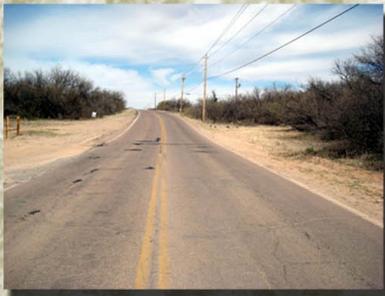


S A N T A C R U Z C O U N T Y

# Palo Parado, I-19 to Pendleton Drive Design Concept Report

August, 2008



Prepared for:  
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2. "Design Concept Report, Palo Parado – I-19 to Pendleton Drive," Novak Environmental, Inc., March 2008
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4. "Palo Parado Bridge at the Santa Cruz River, Bridge Structure Selection Report." Structural Concepts, Inc., March 27, 2008
5. "Preliminary Geotechnical Engineering Review Services.", Terracon Consulting Engineers and Scientists, March 13, 2008

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- A. DRAINAGE REPORT**
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## I. OVERVIEW

The purpose of this Design Concept Report (DCR) is to evaluate alternative roadway alignments across the Santa Cruz River from the Palo Parado Interchange (Exit 25km), across the Union Pacific Railroad (UPRR), to Pendleton Drive.

The study area for this DCR is located in Santa Cruz County, bounded on the west by the Palo Parado Interchange at I-19 and on the east by Pendleton Drive, and encompasses approximately 0.32 square miles/202 acres. See **Exhibit 1: Location Map**, and **Exhibit 2: Project Area**.

A previous report prepared by Tetra Tech, Inc. in 2002 for Santa Cruz County, “**Rio Rico Corridor Study**” (RRCS), analyzed a larger area, approximately 16.5 square miles, which included three alternatives for this all-weather road connection, the Pendleton Drive Extension (Alternative 1), the Santa Gertrudis Lane Alignment Crossing (Alternative 2), and Alternative 3, the Palo Parado Crossing.

It was this final Palo Parado Crossing Alternative which was the selected solution and thus became the study area for this current DCR. In summary, the Palo Parado alignment was chosen because:

1. Majority property owner will consider a no-cost dedication of right-of-way
2. It is ideally located in the central portion of the study area
3. It would result in least amount of environmental disturbance
4. Minimal impediments to construction, thus cost effective
5. Few negative impacts: Located in undeveloped area

**This DCR analyzes three alternatives of the Palo Parado Crossing.** All three begin at Point A, the Palo Parado Interchange on the west and end at Point B, Pendleton Drive. However, from Point A to Point B various alignments are possible, and three of these alignments are studied in this DCR. Four main design components of each alternative are: 1) an intersection at the Palo Parado Interchange, 2) a new bridge crossing of the Santa Cruz River, 3) a new crossing of the Union Pacific Railroad, and 4) a new intersection at Pendleton Drive.

How these four critical design elements are negotiated provides the primary basis for the evaluation and selection of the preferred alignment, along with issues of rights-of-way, safety, construction cost, construction duration, impacts on the UPRR, existing drainage patterns, environmental concerns and requirements, and traffic.



In the past, this area, which is the subject of this DCR, was sparsely populated agricultural land. As such, east-west crossings of the UPRR were accomplished on a case-by-case basis, with “right to pass” permissions given to private landowners in the immediate vicinity as needed. And crossings of the Santa Cruz River were done, when feasible, through the dry riverbed, or at all-weather crossings miles further north or south during monsoon season.

Over the past 25 years, however, development east of the Santa Cruz River and the UPRR has continued at a greater pace, and now, according to population statistics from the 2000 census and from the Tetra Tech study, there are over 13,000 residents in the area bounded on the north by the Tubac Bridge and on the south by the Rio Rico Bridge, all east of Interstate 10, the Santa Cruz River, and the UPRR (see photo of existing crossing on next page). Future projections estimate the population at over 31,000 by the year 2020 (RRCS, page 13). Currently, population densities are clustered around the two all-weather crossings at the Tubac Bridge and at the Rio Rico Bridge. A centrally-located crossing at Palo Parado would likely alter this distribution, ease congestion, and provide a critical safety route for emergency vehicles (RRCS, page 13).

Union Pacific Railroad crossings at Santa Gertrudis and at Palo Parado, permissions for both which had been granted years ago as “private crossings,” have now come into question due to the volume of traffic utilizing them. The UPRR has announced that it will be closing these crossings in the very near future and this presents issues of both safety and convenience for the residents.

With the imminent closure of the Palo Parado Crossing, the Board of Supervisors has approved the creation of a public road from Pendleton Drive to the west side of the UPRR tracks. First United, one of the adjacent land owners, offered to donate its 60-foot-wide easement at Palo Parado to the county. The intent of this action is for the county to take the roadway into its

system so that it can qualify for Section 130 funds from the Arizona Department of Transportation to pay for a signal and control gates. The Supervisors and the developers, under the name Santa Cruz River Access LLC, have agreed to let the County use Caballero Corte as a public road for four years. The roadway will cut straight across from Pendleton Drive just north of the existing road that curves toward the tracks.”

This move by the developers and the Board of Supervisors establishes a temporary, emergency solution to the UPRR crossing issue. See **Exhibit 3: Temporary Crossing** on page 9.

**The construction of a permanent connector road from the Palo Parado Interchange will be the permanent solution, and is the purpose and focus of this DCR.**

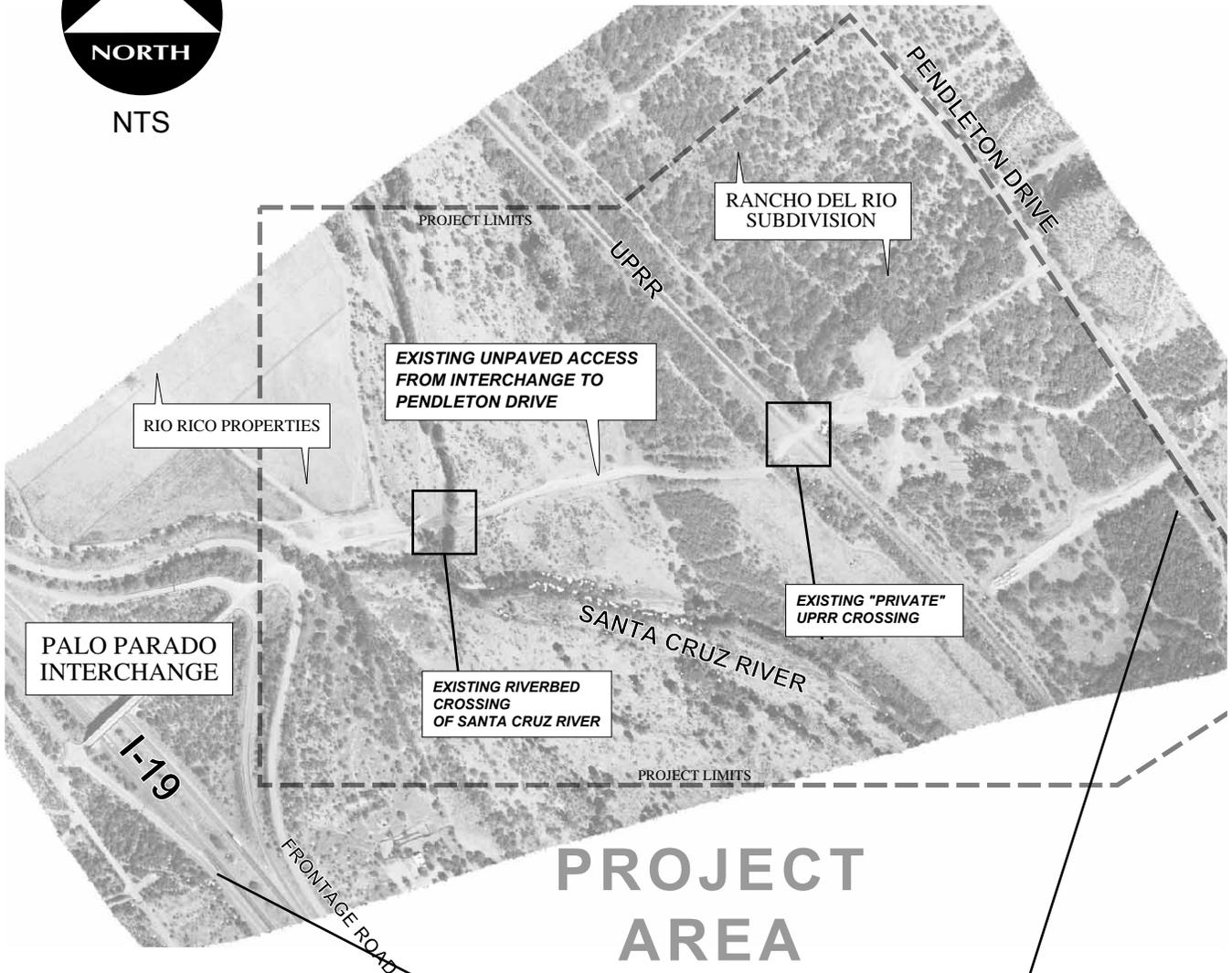
**RECOMMENDED ALTERNATIVE:** The alternatives are presented in Section V. Alternative 1, the northernmost alignment, is the preferred alternative based on roadway geometry and hydraulic considerations. However, Alternative 2, which closely mirrors the present dirt alignment that exists, is the recommended alternative from an economic consideration. This is due to the fact this alignment qualifies additional funding of approximately \$350,000 for the construction of the gated crossing of the UPRR. This alignment requires a new bridge crossing of the Santa Cruz River and a new crossing of the UPRR. The estimated cost to complete the design and construction of Alternative 2 is \$6,236,783, at today’s projected costs. An escalation cost factor will need to be applied for future planning purposes.



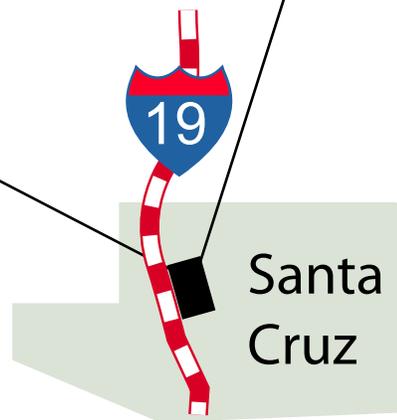
**STUDY AREA**  
PALO PARADO INTERCHANGE



NTS



# PROJECT AREA

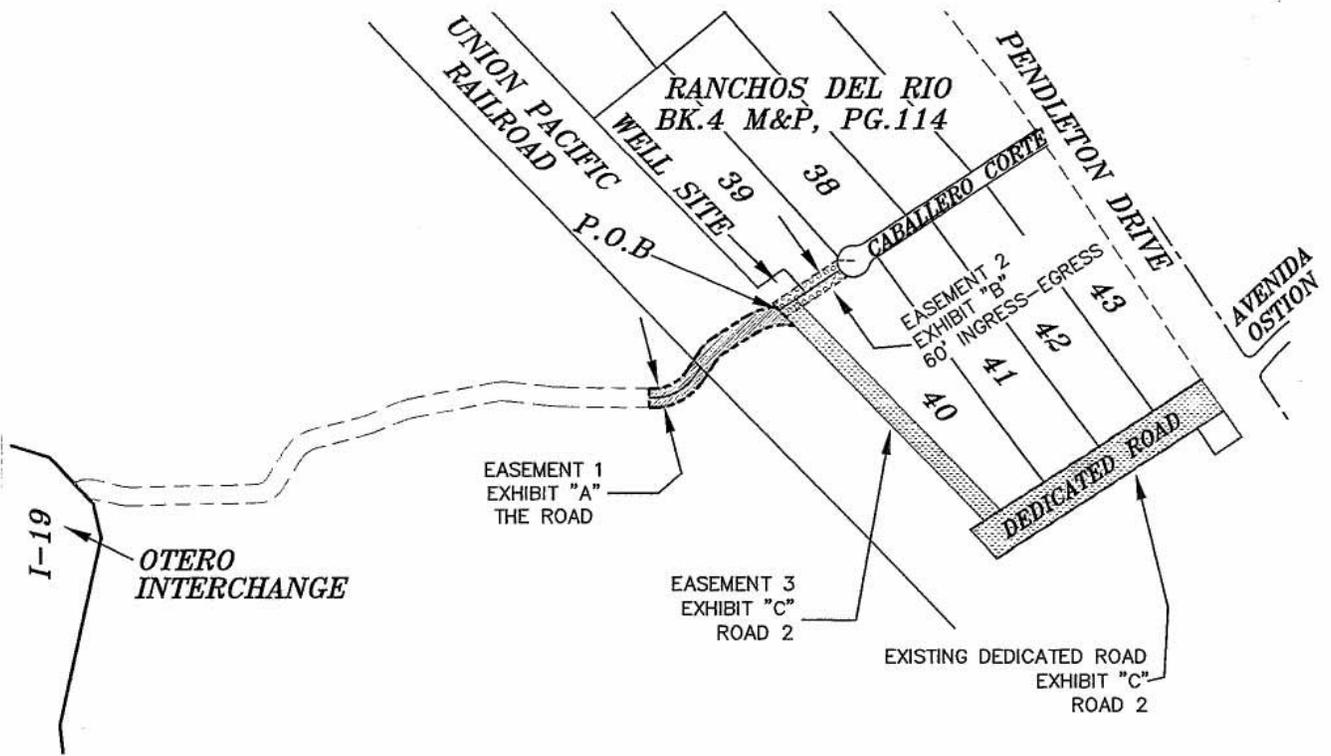


Santa Cruz

NOGALES



NTS



**Exhibit to Accompany Description of  
Ingress-Egress Easements to  
SANTA CRUZ COUNTY**

## II. PROJECT DESCRIPTION – SCOPE OF WORK

Three (3) Palo Parado to Pendleton Drive roadway alignments have been developed for this DCR which meet the project objectives to create an all-weather connection from the I-19 corridor at Palo Parado to Pendleton Drive to the east, crossing both the Santa Cruz River and the UPRR. These alternatives are discussed in Section V. **Alternative 2 is the recommended alignment and includes the following major items:**

