolb Road thru an existing 14 barrel 10-foot x 7-foot RCBC. North of this box culvert and within the project area, there are an additional 14 culvert crossings under Kolb Road and four driveway/side street crossings. Existing pipe sizes range from single barrel 24-inch to three barrel 48-inch culverts. Eleven of the existing culverts are unable to convey the 100-year design storm peak discharge beneath the road and will overtop, spilling across the roadway or resulting in flows along the roadway.

Erosion and rills can be seen throughout the project on the steep slopes on the west side of Kolb Road, along the roadway where stormwater is flowing in the shoulder and on the east side of the roadway where flows cross over Kolb Road. Eroded slopes results in sediment deposition along the roadway, on private property and within culverts. Homeowners experiencing erosion or depositions of sediment on the property perform their own maintenance and have provided rock riprap in an attempt to prevent further erosion and redirect flows away from their residences.

The majority of the cross culverts within the project limits outfall onto private property where no significant or engineered channels exist.



Existing Erosion

3.7 Signalization and Lighting

There are three traffic signals located within the project limits. The signals are located at the intersections of Kolb Road and Sabino Road, Kolb Road and Snyder Road, and Kolb Road and Sunrise Drive.

There is no street lighting along this segment of Kolb Road except for the safety lighting at the signalized intersections listed above and at the unsignalized intersection with Territory Drive.

3.8 Existing Utilities

Existing utilities that can be found within the Kolb Road corridor include sanitary sewer, cable, gas, electric, telephone, water, fiber optic cable and landscaping irrigation. Most utilities fall within the existing roadway ROW, and as a result may fall beneath the proposed roadway. Utility companies located within the project limits are as follows:

- CenturyLink
- Comcast
- Cox Communications
- Level 3
- Pima County Regional Wastewater Reclamation Department
- Southwest Gas
- Tucson Electric Power
- Tucson Water

3.9 Existing Vegetation and Landscape

The project area is located in the foothills of the Santa Catalina Mountains and lies within the Arizona Upland Subdivision of Sonoran Desertscrub. The predominant native tree is foothills palo verde (*Parkinsonia microphylla*) representing 60% of the native plants species inventoried within the ROW. Other tree species present include whitethorn acacia (*Acacia constricta*), blue palo verde (*Parkinsonia florida*) and velvet mesquite (*Prosopis velutina*). Cacti species present include saguaro (*Carnegiea gigantea*), and several types of cholla (*Cylindropuntia* spp.). Ocotillo (*Fouquieria splendens*) is also present. Predominant subshrubs include fairy duster (*Calliandra eriophylla*), brittlebush (*Encelia farinosa*) and triangle-leaf bursage (*Ambrosia deltoidea*). Much of the ROW crosses sloped land that drains quickly; consequently, the vegetation in drainages is not significantly different in species composition and density than surrounding upland. Invasive species, predominantly, buffelgrass (*Pennisetum ciliare*) are present within the ROW.

The project area has significant areas of existing native vegetation. The only areas of constructed landscape are irrigated landscape improvements associated with private development. These are present in the right-of-way in several locations. These are associated with commercial development or residential entry monuments and include plantings, irrigation, boulders and decorative rock. Grouted riprap slopes and landscape lighting are also present in limited locations. Guardrail and retaining walls are present along a significant portion of the eastern ROW where the shoulder slopes away from the roadway. The retaining walls are constructed of a variety of materials including stucco finished CMU block, stacked rock and grouted riprap. Several private residences immediately adjacent to the eastern ROW have planted screening vegetation. The predominant species used for screening is oleander (*Nerium oleander*), a non-native species that is often classified as invasive.



Existing Vegetation and Landscape

3.10 Biological Resources

The project is located within the foothill terrain descending the southern bajada of the Santa Catalina Mountains in the northeastern Tucson Basin. The project limits descend between approximately 2,750 feet elevation at Sunrise Drive at its northern end to approximately 2,560 feet at Sabino Canyon Road. Ventana Canyon Wash, an ephemeral drainage roughly parallels the project limits to the east, then crosses Kolb Road immediately north of Sabino Canyon Road before reaching Tanque Verde Creek about 1.5 miles to south. Within two miles east of the project lies Sabino Creek which issues from Santa Catalina Mountain as Sabino Canyon to join Tanque Verde Creek.

Trees and vegetation that support nesting habitats for birds protected under the MBTA will be affected by construction. As such, tree and vegetation removals will be completed during the non-breeding season (estimated as September 1 – February 28) which will avoid disturbance of migratory bird species. No nests were observed during the biological survey. Desert tortoises have the potential to occur in the project area, so mitigation measures for the contractor and Pima County will be included in the BE. There are RRH areas that cross the project limits. Construction within these areas will be mitigated according to the ESR Design Guidelines, Appendix 4D, Step 3.

3.11 Archaeological and Historic Resources

Record searches showed that no cultural resources had been previously recorded in the project area. Searches of Pima County Assessor online records indicated that most plats adjacent to the project area were not approved for development until the late 20th or early 21st centuries (the earliest plat approval date was 1979). These plats were

therefore not evaluated for historic architectural resources. Parcel information was similarly available for plats absent from online records. A record search of these parcels indicated that two parcels held buildings with construction dates prior to 1972. 4045 N. Sabino Canyon Road includes buildings with a construction date of 1956, and 7225 E. Little Savannah Lane includes buildings with a construction date of 1941. Although these buildings are on parcels adjacent to the project area, the buildings themselves are outside the APE by at least 100 feet. Therefore, these properties were not evaluated for their NRHP eligibility.

3.12 Visual Resources

Kolb Road is designated as a Scenic Route as part of the Pima County Scenic Routes Plan.

Since the route is designated as a scenic route, a Visual Impact Assessment will be conducted using FHWA-HEP-15-019, *Guidelines for the Visual Impact Assessment of Highway Projects* (January 2015).

3.13 Existing Land Use

The land uses within the study area are primarily residential: single family subdivisions, single family homes on one- to five-acre lots, and multiple family buildings. Apartment complexes are located at the southeast corner of the Sunrise Drive and Kolb Road intersection and east of Kolb Road at its intersection with Snyder Road. Vacant residential sites located along Gate Ridge Road will have access to Kolb Road from Gate Ridge Road.

Commercial land use also occurs within the project limits. Bashas' grocery store anchors a group of retail stores and restaurants on the southwest corner of the Kolb Road and Sunrise Drive intersection. A second group of retail stores is located on the southeast corner of the same intersection. One four-acre commercial site located west of Kolb Road and south of Territory Drive has been developed. Rural Metro Fire Station 73 is located across from Cripple Creek Drive.

3.14 Future Land Use

The majority of the land in the northeast part of the Tucson metro area is already developed. There are no major developments planned in the project area.

3.15 Current Zoning

The Pima County Zoning Map shown in Figure 3-1 includes the following land uses and zoning codes:

- CR-1, Single Residence, Single-family residence
- CB-1, Local Business, Indoor retail, residential
- TR, Transitional, High density residential, office and some commercial uses
- SR, Suburban Ranch, Low density rural residential

Most of the existing zoning is Single Residence (CR-1), with some Suburban Ranch (SR) at the northern and southern ends of the study area. The east side of the intersection of Kolb Road with Snyder Road and the intersection of Kolb Road with Sunrise Drive are zoned for Local Business Zone (CB-1) and Transitional (TR).

3.16 Proposed Developments and Traffic Generators

The majority of the land in the northeast part of the Tucson metro area is already developed and there are no major proposed developments in the project area; however, it is reasonable to assume that residual development, combined with the economic recovery and an improved roadway will result in small increases in traffic volumes. For additional information, please refer to the traffic report for this project.

3.17 Potentially Affected Community Facilities

St. Alban’s Episcopal Church, Preschool and Kindergarten is located approximately 0.4 miles south of the intersection of Kolb Road and Sabino Canyon Road. Ventana Vista Elementary School is located approximately 0.9 miles north of the intersection of Kolb Road and Sunrise Drive. No impacts to either of these facilities are anticipated since they are located outside of the construction limits.

Rural Metro Fire Department’s Station 73 is directly adjacent to Kolb Road, near the intersection of Cripple Creek Drive. Close coordination with the Rural Metro Fire Station will occur during construction to ensure 24/7 access.

3.18 Public Lands within the Project Area

Public lands adjacent to the Kolb Road project include nine parcels adjacent to Kolb Road owned by Pima County, totaling approximately 5.03 acres, and detailed as follows:

- 114170890: approx. .52 acres
- 114170900: approx. .82 acres
- 114171030: approx. .59 acres
- 114171230: approx. .56 acres
- 114130740: approx. .53 acres
- 114130730: approx. .58 acres
- 114130720: approx. .56 acres
- 114130710: approx. .46 acres
- 114130700: approx. .42 acres

3.19 Tribal Lands

There are no tribal lands within the project area.

3.20 Intergovernmental and Development Agreements

There are no known intergovernmental or development agreements anticipated for this project.

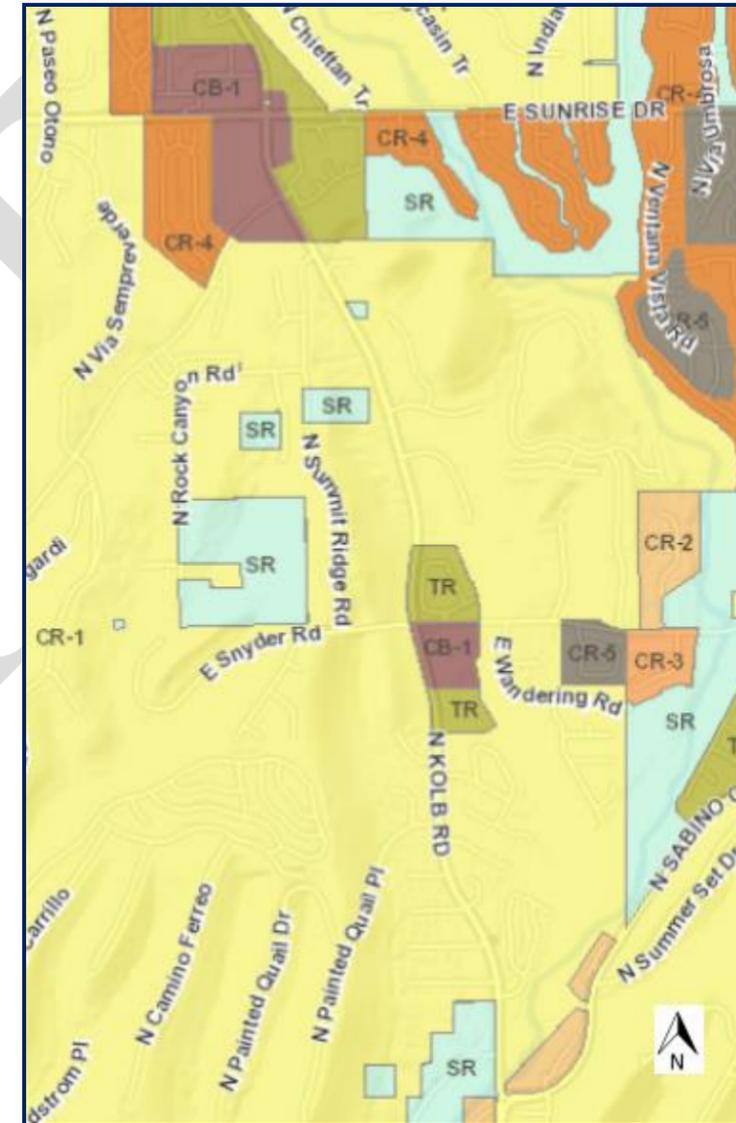


Figure 3-1 – Pima County Zoning Map

CHAPTER 4
TRAFFIC AND ACCIDENT DATA

4.1 Source of Data

The primary source of data is the *Kolb Road, Sabino Canyon Road to Sunrise Drive Final Traffic Engineering Report* (Psomas, May 2017) prepared as part of this project. Additional sources of traffic data referenced in the *Traffic Engineering Report* include:

- *Major Streets Plan* (Pima County, 2015)
- *Scenic Routes Plan* (Pima County, 2015)
- *2013 Quality/Level of Service Handbook* (Florida Department of Transportation, 2013)
- *Highway Safety Manual* (AASHTO, 2010)
- *Pima County Subdivision and Development Street Standards* (Pima County, April 2005)

Pima County provided traffic volume counts for the project area in October 2016. Additional driveway counts were collected by Pima County for this project in March 2017. A speed survey was conducted by Psomas.

4.2 Existing Conditions

Traffic Volumes and Level of Service

Figure 4-1 shows the existing traffic volumes at the study intersections as well as the existing daily volumes in the project area. As seen in the figure, Kolb Road currently carries approximately 11,750 vehicles per day north of Snyder Road and approximately 12,600 vehicles per day south of Snyder Road. Daily volumes on Snyder Road and Territory Drive are significantly lower.

Under existing conditions, all three signalized intersections currently are operating at LOS C or better during the peak hour. Further, all movements at all four study intersections are operating at LOS D or better in the AM peak hour and at LOS C or better in the PM peak hour. Most of the movements are operating at LOS B or better. Intersection LOS and segment LOS are also depicted in Figure 4-1. Note that all roadway segments currently operate at LOS D or better.

Speed Survey

A speed survey was conducted by Psomas to evaluate the prevailing driver speed behavior within the project area. Specifically, speed data was collected for northbound traffic on Kolb Road just north of Sabino Canyon Road. The results of the data collection are shown in Figure 4-2. As seen in the figure, the posted speed limit for Kolb Road throughout the project is 35 mph. According to the speed survey, the 85th percentile speed was 46.2 mph, with the median speed being 40.1 mph. Higher speeds were more common during low volume periods.

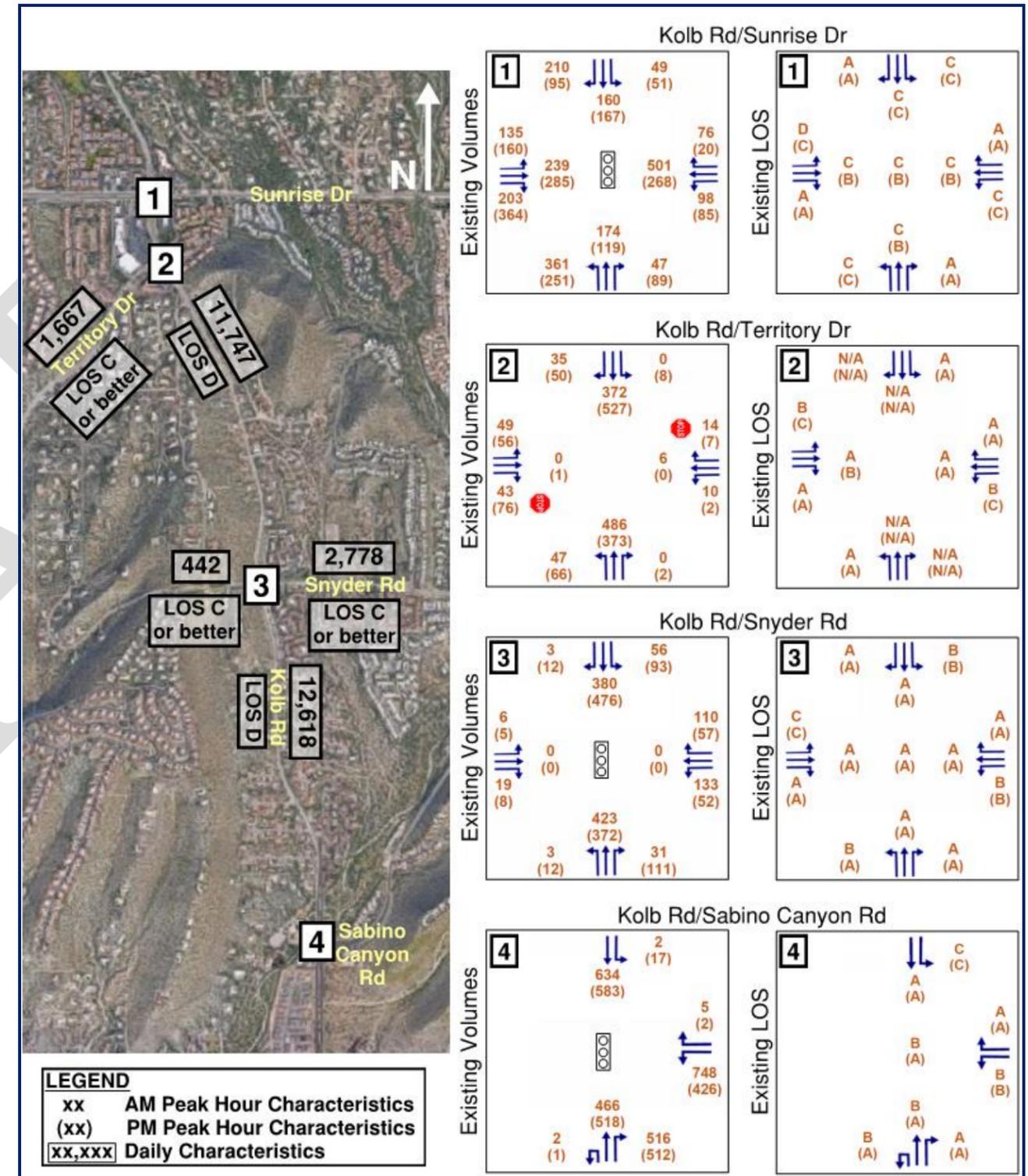


Figure 4-1 – Existing Traffic Volumes and LOS (2016)

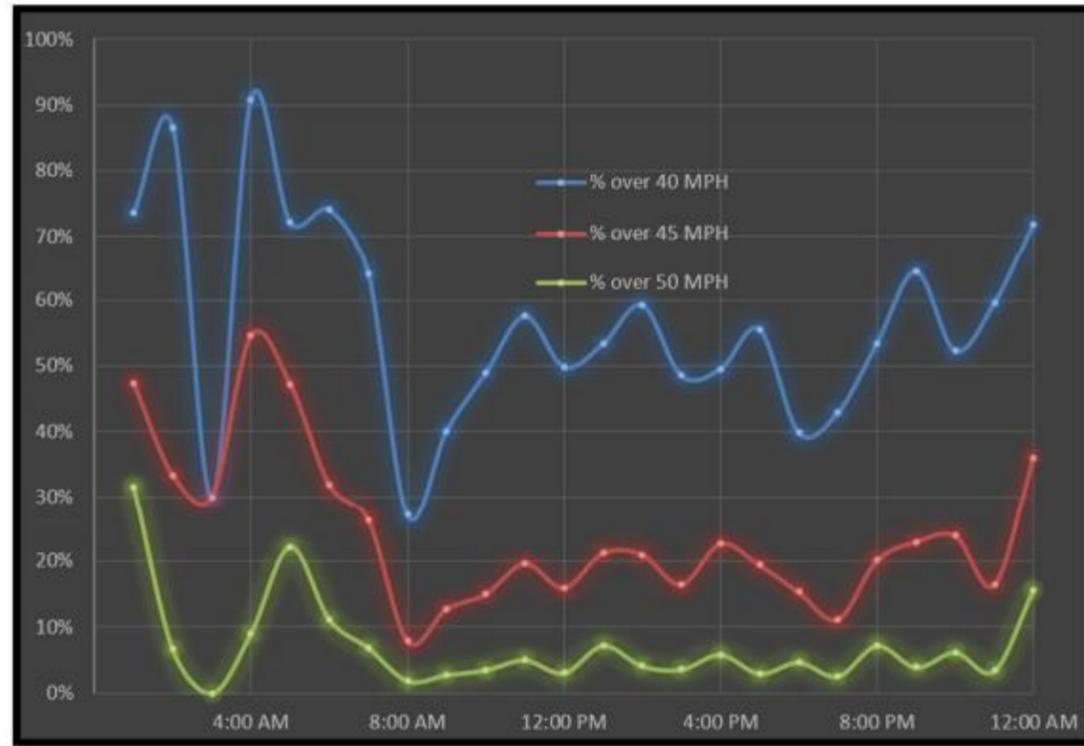


Figure 4-2 – Speed Survey Results

Crash History

Table 4-1 presents the crash data for major signalized intersections within the corridor for the most recent five year period (9/1/2011 to 8/31/2016).

Table 4-1 – Crash Data for Major Signalized Intersections

Intersection with Kolb Road	Fatality	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	Property Damage Only	Total
Sabino Canyon Road	0	1	0	2	8	11
Snyder Road	0	0	1	2	8	11
Sunrise Drive	0	2	1	9	36	48

Table 4-2 presents the crash data for major un-signalized intersections within the corridor for the most recent five year period (9/1/2011 to 8/31/2016).

Table 4-2 – Crash Data for Major Un-signalized Intersections

Intersection with Kolb Road	Fatality	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	Property Damage Only	Total
Territory Drive	0	0	0	0	3	3

Table 4-3 presents the crash data for segments within the corridor for the most recent five year period (9/1/2011 to 8/31/2016).

Table 4-3 – Crash Data for Segments

Kolb Road Segment	Fatality	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	Property Damage Only	Total
Sabino Canyon Rd to Snyder Rd	0	0	2	2	19	23
Snyder Rd to Territory Dr	0	1	1	1	5	8
Territory Dr to Sunrise Dr	0	0	1	3	7	11

Most notably, of the 11 total crashes on Kolb Road between East Sunrise Drive and East Territory Drive, there were six crashes involving drivers exiting the shopping center on the west side of Kolb Road. At least four of the crashes involved drivers making a left turn out of the shopping center; one crash involved a right turn out of the shopping center, and the other is unclear from the data. Although this is a short segment, the crash rate is significantly (three times) higher than the County’s average rate.

4.3 Future Traffic Volumes and Level of Service

PAG maintains a travel demand model that estimates the future volumes for the Tucson metropolitan area. The latest model provides projections for the year 2045, and shows volumes of 13,600 vehicles per day for Kolb Road between Sabino Canyon Road and Snyder Road, and 10,900 vehicles per day for Kolb Road between Snyder Road and Sunrise Drive. These volumes represent annual average growth rates of -0.3% and 0.3% per year, respectively (see Table 4-4). Historic traffic volumes available from PAG are also shown in Figure 4-3, and indicate that volumes have not returned to their pre-recession levels.

Table 4-4 – Segment Existing and Projected Volumes

Kolb Road Segment	Existing (2016) Volume (veh/day)	PAG Projected 2045 Volume (veh/day)	Annual Growth Rate
Sabino Canyon Rd to Snyder Rd	12,618	13,600	0.3%
Snyder Rd to Sunrise Dr	11,747	10,900	-0.3%

While most of the area is already developed, it is reasonable to assume that residual development, combined with the economic recovery and an improved roadway will result in small increases in traffic volumes. Therefore, to be conservative and to provide a consistent estimate throughout the project area, an annual growth rate of 0.5% per year was used for this report. The resulting projected peak hour and daily volumes are shown in Figure 4-4. As seen in the figure, Kolb Road is expected to carry approximately 13,200 vehicles per day north of Snyder Road and approximately 14,200 vehicles per day south of Snyder Road.

Proposed intersection LOS and segment LOS are also depicted in Figure 4-4.

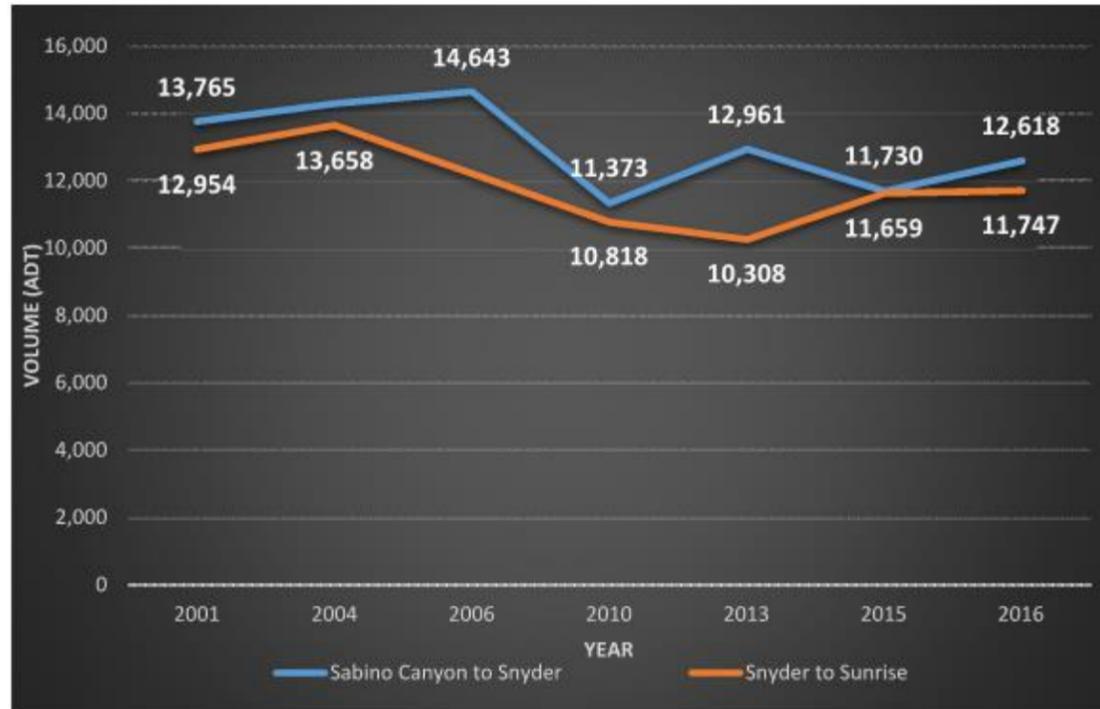


Figure 4-3 – Historic PAG Volumes

4.4 Safety Analysis

A crash safety analysis was conducted for each intersection and for Kolb Road using the Predictive Method for Urban and Suburban Arterials found in the *Highway Safety Manual* (AASHTO, 2010). The predictive method was run for future conditions without the project and with the project. The results are shown below in Table 4-5.