- New road construction
- New river crossing, construction of bridge with 2 – 14' travel lanes
- Palo Parado Interchange to Pendleton Drive, 3260 LF to 4025 LF depending on alternative selected
- Design speed 55 mph, posted speed 35 to 45 mph
- Nominal right-of-way width of 120 feet to 60 feet
- Road section details (see Exhibit 4)
- Drainage improvements – Santa Cruz River channelization, CMP drainage crossings, Cut Ditches and Culverts along roadway section
- New graded railroad crossing requiring coordination with UPRR
- New signage and pavement markings
- Non-signalized intersection at Pendleton Drive
- Intersection at Palo Parado Interchange (non-signalized)
- Environmental mitigation
- New signs and pavement markings
- New Bridge, Abutments, and bank protection at Santa Cruz River

### III. PROJECT AREA CHARACTERISTICS (EXISTING CONDITIONS)

The study area for this DCR is located in Santa Cruz County, bounded on the west by the Palo Parado Interchange at I-19 and on the east by Pendleton Drive, and encompasses approximately 0.32 square miles/202 acres. The project area characteristics outlined and discussed below are common to all three of the alternatives considered in Section V of this DCR. See **Exhibit 1: Location Map**, and **Exhibit 2: Project Area**.

#### A. TOPOGRAPHY/TERRAIN

The topography of the project area varies from the elevated I-19 on the west, through relatively flat Santa Cruz River floodplain, to the “curvilinear and undulating” Pendleton Drive at the base of the foothills on the east. It is at approximately 3300 feet in elevation.

The land slopes at roughly 2.7% for a distance of approximately 1350 feet from Pendleton Drive west to the UPRR. From the UPRR tracks, the land drops off for about 80-100 feet into the Santa Cruz alluvial at approximately 10% slope.

The Santa Cruz River alluvial plain stretches approximately 1600 feet from the base of the UPRR slope west to the Palo Parado Interchange. Except for the river channel itself, this floodplain is relatively flat.



Looking to the east across Santa Cruz River floodplain

**B. EXISTING ROADWAYS/ACCESS**

**Interstate 19** and appurtenant Frontage Roads all lie within ADOT rights-of-way, are paved and in satisfactory to good condition. I-19 is an all-weather access highway.

**The Palo Parado Interchange** (Exit 25km) provides direct access to a two-way, two-lane frontage road located east of the highway. The Interchange is currently connected to an unimproved roadway that runs 0.9 miles east to Pendleton Drive.



Palo Parado Interchange

**Pendleton Drive** is a north-south collector road located east of both the Santa Cruz River and the UPRR tracks. It provides all-weather access to and from I-19 via Rio Rico Drive to the south. Pendleton Drive is a paved, rural, two-lane road that extends through the limits of this study area. It is within Santa Cruz County right-of-way and is in satisfactory condition. Pendleton Drive crosses numerous washes in paved, at-grade ford sections. Lying at the base of the foothills, the Drive is characterized as curvilinear and undulating. Directly west of Pendleton lie the flat agricultural floodplains of the Santa Cruz River (RRCS, pgs 5-6).



Pendleton Drive

**C. SANTA CRUZ RIVER CROSSING**

Any one of the three alternatives will have to cross the Santa Cruz River. The existing reach of the Santa Cruz at any of the three proposed crossings is unimproved without bank protection on either side.



Existing Santa Cruz River Crossing

#### **D. UPRR CROSSING**

The Union Pacific Railroad maintains tracks within the study area. The tracks traverse this area in a north/south direction lying east of the Santa Cruz River and west of Pendleton Drive. Any one of the three alternatives will have to cross the Union Pacific Railroad before connecting to Pendleton Drive.

The tracks lie within UPRR right-of-way which maintains a fairly consistent 200-foot width through the study area, though there are minor variations. The tracks are elevated above the floodplain in which they lie.



As discussed earlier in Section I, this crossing has been a controversial issue, and is a critical factor in satisfying safety concerns for the area, as well as providing efficient transport connection to the I-19 corridor. Maximum sight visibility at the crossing is an important criterion for the alternative alignments.

Currently, Santa Cruz County and the UPRR are in negotiations for establishing an easement at the present crossing, and for securing Section 130 funding for the construction of an at-grade, gated, crossing.

## E. LAND USE

Current land use in the study area of the three alternatives is predominantly ranchland and agricultural, zoned GR, General Rural Zoning District, and it is owned by Rio Rico Properties.

Approximately 40 acres of land south of the Palo Parado Interchange is zoned B2, General Business Zoning District, however all alternatives are outside this district.

## F. TRAFFIC

- a. **General conditions:** Currently there are two all-weather crossings of the Santa Cruz River which provide access to I-19 for the developed areas east of the river and the UPRR. One is the Tubac Bridge, on the Bridge Road alignment, approximately 6.5 miles north of the current Palo Parado alignment study area. The second is at Rio Rico Drive, approximately 4.6 miles south of this study area.

There are also several connections to I-19 from the developed areas east of the river which are generally private, unpaved roads that have at-grade fords of the river. As discussed in Section I, these private roads also typically hold “right to pass” permissions granted by the UPRR when the area was less densely populated. These permissions have recently come into question due to overuse and the safety concerns which result, as well as disputes over ownership of the roads themselves.

The “Santa Cruz County Comprehensive Plan” (2004) shows the Palo Parado-Santa Cruz River Crossing as a “planned roadway improvement” in Figure 5: Transportation Improvements.

- b. **Traffic study of existing conditions**

Kittleston & Associates, Inc. prepared a traffic assessment of the proposed Palo Parado Road Extension from I-19 to Pendleton Drive. The traffic analysis evaluated the impacts of the extension on capacity and operations at the existing I-19 interchange and determined appropriate improvements at both the interchange and intersection at Pendleton Drive.

The existing traffic conditions (900 to 1000 vpd) were established from morning and evening peak period traffic counts (7 AM – 9 AM and 4 PM – 6 PM) collected in March 2008. Existing traffic conditions, including level of service and queuing were analyzed using the 2000 Highway Capacity Manual methodologies provided in the Synchro traffic analysis software. Existing intersection lane configurations, traffic control, and traffic conditions are summarized in Figure 1, Appendix B.

Current peak hour traffic volumes at the interchange are very low. Critical movements at all found unsignalized intersections at the interchange experience essentially no delay and operate at Level of Service (LOS) A. Based on the 95 percentile queue lengths estimated by the Synchro model, no queuing occurs. At the intersection of East Frontage Road/Palo Parado Road, traffic on Palo Parado is stop controlled. The stop sign for eastbound traffic is located in a striped area in the pavement. During data collection, some drivers were observed to ignore the stop sign and pass drivers that made the proper stop at the frontage road.

#### **G. DRAINAGE CHARACTERISTICS / HYDROLOGY**

The Drainage elements presented in this Design Concept Report (DCR) of the Palo Parado Roadway access to Pendleton Road is from the Palo Parado Interchange, Exit 25 of the Interstate Highway I-19. The hydrologic information included in this report impacts safe design features of the proposed roadway. The evaluation of hydraulic parameters controls the design of the all weather access aspect of the roadway. Much of the hydrology information for this 0.40 square mile (265 acres) Study Area is available from previous studies (see References) and information from maps and field investigations.

The average rainfall in the study area is 25 inches annually, increasing to about 30 inches in the San Cayetano Mountain Range, east of Pendleton Drive. Rainfall occurs from three general types of storms. Winter storms are the result of frontal activity and usually cover large areas. The intensity of winter precipitation is generally less however the duration is significantly longer than the high intensity, short duration precipitation during summer, August, September and October. The summer rains result from thunderstorm (convectonal) events.

Extreme flood events occasionally occur during September and October when the topical cyclonic conditions prevail in the area. These are the storm events, which cause major flood events. The project site lies in the 31° 31' Latitude Zone, which is just south of the Tropic of Cancer. The Santa Cruz River watershed above the study area covers 1097 square miles, which includes the 47.5 square miles of Peck Canyon Wash watershed. The 100-year discharge of 41,400 cfs used in this design is however the discharge downstream at the confluence of the Josephine Canyon Wash Watershed, See **Table 3 in Appendix A**.

The embankment of Union Pacific Railroad is the eastern limit of the Santa Cruz River floodplain and a metamorphic steep bank defines the western limit of the Santa Cruz River floodplain. This bank will also provide a firm foundation for the west abutment of the proposed bridge for the Palo Parado Roadway. The bridge and the three alignments of the Palo Parado Roadway are depicted in **EXHIBIT 2: HUNDRED YEAR FLOODPLAIN/FLOODWAY BOUNDARY (Appendix A)**.

The hydrology estimate of 41,400 cfs 100 year discharge is the Santa Cruz County and Federal Emergency Management Agency (FEMA) accepted flow, see Table 3 – Summary of FIS Discharges Table excerpted from the Flood Insurance Study (FIS) Report dated August 23, 2000. Approximately 116 acres of the study area is the Santa Cruz River floodplain, which must be traversed by the Palo Parado Roadway. A bridge crossing across the existing primary natural channel of the Santa Cruz River will be required to ensure the all weather accessibility of the roadway. Preliminary hydraulic assessment of the Santa Cruz River floodplain indicates that the existing average floodplain width of 1700 feet (850 feet average floodway width) will need to be channelized at least 600 feet upstream and about 500 feet downstream for a 440-foot span bridge for the selected alignment of the Palo Parado Roadway.

The hydrology of the three washes impacting the study area is adopted from the drainage report of the Ranchos Del Rio Subdivision, prepared by the WLB Group in October 2004. The 100-year discharges entering the Santa Cruz River and their concentration point locations are depicted in **EXHIBIT 1 (Appendix A)**. Their impact is considered in the alignment location selection process.

The US Army Corps of Engineers, Hydrologic Engineering Center Model, HEC-RAS is used to analyze the floodplain of the Santa Cruz River. Both the floodplain and the floodway boundaries resulting from the 100-year flood magnitude of 41,400 cfs is analyzed and shown on **EXHIBIT 2 (Appendix A)**. The Santa Cruz River 100-year floodplain width in this Study Area varies between 1700 Ft. and 2400 Ft. The floodplain and floodway water surface elevations are also evaluated and labeled on **EXHIBIT 2 (Appendix A)**. These elevations are used in the design of the bridge structure proposed in this DCR. The hydraulic studies also include the scour depth estimate analysis. The results are reported in **Appendix A**, which includes the HEC-RAS Report and the Scour Analysis Calculations. The HEC-RAS Model is also applied to the channelized (proposed) portion of the Santa Cruz River to determine the approximate upstream and downstream bank protection improvements of the river banks to ensure safe/adequate conveyance under the bridge and protection of the bridge during the 100-year flood events.

East and west of the railroad embankment, large capacity culverts will need to be designed and constructed to handle the large flows concentrating within the eastern channels along the railroad. The design of these culvert drainage structures is only a rough estimate considered in this DCR Study to evaluate an approximate cost estimate. More accurate analysis will need to be undertaken once the final alignment of the Palo Parado Roadway and construction schedule are determined and funds for final design and construction are budgeted.

The Drainage Study Report and results are included in the Appendix A. The currently existing Flood Insurance Rate Map (FIRM) panels are 040090 0135A and 040090 0145A, see **Figures 4 and 5 in Appendix A: DRAINAGE**

**REPORT.** The detailed information of the floodplains and floodway shown on **EXHIBIT 2 (Appendix A)** are the same as those, which will be used by FEMA to prepare the revised FIRM Panels, expected in September 2009.

## **H. GEOTECHNICAL**

The study area is located along the Santa Cruz River Basin within the physiographic province that is bounded by the Santa Rita Mountains and the San Cayetano Mountains on the east, by the Tumacacori Mountains and the Atascosa Mountains on the west. This area is characterized by broad alluvial basins bounded by steep, rugged, fault-block mountains. These alternatives fall within the alluvial floodplain of the Santa Cruz River.

The surrounding mountains are composed of igneous, sedimentary and metamorphic rock. The 1997 Uniform Building Code (UBC) shows the project area within seismic zone 2A. Miocene age faults have been mapped parallel to the Santa Cruz River along the mountain ranges to the east and west.

The project is located within the Arizona Department of Water Resources (ADWR) Santa Cruz Active Management Area. Basin-fill sediments in the Upper Santa Cruz River valley form three aquifer units. Listed in ascending order, they are: the Nogales Formation, and the older and younger alluvium. All three units are unconfined, hydraulically connected and yield water to wells.

The report entitled "Maps Showing Groundwater Conditions in the Upper Santa Cruz Basin Area, Pima, Santa Cruz, Pinal and Cochise Counties, Arizona," 1982, indicates depth to groundwater in the vicinity from 6 to 33 feet below ground surface along the Santa Cruz River. Depths to groundwater increase closer to the mountain ranges to the east and west.

The regional groundwater flow, based on a 50-foot contour interval, is northerly along the path of the Santa Cruz River (from RRCS, 2002).

"The proposed bridge location will cross the Santa Cruz River on what is currently private property at Palo Parado. Currently the crossing is a dirt road across the perennial river bottom. The banks of the river are unprotected at this time.

The preliminary opinions are based on our [Terracon] previous experience and knowledge of the conditions and what we expect may be encountered in the subsurface at this location. This evaluation did not include subsurface exploration by drilling and sampling, and any opinions are subject to re-evaluation following subsequent work.

From our experience in this area and with similar bridge crossings, we expect a bridge at this location to be supported on deep drilled shaft foundations extending

below design scour elevations. The Bridge Superstructure will be supported by multiple column piers within 5'-0" diameter concrete drilled shaft foundations with concrete columns. The Abutments will be supported by 4'-0" diameter concrete drilled shaft foundations structures similar to the piers. The design scour depths at the two bridge locations vary between 28 feet and 30 feet below the existing river bed elevation. A detailed geological investigations study will be undertaken during the preparation of bridge construction drawings to verify the above recommendations.

We expect the subsurface soils within about five feet of the ground surface at the banks of the river to be silt or clayey sands with varied amounts of gravel. Below depths of about five feet at the banks, and below the surface of the river bottom, we expect the subsurface soils to consist of sands with gravel, having trace fines and numerous cobbles. We expect some of the subsurface layers to have significant amounts of gravel and cobbles, and could also contain higher percentages of clay within the sand-gravel-cobble matrix. We do not expect bedrock to be encountered within 100 feet of the ground surface.

These soils are expected to be moderately dense to very dense below depths of about 10 feet from the ground surface. Groundwater might be encountered, particularly at depths of 30 feet or more below the ground surface." From "Preliminary Geotechnical Engineering Services, Preliminary DCR Bridge Selection, Palo Parado Over Santa Cruz River," Terracon Consultants, Inc., March 13, 2008.

## **I. ENVIRONMENT**

The environmental screening for this project provides an initial indication of potential environmental impacts to the surrounding physical, social, and economic environment that may result from the construction and operation of the proposed roadway. This screening is the first step in the preparation of the Environmental Assessment and Mitigation Report (EAMR). The EAMR report will not be prepared as part of the DCR, but is requirement of the final design. The purpose of the EAMR is to perform a riparian habitat qualitative and quantitative analysis; endanger species impact mitigation considerations and preservation of native species. A comprehensive EAMR preparation and approval can easily take 6 months to 18 months to complete because there are many Agencies involved, particularly because of the Santa Cruz River Crossing and the Rail Road Crossing/Improvements. Santa Cruz River in this area has some environmental concerns also because of discharge of untreated sewage in the past and transport of untreated sewage with the flows arriving from Mexico. This will require involvement, by the Arizona Department of Environmental Quality (ADEQ), the Arizona Game and Fish, National Forest Service and possibly National Environmental Protection Agency (NEPA).

Key points necessary for the completion of the screening process are:

- State Federal approvals are needed to build a bridge across the Santa Cruz River at the Palo Parado alignment (or any alignment).
- Environmental issues that need to be addressed include native plants, especially potential impacts to species of special interest, endangered species and important riparian areas.
- Arizona Game and Fish Department, AZ Department of Transportation, US Fish and Wildlife and US Army Corps of Engineers are key agencies that have a say in review of potential impacts.
- Biological Evaluations (BE) are more detailed in scope and provide more information for a project.
- Mitigation Reports address impacts and what is going to be done to mitigate them, or offset any negative impacts to the environment in a specific area. The process may include the revegetation of areas and limit any grading if possible.
- Other considerations include cultural or archeological impacts, 404 permits, air quality, or noise issues.

The Corps of Engineer/404 review process is not required at the DCR phase, however, once a preferred alternative location for the roadway is identified, a meeting will be required to identify the Corps of Engineers involvement schedule and guidelines to make the 404 permit application/approval process smooth. Review comments from the Corps staff are difficult to expect at the DCR phase because the staff normally is reluctant to commit themselves, especially because of a recent law suit in progress, which may impact the rule change governing the 404 permitting laws. We can only expect some general information regarding the permitting process. The 404 process will become important at 60% to 75% final plan preparation phase.

The area is composed of deciduous riparian forests in the floodplain and low lying areas. Grasslands and Sonoran Desert Scrub dominate the nearby foothills. Depending on access to water and the amount of grazing in an area, densities of vegetation change from thick mesquite bosques, open pastures, desert scrub, grasslands, and low density riparian scrublands.

The Santa Cruz Valley has a rich and varied history. Native American tribes are known to have lived along its banks for at least 12,000 years. Just north of the project area is the Spanish Mission, Tumacacori. It was established by Father Kino in January of 1691.

Historically, the Santa Cruz River flowed year round; it fostered a dense riparian wetland and the larger floodplain was an ideal place for farming. The introduction of cattle, non-native plants, the rise in population, and increased development has drastically changed the quality and character of the river. The lowering of the water table and drought has also affected the river conditions. Presently, the Santa Cruz River is perennial due to effluent from the Nogales International Wastewater Treatment Plant with a normal flow of 15mgd, and also runs in the rainy seasons. (Novak Environmental, 2008).



The Greater Rio Rico area is home to a wide array of wildlife species. Birding is an especially important activity for this area. Bird watchers from around the world come here to try and catch a glimpse of the many bird species that use this area. The wetlands here, formed by the Santa Cruz River, are known waterbird migration stop-over sites, and draw many species of ducks and herons. In addition, the Cottonwood/ Willow gallery forests and long stretches of high quality Mesquite Bosque draw a wide variety of other common and rare bird species (Novak Environmental, p 15).

One may also see coyotes, red tail hawks, grey fox, javelinas, deer, mountain lions, or other wildlife common to the southwest (Novak Environmental, p 16).

**J. ARCHAEOLOGICAL AND HISTORIC**

Due to its proximity to Mexico, and the rich and varied history, there are many Regional Cultural Resources in this area. Among the most notable are: Tumacacori Mission, Tubac Persido State Historic Park, Salero Mine Ghost Town, Aliso Springs, Tumacacori Mountain, Juan Bautista Anza National Historic Trail, Nogales Historic Area and the International US/ Mexico Border at Nogales (Novak Environmental, p 16).

## IV. MAJOR DESIGN FEATURES

The study area for this DCR is located in Santa Cruz County, bounded on the west by the Palo Parado Interchange at I-19 and on the east by Pendleton Drive, and encompasses approximately 0.32 square miles/202 acres. See Exhibit 1: Location Map, and Exhibit 2: Project Area. All three alternative alignments discussed in Section V will comply with the following design features.

### A. GEOMETRIC DESIGN STANDARDS

The design standards for this project are derived from:

- The American Association of State Highway and Transportation Officials (AASHTO) “A Policy On Geometric Design of Highway and Streets,” 2001 Edition.
- “The Manual On Uniform Traffic Control Devices (MUTCD),” Millennium Edition.
- The policies and guidelines of the Arizona Department of Transportation.
- Santa Cruz County Roadway Standards / MAG Standards

#### **Design Criteria:**

- Design Year: 2008-2009
- Roadway Classification: Rural Minor Collector Road
- Design speed: 55 mph (posted speed limit 45 mph)
- ADT: 1000 vehicles per day, 3740 vpd by year 2000
- Design Hour Volume 100
- Road cross slope: 2% crown, 6% maximum superelevation
- Longitudinal grade: 5%
- Access control: None
- Traffic control: Stop signs/advisory panels
- Roadway width: 40 feet
- Lane width: 12 feet
- Number of lanes: 2
- Shoulder width and type: 5-foot paved, with 7-foot graded shoulder
- Bridge loading class: HS20-44
- Bridge width: 40 feet per report (42' ultimate width)
- Bridge length: 440± feet
- Bicycle/pedestrian accommodations: None
- Maximum allowable curvature: 1150 feet
- Right-of-way width: 120 feet up to the Rail-Road; 60 ft (minimum) East of RR
- Cut/Fill slopes: 4:1 to 6:1
- Pavement section: 3" Asphaltic concrete over 6" aggregate base (Geotechnical report to determine: Min. Pavement Structure # (SN)  $\geq$  2.46))
- Design Vehicle WB-40