Table 4-5 – Predicted Crashes per Year for Future Conditions

Roadway Segments	2040 without Project	2040 with Project	Percent Reduction with Project
Kolb Rd, Sabino Canyon Rd to Snyder Rd	4.36	3.45	21%
Kolb Rd, Snyder Rd to Territory Dr	2.17	1.58	27%
Kolb Rd, Territory Dr to Sunrise Dr	1.19	0.78	34%
Intersections	2040 without Project	2040 with Project	Percent Reduction with Project
Kolb Rd/Sabino Canyon Rd	2.66	2.66	0%
Kolb Rd/Snyder Rd	2.27	2.27	0%
Kolb Rd/Territory Dr	1.04	0.69	34%
Kolb Rd/Sunrise Dr	4.11	4.11	0%

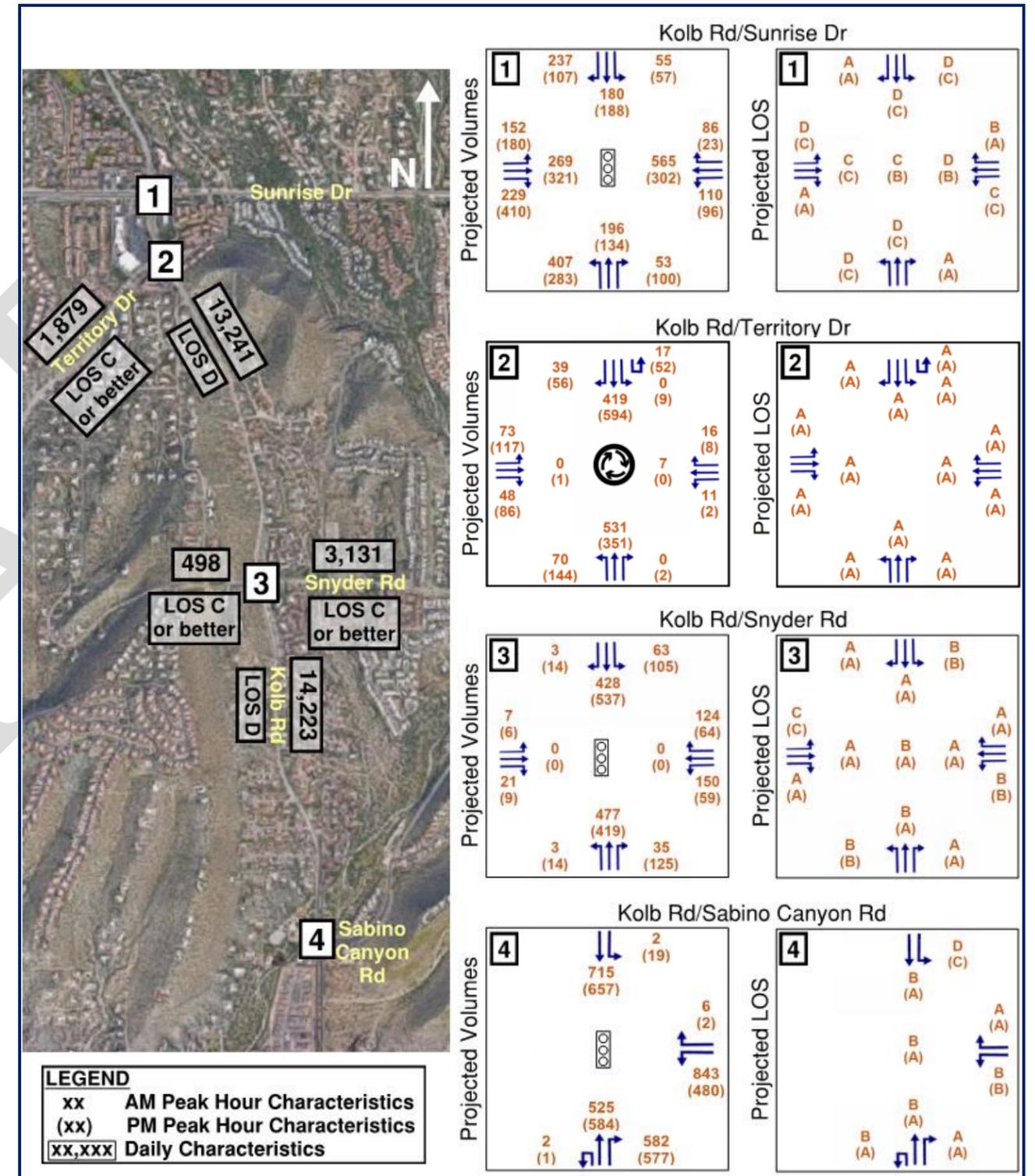


Figure 4-4 – Future Traffic Volumes and LOS (2040)

CHAPTER 5 DESIGN STANDARDS AND CRITERIA

5.1 Design References and Standards

Geometric Standards

Final design and construction documents for the proposed project will be in accordance with the RDM, and *A Policy on Geometric Design of Highways and Streets* (AASHTO, 2011, 6th Edition). Roundabout standards will follow the *Roundabouts: An Informational Guide* (NCHRP Report 672, 2nd Edition) guidelines.

Design Standards

Design standards utilized for the proposed project will primarily be in accordance with the *Standard Specifications for Public Improvements* (PAG, 2014 Edition), the *Construction Standard Drawings* (ADOT, May 2012) and the latest ADOT Bridge Group Structure Details.

Slope Standards

Per the recommendations in the *Geotechnical Engineering Report, Proposed Kolb Road Improvements, Sunrise to Sabino Canyon Rd.* (LMT Engineering, August 21, 2002), standard slopes for the proposed project will be 2:1 for cut slopes throughout the project with the following exceptions:

- Cut slopes of 1:1 are allowable for slope heights less than 10 feet.
- Cut slopes of 0.5:1 are allowable for slope heights less than 4 feet.

Fill slopes constructed using materials derived from roadway cuts or similar materials should be constructed using maximum slopes of 2:1. Fill slopes 2:1 or steeper should consider the use of appropriate slope stabilization methods, such as rip-rap. Note that an updated Geotechnical Engineering Report is being prepared and the slope standards above may change.

Pavement Structure

The pavement structure will be designed following the updated *Modifications to the Pima County Roadway Design Manual* (Adopted 4/29/2016). The Pavement Design Report will include the following:

- A summary of the general geotechnical characteristics of the soil;
- Traffic data considerations being used for the development of the pavement structure;
- Discussion concerning the procedures and results of the pavement structure design;
- Recommended structural sections, including alternatives, with criteria such as cost, construction and other factors considered.

Design Speed

Kolb Road within the project limits is classified as a Low/Medium Volume Arterial in the Pima County Major Streets and Routes Plan. One of the objectives of the Kolb Road project was to closely follow the existing alignment. The existing posted speed is 35 mph. Based on this, a design speed of 40 mph was chosen. This design speed was used for the review of the existing vertical alignments, horizontal alignments and cross slopes, and is in conformance with AASHTO recommendations for urban arterials (30 – 60 mph).

Drainage Design

Drainage design will be in accordance with Section 2.10 of the RDM. Design discharges for cross culverts are calculated using the Pima County Modified Rational method as calculated by the computer program PC Hydro. Design discharges for pavement runoff are calculated using the rational method and a five minute time of concentration.

Culverts will be designed such that the 100-year design storm can be conveyed beneath the roadway and sedimentation potential considered. Consideration for sedimentation potential will be evaluated using equation 11.9 from the City of Tucson SMDDFM.

Channels will be designed to convey the 100-year storm event plus necessary freeboard. Freeboard will be calculated per equation 8.4 from the SMDDFM. Channel velocities will be reviewed and used to determine erosion protection needs for each channel.

Pavement drainage will be designed to maintain a one lane equivalent in each travel direction free from flow during the 10-year storm event and to ensure no more than one foot of flow or ponding within the roadway during the 100-year storm event. Pavement runoff must also be collected before a superelevation transition and at major intersections.

All improvements will be designed such that there is no increase in flood limits, depths or velocities unless drainage improvements to prevent flood damage are provided, or the flood limits are contained within the road right-of-way, or drainage easements are acquired.

Access Control

Access to Kolb Road will be controlled by Pima County permit. There are numerous access points to existing parcels within the project limits. No changes to this access control are anticipated as part of the proposed project.

5.2 Cross Section Elements

The Kolb Road cross section will be designed in accordance with Section 2.3 of the RDM. The proposed cross section will include two 11-foot travel lanes (one in each direction), a 12-foot two-way left turn lane and six-foot bike lanes/paved shoulders/multi-use lanes. A sidewalk or pathway will also be included at specific locations throughout the project. Appendix A-1 shows the typical cross sections for the project.

5.3 Roadway Geometrics

Horizontal Geometrics

Per the RDM, 4% is the maximum rate of super elevation for urban/suburban roadways. Per AASHTO, for a 40-mph design speed, the minimum radius at the specified maximum 4% super elevation rate is 533 feet. With a normal crown, the minimum radius would be 4,770 feet. The minimum horizontal curve length will be 500 feet. Angle breaks of 1°08' or less may be used in lieu of a horizontal curve. Note that the cross slope of Kolb Road at the Snyder Road intersection will be 5%, matching existing, to help mitigate the steep slopes along Snyder Road.

Vertical Geometrics

Per the RDM, for areas in the foothills, the maximum profile grade shall not exceed 7%. The minimum recommended profile grade is 0.5%.

Right-of-Way Width

Kolb Road ROW varies in width; however, is generally 90 feet wide.

The existing ROW along Snyder Road varies between 90 and 145 feet wide west of the intersection with Kolb Road and is 150 wide east of Kolb Road.

CHAPTER 6 MAJOR DESIGN FEATURES

6.1 Introduction

The proposed project will widen approximately 1.9 miles of Kolb Road between Sabino Canyon Road and Sunrise Drive from an existing two-lane roadway to a three lane (one 11-foot through lane in each direction and a 12-foot two-way left turn lane) roadway with six-foot bike lanes/paved shoulders/multi-use lanes in each direction. The major project elements include:

- Reconstruction of the roadway to provide a three lane (one 11-foot through lane in each direction and a 12-foot two-way left turn lane) roadway with six-foot bike lanes/paved shoulders/multi-use lanes in each direction
- Addition of retaining walls as needed
- Replacement of guardrails as needed
- Construction of pedestrian facilities
- Construction of drainage improvements including channels, culverts, storm drain catch basins and scuppers
- Reconstruction of the traffic signal at Kolb Road and Snyder Road
- Addition of a roundabout at Kolb Road and Territory Drive
- Addition or improvement of street lighting
 - from Sunrise Drive to Territory Drive
 - at the Kolb Road and Snyder Road intersection
 - at the Rural Metro Fire Station
- Addition of landscape improvements including plantings and irrigation
- Evaluation of noise mitigation
- Evaluation of geotechnical conditions
- Potholing for utilities
- Relocation of utilities as needed

6.2 Horizontal and Vertical Alignments

The horizontal and vertical alignments for the preferred alternatives are shown in the Initial Design Plans contained in Appendix A-1. All horizontal and vertical curves comply with the proposed design speeds shown in Chapter 5. Development of the alignments were controlled by a number of factors: varied terrain in the project area; existing ROW and slope easement limits; large number of residential driveways on the east side of the road; and the complex vertical geometry of the Kolb Road and Snyder Road intersection, including the need to provide ADA compliant pedestrian crossings. To the extent possible, the alignments closely follow and match the existing geometry and the roadway will be widened mostly to the west.

Horizontal Geometrics

There are eight horizontal curves located within the project limits along Kolb Road with radii ranging from 1350 feet to 9600 feet.

Vertical Geometrics

There are eight sag vertical curves and eight crest vertical curves located within the project limits along Kolb Road. The maximum grade of Kolb Road within the project limits is 7.0% and the minimum grade is 0.5%. These grades are in conformance with AASHTO recommendations and the RDM.

Snyder Road

Snyder Road, west of the Kolb Road intersection has an existing vertical grade of approximately 19% and a grade of approximately 13% east of Kolb Road. Improvements to Snyder Road, west of the intersection, are outside the scope of work of this project and will remain at a 19% downgrade approaching the intersection. East of the intersection, Snyder Road will be reconstructed; however, it will remain a 13% upgrade approaching the intersection.



Existing Kolb Road

6.3 Right-of-Way

No new ROW is anticipated for this project. Drainage easements and/or temporary construction easements are anticipated for this project and will be further defined during final design. Existing ROW, existing parcels with owner's names and anticipated TCE requirements are shown on the Initial Design Plans contained in Appendix A-1.

6.4 Drainage

Offsite stormwater runoff impacting this project primarily originates on the hillsides west of Kolb Road and is conveyed from west to east via cross culverts or at grade crossings. A short distance downstream, flows are discharged into the Ventana Canyon Wash, which is the only FEMA mapped floodplain within the project

vicinity. The Ventana Canyon Wash is located just south of the project limits and is mapped as a Zone AE floodplain per FEMA FIRM Panel 04019C1715L, dated June 16, 2011. Zone AE is defined as a Special Flood Hazard Area subject to inundation by the 1% annual chance flood, also known as the base flood. The proposed improvements will not impact the Ventana Canyon Wash floodplain, therefore will not require mapping revisions.

Twenty-three culverts, including driveway/side street culverts and cross culverts beneath Kolb Road, exist within the project limits excluding the Ventana Wash crossing. Existing culverts vary in size and material, however, the majority are comprised of CMP. Eleven of the cross culverts are inadequately sized to convey the 100-year storm event peak discharge under the roadway. Two at grade crossings exist within the project limits. Proposed improvements will replace all CMP with RCP, except at two locations where existing CMP will be extended. All crossings will also be upsized to provide 100-year conveyance capacity. Existing adequately sized concrete pipe may be extended. Culvert improvements will be provided at 29 locations under proposed conditions.

Stormwater runoff generated within the paved section of roadway is generally allowed to flow freely off the roadway. Where runoff flows to the west side of the roadway, flows concentrate and flow along the shoulder. Flows to the east are generally allowed to freely flow out of the ROW and onto private property. Limited curbing exists along the roadway. Where curb does exist, concrete spillways are typically provided to allow concentrated flows to discharge from the roadway and prevent erosion on the fill slopes. Proposed improvements include curb along both sides of the roadway for the majority of the project and will require scuppers, catch basins and short stormdrain systems to capture stormwater runoff and discharge it from the roadway in order to meet pavement drainage criteria. Scuppers will generally be utilized along the west side of the roadway where roadside ditches are proposed and the scuppers will discharge directly into the ditches. Catch basins will be provided on the east side of the roadway and short stormdrain segments will convey flows to adjacent cross culverts. Opening lengths for each location range from 8 to 28 feet. Large openings are generally required due to steep roadway slopes, 100% capture requirements at intersections and superelevation changes, and to provide a factor of safety for clogging. Two alternatives to reduce the number of openings required were evaluated and included either allowing an additional two feet of spread into the travel lane or increasing the cross slope from 2% to 2.5%. Both alternatives resulted in roughly a 25% reduction in the total number of inlets required and a small reduction in total stormdrain length required was also observed. An additional option of widening the shoulders to allow more capacity was eliminated from further consideration due to geometric constraints.

Erosion protection and energy dissipation will be provided at all culvert and scupper outlets. Proposed roadside channels will be constructed with rock riprap linings to prevent erosion due to high velocities caused by steep slopes and large peak discharges.

6.5 Earthwork Considerations

As discussed in Section 6.2, the project was designed to minimize impacts to adjacent properties. This design philosophy along with the steep side slopes on the west side of the roadway result in an anticipated waste job that will generate approximately 35,000 cubic yards of material.

6.6 Structures

RCBCs, wing walls and head walls, will be in accordance with ADOT SD standards.

Retaining walls will be necessary within the project limits. Preliminarily, there would be a cut retaining wall, such as soil nail or slope cast-in-place, required on the east side of Kolb Road from approximately Foothills View Court to 330 feet to the north. Fill retaining walls, such as MSE or cast-in-place, preliminarily would be required at the following four locations:

- Approximately 280 linear feet of retaining wall south of East Snyder Road on the east side of Kolb Road.
- Approximately 250 linear feet of retaining wall north of Snyder Road on the east side of Kolb Road.

- Approximately 210 linear feet of retaining wall east of Kolb Road on the north side of Snyder Road.
- Approximately 140 linear feet of retaining wall south of Pintail Drive on the west side of Kolb Road

Retaining walls (cast-in-place or masonry) will be ADOT standard. Soil nail walls, slope cast-in-place and MSE walls will be a project specific design.

6.7 Roadway Cross Section and Pavement Design

The roadway cross section for the proposed project is described in Section 5.2 and is in accordance with the requirements of the RDM. Typical sections for the proposed project can be seen in Appendix A-1.

The geotechnical analysis and pavement design is underway. For estimating purposes, the assumed structural section is five inches of AC over eight inches of AB.

6.8 Traffic

Access Control

Between Sabino Canyon Road and Gate Ridge Road (just south of Territory Drive), Kolb Road almost exclusively serves residential properties. There are numerous driveways along this segment of Kolb Road to provide access to those properties, including many which provide access to only one residence. Therefore, it is necessary to provide safe access throughout this segment, which will be accomplished with the addition of a two-way left turn lane.

To provide better access management and help improve safety along Kolb Road from Sunrise Drive to just south of Territory Drive the following is recommended:

- The shopping center driveway (west side) access would be restricted to right-in, right-out only; with a raised pork chop median to prohibit left turn movements out of the driveway and eliminate the left turn conflicts with northbound through traffic on Kolb Road. Drivers wishing to travel north would likely divert to Territory Drive; however, they can also access Sunrise Drive directly. The southern driveway to the businesses on the east side of Kolb Road will operate with a right-in, right-out, left-out configuration.
- The median on Kolb Road would continue past the shopping center driveways with a one-lane curbed roundabout constructed at the intersection of Kolb Road and Territory Drive. The roundabout would include a truck apron to accommodate a WB-60 design vehicle.

Turn Lane Storage

An evaluation of the 95th percentile queues was also conducted for each of the intersections in the study area. The turn lane storage lengths were found to be sufficient at the Kolb Road/Snyder Road and Kolb Road/Territory Drive intersections, but several of the movements at the Kolb Road/Sabino Canyon Road and Kolb Road/Sunrise Drive intersections exceed the existing storage lengths.

The future northbound left turn queue at Sunrise Drive is significantly longer than the available storage (300 feet vs. 180 feet), and falls within the project limits. Therefore, it is recommended that the northbound left turn storage be extended to 300 feet with this project. The queues for the westbound left- and right-turns on Sunrise Drive will also exceed the available storage, but they fall outside of the limits of this project.

Bicycle and Pedestrian Facilities

Six foot shoulders suitable for bicycle use will be provided along Kolb Road.

Pedestrian facilities will be provided on both sides of Kolb Road by an attached sidewalk or pathway from Sabino Canyon Road to Snyder Road and from Gate Ridge Road to Sunrise Drive (see Figure 6-1). Pedestrian facilities will be provided only on the east side of Kolb Road by an attached sidewalk or pathway from Snyder Road to Gate Ridge Road (see Figure 6-2).

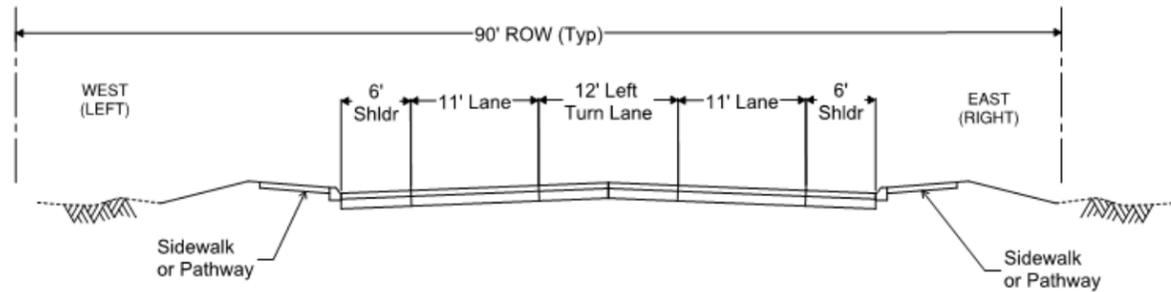


Figure 6-1 – Typical Section with Adjacent Sidewalk or Pathway, Both Sides

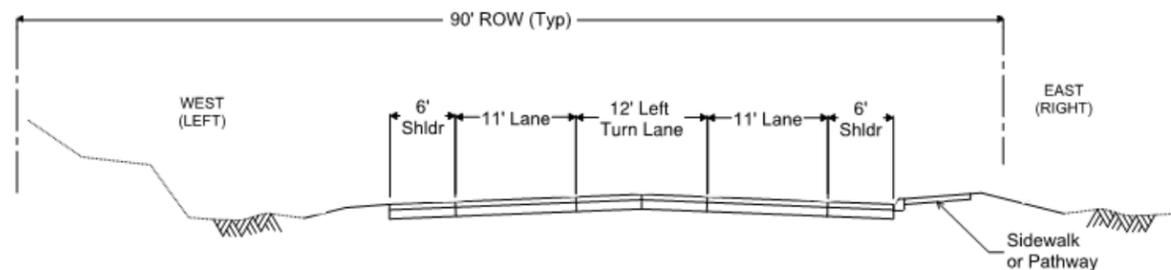


Figure 6-2 – Typical Section with Adjacent Sidewalk or Pathway, East Side Only

Signalization and Lighting

Proposed signalization and lighting facilities are described in Section 2.9.

6.9 Utilities

The utility companies with facilities within the project area have been contacted to obtain record drawing information, prior rights information and to determine the utilities’ future plans within the project area. Coordination will continue through the planning and design process.

At this time, Comcast has indicated no prior rights. Pima County Reclaimed Water Reclamation Department and Tucson Water do not have prior rights; however, they do have separate agreements with Pima County for construction and design funding. Southwest Gas has indicated planned upgrades throughout the project limits and have provided prior rights information.

It is anticipated that utilities may need to be relocated as conflicts with drainage and roadway elements are assessed during the project design. Potholing (between 2 feet and 15 feet deep) of potential conflicts during design is planned and the proposed design will minimize the impacts to utilities where possible.

No seasonal constraints for utility relocations are anticipated at this time since Tucson Water, Tucson Electric Power and Southwest Gas lines are smaller distribution lines within the project limits.

6.10 Construction Issues

No traffic detours for Kolb Road are anticipated. The roadway will be constructed one half at a time with temporary traffic control signs and pavement markings meeting MUTCD guidelines.

In order to construct the vertical alignment of Snyder Road approaching Kolb Road from the east, it may be necessary to provide a short term alternate route for Snyder Road traffic. The east leg of the intersection will be closed and traffic will be routed to Sabino Canyon Road to the east as shown on Figure 6-3.

6.11 Design Exceptions

The vertical alignment of Snyder Road will require a design exception through the Pima County design exception process. In order to tie-in to Snyder Road, east and west of Kolb Road, the proposed vertical alignment, including grades and vertical curve lengths, will require a design exception. In addition, the cross slope of Kolb Road at the Snyder Road intersection will be 5%, matching existing, to help mitigate the steep slopes along Snyder Road.