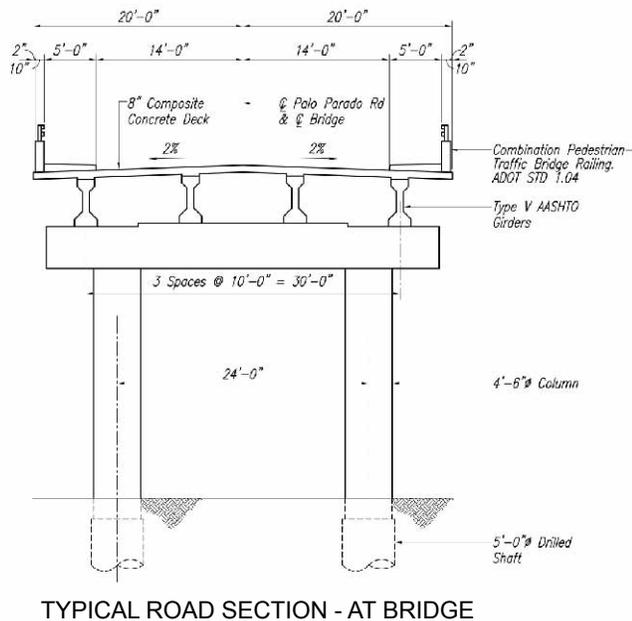
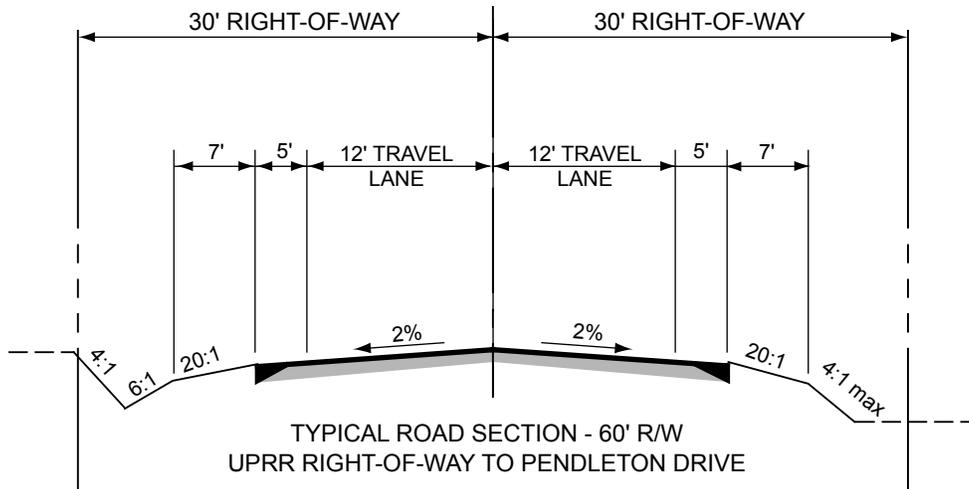
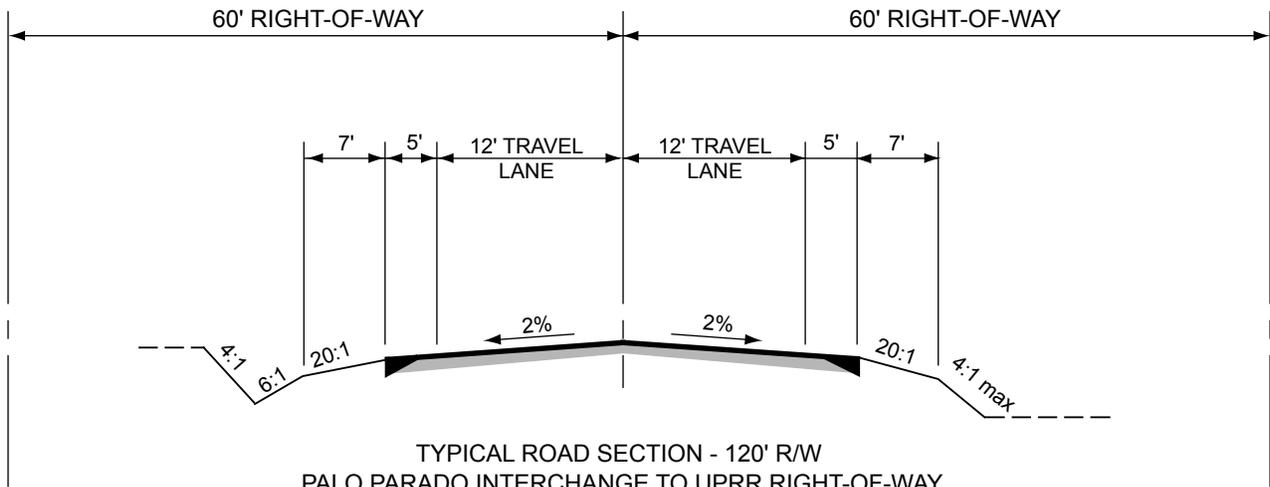
**B. TYPICAL SECTIONS**

The recommended typical section is 2-12 foot lanes with 5-foot paved shoulders, 7-foot unpaved shoulders, for a total roadway width of 48 feet per MAG design standards for a minor rural two-lane collector.

Roadway cut and fill slopes should be constructed according to ADOT Standard C-02.30.

At the bridge crossing the roadway has 14-foot travel lanes with 5-foot paved shoulder each side. The total width from abutment to abutment is 40 feet.

See **Exhibit 4, Typical Sections** on the following page. Also see sections in **Appendix B: Traffic Assessment**.



### C. ALIGNMENT AND GRADE

Three alignments between the Palo Parado Interchange and Pendleton Drive were studied (see **Exhibit 5: Alternative Alignments**, page 29) and all three alignments were guided by the following goals:

- Obtain the greatest sight distance at the UPRR crossing for safety
- Minimize the limits of construction
- Minimize overall environmental impact on the Santa Cruz River and surrounding area, mitigate where necessary
- Maximize the hydraulic capacity of the bridge opening
- Minimize right-of-way acquisition
- Minimize earthwork/excavation as much as is practical
- Roadway Safety, need for guardrails, fences, etc.
- Railroad crossing: gated, signalized, visibility north and south

The Palo Parado Alignment 1 is basically straight extending east from the Interstate I-19 Frontage Road intersection to Pendleton Drive, a distance of 3200 Feet. The existing ground falls easterly towards a 7 foot bank, which is the existing west bank of the Santa Cruz River at approximately 7% grade which then becomes relatively flat up to the west bank. During field visits to the site, it was observed that this west bank of the River composition is several pieces of large rocks embedded in or cemented together with voids filled with sand and gravel configuration. The sedimentary depositions have permitted rather dense growth of vegetation along this west bank making it somewhat stable. The rocks appear to be of metamorphic origin. Hence in this report this west bank is called a metamorphic ledge. A detailed geologic study will be undertaken during the roadway design phase to verify these findings. Similar grade changes occur along alignments 2 and 3; however, these alignments take a slight south-easterly route towards the metamorphic ledge. The proposed roadway grade is a positive 1% to 1.2% to the bridge alignment. This is because the bridge will be constructed to pass the entire 100-year flood of 41,400 cfs under the bridge with a five (5) foot freeboard. The bridge superstructure is approximately 8 feet thick from the low chord to the finished surface.

The natural grade from the Santa Cruz River up to the railroad right-of-way east and south-easterly is flat at about 0.5%. The proposed roadway alignment from the bridge will then drops down towards the railroad right-of-way at a negative grade of about 1.2% and 1% to the existing east top of bank of the river. The natural grade of Alignment 1 to Pendleton Drive then rises at a steady grade of about 3.5% east of the railroad right-of-way. The proposed roadway alignment grade does the same except that it rises at about 3% to Pendleton Drive for Alignment 1. This existing topographic rise feature of alignment 1 makes it the favorable and desirable location for the safe railroad crossing. Local drainage is also minimal except for the discharges flowing in the ditch along east toe of the railroad embankment. **See the proposed Plan and Profiles of Alignment 1 in the Appendix.**

For alignment 2 the natural ground to the east bank of the Santa Cruz River Valley rises at a relatively flat grade of 0.5% up to the railroad right-of-way west line. The railroad is constructed on an embankment to stay dry during large flow events. The alignment 2 roadway will drop down at a 1.4% grade to stay about one foot above the 100-year water surface elevation in the river and then it will rise at about 1.3% grade to the railroad embankment. This location for railroad crossing is undesirable because considerable fill will be required within the railroad right-of-way to construct a safe crossing across the railroad. Furthermore, this alignment will require construction of a large drainage structure either under the railroad or along east toe of railroad embankment. This alignment 2 then meets the western limit of Caballero Corte which is a constructed local road of the Rancho Del Rio subdivision. This road is not constructed to meet the necessary roadway standards. Therefore it will need to be upgraded. Upgrading the intersection would require removing existing pavement and curbs and replacing them with the appropriate improvements, and will add to the cost estimate of this alignment 2, see **the Plan and Profiles in the Appendix**.

The natural ground along alignment 3 is within the proposed floodway of Santa Cruz River. All efforts to keep this roadway alignment outside of floodway were found to be unfeasible. The encroachment within the floodway however, does not create an adverse impact to the adjacent properties upstream or downstream, therefore, the alignment is feasible, although for considerably high cost. This is later explained in the alignment selection process Section / Chapter. The roadway grade is negative about 1% down to the 100-year water surface elevation of 3328 feet and then rises at positive grade of 0.5% to the railroad embankment. It then follows an easterly alignment to Pendleton Drive at negative grade of 0.75% for about four hundred feet east of the UPRR Rail-Road Right-Of-Way. From this location the Palo Parado Roadway will follow the existing ground surface positive grade of 2.4% to Pendleton Drive. This alignment will require considerable amount of soil cement bank protection to protect the roadway from even more frequent floods of the Santa Cruz River. The Rail-Road crossing location is also not desirable at this location, see **the Plans and Profiles in the Appendix E**. This crossing is unsafe because the alignment places the intersection with the Rail-Road at a skewed angle with availability of limited sight distance along the rail-road. The fast coming trains will not be clearly visible by the commuters approaching the Rail-Road.

The 30% plan and profile sheets of all three alignments are included in Appendix E.

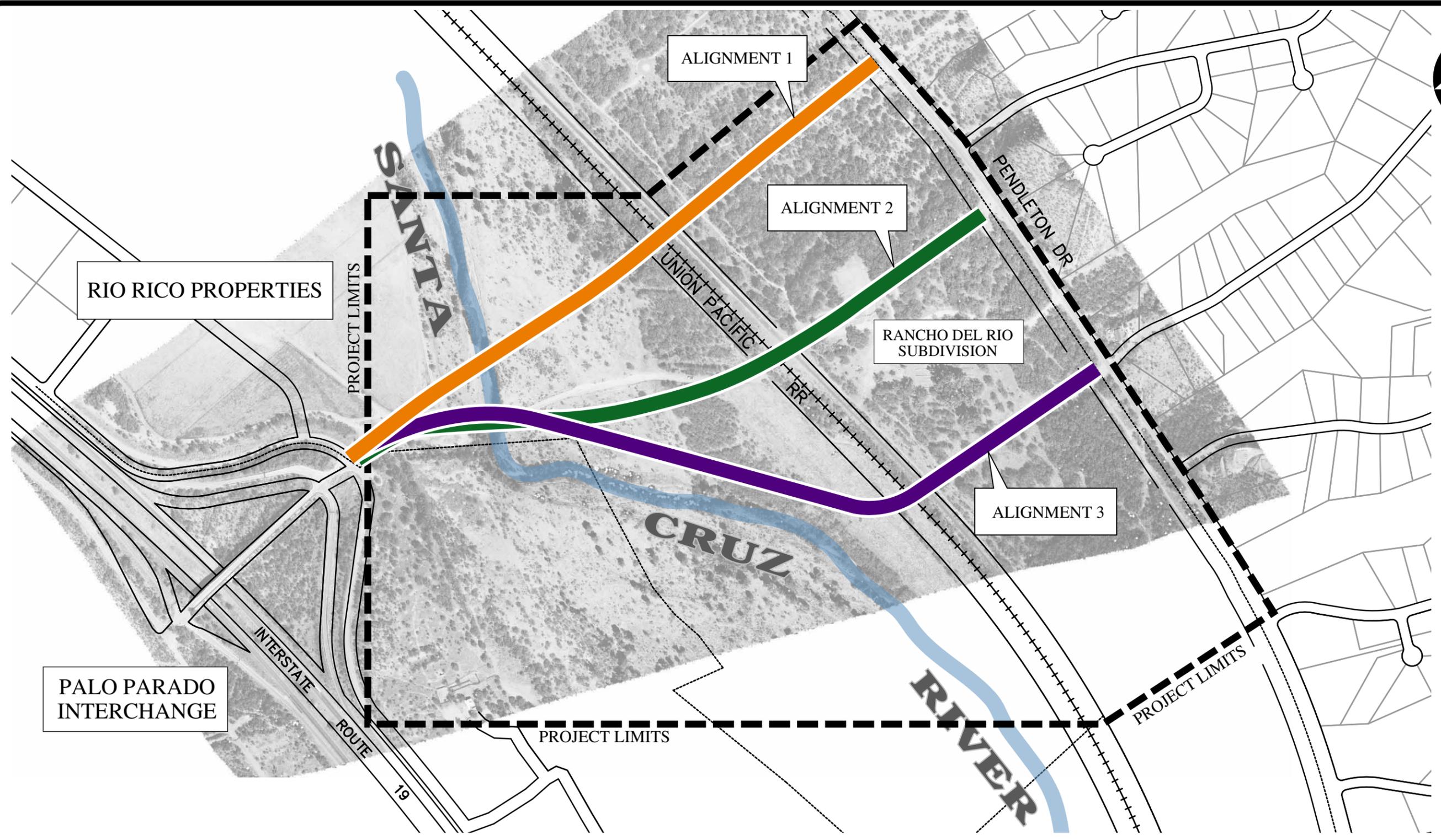
**ACCESS CONTROL:** The Palo Parado Roadway from I-19 Interchange Frontage Road to Pendleton Drive is desired to provide safe access to residents and an expedient response time for emergency vehicles and services. This roadway will also provide reduction of travel time for the eastside residents in commuting to the schools on the west side. Therefore, to maintain safety for resident's access to and from this roadway must be limited. Preferably, the Alignments 1 and 3 should provide **no** access to adjacent lots east of the rail-road. Only one drive to each lot adjacent to the roadway should be allowed at locations permitted by the local agency for Alignment 2. Limited intersections of north/south local roads should be allowed, preferably only

one between the bridge and Railroad for the planned industrial subdivision. Also only one north / south access should be allowed west of the bridge. It is also recommended that all riparian habitats along both banks from the Santa Cruz River be preserved. For alignment 3 no north / south local access road intersection should be permitted east of the Palo Parado Roadway unless permission is granted by the Union Pacific Railroad for this access to be constructed within the railroad right-of-way.