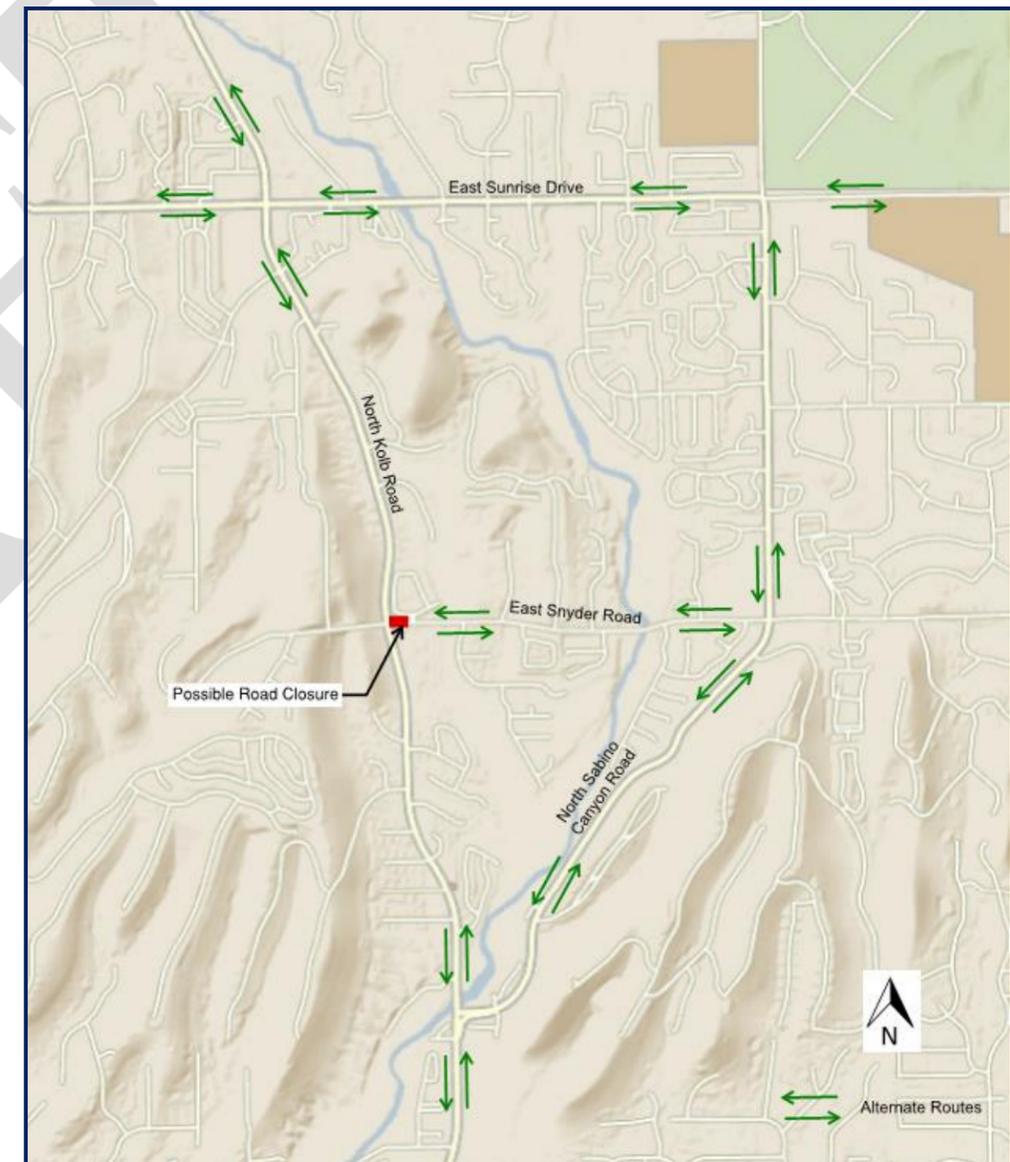


Figure 6-3 – Proposed Snyder Road Alternate Route

CHAPTER 7

SOCIAL, ECONOMIC AND ENVIRONMENTAL CONSIDERATIONS

7.1 Air Quality

The project is located in the Tucson Regional Carbon Monoxide Limited Maintenance Area. The Kolb Road widening from Sabino Canyon Road to Sunrise Drive is listed in the approved PAG 5-Year Regional TIP, 2016-2020, and thus is in conformity with the State Implementation Plan for air quality. The project does not add capacity and is thus exempt from microscale air quality modeling.

7.2 Biological Resources

A BE was prepared to address potential impacts to protected species. The analysis included plants and animals covered under Section 7 of the Endangered Species Act and Arizona Native Plant Law. The report concludes no impacts to Threatened or Endangered species will occur as a result of the project.

Native plant species subject to Appendix 4D of the ESR Design Guidelines and the Arizona Native Plant Law have been identified within the project limits. Plants that are removed will be mitigated per the ESR Guidelines. A Notice of Intent to Clear Land will be filed with the Arizona Department of Agriculture before any Arizona protected plant species are removed from the site.

Washes within the project area feature Important Riparian Areas under the Conservation Lands System. These areas are Pima County protected RRH, as designated by the Pima County Board of Supervisors. Xeroriparian A (Pima Co. Ord. 2005-FC2) habitat crosses Kolb Road and abuts the road from Sabino Canyon Road to Sunrise Drive. Xeroriparian C habitat crosses Kolb Road just south of Sunrise Drive. An Important Riparian Area, characterized by hydroriparian plant communities (IRA-H) crosses Kolb Road just north of Sabino Canyon Road at the Ventana Canyon Wash. Impacts to these areas will require coordination with the Pima County Regional Flood Control District to obtain a Regional Flood Control Permit. If impacts to RRH exceed 1/3 acre, these areas will be mitigated according to the ESR Design Guidelines, Appendix 4D, Step 3. Required mitigation may include on-site mitigation, incorporated in the landscape plans, and/or in-lieu fee.

No wetlands are present in the project area.

Tree and vegetation removal may affect nesting birds protected under the MBTA. Clearing and grubbing up to the ROW are expected on both sides of the roadway. Tree removal is to be completed during the non-breeding season (estimated September 1 – February 28) to avoid disturbance to migratory bird species.

Desert tortoises have the potential to occur in the project area. Anyone working on-site will be required to review the AGFD's "Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects" and will be required to contact the Pima County Department of Environmental Quality in the event that a desert tortoise is encountered.

Various noxious and invasive plants were observed along the outside margin of the shoulder of Kolb Road. Some of the species observed were buffelgrass, oleander (*Nerium oleander*), African sumac (*Rhus lancea*), and saltcedar (*Tamarix ramosissima*). The contractor will inspect and wash all earthmoving equipment before it enters or leaves the construction site in order to limit the introduction and spread of invasive species. The contractor will also comply with the PCDOT's Special Provision 201-3.04, Noxious and Invasive Vegetation.

7.3 Community Resource Impact

Temporary, short term impacts to the community are anticipated during construction, as pedestrians and bicyclists may be directed to short term alternative routes around construction activities. The project will improve pedestrian and bicycle connectivity by constructing new sidewalks and new paved shoulder for motorist and bicycle use on both sides of Kolb Road. Close coordination with the Rural Metro Fire

Station will occur during construction to ensure 24/7 access. No other public services or schools occur within the project limits. Access to commercial business areas will be maintained during construction.

7.4 Hazardous Materials

A PISA was conducted in conjunction with project geotechnical investigations. The PISA prepared by Ninyo and Moore (February 22, 2017) noted the potential for hazardous materials is low due to the adjacent land uses. No industrial activity occurs in the vicinity. There are three dry cleaners adjacent to the project, though only one actually conducts cleaning on site (other two are drop off/pick-up locations). A gas station and auto repair facility are just north and west of the project limits with no records of releases or incidents. The PISA concludes the area is of Low Risk and did not recommend any further investigations. Prior to construction the project will be tested for asbestos containing materials (structural concrete / paint stripes) and lead-based paint (roadway striping).

7.5 Historic/Cultural Resources

The project limits or APE was surveyed for cultural resources on January 20, 2017. The survey area included the existing roadway ROW, slope/utility easements, and potential staging area. The cultural survey work was accomplished through EcoPlan permits from the Arizona State Museum. The APE varies in width from 103 feet to 161 feet. The APE also includes a 610-foot segment of existing ROW for Snyder Road, and portions of existing ROW for cross street Territory Drive and minor cross streets Ventana Drive, Clayridge Drive, Cripple Creek Drive, Gambel Circle, Pintail Drive, Painted Quail Place, Quail Run Drive, and Gate Ridge Road.

No cultural resources were encountered within the APE.

7.6 Neighborhood Impact

This project will not require the acquisition of residential properties or land, and will not displace existing residents. Vehicle access to residences and cross streets will be maintained throughout construction. The project will not impact neighborhoods or reduce access to services.

Positive project-related impacts to neighborhoods will include improved vehicle access along and between Kolb Road and cross streets, as well as improved vehicle traffic flow through the project area. The addition of a roundabout at Territory Drive will alter some commercial use access, however all businesses retain current access points. Public and business notification will need to occur prior to and during construction to limit construction related inconveniences.

7.7 Noise

Sensitive noise receivers are present in the project area including single- and multi-family residences along Kolb Road and cross roads. Some residences have existing privacy walls with various capacities to mitigate noise. Several homes front on Kolb Road with direct driveway access, thus limited opportunity to mitigate any noise impacts. Due to varied elevations of the receivers to the roadway, multiple driveways, and side street access points; mitigation through noise walls is not practical. A project noise analysis will be prepared to determine if residences are impacted and what mitigation options are available. The analysis will be consistent with the PCDOT – *Traffic Noise and Mitigation Guidance for Major Road Projects, Procedure 03-5*.

The project will result in temporary noise impacts during project construction associated with the operation of heavy equipment. During construction the contractor shall comply with the Pima County noise ordinance (Pima County Code Chapter 9.30.070), which sets construction start and stop times to avoid nighttime noise disruptions. If nighttime work is required, the contractor shall obtain a permit from Pima County.

7.8 Water Quality and Clean Water Act

This project will affect jurisdictional Waters. A preliminary jurisdictional delineation was prepared and submitted to the U.S. Army Corps of Engineers for approval. The level of CWA Section 404/401 permitting will be determined following feedback from the Army Corps of Engineers. Preliminary drainage design indicates the work will qualify as a non-notifying NWP #14, Linear Transportation Projects. There were four washes recommended as Waters, however only three would be impacted. Due to the small size of the Waters, and limited project footprint; permanent impacts are expected to be less than 0.10 acres.

The project will disturb more than one surface acre and is thus subject to Section 402 of the CWA. Submittal of an Arizona Pollutant Discharge Elimination System Permit will be required. A Notice of Intent and a Notice of Termination will be prepared and submitted to the ADEQ at the appropriate times. As required by the permit, a SWPPP will be prepared.

7.9 Visual/Aesthetic Resources

Since the route is designated as a scenic route, a Visual Impact Assessment will be conducted using the direction provided by FHWA-HEP-15-029, *Guidelines for the Visual Impact Assessment of Highway Projects* (January 2015). This will be included in the final DCR.



Existing Kolb Road Transition to 2-lanes north of Sabino Canyon

**CHAPTER 8
PUBLIC INVOLVEMENT**

The project team recognizes that conveying and collecting accurate and easy-to-understand information is vital to the public involvement effort and the success of the project. Members of the public are provided with a basic understanding of the project to help them provide input and express their concerns. Public outreach efforts focus on information exchange with the public that affords an opportunity for understanding what is important to the public at an early stage and for seeking ways to respond to citizen issues as an integral part of the design concept process. The following specific strategies will be used in order to involve residents, businesses and other project stakeholders:

- Public open houses
- CAC
- Scoping letters to adjacent property owners
- Project website (<https://webcms.pima.gov/cms/One.aspx?portalId=169&pageId=255052>)

Public Open Houses

A total of two Public Open Houses and one Public Hearing are planned during the development of the project.

CAC

To date, public involvement activities have included the establishment of a CAC and two CAC meetings. The CAC was formed to provide PCDOT with feedback and input during the EAMR process and through the design of the project. CAC meetings were held January 31, 2016 and March 29, 2016. A total of four CAC meetings are scheduled during the development of the project.

The first CAC meeting included a description of the project scope and limits and an introduction to the project approach. A brief overview of current activities of the design team was also included.

The second CAC meeting included a discussion of the preliminary traffic and accident results and the upcoming geotechnical analysis. Sidewalk/pathway and roundabout alternatives were also discussed.

The main concerns of the CAC through the first two meetings include traffic noise, roadway safety, location of pedestrian facilities, existing drainage issues and wildlife concerns.

Project Website

Project information is also available online at <https://webcms.pima.gov/cms/One.aspx?portalId=169&pageId=255052>. Some of the information available includes the project location map and CAC presentations. As project documents are finalized, they will be added to the website. Contact information for the design team is also available on the website.

**CHAPTER 9
AGENCY COORDINATION**

Coordination between Pima County and the design team has been ongoing since the beginning of the project. Progress meetings are held monthly in order to ensure that no design issues are overlooked.

The notice of intent for stormwater discharges will be submitted to ADEQ and ADEQ will issue the authorization number. Construction will not commence until the authorization number is received from ADEQ and the SWPPP has been implemented.

Utilities have been contacted to obtain as-built utility information and to determine utilities' plans within the project area. Coordination will continue through the planning and design process.

Environmental coordination will continue with the following agencies through scoping letters and meetings:

Federal Agencies

- U.S. Army Corps of Engineers
 1. Compliance with Section 404 of the CWA
 2. Section 404 NWP #14 (non-notifying is currently anticipated)
- USFWS – Federal threatened and endangered plant and animal species
- FEMA – Floodplain use or modification
- FHWA – Funding, environmental clearance
- EPA – Sole Source Aquifer coordination

Arizona State Agencies

- ADOT – Local Public Assistance and environmental clearance
- ADEQ – compliance with Sections 401 and 402 of the CWA
- Arizona Department of Agriculture – native plant requirements
- AGFD – sensitive plant and animal species
- State Historic Preservation Office and interested tribes – impacts to cultural resources

Local Government Agencies

- Pima County Cultural Resources and Historic Preservation; Environmental Quality – project coordination
- Pima County Natural Resources Parks and Recreation Department – project coordination
- Pima County Regional Flood Control District - RRH

**CHAPTER 10
ALTERNATIVES**

10.1 Introduction

Two design concept alternatives were developed and evaluated within the project limits as follows:

- Pedestrian Facilities
- Territory Drive to Sunrise Drive Access Management Alternatives

Input to the development of alternatives included Pima County and the CAC.

10.2 Description and Evaluation of Alternatives

Pedestrian Facilities

Existing pedestrian facilities within the project limits are limited. There are short sections of sidewalk at the north end of the project near Sunrise Drive and at the south end of the project near Sabino Canyon Road. The three alternatives for pedestrian connectivity are discussed below.

Alternative 1 – Pedestrian Facilities, West Side Only

Adjacent sidewalks or separated pathways are provided on the west side only (see Figure 10-1). This alternative keeps the east side of the roadway in the same location as the existing roadway and has the least impacts associated with rebuilding the many eastside driveways along the route. This in turn helps to keep construction costs down; however, since the majority of the neighborhoods are on the east side of the roadway, this alternative is not as favorable for pedestrian connectivity.

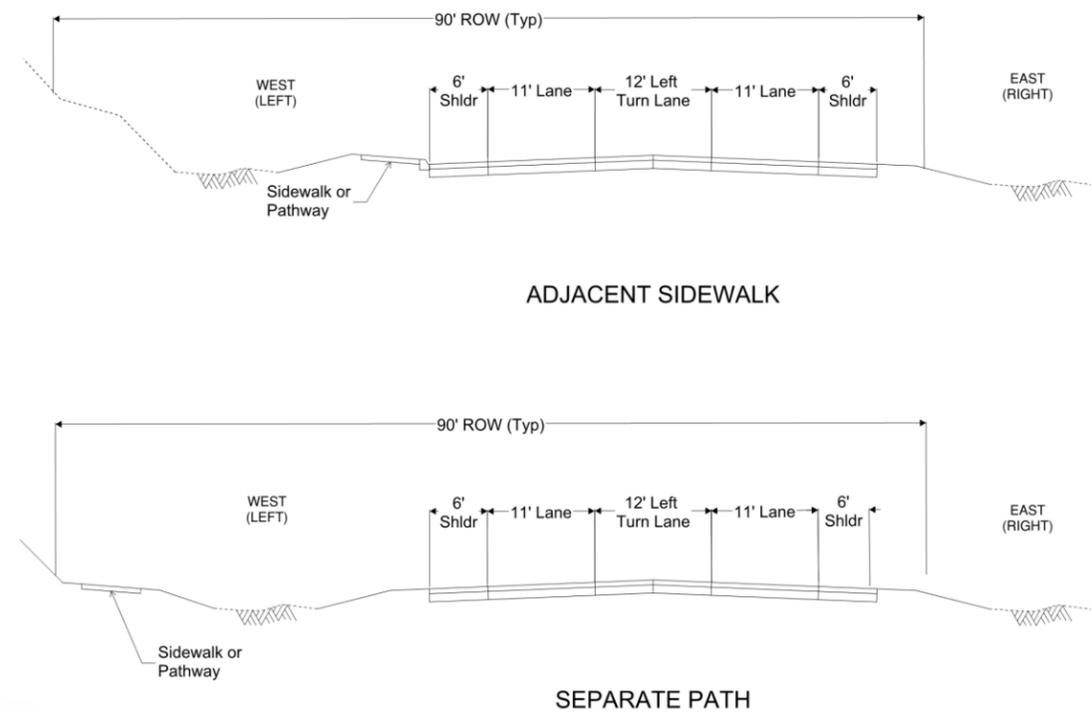


Figure 10-1 – Pedestrian Facilities, West Side Only – Typical Sections

Alternative 2 – Pedestrian Facilities, Continuous on Both East and West Sides

An adjacent sidewalk or pathway is provided throughout the project limits on both sides of Kolb Road (see Figure 10-2). The roadway would be shifted nine-feet farther to the west in order to keep the east side edge of the driveways at about the existing location of the edge of roadway. This reduces the impacts associated with rebuilding the many driveways on the east side of Kolb Road. Of the three alternatives, this one has the widest footprint, plus requires more retaining walls and results in steeper driveways for properties on the west side of the roadway. This alternative also creates a more challenging tie-in at Snyder Road due to the requirement to have ADA accessible cross walks on both the east and the west side of Kolb Road at Snyder Road. Preliminary cost analysis indicated that this alternative was beyond the available budget; therefore this option is not feasible and will not be discussed further.

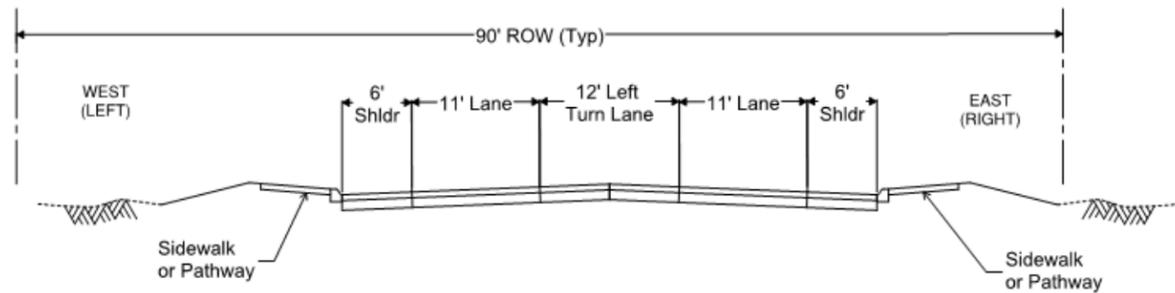


Figure 10-2 – Pedestrian Facilities, Both Sides – Typical Section

Alternative 3 – Pedestrian Facilities, Hybrid

Pedestrian facilities are provided on both sides of Kolb Road by an attached sidewalk or pathway from Sabino Canyon Road to Snyder Road and from Gate Ridge Road to Sunrise Drive (see Figure 10-2). Pedestrian facilities would be provided only on the east side of Kolb Road by an attached sidewalk or pathway from Snyder Road to Gate Ridge Road (see Figure 10-3). The facilities are placed in the areas of highest need. Figure 10-4 shows the concentration of neighborhoods in the project area. Orange highlights are multi-family residential areas, yellow highlights are single-family residential areas and green highlights are larger residential properties. As shown on the figure, the majority of the use is concentrated on the east side of Kolb Road. In this alternative, crosswalks would only be provided on the south and east legs of the Kolb Road at Snyder Road intersection. This allows a better tie-in for the improvements on Snyder Road. The construction costs are between Alternative 2 and Alternative 3.

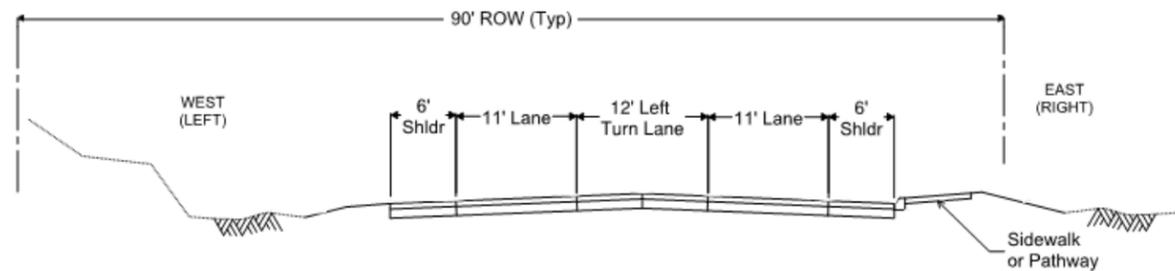


Figure 10-3 – Pedestrian Facilities, East Side Only – Typical Section



Figure 10-4 – Pedestrian User Concentrations

Pedestrian Facilities Recommendation

One of the purposes of the project was to improve pedestrian mobility. All three alternatives met this objective; however, Alternative 3 placed the facilities in the locations of greatest need, while remaining within the project budget. All three alternatives were discussed with the CAC and their recommendation was Alternative 3. Following the CAC meeting, the County and the design team discussed the alternatives, the associated costs and the CAC recommendation and made the recommendation to move forward to final design with Alternative 3.

Territory Drive to Sunrise Drive Access Management Alternatives

As discussed in Chapter 4 and the *Kolb Road, Sabino Canyon Road to Sunrise Drive Final Traffic Engineering Report* (Psomas, May 2017), Kolb Road between Sunrise Drive and Territory Drive, the crash rate is significantly (three times) higher than the County’s average rate. To provide better access management and help improve safety in the area, the following three alternatives were evaluated:

Alternative 1 – Improve shoulders, add lighting, and clarify southbound shared right turn/bike lane

Paved shoulders are widened and a safety edge added (see Figure 10-5). Lighting will be added throughout the segment to improve nighttime visibility. The existing southbound shared right turn/bike lane at the main Bashes’ shopping center driveway may be a source of confusion for drivers. With the project, a right turn lane and separated bike lane will be provided into the main shopping center driveway (west side) to further delineate traffic ingress and egress at this location and minimize confusion. The *Highway Safety Manual* (AASHTO, 2010) analysis shows that the 2040 crash reduction, compared to no project, would be 18% for the segment between Territory Drive and Sunrise Drive. The 2040 crash reduction at the intersection of Territory Drive and Kolb Road would not change. Alternative 1 can be assumed to be the baseline condition as it represents what was already included in the project.



Figure 10-5 – Improve Shoulders and Improve Southbound Shared Right-Turn Lane and Bike Lane

Alternative 2 – Restrict Bashes’ shopping center driveway access to right-in right-out only with a raised pork chop median

In addition to the improvements in Alternative 1, Alternative 2 prohibits left turn movements out of the Bashes’ driveway (see Figure 10-6), eliminating the left turn conflicts with through traffic on Kolb Road. Drivers wishing to travel north would likely divert to Territory Drive, but they can also access Sunrise Drive directly. With additional traffic on Territory Drive, delays for drivers on Territory Drive turning onto Kolb Road would likely increase. Although a signal would likely be warranted, installation is not recommended because of the intersection’s proximity to Sunrise Drive (800 feet). As a result, the eastbound left turn delay at the Territory Drive intersection would increase to approximately 55 seconds. Note that full access would be maintained for the commercial driveway on the east side of Kolb Road. The 2040 crash reduction, compared to no project, would be

34% for the segment between Territory Drive and Sunrise Drive; however, a 6% increase in crashes is also predicted at the intersection of Territory Drive and Kolb Road due to the higher volumes and delays. Costs for this alternative would be slightly higher than Alternative 1 due to the addition of the raised medians; however, delay on Territory Drive would increase significantly.



Figure 10-6 – Restrict Bashes’ Shopping Center Driveway Access

Alternative 3 – Extend the median past the shopping center and add a roundabout at the Kolb Road and Territory Drive intersection

In addition to the improvements in Alternative 1, Alternative 3 extends the median on Kolb Road south past the shopping centers and a single-lane roundabout is proposed at the intersection of Kolb Road and Territory Drive (see Figure 10-7). By extending the raised median, all of the commercial driveways between Sunrise Drive and Territory Drive would operate at right-in right-out only, reducing potential conflicts. The only exception would be to allow left turns out of the southern driveway for the shopping center on the east side of Kolb Road. This is suggested in order to avoid an excessively circuitous route for motorist desiring to head south from this commercial driveway. As with Alternative 2, drivers leaving the west side commercial property would likely divert to Territory Drive for movements other than a right turn to head south of Kolb Road. A single-lane roundabout would minimize delays and improve safety at the Territory Drive/Kolb Road intersection. The roundabout would also slow traffic through the area, provide pedestrian facilities and act as a visual separation between the commercial area near Sunrise Drive and the residential areas further south. The 2040 crash reduction, compared to no project, would be 34% for the segment between Territory Drive and Sunrise Drive. A 33% reduction in crashes is predicted at the intersection of Territory Drive and Kolb Road. Existing ROW is adequate for a roundabout at the intersection of Kolb Road and Territory Drive and there would only be a nominal increase in costs over Alternatives 1 and 2 due to the additional curb and pavement.