The Palo Parado roadway should have no access from adjacent properties for the first 200 feet west of Pendleton Drive both for safety and visibility reasons. This is because east of Pendleton Road the ground rise is steep towards the San Cayetano Mountain Range. It is expected both Alignments 2 and 3 will convey large flows within them from tributaries flowing down the slopes of the San Cayetano Mountains.



1"=6000'



**CPE** CONSULTANTS



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520•545•7001

MARCH 27, 2008

EXHIBIT 5

ALIGNMENT ALTERNATIVES  
1,2 AND 3

SANTA CRUZ AND RR CROSSING

#### **D. RIGHT-OF-WAY**

From the Palo Parado Interchange across the Santa Cruz River to the UPRR right-of-way, the land is owned by Rio Rico Properties (RRP). Presently a wide blanket easement of one-quarter mile both north and south exists, granted by RRP, for the purposes of this study. Once a final alignment has been recommended and adopted for design, a permanent right-of-way of 120 feet, 60 feet either side of the alignment centerline, will be granted by RRP from the Palo Parado Interchange to the UPRR right-of-way.

During a Friday, March 28, meeting with the Assistant Project Manager of Rio Rico Properties and their engineers, Rio Rico Properties expressed a preference for Alternative #3 because 120' of right-of-way already has been dedicated and platted roughly along this alignment after the Rio Rico Corridor Study results of several years ago. This right-of-way was dedicated from the railroad to Pendleton Drive. Rio Rico Properties wonders what would happen to the existing right-of-way if Alternative #3 is not selected. Would it be vacated and revert back to the adjacent properties?

Alternative #2 contains Caballero Corte though it is only 60'. A 120' right-of-way would seriously damage the adjacent 5 lots because this alignment would be located within the front yards of these lots. This appears to be the least favorite alignment to the Developer.

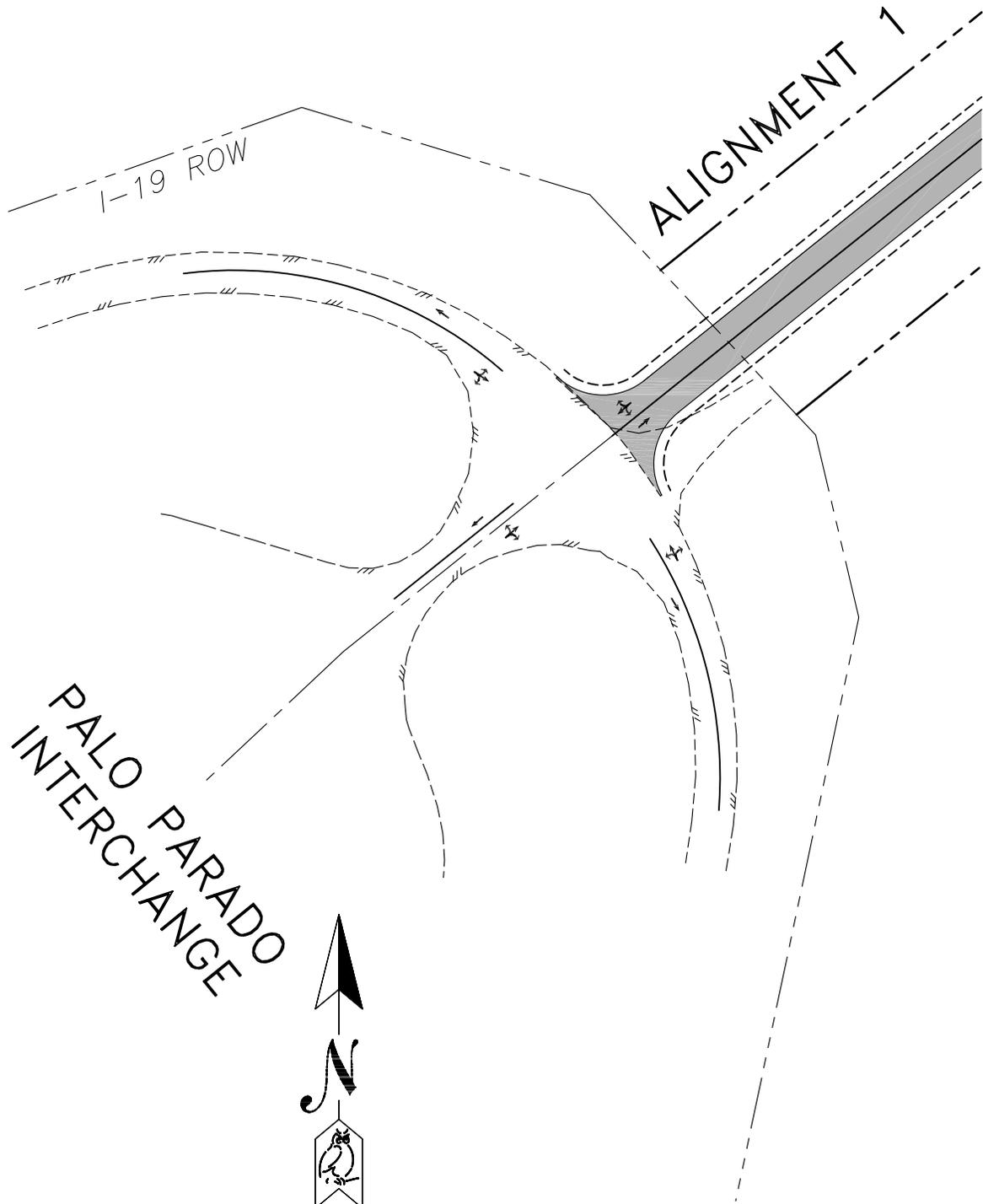
Rio Rico Properties also has expressed concerns with Alternative #1, which would follow the existing 60' equestrian easement within the Ranchos del Rio subdivision, and widen to 120' west of the UPRR R/W. This alignment would have a very negative impact on the adjacent 8 platted lots (4 north and 4 south). Although this alignment would be located towards the rear lot lines of the 4 acre lots. The Developer could request compensation due to this negative impact. A better solution might be to locate the 60' right-of-way entirely within the backyards of one tier of lots, namely the north or south 4 lots, thereby limiting the impact to four lots and maintaining the minimum square footage per zoning regulations

Right-of-way across the UPRR property will have to be negotiated and coordinated with UPRR, however it is anticipated that a minimum of 60-foot right-of-way will be pursued and acquired at the crossing location.

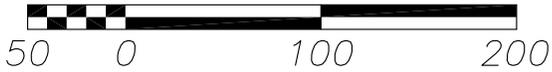
No additional ADOT right-of-way will be required at the interchange connection, as no realignment of either the ramps or the frontage road will be necessary.

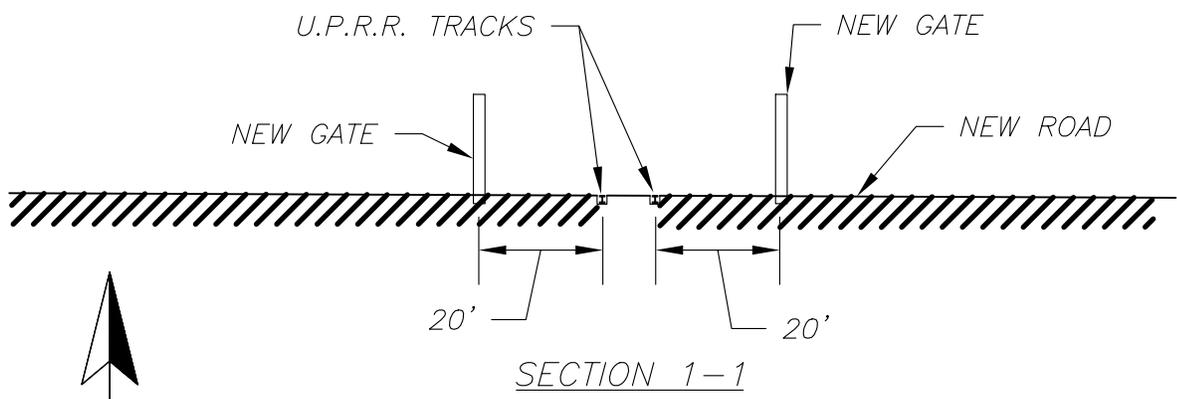
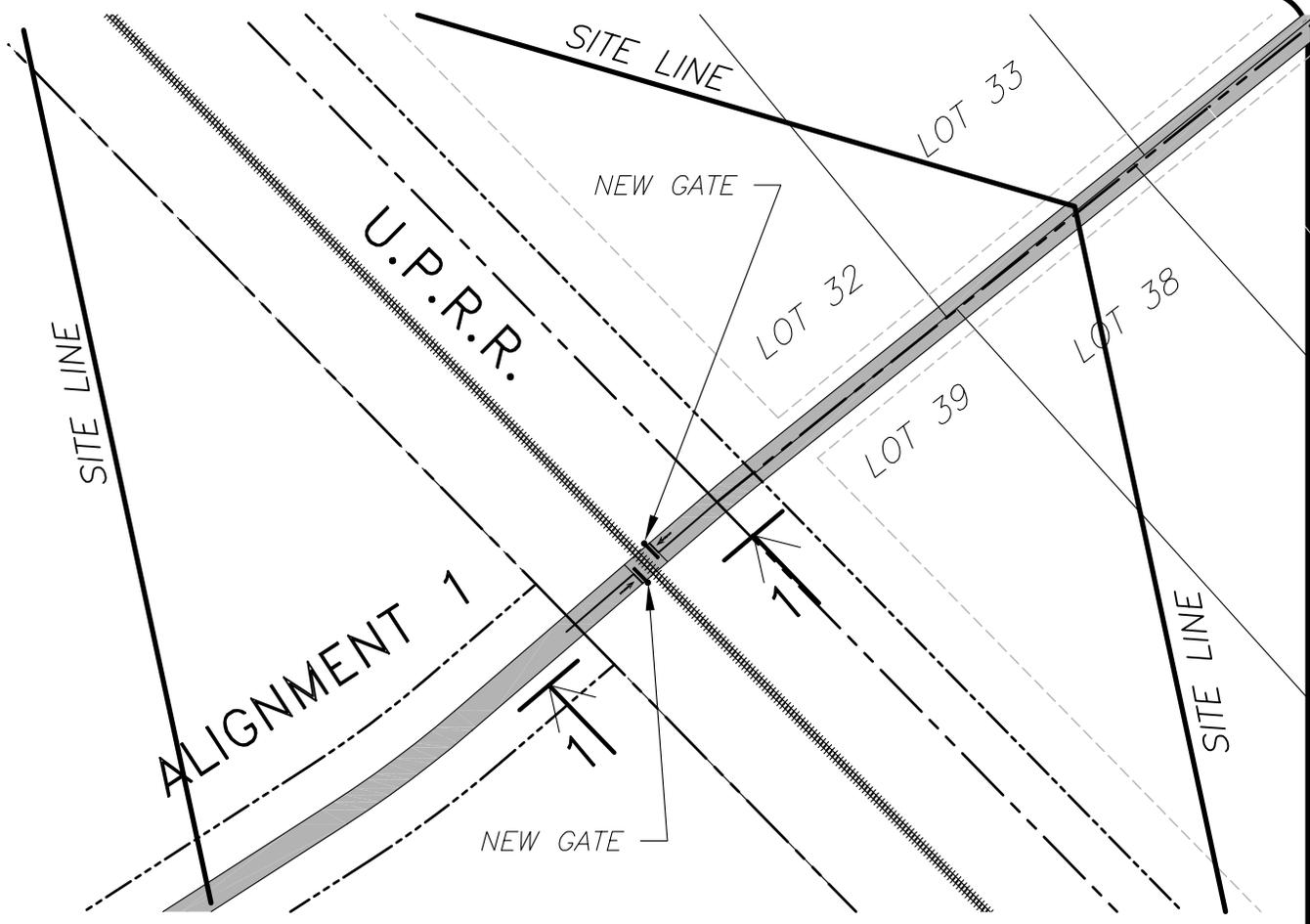
**E. INTERSECTIONS**

The following pages 32 through 36 are **Exhibits 6 through 10** showing the striping and layouts for the intersections and crossings for the three alternatives.



1" = 100'



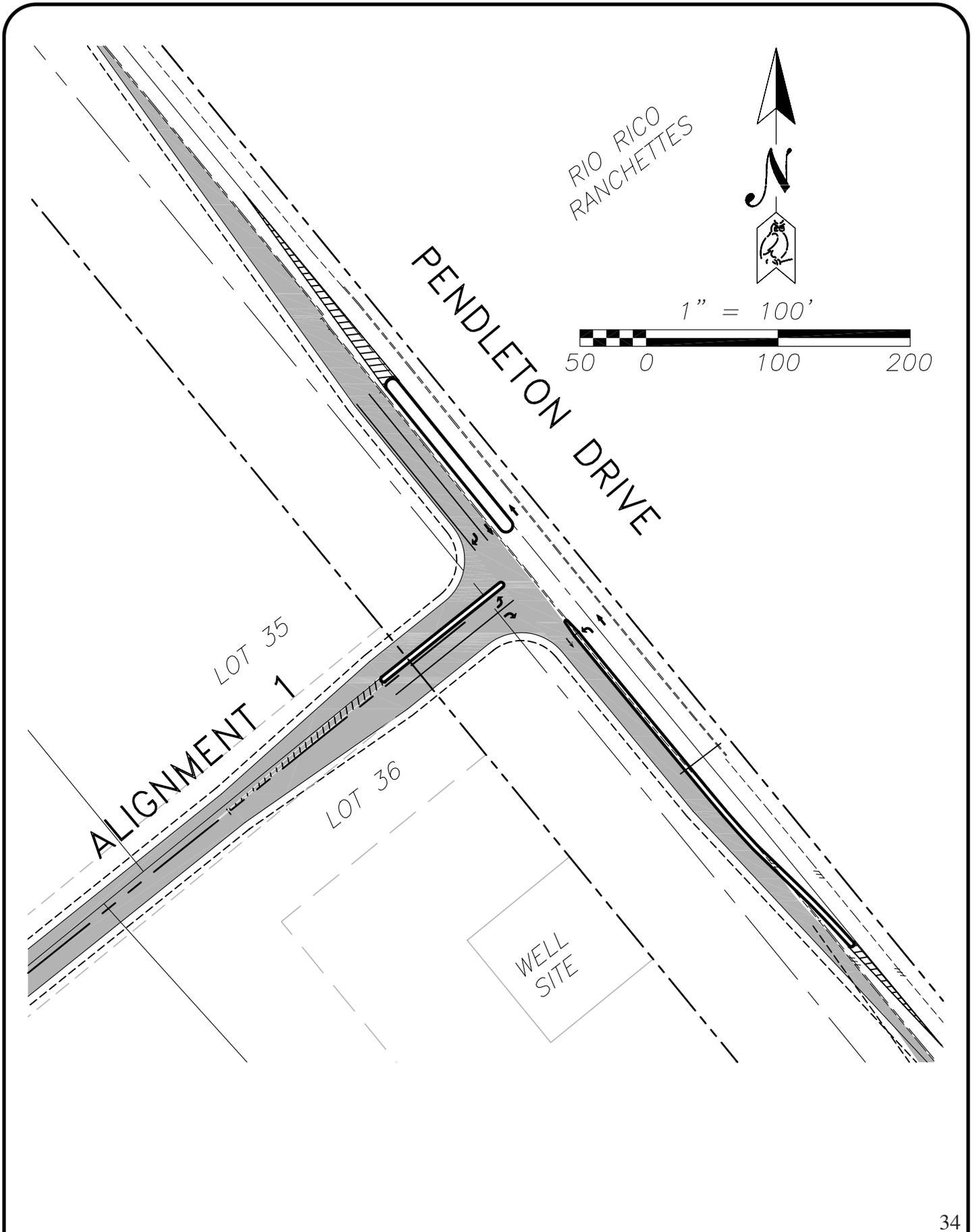


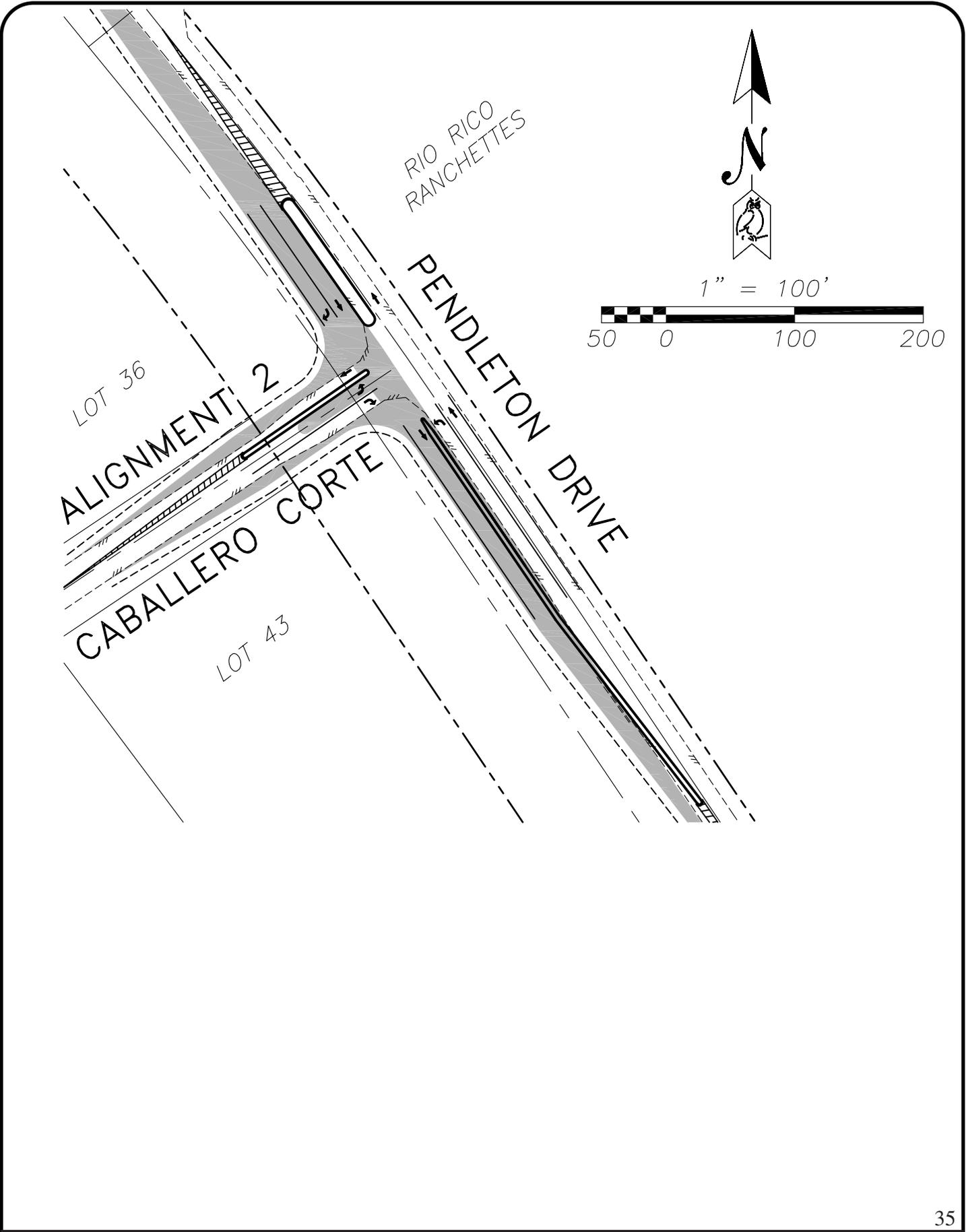
RAILROAD CROSSING DETAIL  
FOR ALIGNMENT 1

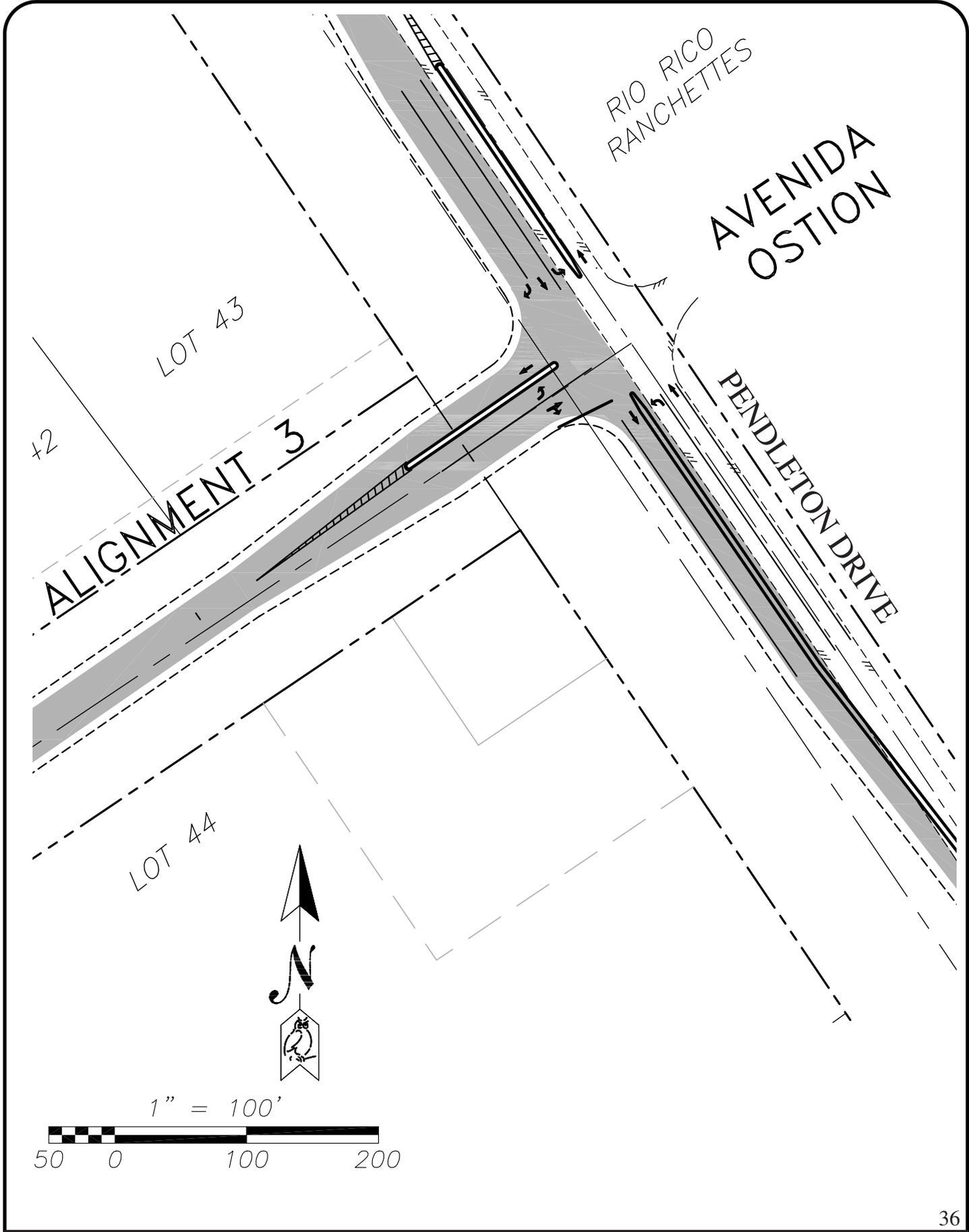


1" = 100'









## **F. DRAINAGE / HYDROLOGY**

The basic drainage concept is to convey all 100-year storm flows beneath the roadway through culverts, thereby providing the all-weather access needed.

The pavement drainage shall provide for a minimum of one lane dry in a ten-year storm (applicable on bridges/culverts where the roadway is confined by vertical curb). Cross-drainage shall accommodate the 100-year event.

The 100-year flood drainage from local watersheds shall be handled in drainage culvert systems under the proposed Palo Parado Roadway. These culvert systems are located as shown in **EXHIBITS 3 and 4** of the **DRAINAGE REPORT** in **APPENDIX A**.

Roadside drainage channels shall be unlined. The Santa Cruz River channelization upstream and downstream from the bridge will be soil cement bank protection up to locations shown in **EXHIBIT 4a, 4b & 4c** in **Appendix A** for each of the alignments 1-3 respectively. The Rail-Road ditches may have to be improved with permission from the Union Pacific Rail-Road.

## **G. UTILITIES**

There are no existing utility issues in the project area. New electrical service may be necessary in the future should signalization be introduced to either of the intersections at either the Palo Parado Interchange or Pendleton Drive.