Figure 10-7 – Restrict Bashas’ Shopping Center Driveway Access and Construct Roundabout

Territory Drive to Sunrise Drive Access Management Alternatives Recommendation

One of the purposes of the project was to improve traffic operations and safety. Alternative 1 meets this objective with a predicted 18% decrease in crashes for the segment. Alternative 2 shows a higher reduction in crashes for the segment at a 34% decrease; however, predicted crashes are anticipated to rise 6% at the intersection of Territory Drive and Kolb Road. Alternative 3 reduced the predicted crashes for the segment by 34% and reduced the crashes at the intersection by 33%. All three alternatives were discussed with the CAC and their recommendation was Alternative 3 with the roundabout. Following the CAC meeting, the County and the design team discussed the alternatives, the associated costs and the CAC recommendation and made the recommendation to move forward to final design with Alternative 3.

DRAFT

**CHAPTER 11
COST ESTIMATE**

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1090010	Fuel Adjustment Allowance	USD	20,000	\$1.00	\$20,000
2010001	Clearing and Grubbing	L.S.	1	\$50,000.00	\$50,000
2010010	Clearing and Grubbing (Noxious and Invasive Species Control Allowance)	USD	60,000	\$1.00	\$60,000
2020001	Removal of Structures & Obstructions	L.S.	1	\$150,000.00	\$150,000
2030300	Roadway Excavation	C.Y.	52,244	\$10.00	\$522,440
2030401	Drainage Excavation	C.Y.	2,800	\$15.00	\$42,000
3030003	Aggregate Base	C.Y.	11,386	\$30.00	\$341,580
4040111	Tack Coat	TON	13	\$1,200.00	\$15,600
4060001	Asphaltic Concrete (No. 1)	TON	9,188	\$70.00	\$643,160
4060004	Asphaltic Concrete No. 2 (Terminal Mix)	TON	5,710	\$85.00	\$485,350
4060510	Bituminous Material Price Adjustment Allowance	USD	20,000	\$1.00	\$20,000
5011023	Pipe, Reinforced Concrete, Class III,24"	L.F.	5,928	\$75.00	\$444,600
5011033	Pipe, Reinforced Concrete, Class III,30"	L.F.	373	\$95.00	\$35,435
5011043	Pipe, Reinforced Concrete, Class III,36"	L.F.	1,460	\$95.00	\$138,700
5011053	Pipe, Reinforced Concrete, Class III, 48"	L.F.	330	\$110.00	\$36,300
5011223	Pipe, Reinforced Concrete, Class HE III, 19" x 30"	L.F.	290	\$200.00	\$58,000
5014124	Concrete End Section, 24" (ADOT C-13.20)	EACH	2	\$400.00	\$800
5014127	Concrete End Section, 30" x 19" (ADOT C-13.20)	EACH	10	\$500.00	\$5,000
5014136	Concrete End Section, 36" (ADOT C-13.20)	EACH	2	\$500.00	\$1,000
5030084	Sidewalk Scupper (Type 3) (8' Opening)	EACH	7	\$4,500.00	\$31,500
5030085	Sidewalk Scupper (Type 3) (12' Opening)	EACH	12	\$5,000.00	\$60,000
5030086	Sidewalk Scupper (Type 3) (16' Opening)	EACH	9	\$5,500.00	\$49,500
5030087	Sidewalk Scupper (Type 3) (20' Opening)	EACH	15	\$6,000.00	\$90,000
5030088	Sidewalk Scupper (Type 3) (24' Opening)	EACH	3	\$6,500.00	\$19,500
5030089	Sidewalk Scupper (Type 3) (28' Opening)	EACH	3	\$7,000.00	\$21,000
5030714	Catch Basin, Type 3, One 8' Wing, D=8' or Less	EACH	1	\$4,500.00	\$4,500
5030716	Catch Basin, Type 3, One 12' Wing, D=8' or Less	EACH	9	\$5,000.00	\$45,000
5030718	Catch Basin, Type 3, One 16' Wing, D=8' or Less	EACH	6	\$5,500.00	\$33,000
5030720	Catch Basin, Type 3, One 20' Wing, D=8' or Less	EACH	5	\$6,500.00	\$32,500

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
5030726	Catch Basin, Type 3, Two 16' Wings, D=8' or Less	EACH	1	\$10,000.00	\$10,000
5030728	Catch Basin, Type 3, Two 12' Wings, D=8' or Less	EACH	2	\$8,500.00	\$17,000
5030734	Catch Basin, Type 4, Off Road, 1-grate, D=8' or Less	EACH	4	\$4,500.00	\$18,000
5090110	Sewer Manhole, Adjustment	EACH	18	\$1,100.00	\$19,800
510XXXX	Water System Modifications	L.S.	1	\$500,000.00	\$500,000
5150005	Utility Potholing, Depth <12'	EACH	100	\$250.00	\$25,000
5150007	Utility Potholing, Depth ≥12'	EACH	25	\$350.00	\$8,750
5150101	Utility Impact Allowance	USD	60,000	\$1.00	\$60,000
5150103	Miscellaneous Utility Relocation Allowance (Tucson Water)	USD	25,000	\$1.00	\$25,000
6010161	Box Culvert 1	L.S.	1	\$120,000.00	\$120,000
6010162	Box Culvert 2	L.S.	1	\$80,000.00	\$80,000
6010220	Concrete Retaining Wall (ADOT Std. Dwg. SD-7.01)	S.F.	5,415	\$50.00	\$270,750
6016087	Pipe Culvert Headwall	EACH	26	\$5,000.00	\$130,000
607XXXX	Signing	L.S.	1	\$50,000.00	\$50,000
6200001	Soil Nailing	S.F.	2,040	\$75.00	\$153,000
6200002	Soil Nailing, Architectural Treatment	S.F.	1,730	\$5.00	\$8,650
6200003	Soil Nailing (Drainage Swale)	L.F.	380	\$30.00	\$11,400
7010001	Maintenance and Protection of Traffic	L.S.	1	\$350,000.00	\$350,000
7010007	Construction Area Elements (Predetermined Reimbursement Rate Allowance)	USD	175,000	\$1.00	\$175,000
704XXXX	Pavement Markings	L.S.	1	\$50,000.00	\$50,000
731XXXX	Signals and Roadway Lighting	L.S.	1	\$350,000.00	\$350,000
803XXXX	Landscape & Irrigation	L.S.	1	\$400,000.00	\$400,000
8100001	AZPDES/NPDES(Original)	L.S.	1	\$200,000.00	\$200,000
8100012	AZPDES/NPDES Allowance (Modified)	USD	50,000	\$1.00	\$50,000
9010001	Mobilization	L.S.	1	\$800,000.00	\$800,000
9050001	Guard Rail, W-Beam, Single Face	L.F.	1,735	\$17.00	\$29,495
9050020	Guard Rail Terminal (SKT 350)	EACH	2	\$5,000.00	\$10,000
9080001	Concrete Curb (Std. Dtl. 209) (Type 1)	L.F.	18,653	\$15.00	\$279,795
9080006	Concrete Wedge Curb (Std. Dtl. 209)	L.F.	227	\$25.00	\$5,675
9080090	Concrete Curb Terminal Section (Std. Dtl. 212)	EACH	33	\$150.00	\$4,950

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
9080112	Concrete Curb Transition (Std. Dtl. 210)	L.F.	120	\$30.00	\$3,600
9080201	Concrete Sidewalk	S.F.	81,696	\$4.00	\$326,784
9080280	Curb Access Ramp, Std. Dtl. 207 (Type 1)	EACH	6	\$1,500.00	\$9,000
9080281	Curb Access Ramp, Std. Dtl. 207 (Type 2)	EACH	27	\$1,600.00	\$43,200
9080282	Curb Access Ramp, Std. Dtl. 207 (Type 3)	EACH	6	\$1,800.00	\$10,800
9080285	Median Refuge Area (Type 1)	EACH	4	\$1,200.00	\$4,800
9080297	Concrete Sidewalk Ramp, Type D (C-05.30)	EACH	2	\$1,500.00	\$3,000
9080305	Concrete Driveway Apron	S.F.	4,775	\$6.00	\$28,650
9080402	Concrete Header	L.F.	725	\$15.00	\$10,875
9090021	Survey Monument, Frame and Cover	EACH	40	\$325.00	\$13,000
9100033	Concrete Half Barrier (Type F) (32") (With Gutter)	L.F.	175	\$160.00	\$28,000
913XXXX	Permanent Erosion Control	L.S.	1	\$200,000.00	\$200,000
9170001	Embankment Spillway	L.F.	120	\$85.00	\$10,200
9260001	Engineer's Field Office	L.S.	1	\$50,000.00	\$50,000
9300100	Incidental Items Allowance	USD	400,000	\$1.00	\$400,000
9330008	Handrail (Std. Dtl. 105) (Standard Lower Rail Location)	L.F.	1,500	\$25.00	\$37,500

SUBTOTAL VALENCIA ROAD CONSTRUCTION COST	\$8,848,139
CONTINGENCIES (~15%)	\$1,493,861
TOTAL VALENCIA ROAD CONSTRUCTION COST	\$10,342,000
RIGHT-OF-WAY ACQUISITION COST	\$290,000
UTILITY RELOCATION COST (PRIOR RIGHTS)	\$375,000
PUBLIC ART	\$100,000
DESIGN COST	\$3,170,000
CONSTRUCTION ADMINISTRATION COST	\$1,750,000
PROJECT TOTAL	\$16,027,000

**CHAPTER 12
BUDGET CONSIDERATIONS**

The estimated project cost is \$16,027,000 (See Chapter 11 for an itemized breakdown). The project is programmed in the PAG 2017-2021 TIP as project number 787.00. Financing for the Kolb Road project will come from federal (STP), local (Pima County Bond) funds and an estimated Tucson Water contribution for water facility relocations as shown below:

Funding Source	Funding
Estimated Federal (STP) Funds	\$ 8,500,000
Estimated Local (Pima County Bonds) Funds	\$ 7,027,000
Estimated Tucson Water Contribution	\$ 500,000
TOTAL	\$16,027,000

Kolb Road is also identified in the *2045 Regional Mobility and Accessibility Plan* published by PAG. The segment from Sabino Canyon Road to Sunrise Drive (ID# 437.03) is proposed for the early period (2016-2025).

CHAPTER 13 DELIVERY METHOD

Historically, Pima County has delivered their projects through the Design-Bid-Build process. The Kolb Road project will be delivered using this method. Since this project is predominately a roadway widening project and would not be considered a particularly complex project, there are few opportunities to take advantage of an alternate delivery method such as CMAR or Design/Build; therefore, the Design-Bid-Build delivery method would most likely result in a lower construction cost.

CMAR is typically useful in taking advantage of the contractor's perspective to review and comment on the design. CMAR is typically used on complex projects, on projects that are schedule driven, or when an agency would like to award the contract based on qualifications and is not as concerned with costs, although a guaranteed maximum price is negotiated. Partnering is a key to this delivery method.

The Design/Build delivery method can be used to award the contract based on qualifications or based on costs. This method provides some advantages such as awarding the design and construction contract to one firm, providing opportunities for potential costs savings and schedule reductions, and obtaining an early knowledge of actual contractor project costs. The design contract for this project has already been awarded, so it is unlikely that this delivery method would be used.

CHAPTER 14 RECOMMENDATIONS AND CONCLUSIONS

This DCR describes the recommended design for widening Kolb Road from Sabino Canyon Road to Sunrise Drive. The project fulfills the purpose and need of increasing safety and improving multi-modal connectivity by:

- Improving operational conditions and safety through the addition of a center 12-foot two-way left turn lane for motorists.
- Improving safety and reducing delays by controlling access between Territory Drive and Sunrise Drive and providing a single-lane roundabout at the intersection of Territory Drive and Kolb Road.
- Improving pedestrian and bicycle mobility through the addition of sidewalks and multi-use lanes for bicycle access.

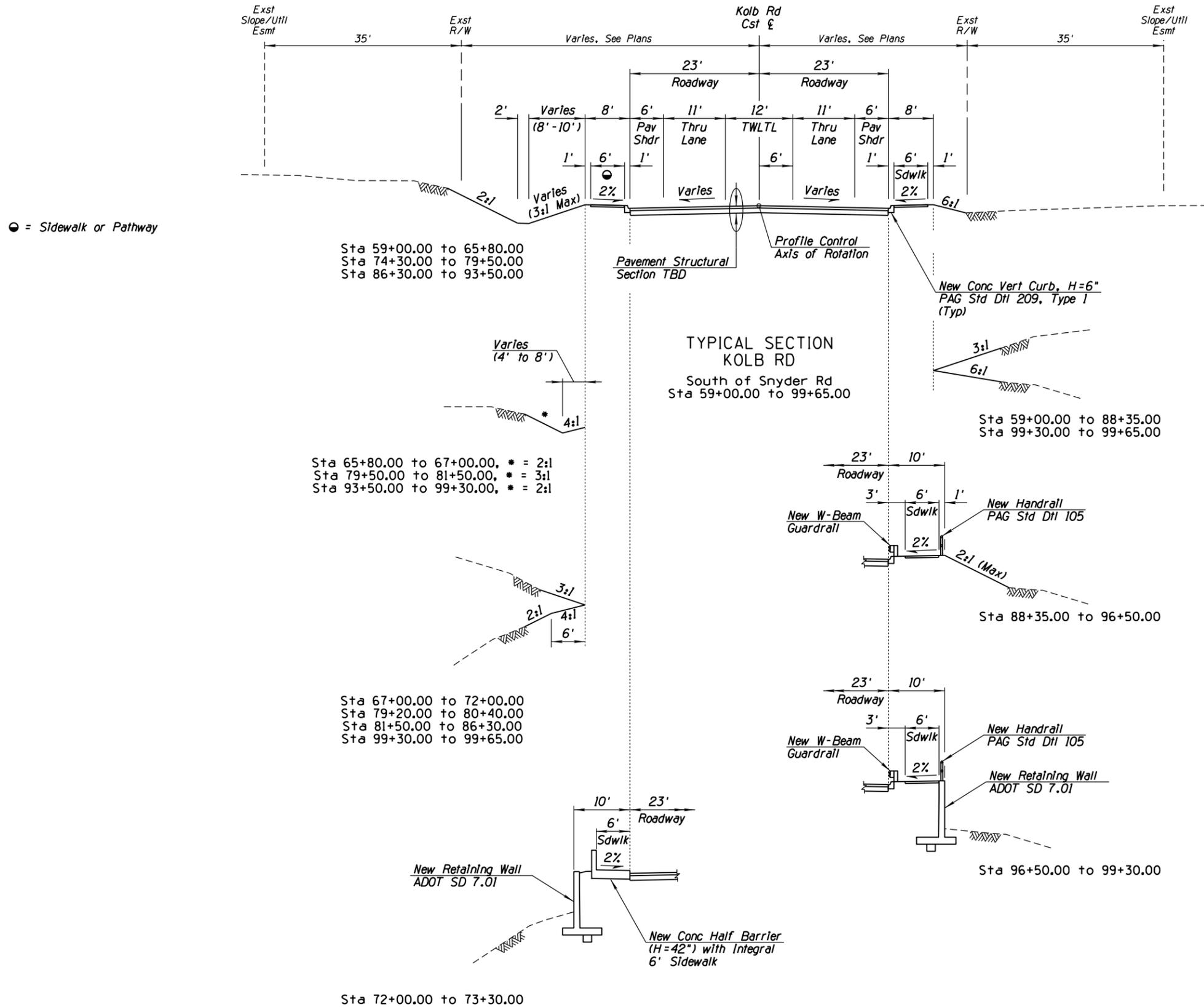
The design concept development process and alternatives analysis resulted in the following recommendations:

- Reconstruction of the roadway to provide a three lane (one 11-foot through lane in each direction and a 12-foot two-way left turn lane) roadway with six-foot paved shoulders suitable for multiple uses including bicycle use and an automobile emergency area in each direction
- Addition of retaining walls as needed
- Replacement of guardrails as needed
- Construction of pedestrian facilities
- Construction of drainage improvements (including channels, culverts, stormdrain catch basins and scuppers)
- Reconstruction of the traffic signal at Kolb Road and Snyder Road
- Addition of a single-lane roundabout at Kolb Road and Territory Drive
- Addition or improvement of street lighting
 - from Sunrise Drive to Territory Drive
 - at the Kolb Road and Snyder Road intersection
 - at the Rural Metro Fire Station
- Addition of landscape features, including plantings and irrigation
- Evaluation of noise mitigation
- Evaluation of geotechnical conditions
- Potholing for utilities
- Relocation of utilities as needed

DRAFT

APPENDIX A-1
INITIAL DESIGN PLANS

NOTE: PAVEMENT SECTIONS TO BE INCLUDED UPON COMPLETION OF PAVEMENT DESIGN REPORT



● = Sidewalk or Pathway

PRISCILLA S. CORNELIO, P.E., DIRECTOR

Date	5/17
Designed	M. ASHBY
Drawn	M. ASHBY
Checked	K. THORNTON
Proj. Engr.	K. THORNTON

No.	Revision Description	Engineer	Date

Initial Design
Phase Plans
Design Review
NOT FOR
CONSTRUCTION
OR RECORDING

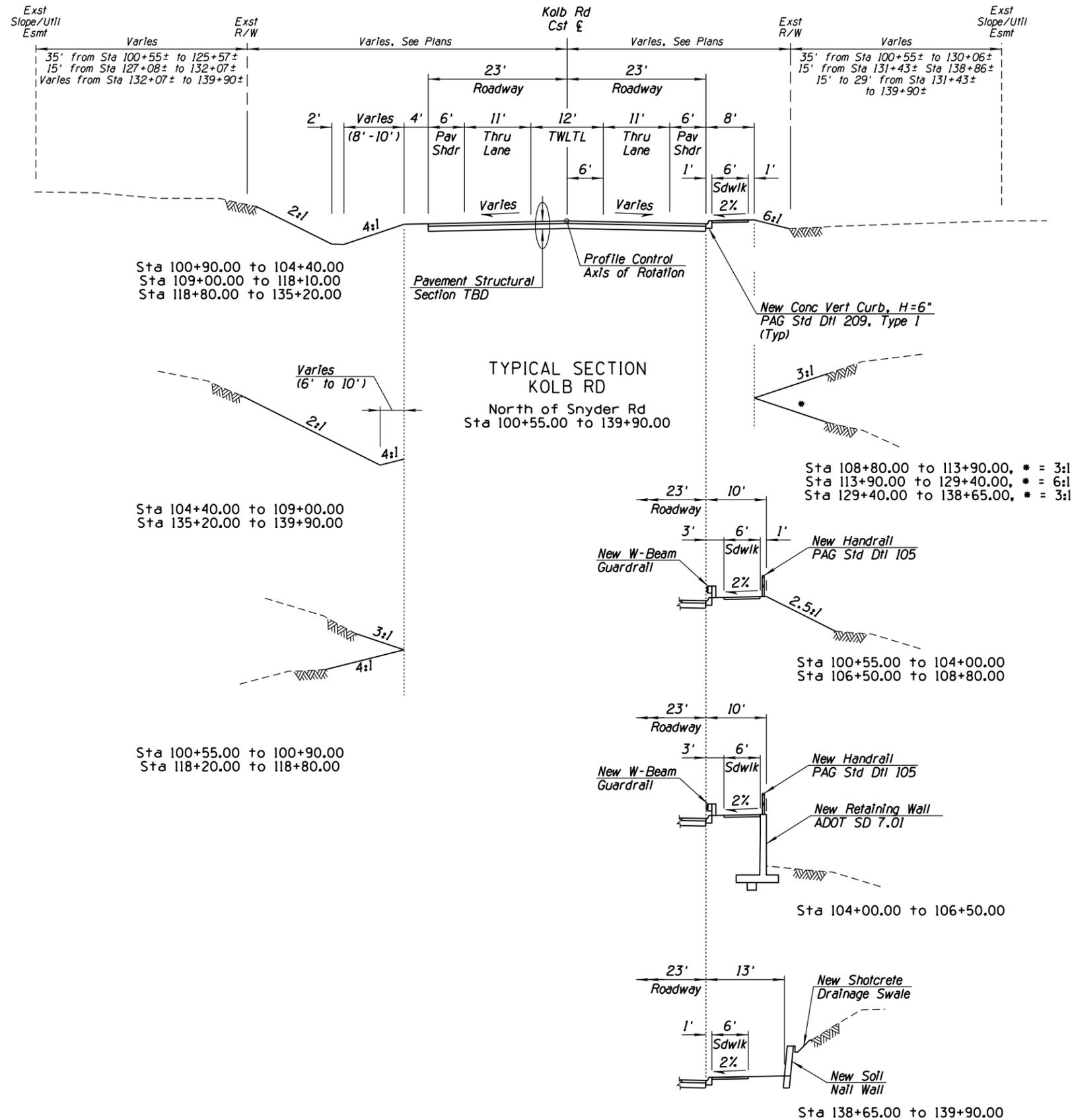
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(520) 292-2300 (520) 292-1290 fax
www.psomas.com

TYPICAL SECTIONS
FOR
KOLB ROAD
SABINO CANYON ROAD TO SUNRISE DRIVE
Kolb Road

PIMA COUNTY DEPARTMENT OF TRANSPORTATION



NOTE: PAVEMENT SECTIONS TO BE INCLUDED UPON COMPLETION OF PAVEMENT DESIGN REPORT



TYPICAL SECTION
KOLB RD
North of Snyder Rd
Sta 100+55.00 to 139+90.00

PRISCILLA S. CORNELIO, P.E., DIRECTOR

Date	5/17
Designed	M. ASHBY
Drawn	M. ASHBY
Checked	K. THORNTON
Proj. Engr.	K. THORNTON

No.	Revision Description	Engineer	Date

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Phase Plans
Design Review
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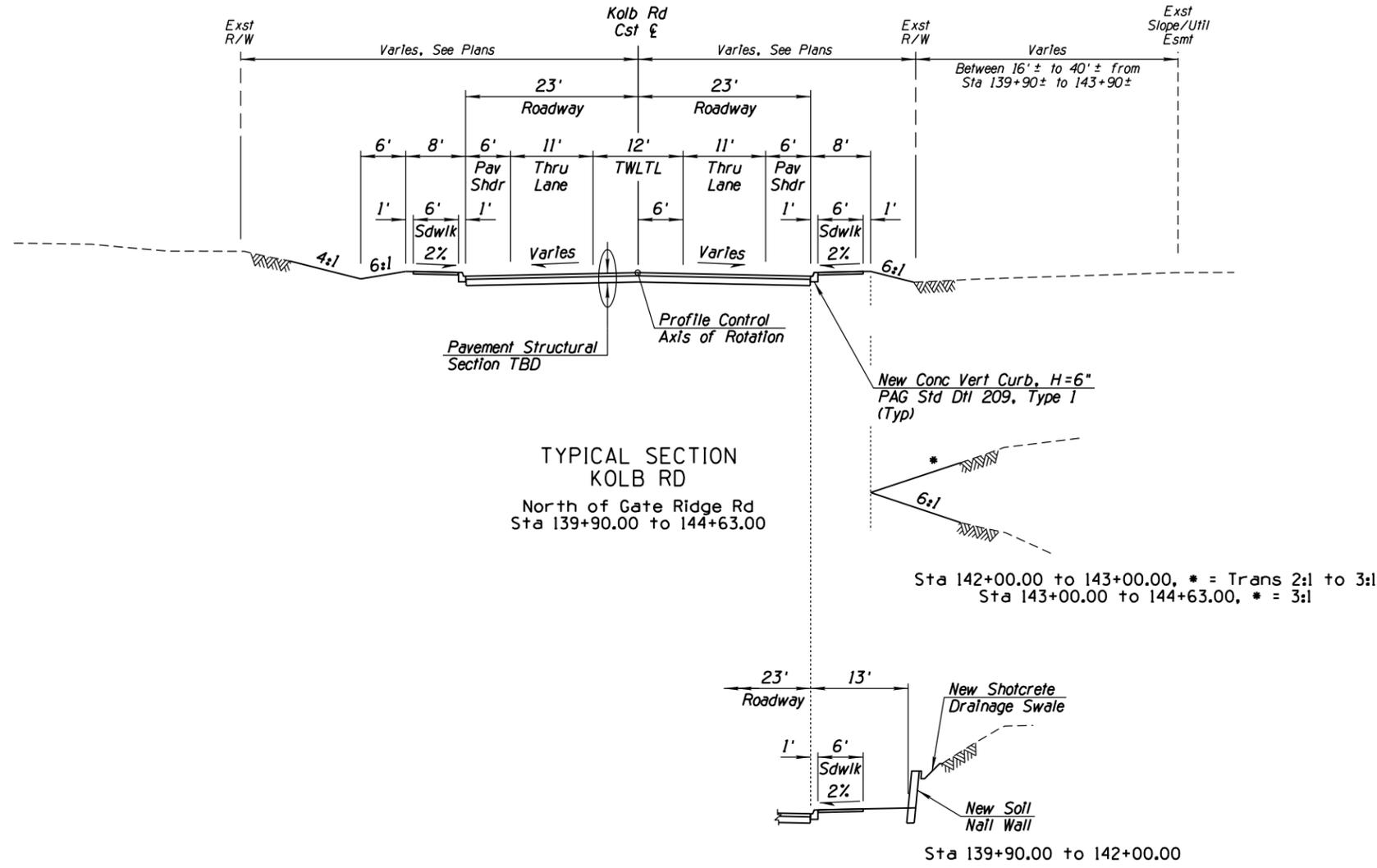
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TYPICAL SECTIONS
FOR
KOLB ROAD
SABINO CANYON ROAD TO SUNRISE DRIVE
Kolb Road

PIMA COUNTY DEPARTMENT OF TRANSPORTATION



NOTE: PAVEMENT SECTIONS TO BE INCLUDED UPON COMPLETION OF PAVEMENT DESIGN REPORT



TO BE PROVIDED WITH FINAL DESIGN PHASE PLANS
 For key roundabout parameters and dimensions,
 see roadway plan and profile Sheet RP11 (Page 15).