Where new electrical services will be needed, the service lines will be installed in below ground conduits crossing the road and the rail-road. All private services will also be underground and conduits locations will be designed when the roadway plans are designed. Once the roadway is constructed it will be necessary to establish a 10-year moratorium on pavement exits.

## V. ALTERNATIVE ALIGNMENTS

The identification of alternatives for a new all-weather crossing within the study area of the Palo Parado Interchange were selected and evaluated based on the following criteria:

1. Safety crossing at the railroad
2. Impacts on the UPRR
3. Existing drainage patterns
4. Environmental concerns and requirements
5. Santa Cruz River crossing / Bridge location
6. Traffic concerns and requirements
7. Route length
8. Design and posted speed limits
9. The best comfort for the driver
10. Construction cost
11. Construction duration
12. Right of Way

The alternatives were identified through field visits, study of topographic mapping and aerial photography, discussions with Santa Cruz County staff, research of public hearing records, interviews with stakeholders, and study of previous reports, particularly the RRCS from Tetra Tech (2002).

All three alternative alignments of the road extension are located in the floodplain/ floodway **ZONE A** of the Santa Cruz River. The proposed road surface will need to be raised above floodplain/ floodway water surface elevation. This condition of the road design makes impossible to provide zero balance of earthwork for any of the proposed road alignment alternatives.

Three alternative alignments have been identified and are discussed below. **Alternative Alignment 1 is preferable from a roadway geometry and hydraulic standpoint, however, Alternative Alignment 2 is the recommended alternative from an economic standpoint.**

### A. ALTERNATIVE 1

Alignment 1 is the northernmost, and most direct alignment of the three alternatives.

This alternative provides the best site visibility for the UPRR crossing. From either direction, vehicles are approaching the railroad crossing moving downhill and perpendicular to the railroad. This condition allows increase traffic safety and reduces potential delay at the crossing. This alternative also requires the shortest and most economical Santa Cruz River channelization. The alignment provides a straight roadway with very minimal and gentle horizontal and vertical curvature, which increases driver's comfort significantly. The bridge alignment at this location is on a straight alignment.

Full route length from existing pavement at Palo Parado Interchange to existing pavement at Pendleton Drive is approximately 3,260 feet.

The total Right-of-way necessary for this alternative is approximately 294,400 square feet. This right of way includes approximately 218,400 s.f. from I-19 to the UPRR that is already dedicated, 12,000 s.f. of easement needed from the UPRR, and approximately 64,000 needed to be acquired from the Ranchos Del Rio subdivision that is currently an equestrian easement.

The design speed of this alternative is 55 mph, with a recommended posted speed of 45 mph. No private driveways from adjacent properties will connect to the new roadway.

## **B. ALTERNATIVE 2**

Alternative 2 provides good site visibility for the UPRR crossing. From either direction, vehicles approach the UPRR crossing going downhill. Westbound traffic approaches the crossing perpendicular to the railroad providing good sight distance, however newly-constructed homes along Caballero Corte may reduce site visibility in future.

A gated railroad crossing is essential for this alignment. This alternative requires the second shortest and economical Santa Cruz River channelization. The alignment features gentle horizontal and vertical curvature, which promotes driver comfort. The alignment requires horizontal curvature at the bridge.

Route length from existing pavement at Palo Parado Interchange to the existing pavement at Caballero Corte is 2,596 feet. Caballero Corte to Pendleton Drive is paved residential street 913 feet in length. The full route length is 3,509 feet.

The total Right-of-way necessary for this alternative is approximately 332,700 square feet. This right of way includes approximately 259,200 s.f. from I-19 to the UPRR that is already dedicated, 12,000 s.f. of easement needed from the UPRR, and approximately 61,500 of Caballero Corte from the UPRR to Pendleton Drive that is already dedicated as a public road per the subdivision plat.

The design speed for this alternative is 55 mph, with a recommended posted speed of 45 mph from the Palo Parado Interchange to the UPRR crossing. A posted speed of 25 mph is recommended for the section of roadway from the UPRR crossing to Pendleton Drive.

Eight private driveways had been designed from Caballero Corte previously (see Ranchos Del Rio lots 1 – 55 improvement plans by WLB).

This alternative is the least expensive of all.

**C. ALTERNATIVE 3**

Alternative 3 provides acceptable site visibility for the UPRR crossing. The new roadway crosses the railroad at a point-of-beginning of the railroad curvature. Eastbound traffic approaches the railroad under a sharp angle that reduces visibility and safety. Westbound traffic approaches perpendicular to the railroad. A gated railroad crossing is essential for this alignment.

This alternative requires the longest and most expensive Santa Cruz River channelization. The alignment features a roadway with gentle vertical curvature, which promotes driver comfort. The alignment requires horizontal curvature at the bridge. A horizontal curve located close to railroad crossing is sharp and requires speed reduction.

The route length from the existing pavement at the Palo Parado Interchange to the existing pavement at Pendleton Drive is 4,025 feet.

No right-of-way acquisition is necessary for this alignment, except for an easement from the UPRR. The total Right-of-way necessary for this alternative is approximately 462,000 square feet. This right of way includes approximately 342,000 s.f. from I-19 to the UPRR that is already dedicated, 12,000 s.f. of easement needed from the UPRR, and approximately 108,000 s.f. already dedicated south of the Ranchos Del Rio subdivision from the UPRR to Pendleton Drive.

The design speed for this alignment is 55 mph and 35 mph. A posted speed of 45 mph is recommended for the roadway from Palo Parado Interchange to Station 48+90, and 30 mph from Station 48+90 to Pendleton Drive.

This alignment ties the new road to the existing intersection Pendleton Drive and Avenida Ostion.

This alternative is the most expensive of all.

**QUALITATIVE ALTERNATIVES COMPARISON MATRIX**

<b>COMPARISON CATEGORIES</b>	<b>Alt 1</b>	<b>Alt 2</b>	<b>Alt 3</b>	<b>COMMENTS</b>
Design and construction cost	2	3	1	
ROW availability / cost	2	2	3	Dedicated R/W, Required new R/W, UPRR E'smt
Safety	3	2	1	Sight Visibility at UPRR crossing, Livestock
Railroad crossing improvements	1	3	1	UPRR Easement, Funding availability
Bridge Design	3	2	2	Straight Reach of River upstream and downstream
Trip length	3	2	1	Alternative 1 is shortest
Acceptability by Development	2	1	3	Required Access through Development
Acceptability by ADOT	2	2	1	Bridge Curvature, Intersection Improvements
Adjacent Access	2	3	2	Continuous access from I-19 to Pendelton Drive
Environmental	1	2	1	Destruction of Riparian Habitat/Existing roadway
<b>TOTAL</b>	<b>21</b>	<b>22</b>	<b>16</b>	

**NOTE: WEIGHT; 3 HIGHEST, 1 LOWEST**

**Note: Alternative Alignment 1 is preferable from a roadway geometry and hydraulic standpoint, however, Alternative Alignment 2 is the recommended alternative from an economic standpoint.**

Palo Parado, I-19 to Pendleton Road, Design Concept Report

PRELIMINARY (30% PLANS) PALO PARADO ROAD FROM I-19 INTERCHANGE TO PENDLETON DR. ESTIMATE SUMMARY (ALTERNATIVE 1)					
Item No.	Item Description	Unit	Quantity	Unit Cost	Amount
	PALO PARADO ROAD FROM I-19 TO PENDLETON DR. (ALTERNATIVE 1)	LS	1	\$ 2,628,852.00	\$2,628,852
	SANTA CRUZ RIVER BRIDGE L=440' (Straight Alignment)	LS	1	\$ 1,750,000.00	\$1,750,000
	RAILROAD CROSSING SIGNALIZATION	LS	1	\$ 350,000.00	\$350,000
	<b>PROJECT SUBTOTAL</b>				\$4,728,852
	EROSION CONTROL (1%)	LS	1	\$ 47,288.52	\$47,289
	WATER SUPPLY/ DUST PALLIATIVE (1%)	LS	1	\$ 47,288.52	\$47,289
	MOBILIZATION	LS	1	\$ 100,000.00	\$100,000
	CONSTRUCTION SURVEY	LS	1	\$ 150,000.00	\$150,000
	RIGHT OF WAY ACQUISITION	AC	0	\$ -	\$0
	DESIGN AND COSTRUCTION ENGINEERING (15%)	LS	1	\$ 709,327.80	\$709,328
	CONTIGENCIES (15%)	LS	1	\$ 709,327.80	\$709,328
	<b>PROJECT TOTAL</b>				\$6,492,085

PRELIMINARY (30% PLANS) PALO PARADO ROAD FROM I-19 INTERCHANGE TO PENDLETON DR. (ALTERNATIVE 1)					
Item No.	Item Description	Unit	Quantity	Unit Cost	Amount
1070001	STORMWATER POLLUTION PREVENTION PLAN	LS	1	\$ 15,000.00	\$ 15,000.00
1070002	MODIFY STORMWATER POLLUTION PREVENTION PLAN	FA	7,000	\$ 1.00	\$ 7,000.00
2010001	CLEARING AND GRABBING	LS	1	\$ 30,000.00	\$ 30,000.00
2010020	REMOVAL OF TREES	EACH	50	\$ 300.00	\$ 15,000.00
2020001	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	\$ 10,000.00	\$ 10,000.00
2020020	REMOVAL OF CONCRETE CURB/ HEADER	LF	340	\$ 5.00	\$ 1,700.00
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS AND SLABS	SF	100	\$ 5.00	\$ 500.00
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SY	3,000	\$ 5.00	\$ 15,000.00
2020034	REMOVAL OF SIGNS AND DELINEATERS	LS	1	\$ 1,000.00	\$ 1,000.00
2020052	REMOVE (CHAINLINK FENCE)	LF	550	\$ 5.00	\$ 2,750.00
2030201	EXCAVATION	CY	3474	\$ 15.00	\$ 52,110.00
2030900	BORROW	CY	48060	\$ 16.00	\$ 768,960.00
2050001	GRADING ROADWAY FOR PAVEMENT	SY	42,500	\$ 6.00	\$ 255,000.00
3030102	AGGREGATE BASE	CY	2,405	\$ 45.00	\$ 108,225.00
4040111	BITUMINOUS TACK COAT	TN	4	\$ 550.00	\$ 2,222.00
4060003	ASPHALTIC CONCRETE (MIX NO. 1)	TN	1,746	\$ 75.00	\$ 130,950.00
4060004	ASPHALTIC CONCRETE (MIX NO. 2)	TN	1,455	\$ 75.00	\$ 109,125.00
5010011	PIPE, CORRUGATED METAL, 24"	LF	200	\$ 30.00	\$ 6,000.00
5010045	PIPE, CORRUGATED METAL, 60"	LF	360	\$ 75.00	\$ 27,000.00
6070049	FOUNDATION FOR SIGN POST (PERFORATED)	EA	18	\$ 200.00	\$ 3,600.00
6070054	SIGN POST (PERFORATED) (SINGLE)	LF	216	\$ 22.00	\$ 4,752.00
6080015	SIGN PANEL (TRAFFIC CONTROL) (PERMANENT) (TYPE III)	SF	111	\$ 18.00	\$ 1,998.00
7010001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	\$ 10,000.00	\$ 10,000.00
7010006	FURNISH AND INSTALL TEMPORARY TRAFFIC CONTROL ELEMENTS	FA	1	\$ 50,000.00	\$ 50,000.00
7040003	PAVEMENT MARKING (WHITE SPRAYED THERMOPLASTIC) (0.060")	LF	10200	\$ 0.70	\$ 7,140.00
7040004	PAVEMENT MARKING (YELLOW SPRAYED THERMOPLASTIC) (0.060")	LF	6800	\$ 0.70	\$ 4,760.00
7040033	PAVEMENT SYMBOL (WHITE SPRAYED THERMOPLASTIC) (0.090") (BIKE LANE)	EA	16	\$ 300.00	\$ 4,800.00
7040070	PAVEMENT MARKING (WHITE SPRAYED THERMOPLASTIC) (TRANSVERSE) (0.90")	LF	300	\$ 1.00	\$ 300.00
7060015	PAVEMENT MARKER, RAISED, TYPE D	EA	170	\$ 5.00	\$ 850.00
7060017	PAVEMENT MARKER, RAISED, TYPE F	EA	30	\$ 5.00	\$ 150.00
7060018	PAVEMENT MARKER, RAISED, TYPE G	EA	2	\$ 5.00	\$ 10.00
906001	CATTLE GUARD	EA	3	\$ 5,000.00	\$ 15,000.00
9090003	SURVEY MONUMENT	EA	9	\$ 300.00	\$ 2,700.00
9130001	RIP RAP (WITH FILTER FABRIC)	CY	53	\$ 100.00	\$ 5,250.00
9240112	MISCELLANEOUS WORK (SOIL CEMENT BANK PROTECTION) H= 25', TOP=8', BOTTOM=33'	LF	1900	\$ 500.00	\$ 950,000.00
9240350	RAILROAD CONSTRUCTION (RAIL ROAD CROSSING ON GRADE)	LS	1	\$ 10,000.00	\$ 10,000.00
				<b>TOTAL</b>	\$ 2,628,852.00