TYPICAL SECTION
 KOLB RD ROUNDABOUT AT TERRITORY DR
 Roundabout Approaches & Circulatory Roadway

PRISCILLA S. CORNELIO, P.E., DIRECTOR

Designed	M. ASHBY	Date	5/17
Drawn	M. ASHBY	Checked	K. THORNTON
Proj. Engr.	K. THORNTON		

No.	Revision Description	Engineer	Date

Initial Design Phase Plans Design Review NOT FOR CONSTRUCTION OR RECORDING

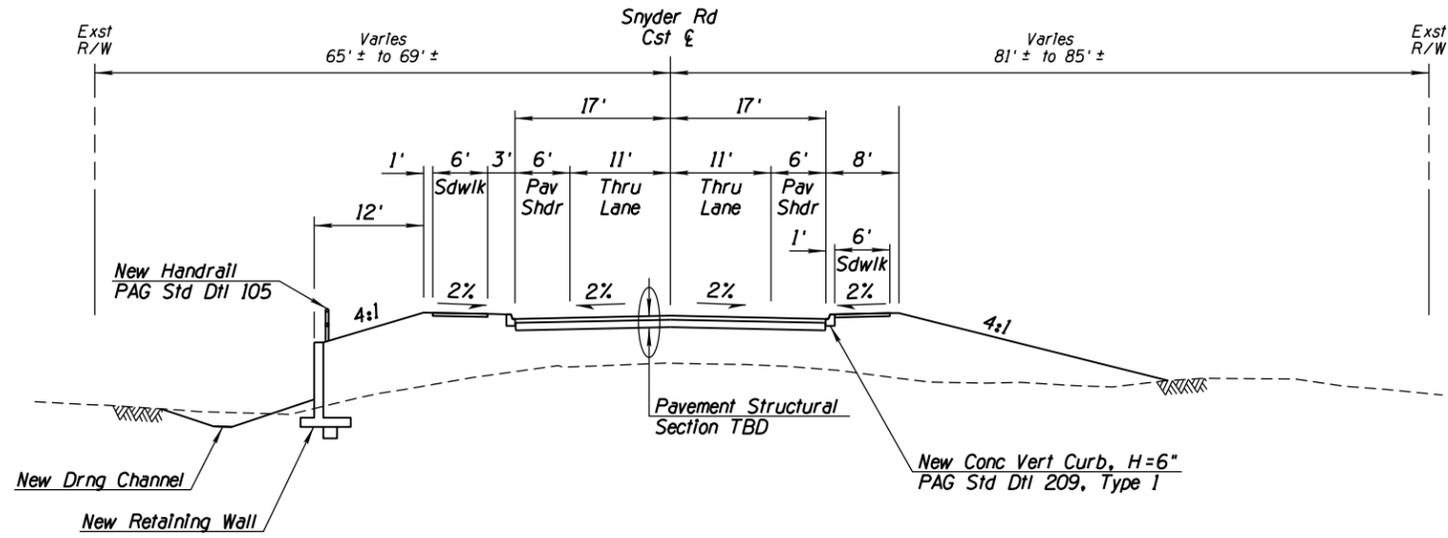
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TYPICAL SECTIONS FOR
 KOLB ROAD
 SABINO CANYON ROAD TO SUNRISE DRIVE
 Kolb Road



NOTE: PAVEMENT SECTIONS TO BE INCLUDED UPON COMPLETION OF PAVEMENT DESIGN REPORT



TYPICAL SECTION
SNYDER RD
East of Kolb Road

PRISCILLA S. CORNELIO, P.E., DIRECTOR

Designed	Date
M. ASHBY	5/17
M. ASHBY	5/17
K. THORNTON	5/17
K. THORNTON	5/17

No.	Revision Description	Engineer	Date

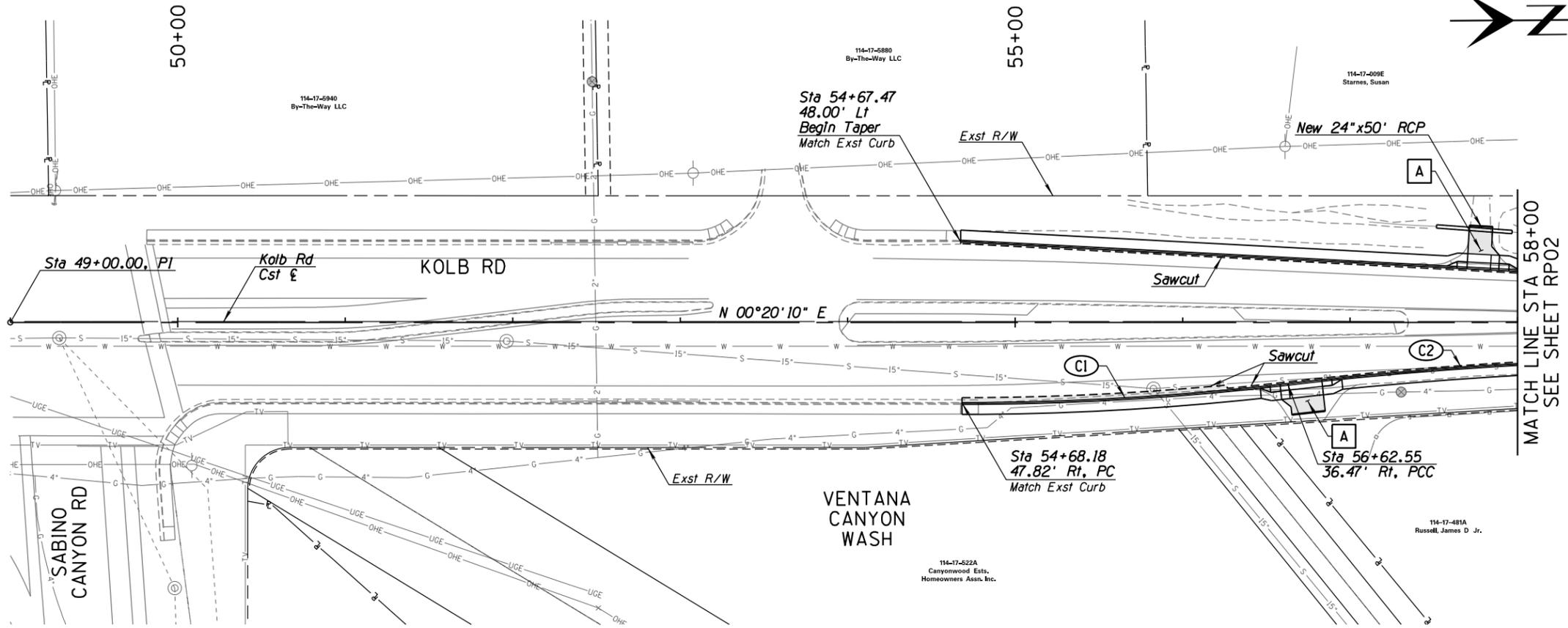
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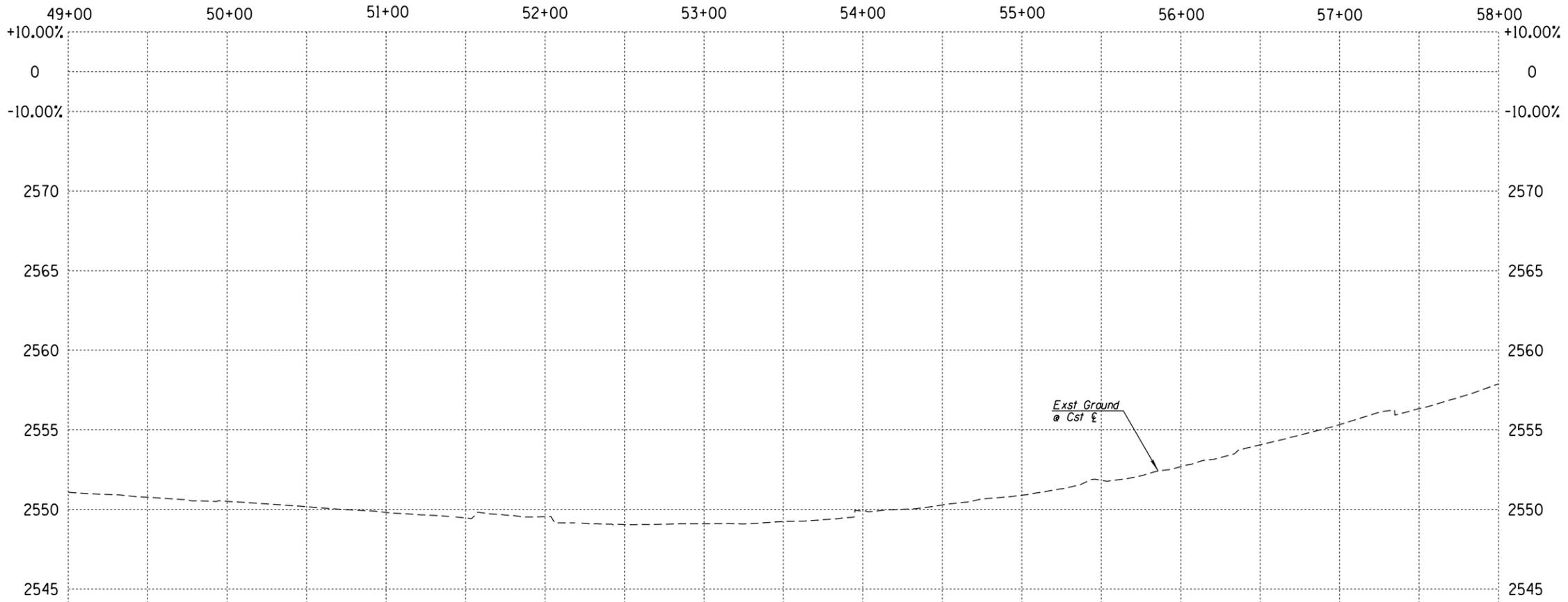
PIMA COUNTY DEPARTMENT OF TRANSPORTATION

TYPICAL SECTIONS
FOR
KOLB ROAD
SABINO CANYON ROAD TO SUNRISE DRIVE
Snyder Road





A Estimated driveway geometry.
Exact limits to be refined later.



Curve Table				
Curve No	Radius (ft)	Length (ft)	Delta	Tangent (ft)
C1	1684.33	194.81	06°37'37"	97.52
C2	2283.84	194.91	04°53'23"	97.52



Scales: Horiz. 1"=40'
Vert. 1"=4'



PRISCILLA S. CORNELIO, P.E., DIRECTOR

Date	By
5/17	M. ASHBY
5/17	M. ASHBY
5/17	K. THORNTON
5/17	K. THORNTON

No.	Revision Description	Engineer	Date

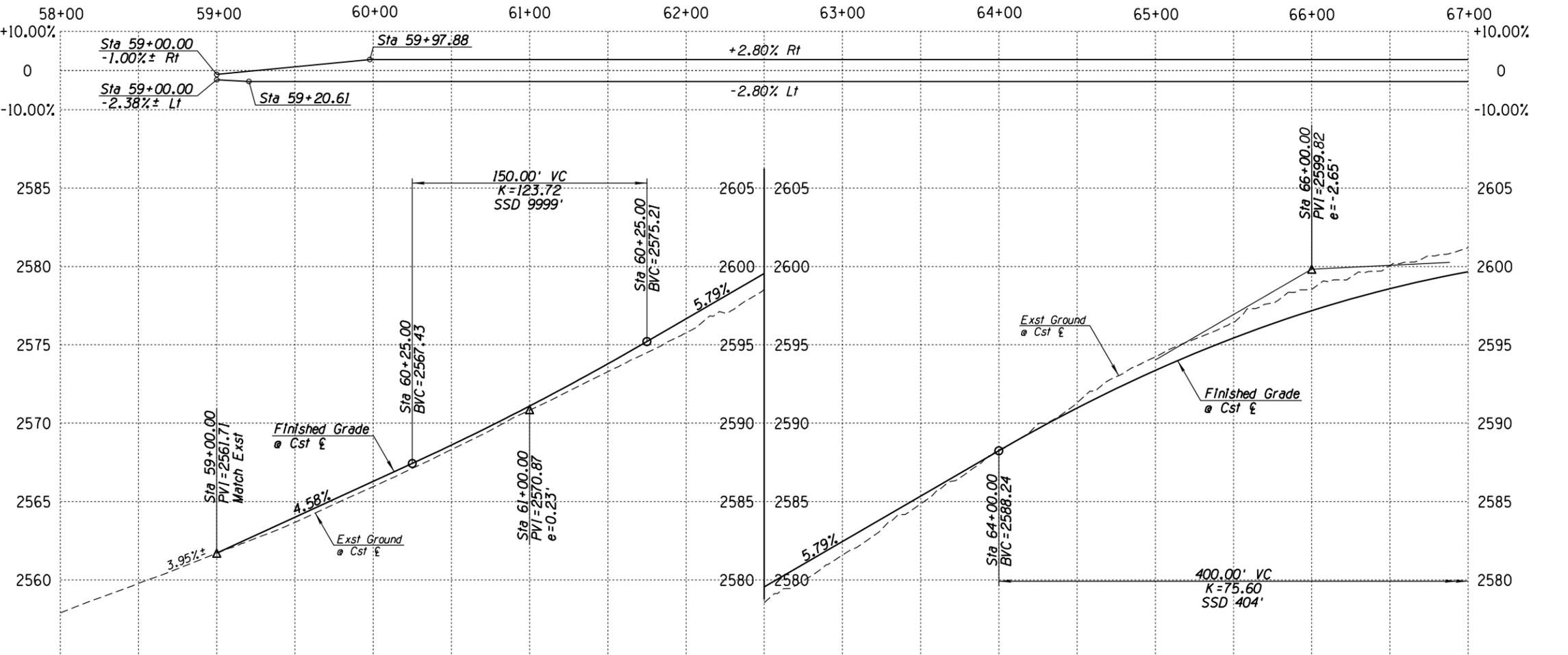
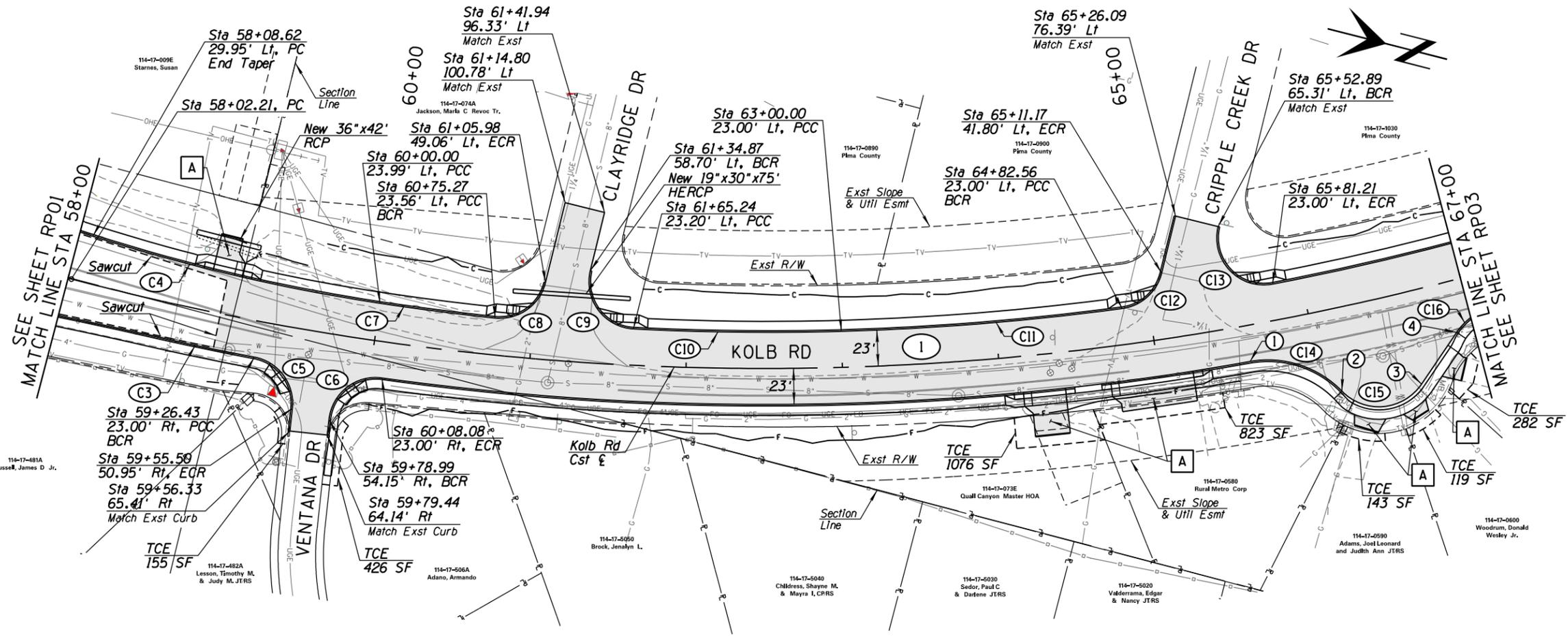
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PIMA COUNTY DEPARTMENT OF TRANSPORTATION
ROADWAY PLAN AND PROFILE
FOR
KOLB ROAD
SABINO CANYON ROAD TO SUNRISE DRIVE
STA 49+00 TO STA 58+00

SHEET RP01 OF RP13

PAGE 5 OF 17



CURVE DATA

①

R = 1750.00'
 L = 1060.99'
 Δ = 34°44'15"
 T = 547.37'
 D = 03°16'27"

① Sta 65+58.16, 23.00' Rt, PC
 ② Sta 66+11.01, 52.67' Rt, PCC
 ③ Sta 66+60.10, 59.46' Rt, PT
 ④ Sta 66+89.13, 32.78' Rt, PC

A DW Geometry TBD

Date	Design	Drawn	Checked	Proj. Eng.
5/17	M. ASHBY	M. ASHBY	K. THORNTON	K. THORNTON

No.	Revision Description	Engineer	Date

Initial Design
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 ROADWAY PLAN AND PROFILE
 FOR
KOLB ROAD
 SABINO CANYON ROAD TO SUNRISE DRIVE
 STA 58+00 TO STA 67+00

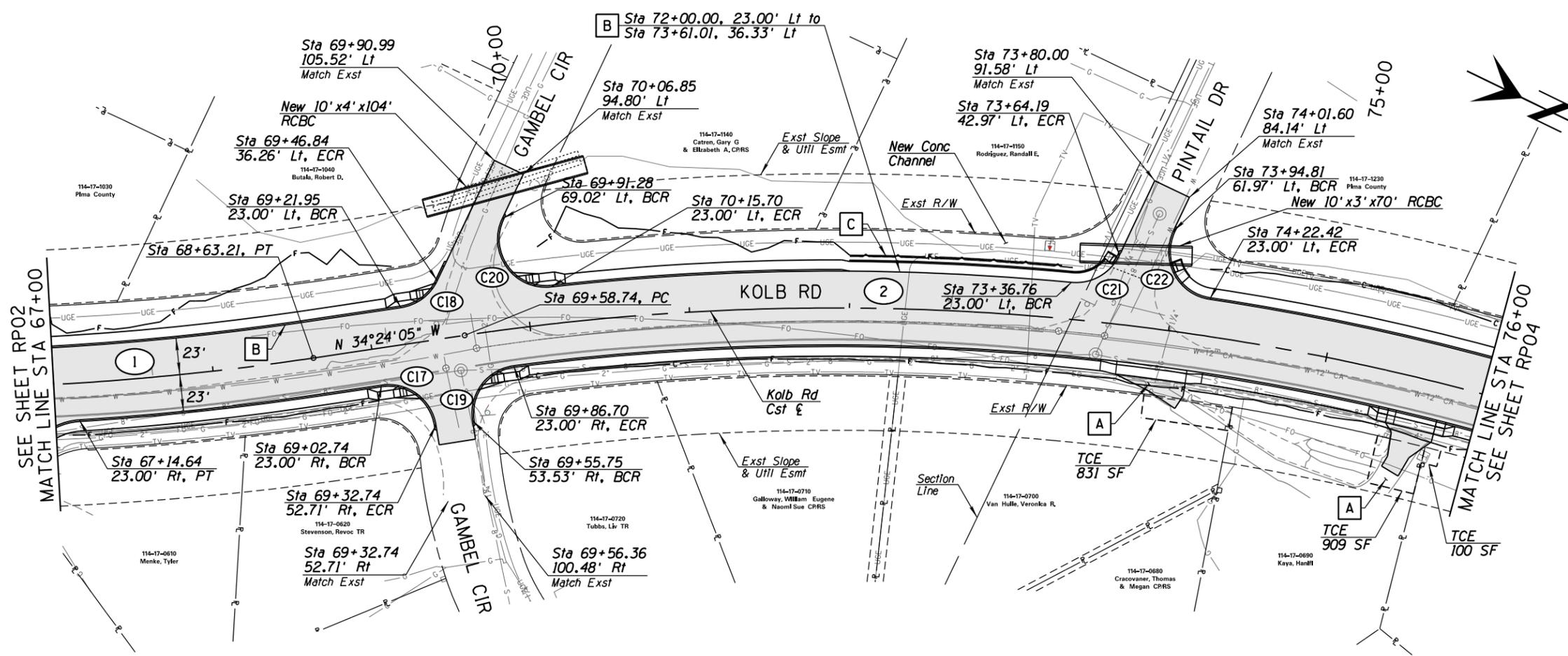
Curve No	Radius (ft)	Length (ft)	Delta	Tangent (ft)
C3	1773.00	71.17	02°17'60"	35.59
C4	1185.05	188.63	09°07'12"	94.51
C5	30.00	44.83	85°36'40"	27.79
C6	30.00	48.02	91°42'56"	30.91
C7	1661.88	74.25	02°33'35"	37.13
C8	30.00	43.03	82°10'26"	26.16
C9	30.00	52.82	100°53'12"	36.32
C10	1661.88	132.98	04°35'05"	66.53
C11	1727.00	180.16	05°58'38"	90.16
C12	30.00	35.89	68°32'55"	20.44
C13	30.00	60.05	114°40'52"	46.80
C14	65.78	64.11	55°50'33"	34.86
C15	33.00	58.45	101°29'16"	40.38
C16	40.00	28.29	40°31'19"	14.77

Scales: Horiz. 1"=40'
 Vert. 1"=4'

SHEET RP02 OF RP13

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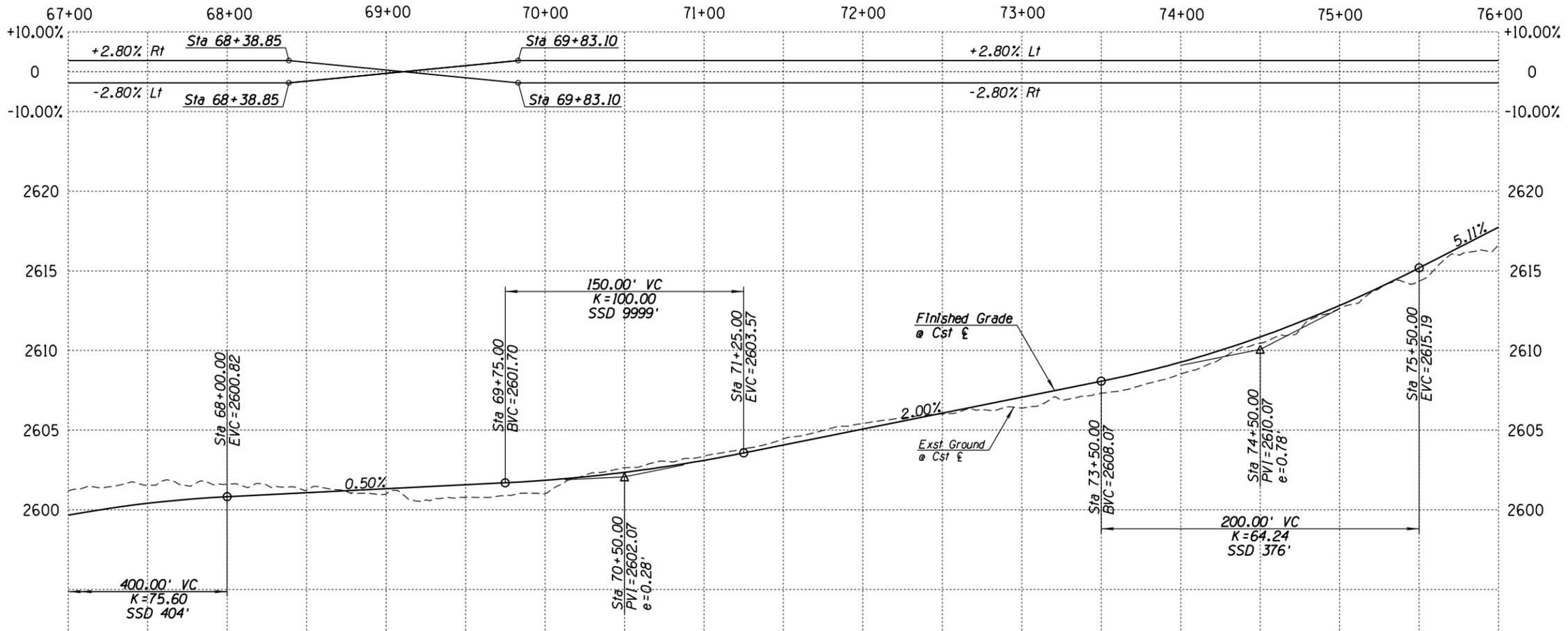
PRISCILLA S. CORNELIO, P.E., DIRECTOR



CURVE DATA

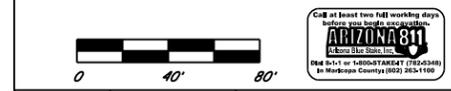
Curve No.	Radius (ft)	Length (ft)	Delta	Tangent (ft)
1	1750.00'	1060.99'	34°44'15"	547.37'
2	1560.00'	895.43'	32°53'14"	460.42'

A Estimated driveway geometry. Exact limits to be refined later.
B Conc Half-Barrier (H=42") with Integral 6' Sidewalk
C New CIP retaining wall Sta 72+00.00, 32.26' Lt to Sta 73+36.76, 32.26' Lt



Curve Table

Curve No	Radius (ft)	Length (ft)	Delta	Tangent (ft)
C17	30.00	46.84	89°26'56"	29.71
C18	30.00	29.37	56°05'21"	15.98
C19	30.00	47.95	91°34'41"	30.84
C20	30.00	63.78	121°49'08"	53.92
C21	30.00	36.64	69°58'10"	20.99
C22	30.00	55.96	106°53'04"	40.46



Scales: Horiz. 1"=40'
Vert. 1"=4'

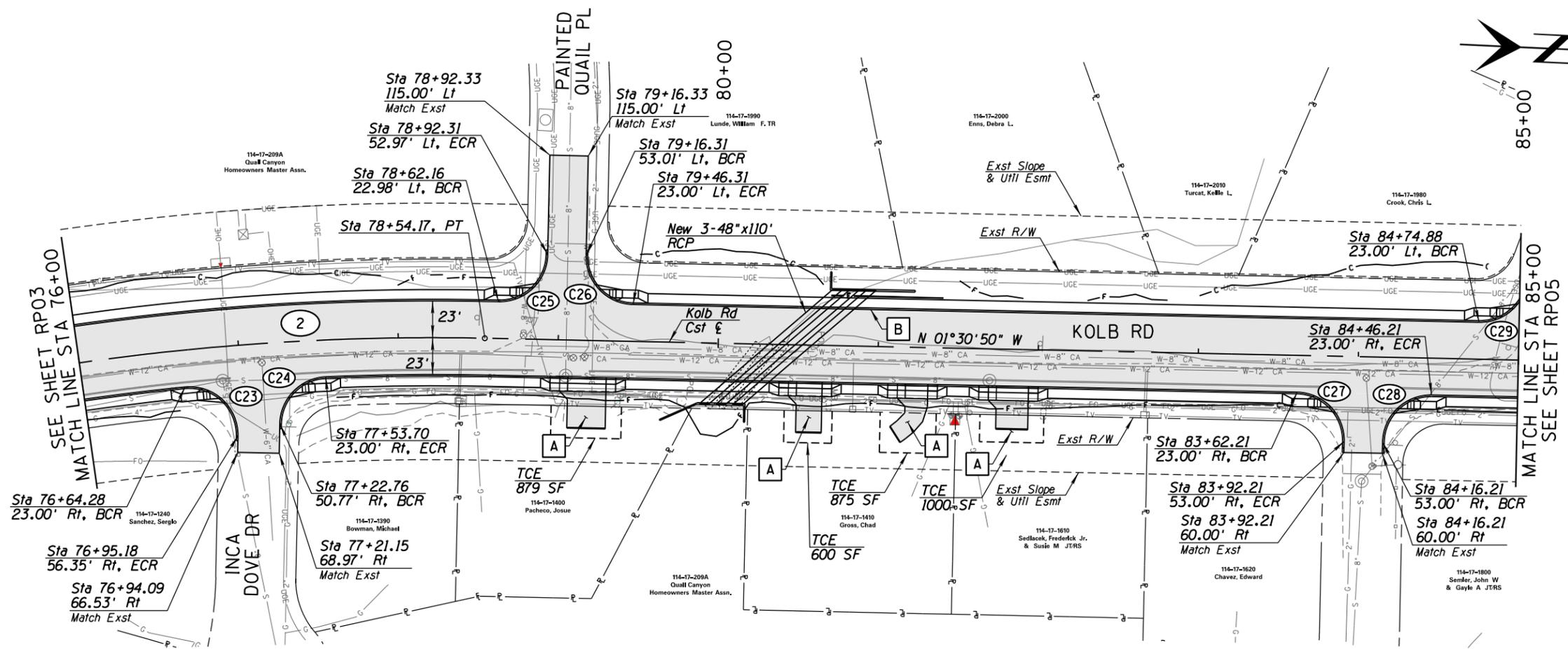
PRISCILLA S. CORNELIO, P.E., DIRECTOR

No.	Revision Description	Engineer	Date

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 ROADWAY PLAN AND PROFILE
 FOR
KOLB ROAD
 SABINO CANYON ROAD TO SUNRISE DRIVE
 STA 67+00 TO STA 76+00



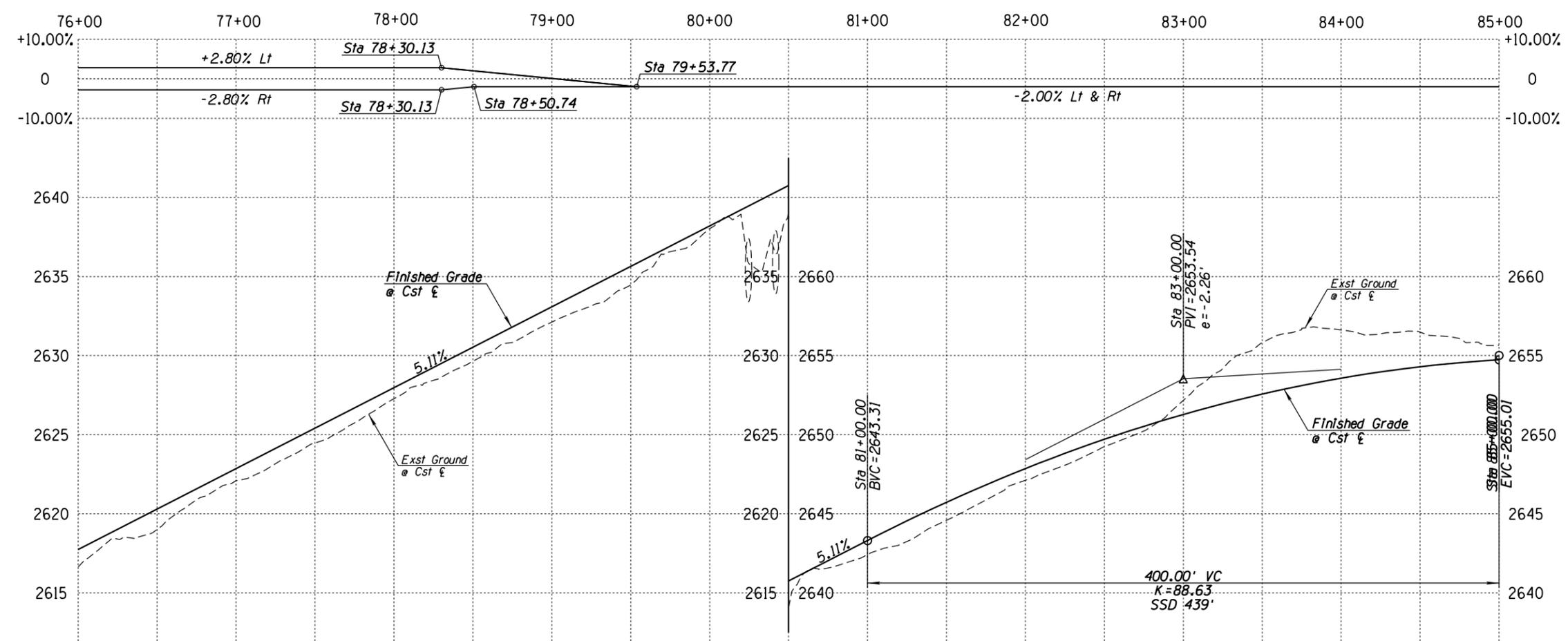
CURVE DATA

②

R = 1560.00'
 L = 895.43'
 $\Delta = 32^\circ 53' 14''$
 T = 460.42'
 D = $03^\circ 40' 22''$

A Estimated driveway geometry.
 Exact limits to be refined later.

B New guardrail



Curve Table

Curve No	Radius (ft)	Length (ft)	Delta	Tangent (ft)
C23	30.00	50.78	96°58'46"	33.90
C24	30.00	45.19	86°18'18"	28.13
C25	30.00	47.27	90°16'38"	30.15
C26	30.00	47.13	90°00'43"	30.01
C27	30.00	47.12	90°00'00"	30.00
C28	30.00	47.12	90°00'00"	30.00
C29	30.00	38.15	72°51'34"	22.14



PRISCILLA S. CORNELIO, P.E., DIRECTOR

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PIMA COUNTY DEPARTMENT OF TRANSPORTATION
 ROADWAY PLAN AND PROFILE
 FOR
KOLB ROAD
 SABINO CANYON ROAD TO SUNRISE DRIVE
 STA 76+00 TO STA 85+00

No.	Revision Description	Engineer	Date

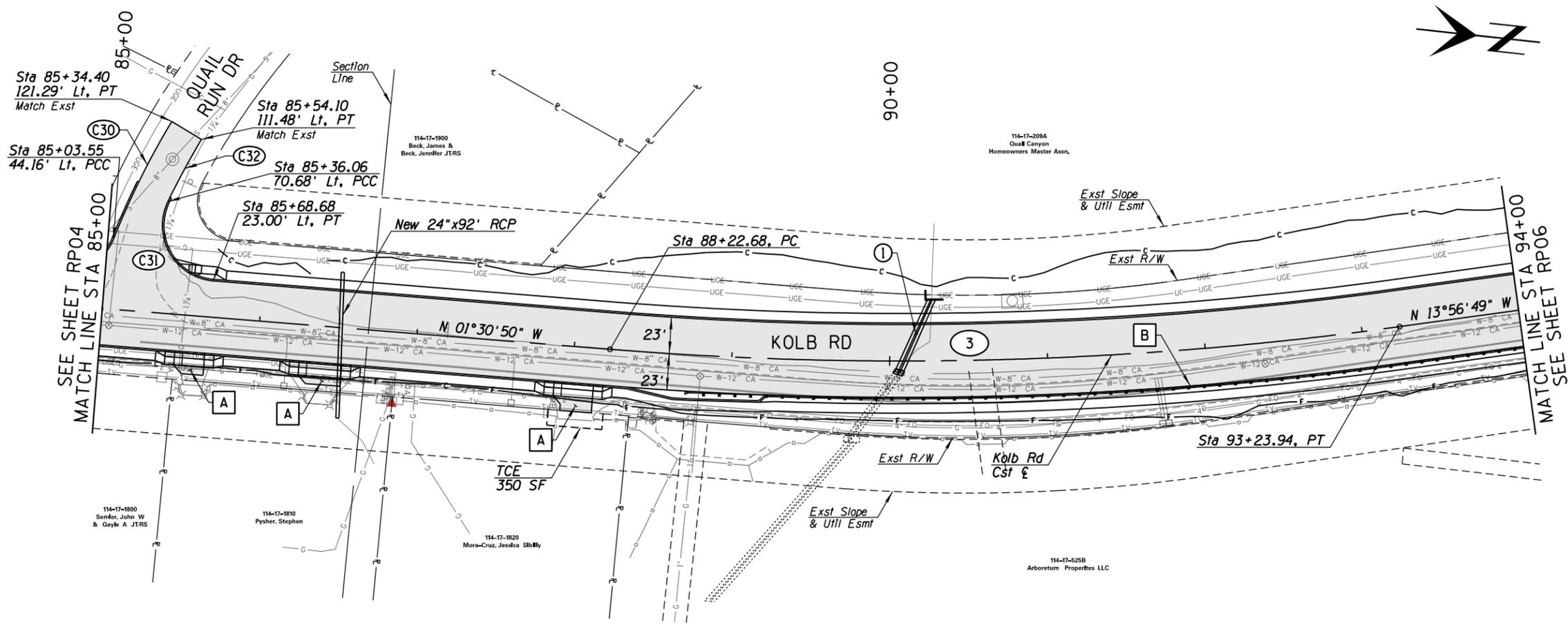
Designed: M. ASHBY
 Drawn: M. ASHBY
 Checked: K. THORNTON
 Proj. Eng'r: K. THORNTON

Date: 5/17
 Date: 5/17
 Date: 5/17

Scales: Horiz. 1"=40'
 Vert. 1"=4'

SHEET RP04 OF RP13

PAGE 8 OF 17



CURVE DATA

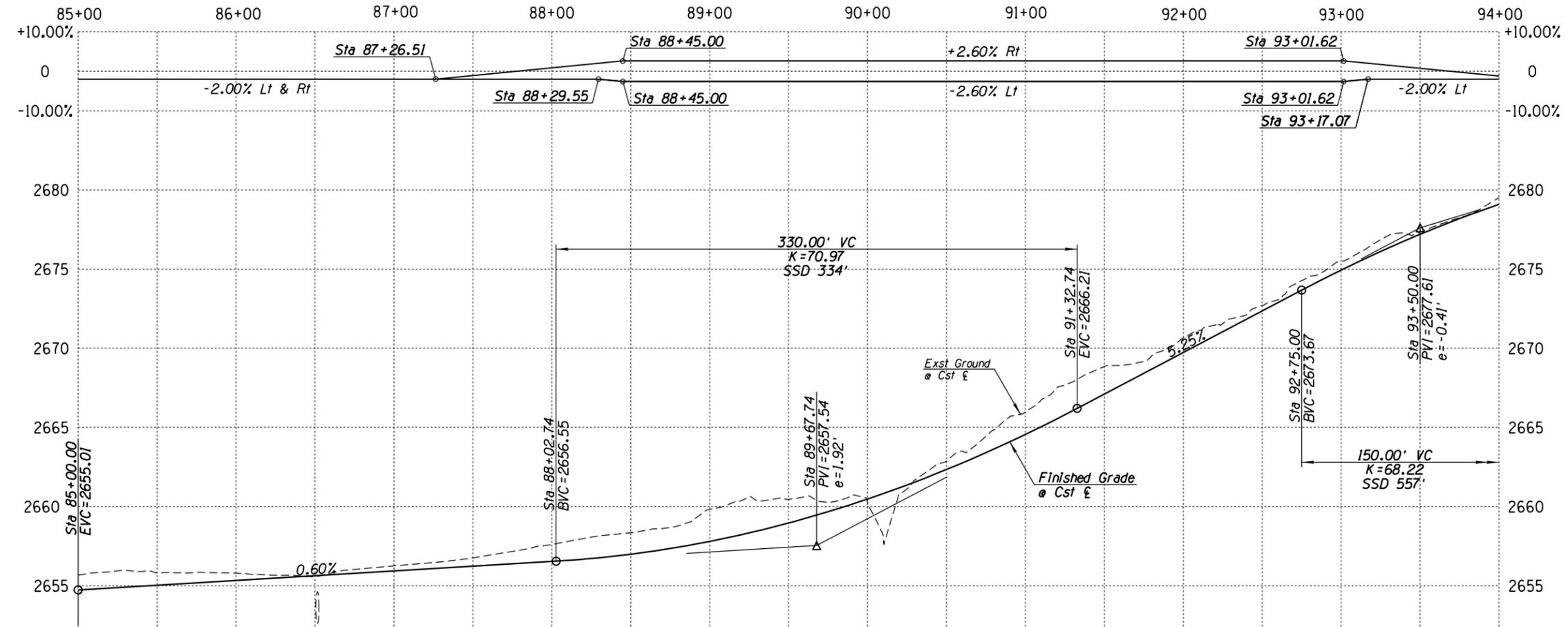
③
 R = 2310.00'
 L = 501.26'
 Δ = 12°25'59"
 T = 251.62'
 D = 02°28'49"

- A Estimated driveway geometry. Exact limits to be refined later.
- B New guardrail
- ① Pipe extension 2-24" CMP and new headwall

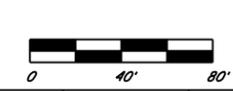
PRISCILLA S. CORNELIO, P.E., DIRECTOR

Date	Design	Drawn	Checked	Proj. Engr.
5/17	M. ASHBY	M. ASHBY	K. THORNTON	K. THORNTON
5/17				
5/17				

No.	Revision Description	Engineer	Date



Curve No	Radius (ft)	Length (ft)	Delta	Tangent (ft)
C30	511.00	83.16	09°19'29"	41.67
C31	35.00	67.95	111°14'08"	51.15
C32	489.00	44.63	05°13'46"	22.33



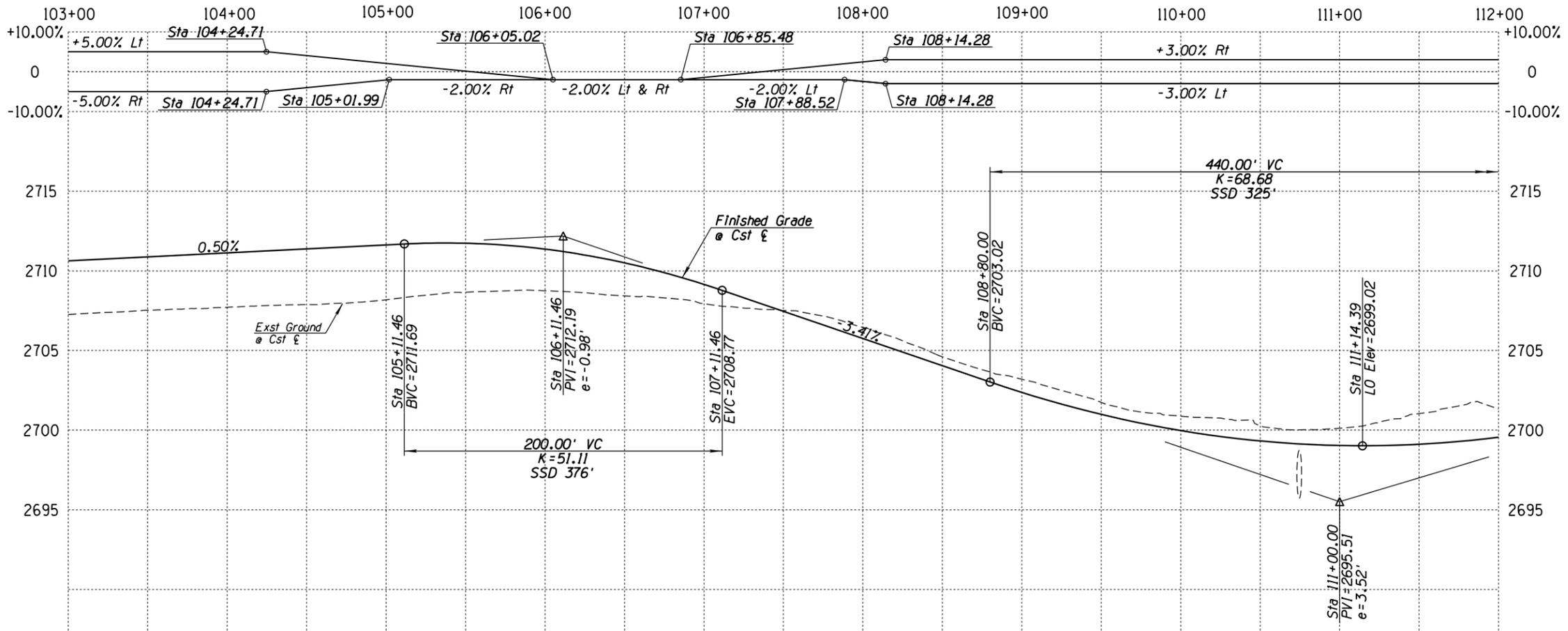
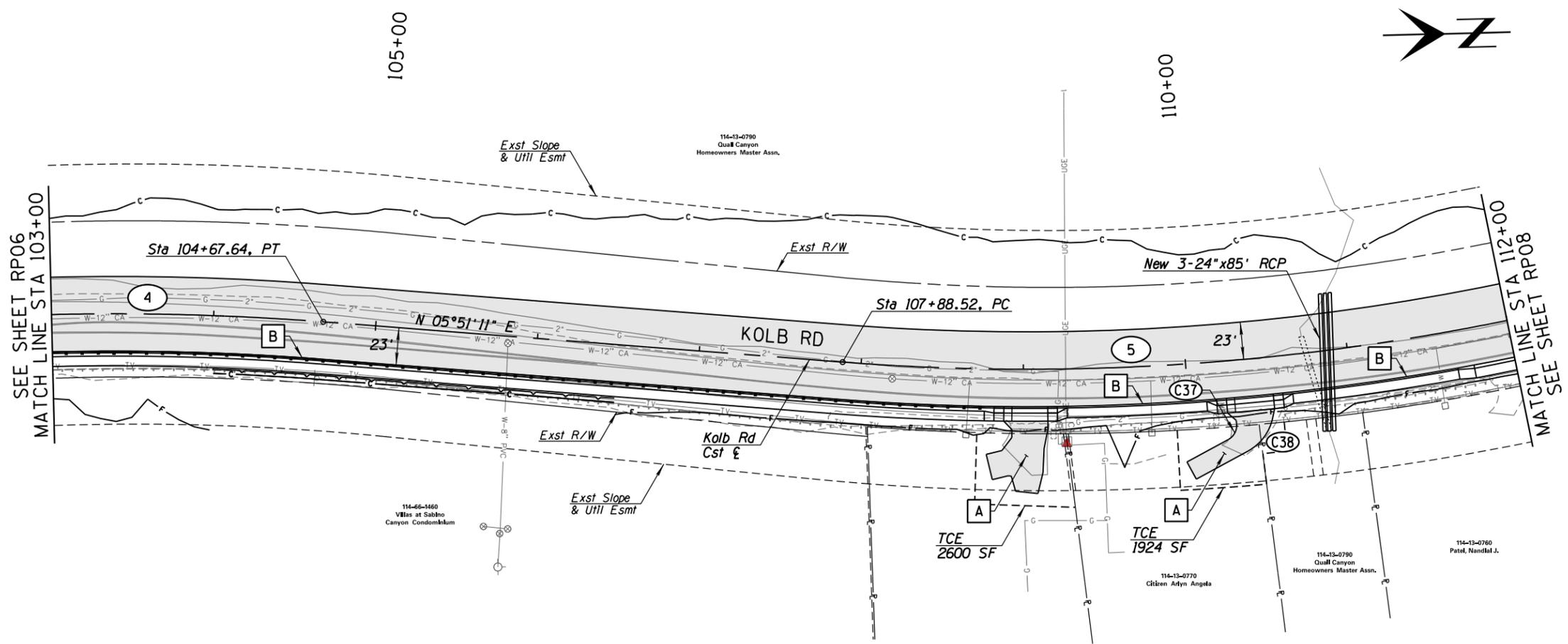
Scales: Horiz. 1"=40'
 Vert. 1"=4'

Initial Design
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PIMA COUNTY DEPARTMENT OF TRANSPORTATION

ROADWAY PLAN AND PROFILE
 FOR
KOLB ROAD
 SABINO CANYON ROAD TO SUNRISE DRIVE
 STA 85+00 TO STA 94+00



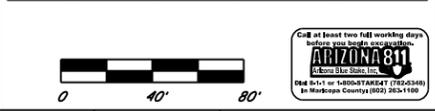
CURVE DATA

Curve No.	Radius (ft)	Length (ft)	Delta	Tangent
4	1660.00'	574.70'	19°50'09"	6.60
5	1473.00'	561.15'	21°49'38"	13.87

- A** Estimated driveway geometry. Exact limits to be refined later.
- B** New guardrail

Curve Table

Curve No	Radius (ft)	Length (ft)	Delta	Tangent (ft)
C37	10.00	11.66	66°49'01"	6.60
C38	30.00	25.98	49°36'53"	13.87



Scales: Horiz. 1"=40'
Vert. 1"=4'

PRISCILLA S. CORNELIO, P.E., DIRECTOR

No.	Revision Description	Engineer	Date

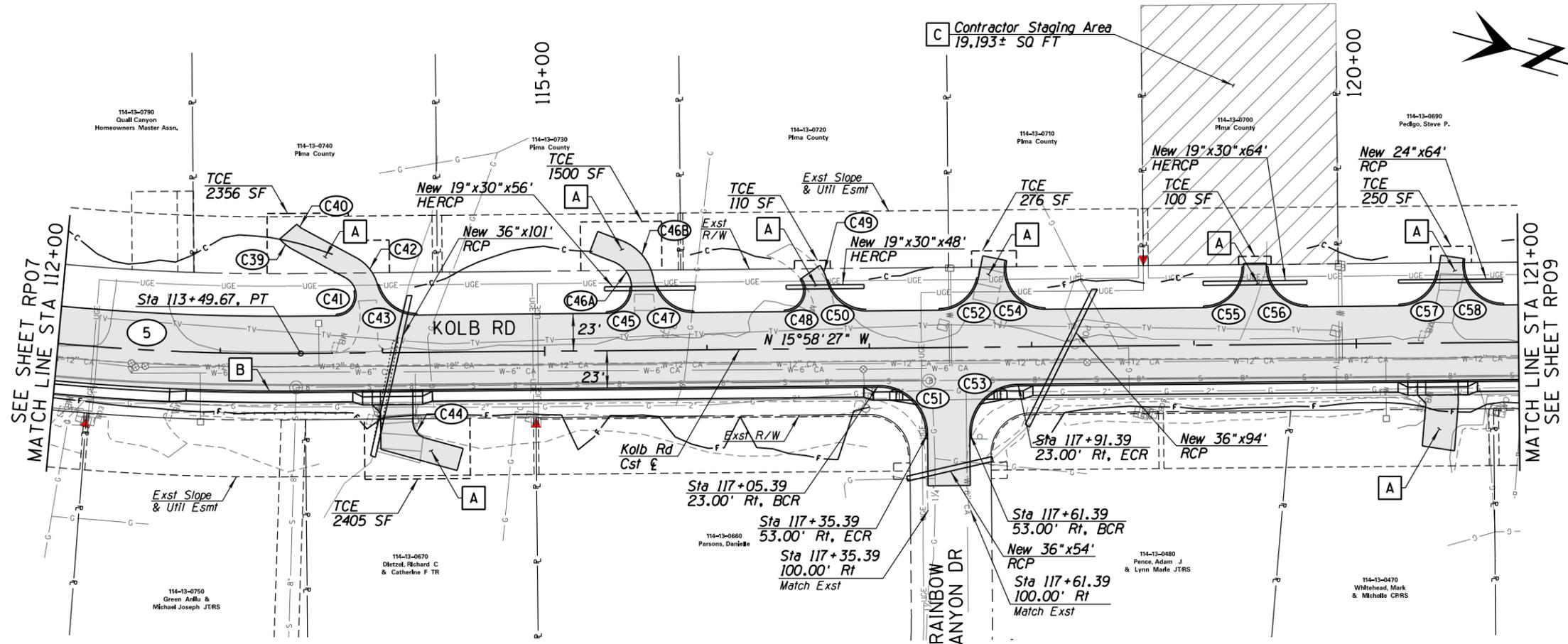
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ROADWAY PLAN AND PROFILE
FOR
KOLB ROAD
SABINO CANYON ROAD TO SUNRISE DRIVE
STA 103+00 TO STA 112+00



CURVE DATA

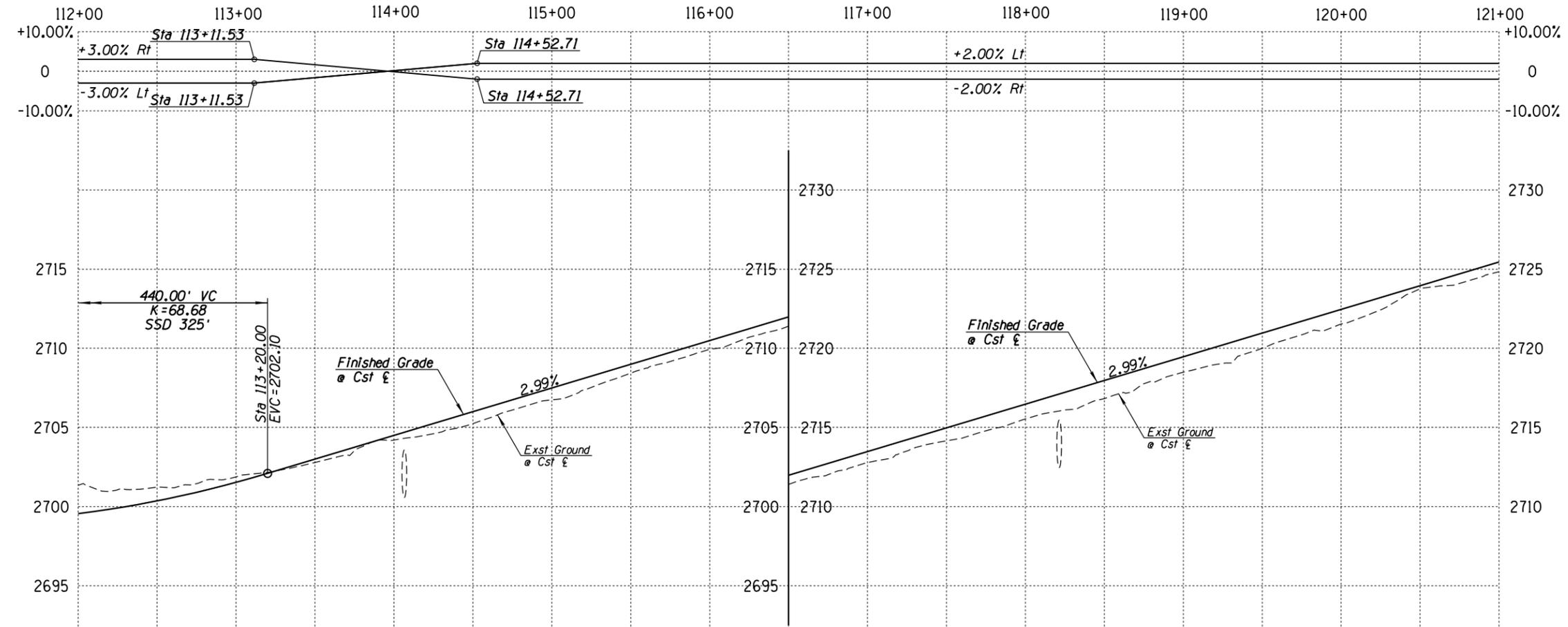
5

R = 1473.00'
 L = 561.15'
 Δ = 21°49'38"
 T = 284.02'
 D = 03°53'23"

A Estimated driveway geometry.
 Exact limits to be refined later.

B New guardrail

C The Contractor shall stay within the boundary of parcel 114-13-0700 for all staging activities.



Curve Table

Curve No	Radius (ft)	Length (ft)	Delta	Tangent (ft)
C39	27.00	9.94	21°06'09"	5.03
C40	13.00	4.79	21°06'13"	2.42
C41	12.40	32.71	151°08'19"	48.20
C42	26.40	21.64	46°57'05"	11.47
C43	25.00	33.08	75°48'46"	19.47
C44	10.00	12.92	74°01'33"	7.54
C45	15.70	24.60	89°48'18"	15.64
C46A	17.00	20.30	68°24'49"	11.56
C46B	31.00	31.74	58°39'33"	17.42
C47	25.00	35.10	80°26'19"	21.14
C48	13.00	28.26	124°32'02"	24.73
C49	27.00	9.99	21°11'39"	5.05
C50	25.00	33.45	76°39'37"	19.77
C51	30.00	47.12	89°59'57"	30.00
C52	25.00	33.98	77°53'08"	20.20
C53	30.00	47.12	90°00'03"	30.00
C54	25.00	44.56	102°06'52"	30.94
C55	25.00	39.27	89°59'60"	25.00
C56	25.00	39.27	90°00'00"	25.00
C57	25.00	35.44	81°13'57"	21.44
C58	25.00	43.10	98°46'03"	29.15



PRISCILLA S. CORNELIO, P.E., DIRECTOR

Initial Design
 Phase Plans
 Design Review
 NOT FOR
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PSOMAS
 333 E. Wetmore Road, Suite 450
 Tucson, AZ 85705
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PIMA COUNTY DEPARTMENT OF TRANSPORTATION
 ROADWAY PLAN AND PROFILE
 FOR
KOLB ROAD
 SABINO CANYON ROAD TO SUNRISE DRIVE
 STA 112+00 TO STA 121+00

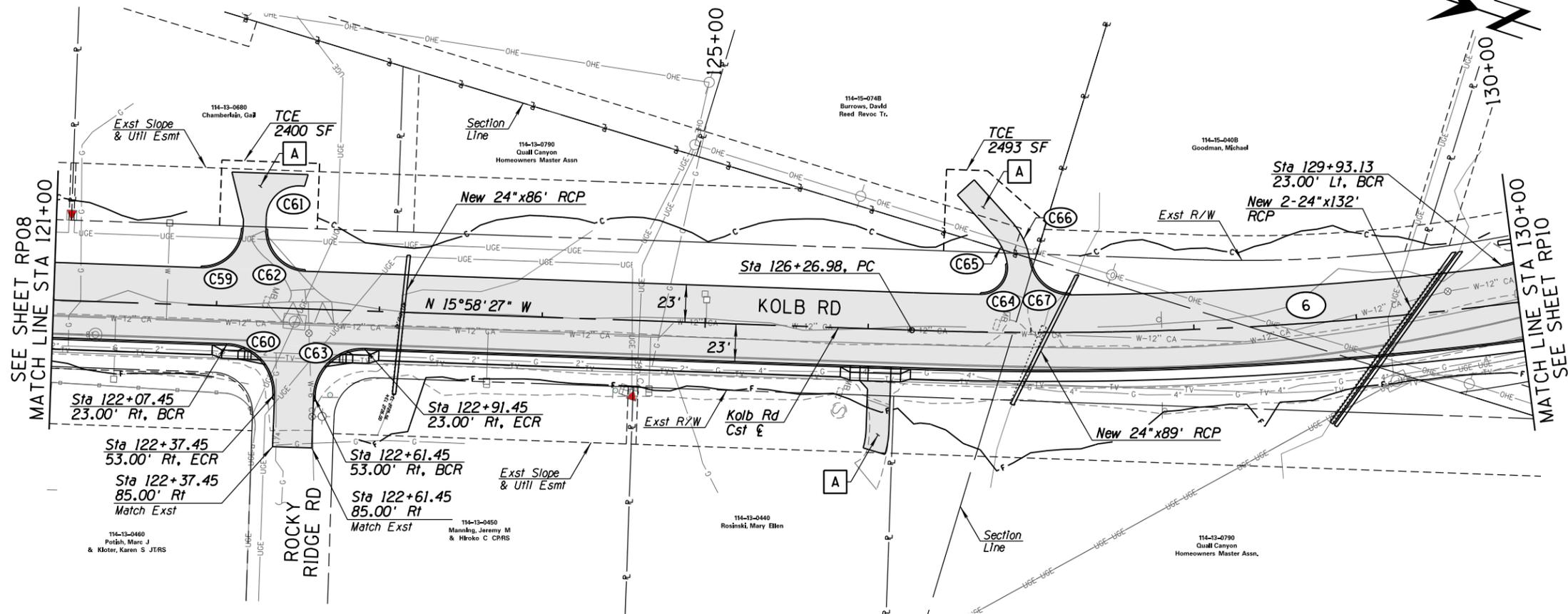
DESIGNED: M. ASHBY
 DRAWN: M. ASHBY
 CHECKED: K. THORNTON
 PROJ. ENGR.: K. THORNTON

DATE: 5/17
 DATE: 5/17
 DATE: 5/17
 DATE: 5/17

Scale: Horiz. 1"=40'
 Vert. 1"=4'

SHEET RP08 OF RP13

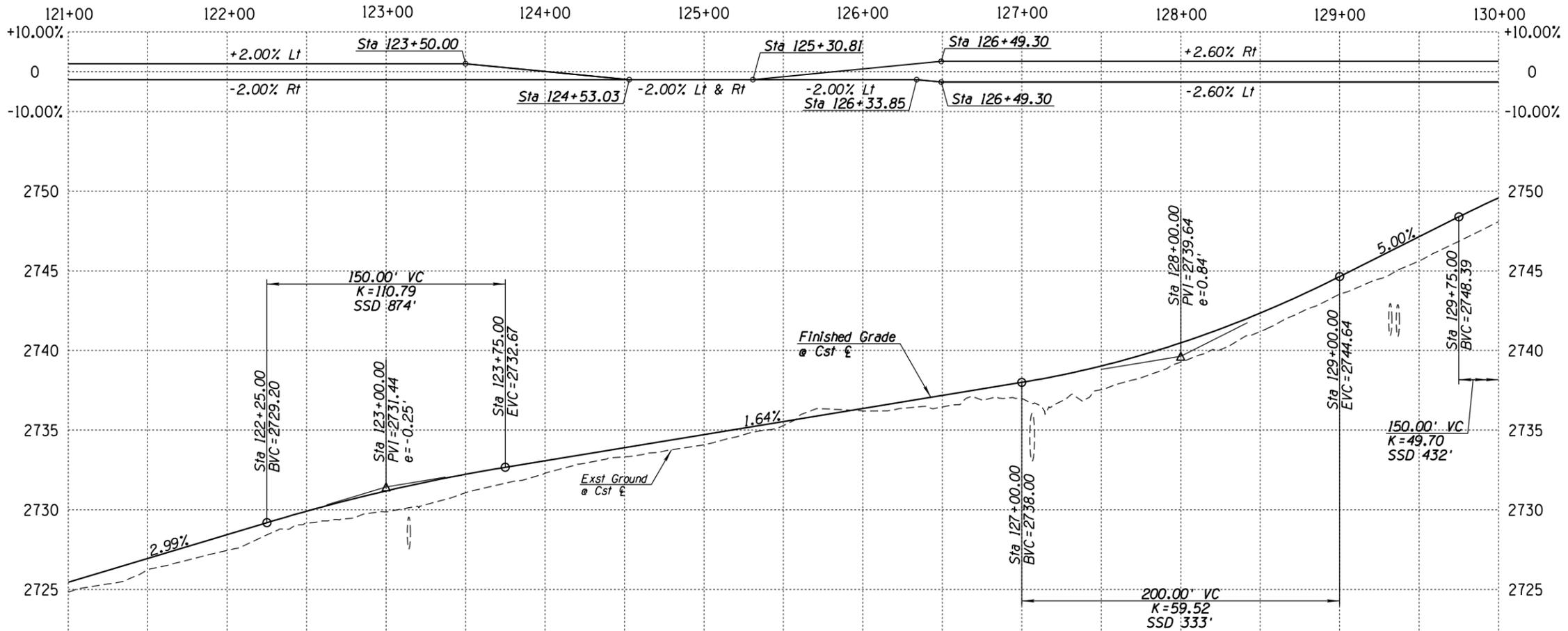
PAGE 12 OF 17



CURVE DATA

6
 R = 2300.00'
 L = 506.86'
 Δ = 12°37'36"
 T = 254.46'
 D = 02°29'28"

A Estimated driveway geometry.
 Exact limits to be refined later.



Curve Table				
Curve No	Radius (ft)	Length (ft)	Delta	Tangent (ft)
C59	25.00	39.27	89°59'60"	25.00
C60	30.00	47.13	90°00'12"	30.00
C61	20.00	34.17	97°53'48"	22.97
C62	25.00	39.27	90°00'00"	25.00
C63	30.00	47.12	89°59'48"	30.00
C64	16.34	28.44	99°41'27"	19.37
C65	32.22	18.65	33°10'33"	9.60
C66	46.22	26.76	33°10'33"	13.77
C67	25.00	35.65	81°41'51"	21.62



Scales: Horiz. 1"=40'
 Vert. 1"=4'

PRISCILLA S. CORNELIO, P.E., DIRECTOR

Date	By
5/17	M. ASHBY
5/17	M. ASHBY
5/17	K. THORNTON
5/17	K. THORNTON

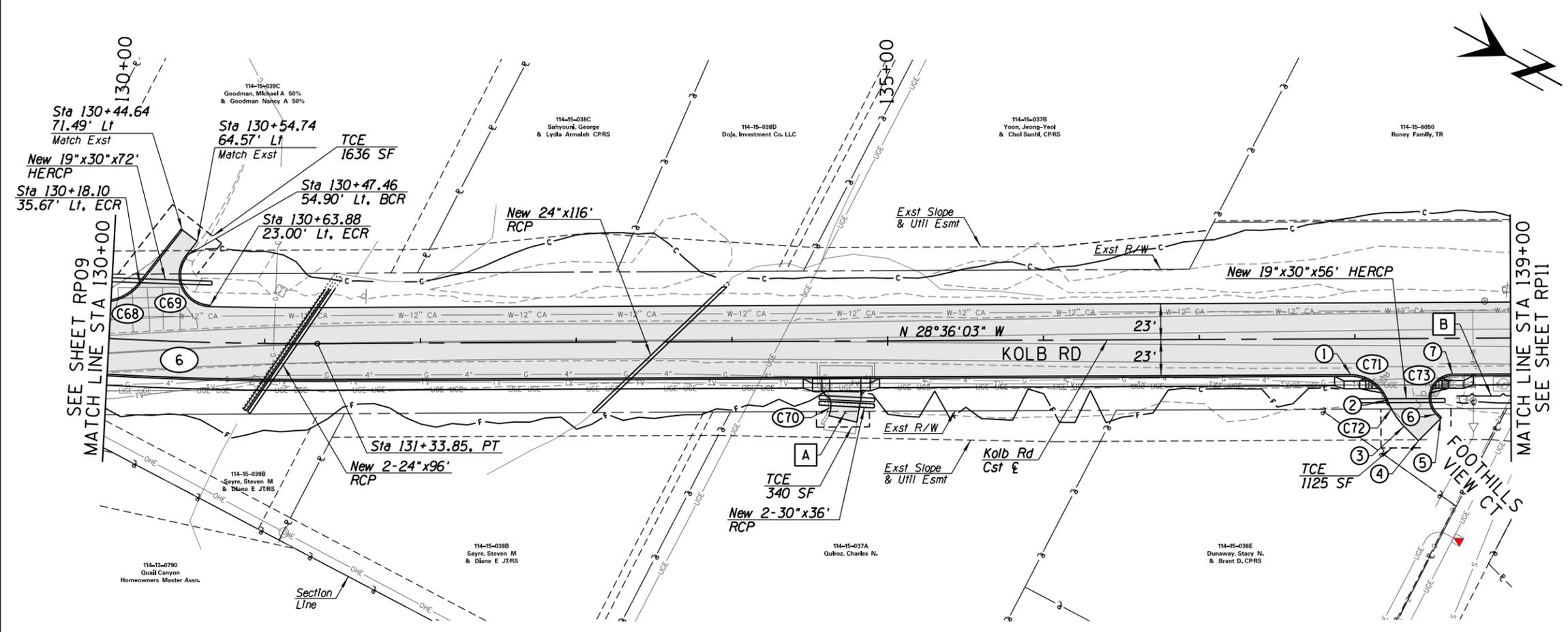
No.	Revision Description	Engineer	Date

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ROADWAY PLAN AND PROFILE
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KOLB ROAD
 SABINO CANYON ROAD TO SUNRISE DRIVE
 STA 121+00 TO STA 130+00

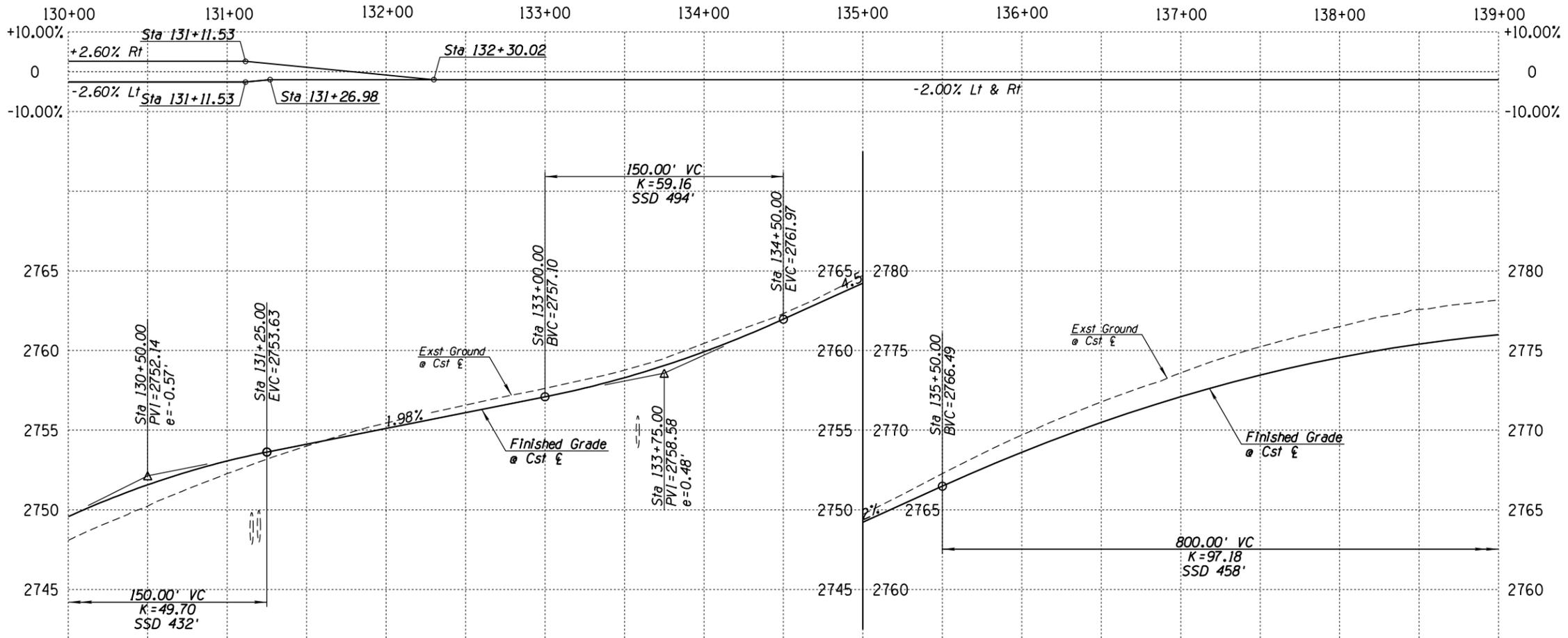


CURVE DATA

⑥

R = 2300.00'
 L = 506.86'
 $\Delta = 12^\circ 37' 36''$
 T = 254.46'
 D = $02^\circ 29' 28''$

- A Estimated driveway geometry. Exact limits to be refined later.
- B New soil nail retaining wall
 Sta 138+65.00, 37.00' Rt to
 Sta 139+00.00, 37.00' Rt
- ① Sta 137+97.20, 23.00' Rt, PC
- ② Sta 138+20.66, 39.36' Rt, PCC
- ③ Sta 138+31.29, 56.17' Rt, PT
- ④ Sta 138+40.40, 65.46' Rt
 Match Exst
- ⑤ Sta 138+54.68, 51.45' Rt
- ⑥ Match Exst
- ⑦ Sta 138+51.79, 48.50' Rt, PC
- ⑧ Sta 138+62.50, 23.00' Rt, PT



Curve Table				
Curve No	Radius (ft)	Length (ft)	Delta	Tangent (ft)
C68	30.00	28.81	55°01'40"	15.63
C69	20.00	44.24	126°44'05"	39.88
C70	14.27	11.01	44°11'60"	5.79
C71	25.00	30.45	69°47'21"	17.44
C72	47.36	20.03	24°14'05"	10.17
C73	15.00	35.20	134°26'44"	35.72



Scales: Horiz. 1"=40'
 Vert. 1"=4'

PRISCILLA S. CORNELIO, P.E., DIRECTOR

No.	Revision Description	Engineer	Date

No.	Revision Description	Engineer	Date

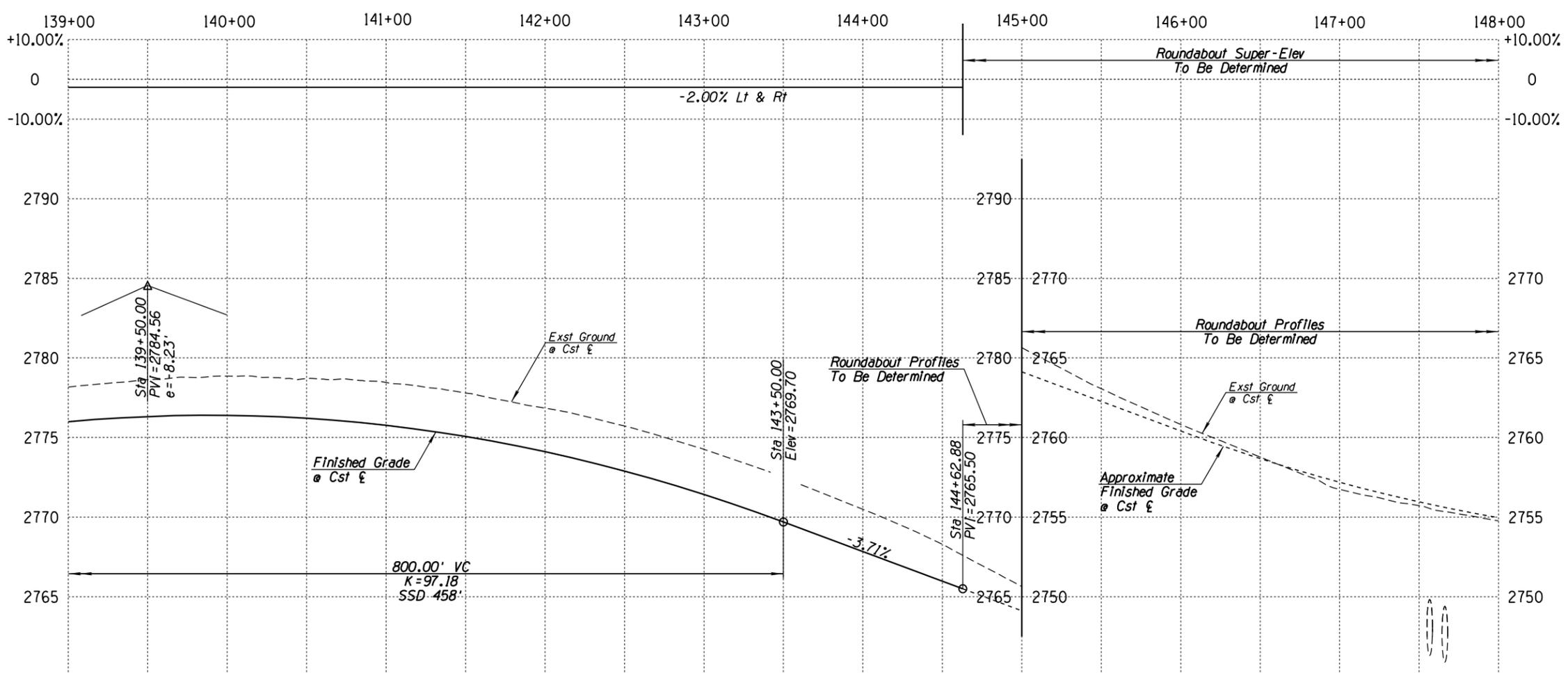
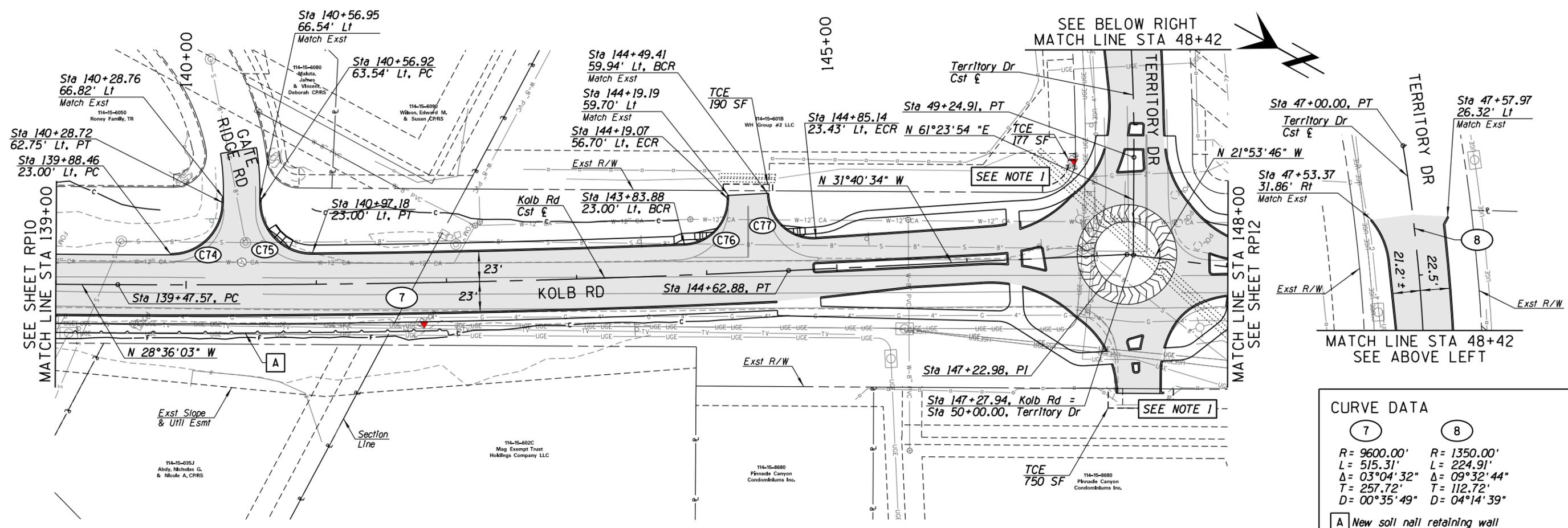
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ROADWAY PLAN AND PROFILE
 FOR
KOLB ROAD
 SABINO CANYON ROAD TO SUNRISE DRIVE
 STA 130+00 TO STA 139+00





CURVE DATA

Curve No.	Radius (ft)	Length (ft)	Delta (°)	Tangent (ft)	Delta (°)
7	9600.00'	62.66	89°45'21"	39.83	
8	1350.00'	63.46	90°53'34"	40.63	
		53.74	87°58'47"	33.79	
		57.18	93°35'55"	37.27	

NOTES:

A New soil nail retaining wall Sta 139+00.00, 37.00' Rt to Sta 142+00.00, 37.00' Rt

NOTES:

1. Precise roundabout geometry to be refined later. Current dimensions and parameters are the following:
 Inscribed Circle Diameter = 122.5'
 Central Island Diameter = 50.5'
 Circulatory Roadway Width = 23.0'
 Truck Apron Width = 13.0'
 Design Vehicle = WB-62
 Average Entry Width = 15.9'
 Average Exit Width = 14.9'

Curve Table

Curve No	Radius (ft)	Length (ft)	Delta (°)	Tangent (ft)
C74	40.00	62.66	89°45'21"	39.83
C75	40.00	63.46	90°53'34"	40.63
C76	35.00	53.74	87°58'47"	33.79
C77	35.00	57.18	93°35'55"	37.27

Scale: Horiz. 1"=40'
 Vert. 1"=4'

SHEET RP11 OF RP13

Arizona 811 logo

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ROADWAY PLAN AND PROFILE
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 STA 139+00 TO STA 148+00

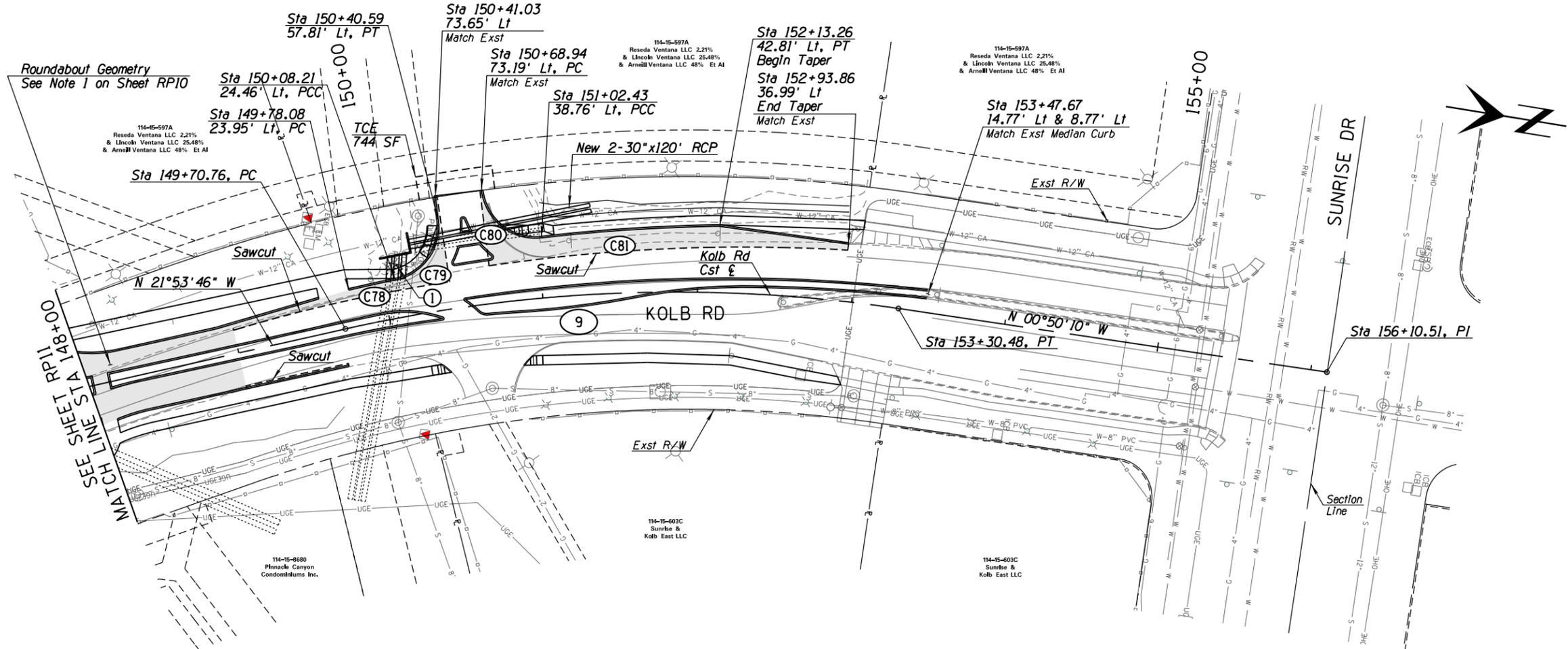
PIMA COUNTY DEPARTMENT OF TRANSPORTATION

PRISCILLA S. CORNELIO, P.E., DIRECTOR

No.	Revision Description	Engineer	Date

Date	5/17	5/17	5/17
Designed	M. ASHBY	M. ASHBY	K. THORNTON
Drawn	M. ASHBY	M. ASHBY	K. THORNTON
Checked	M. ASHBY	M. ASHBY	K. THORNTON
Proj. Engr.	M. ASHBY	M. ASHBY	K. THORNTON

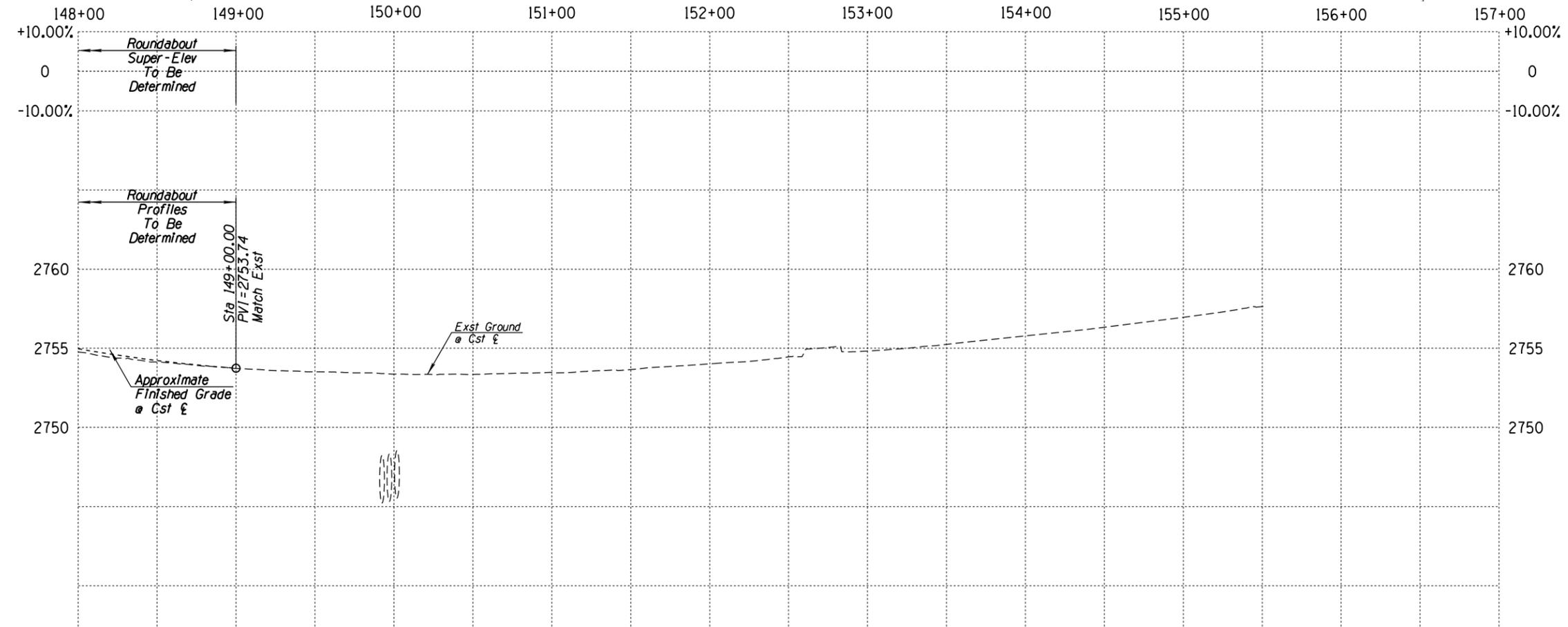
PAGE 15 OF 17



CURVE DATA

⑨
 R = 978.66'
 L = 359.72'
 Δ = 21°03'35"
 T = 181.91'
 D = 05°51'16"

① Pipe extension 3-36"x20' CMP and new headwall



Curve Table				
Curve No	Radius (ft)	Length (ft)	Delta	Tangent (ft)
C78	1132.63	30.88	01°33'43"	15.44
C79	35.00	52.13	85°20'35"	32.26
C80	35.00	54.82	89°44'51"	34.85
C81	1144.63	115.51	05°46'55"	57.80



Scales: Horiz. 1"=40'
 Vert. 1"=4'

PRISCILLA S. CORNELIO, P.E., DIRECTOR

No.	Revision Description	Engineer	Date

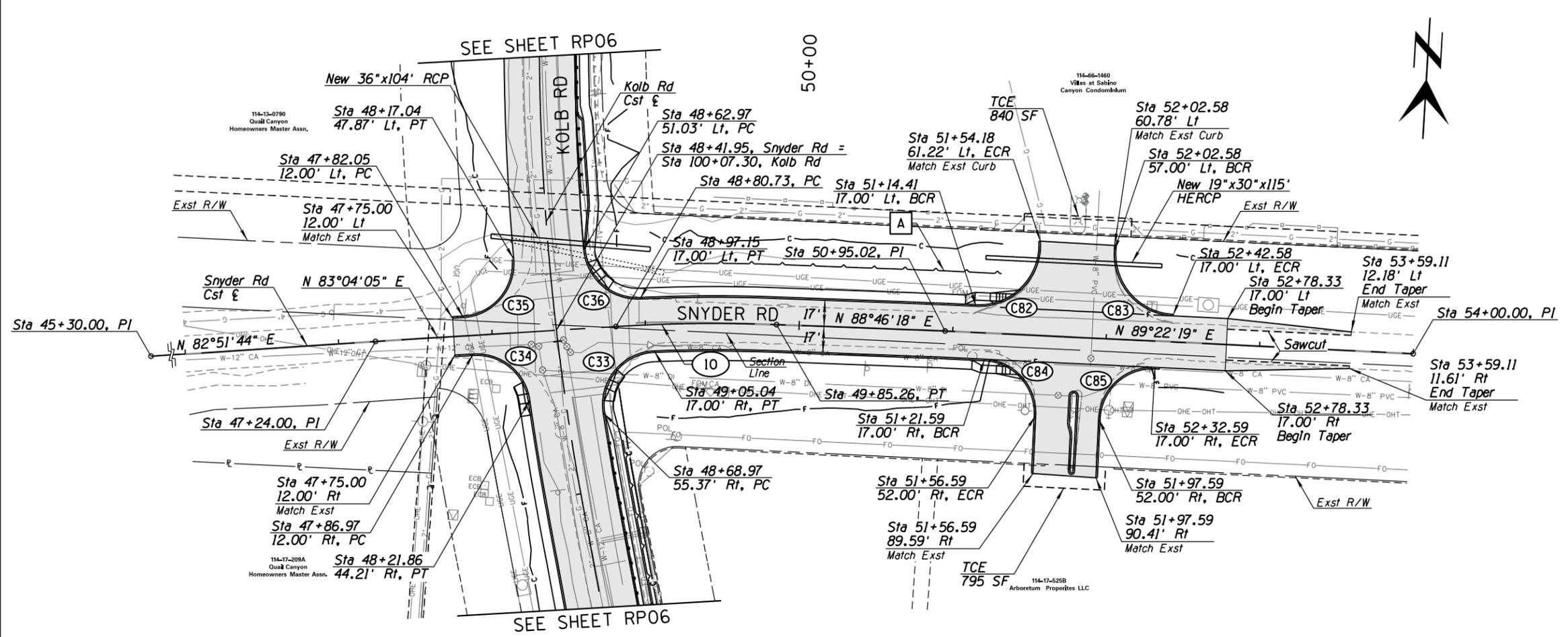
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 STA 148+00 TO STA 157+00





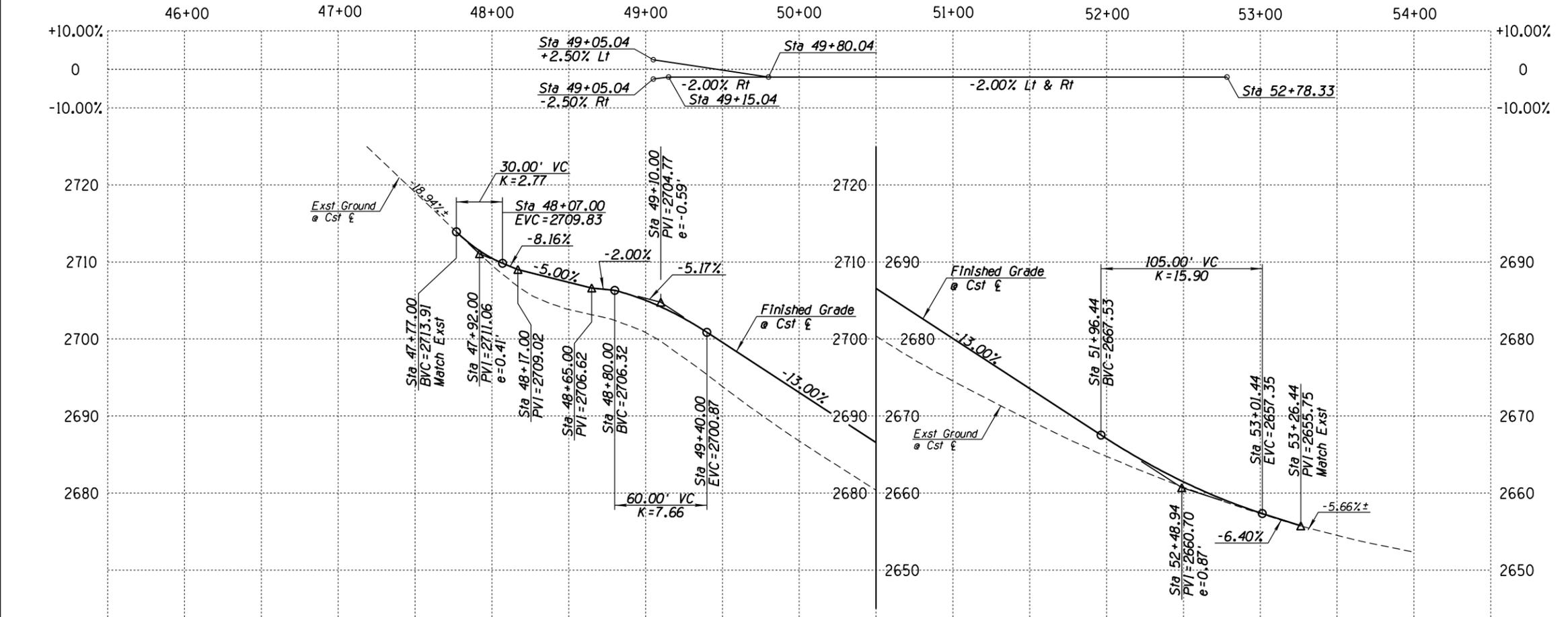
CURVE DATA

(10)

R = 1050.00'
 L = 104.52'
 Δ = 05°42'13"
 T = 52.30'
 D = 05°27'24"

A New CIP retaining wall
 Sta 49+20.00, 39.00' Lt to
 Sta 51+30.00, 39.00' Lt

Date	5/17
Designed	M. ASHBY
Drawn	M. ASHBY
Checked	K. THORNTON
Proj. Engr.	K. THORNTON



Curve Table

Curve No	Radius (ft)	Length (ft)	Delta	Tangent (ft)
C33	35.00	58.90	96°25'00"	39.16
C34	35.00	52.19	85°25'48"	32.31
C35	35.00	55.85	91°25'49"	35.88
C36	35.00	53.60	87°44'40"	33.65
C82	40.00	67.06	96°03'05"	44.46
C83	40.00	62.83	90°00'00"	40.00
C84	35.00	54.98	89°59'51"	35.00
C85	35.00	54.98	90°00'09"	35.00



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KOLB ROAD
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 STA 46+00 TO STA 54+00

PIMA COUNTY DEPARTMENT OF TRANSPORTATION

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DRAFT

APPENDIX A-2

ENVIRONMENTAL IMPACT SCREENING SUMMARY IMPACT MATRIX

Environmental Impact Screening Summary Matrix
4KSCSD Kolb Road: Sabino Canyon Road to Sunrise Drive

Potentially Affected Environmental Categories		Types of Impacts										
Applicable to Project	Project Construction and Operation Activities	Water Quality	100-Year Floodplain	Protected Watersheds	Visual Quality/Viewsheds	Protected Plants/Vegetation	Protected Animals/Wildlife	Cultural Resources	Air Quality	Noise	Hazardous Materials	Land Uses / Community Character
√	Change in the Vertical or Horizontal Alignment	X	X	NA	O	X	X	O	O	X	O	NA
	New Alignment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Added Capacity (i.e., through lanes)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
√	Milling/Grading	X	O	NA	O	X	X	O	X	X	O	NA
	Change in Access (e.g., driveways, intersections)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
√	Clearing and Grubbing	M	X	NA	M	M	M	O	X	X	O	X
	Excavation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
√	Cut Slope	X	O	NA	M	M	M	O	NA	NA	NA	NA
	Demolition	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Demolition Debris Disposal	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
√	Acquisition of Additional Right-of-Way	NA	NA	NA	NA	NA	NA	NA	NA	NA	O	X
√	Temporary Construction Easements	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	X
√	Discharge of Dredge or Fill Material	X	X	NA	X	M	X	O	X	O	O	NA
	Channeling or Dredging	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
√	Hauling	O	O	NA	O	NA	NA	NA	X	X	NA	NA
	New Signals	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
√	Storm Water Drainage	X	X	NA	X	X	X	O	NA	NA	O	NA
√	Construction Equipment	X	X	NA	X	X	X	O	X	X	O	NA
	Detour Route	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

M = Potential moderate impact
 NA = Not applicable
 O = No involvement
 X = Potential involvement but no or minimal impact



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