Palo Parado, I-19 to Pendleton Road, Design Concept Report

<b>PRELIMINARY (30% PLANS)</b>					
<b>PALO PARADO ROAD FROM I-19 INTERCHANGE TO PEDLINGTON RD</b>					
<b>ESTIMATE SUMMARY (ALTERNATIVE 2)</b>					
Item No.	Item Description	Unit	Quantity	Unit Cost	Amount
	PALO PARADO ROAD FROM I-19 TO PEDLINGTON RD	LS	1	\$ 2,535,442.00	\$2,535,442
	SANTA CRUZ RIVER BRIDGE L=440' (Curved Alignment)	LS	1	\$ 2,000,000.00	\$2,000,000
	RAILROAD CROSSING SIGNALIZATION	LS	1		\$0
	<b>PROJECT SUBTOTAL</b>				\$4,535,442
	EROSION CONTROL (1%)	LS	1	\$ 45,354.42	\$45,354
	WATER SUPPLY/ DUST PALLIATIVE (1%)	LS	1	\$ 45,354.42	\$45,354
	MOBILIZATION	LS	1	\$ 100,000.00	\$100,000
	CONSTRUCTION SURVEY	LS	1	\$ 150,000.00	\$150,000
	RIGHT OF WAY ACQUISITION	AC	0	\$ -	\$0
	DESIGN AND COSTRUCTION ENGINEERING (15%)	LS	1	\$ 680,316.30	\$680,316
	CONTIGENCIES (15%)	LS	1	\$ 680,316.30	\$680,316
	<b>PROJECT TOTAL</b>				\$6,236,783

<b>PRELIMINARY (30% PLANS)</b>					
<b>PALO PARADO ROAD FROM I-19 INTERCHANGE TO PENDLETON DR.</b>					
<b>(ALTERNATIVE 2)</b>					
Item No.	Item Description	Unit	Quantity	Unit Cost	Amount
1070001	STORMWATER POLLUTION PREVENTION PLAN	LS	1	\$30,000.00	\$30,000.00
1070002	MODIFY STORMWATER POLLUTION PREVENTION PLAN	FA	15,000	\$1.00	\$15,000.00
2010001	CLEARING AND GRABBING	LS	1	\$30,000.00	\$30,000.00
2010020	REMOVAL OF TREES	EACH	30	\$300.00	\$9,000.00
2020001	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	\$10,000.00	\$10,000.00
2020020	REMOVAL OF CONCRETE CURB/ HEADER	LF	100	\$5.00	\$500.00
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS AND SLABS	SF	100	\$5.00	\$500.00
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SY	2,800	\$5.00	\$14,000.00
2020034	REMOVAL OF SIGNS AND DELINEATORS	LS	1	\$1,000.00	\$1,000.00
2020052	REMOVE (CHAINLINK FENCE)	LF	550	\$5.00	\$2,750.00
2030201	EXCAVATION	SY	68	\$ 15.00	\$ 1,020.00
2030900	BORROW	CY	38,715	\$ 16.00	\$ 619,440.00
2050001	GRADING ROADWAY FOR PAVEMENT	SY	35,600	\$6.00	\$213,600.00
3030102	AGGREGATE BASE	CY	2,119	\$45.00	\$95,355.00
4040111	BITUMINOUS TACK COAT	TN	4	\$550.00	\$1,952.50
4060003	ASPHALTIC CONCRETE (MIX NO. 1)	TN	1,538	\$75.00	\$115,350.00
4060004	ASPHALTIC CONCRETE (MIX NO. 2)	TN	1,282	\$75.00	\$96,150.00
501011	PIPE, CORRUGATED METAL, 24"	LF	240	\$30.00	\$7,200.00
5010045	PIPE, CORRUGATED METAL, 60"	LF	270	\$75.00	\$20,250.00
6070049	FOUNDATION FOR SIGN POST (PERFORATED)	EA	18	\$200.00	\$3,600.00
6070054	SIGN POST (PERFORATED) (SINGLE)	LF	216	\$22.00	\$4,752.00
6080015	SIGN PANEL (TRAFFIC CONTROL) (PERMANENT) (TYPE III)	SF	111	\$18.00	\$1,998.00
7010001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	\$10,000.00	\$10,000.00
7010006	FURNISH AND INSTALL TEMPORARY TRAFFIC CONTROL ELEMENTS	FA	1	\$100,000.00	\$100,000.00
7040003	PAVEMENT MARKING (WHITE SPRAYED THERMOPLASTIC) (0.060")	LF	8,010	\$0.70	\$5,607.00
7040004	PAVEMENT MARKING (YELLOW SPRAYED THERMOPLASTIC) (0.060")	LF	5,340	\$0.70	\$3,738.00
7040033	PAVEMENT SYMBOL (WHITE SPRAYED THERMOPLASTIC) (0.090")	EA	16	\$300.00	\$4,800.00
7040070	PAVEMENT MARKING (WHITE SPRAYED THERMOPLASTIC) (TRANSVERSE) (0.90")	LF	300	\$1.00	\$300.00
7060015	PAVEMENT MARKER, RAISED, TYPE D	EA	134	\$5.00	\$670.00
7060017	PAVEMENT MARKER, RAISED, TYPE F	EA	30	\$5.00	\$150.00
7060018	PAVEMENT MARKER, RAISED, TYPE G	EA	2	\$5.00	\$10.00
906001	CATTLE GUARD	EA	3	\$5,000.00	\$15,000.00
9090003	SURVEY MONUMENT	EA	5	\$300.00	\$1,500.00
9130001	RIP RAP (WITH FILTER FABRIC)	CY	53	\$100.00	\$5,250.00
9240112	MISCELLANEOUS WORK (SOIL CEMENT BANK PROTECTION) H= 25', TOP=8', BOTTOM=33'	LF	2250	\$500.00	\$1,125,000.00
9240350	RAILROAD CONSTRUCTION (RAIL ROAD CROSSING ON GRADE)	LS	1	\$10,000.00	\$10,000.00
				TOTAL	\$2,535,442.50

Palo Parado, I-19 to Pendleton Road, Design Concept Report

<b>PRELIMINARY (30% PLANS)</b>					
<b>PALO PARADO ROAD FROM I-19 INTERCHANGE TO PEDLINGTON RD</b>					
<b>ESTIMATE SUMMARY (ALTERNATIVE 3)</b>					
<b>Item No.</b>	<b>Item Description</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Amount</b>
	PALO PARADO ROAD FROM I-19 TO PEDLINGTON RD	LS	1	\$ 2,535,442.00	\$3,732,458
	SANTA CRUZ RIVER BRIDGE L=440' (Curved Alignment)	LS	1	\$ 2,000,000.00	\$2,000,000
	RAILROAD CROSSING SIGNALIZATION	LS	1	\$ 350,000.00	\$350,000
	<b>PROJECT SUBTOTAL</b>				\$6,082,458
	EROSION CONTROL (1%)	LS	1	\$ 60,824.58	\$60,825
	WATER SUPPLY/ DUST PALLIATIVE (1%)	LS	1	\$ 60,824.58	\$60,825
	MOBILIZATION	LS	1	\$ 100,000.00	\$100,000
	CONSTRUCTION SURVEY	LS	1	\$ 150,000.00	\$150,000
	RIGHT OF WAY ACQUISITION	AC	0	\$ -	\$0
	DESIGN AND COSTRUCTION ENGINEERING (15%)	LS	1	\$ 912,368.70	\$912,369
	CONTIGENCIES (15%)	LS	1	\$ 912,368.70	\$912,369
	<b>PROJECT TOTAL</b>				\$8,278,845

<b>PRELIMINARY (30% PLANS)</b>					
<b>PALO PARADO ROAD FROM I-19 INTERCHANGE TO PENDLETON DR.</b>					
<b>(ALTERNATIVE 3)</b>					
<b>Item No.</b>	<b>Item Description</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Amount</b>
1070001	STORMWATER POLLUTION PREVENTION PLAN	LS	1	\$ 30,000.00	\$ 30,000.00
1070002	MODIFY STORMWATER POLLUTION PREVENTION PLAN	FA	15,000	\$ 1.00	\$ 15,000.00
2010001	CLEARING AND GRABBING	LS	1	\$ 30,000.00	\$ 30,000.00
2010020	REMOVAL OF TREES	EACH	50	\$ 300.00	\$ 15,000.00
2020001	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	\$ 10,000.00	\$ 10,000.00
2020020	REMOVAL OF CONCRETE CURB/ HEADER	LF	200	\$ 5.00	\$ 1,000.00
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS AND SLABS	SF	100	\$ 5.00	\$ 500.00
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SY	2,300	\$ 5.00	\$ 11,500.00
2020034	REMOVAL OF SIGNS AND DELINEATERS	LS	1	\$ 1,000.00	\$ 1,000.00
2020052	REMOVE (CHAINLINK FENCE)	LF	550	\$ 5.00	\$ 2,750.00
2030201	EXCAVATION	SY	7000	\$ 15.00	\$ 105,000.00
2030900	BORROW	CY	56618	\$ 16.00	\$ 905,888.00
2050001	GRADING ROADWAY FOR PAVEMENT	SY	45,000	\$ 6.00	\$ 270,000.00
3030102	AGGREGATE BASE	CY	3,097	\$ 45.00	\$ 139,365.00
4040111	BITUMINOUS TACK COAT	TN	5	\$ 550.00	\$ 2,860.00
4060003	ASPHALTIC CONCRETE (MIX NO. 1)	TN	2,247	\$ 75.00	\$ 168,525.00
4060004	ASPHALTIC CONCRETE (MIX NO. 2)	TN	1,873	\$ 75.00	\$ 140,475.00
5010045	PIPE, CORRUGATED METAL, 60"	LF	210	\$ 75.00	\$ 15,750.00
6070049	FOUNDATION FOR SIGN POST (PERFORATED)	EA	18	\$ 200.00	\$ 3,600.00
6070054	SIGN POST (PERFORATED) (SINGLE)	LF	216	\$ 22.00	\$ 4,752.00
6080015	SIGN PANEL (TRAFFIC CONTROL) (PERMANENT) (TYPE III)	SF	111	\$ 18.00	\$ 1,998.00
7010001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	\$ 10,000.00	\$ 10,000.00
7010006	FURNISH AND INSTALL TEMPORARY TRAFFIC CONTROL ELEMENTS	FA	1	\$ 100,000.00	\$ 100,000.00
7040003	PAVEMENT MARKING (WHITE SPRAYED THERMOPLASTIC) (0.060")	LF	12390	\$ 0.70	\$ 8,673.00
7040004	PAVEMENT MARKING (YELLOW SPRAYED THERMOPLASTIC) (0.060")	LF	8260	\$ 0.70	\$ 5,782.00
7040033	PAVEMENT SYMBOL (WHITE SPRAYED THERMOPLASTIC) (0.090")	EA	16	\$ 300.00	\$ 4,800.00
7040070	PAVEMENT MARKING (WHITE SPRAYED THERMOPLASTIC) (TRANSVERSE) (0.90")	LF	300	\$ 1.00	\$ 300.00
7060015	PAVEMENT MARKER, RAISED, TYPE D	EA	206	\$ 5.00	\$ 1,030.00
7060017	PAVEMENT MARKER, RAISED, TYPE F	EA	30	\$ 5.00	\$ 150.00
7060018	PAVEMENT MARKER, RAISED, TYPE G	EA	2	\$ 5.00	\$ 10.00
906001	CATTLE GUARD	EA	3	\$ 5,000.00	\$ 15,000.00
9090003	SURVEY MONUMENT	EA	5	\$ 300.00	\$ 1,500.00
9130001	RIP RAP (WITH FILTER FABRIC)	CY	53	\$ 100.00	\$ 5,250.00
9240112	MISCELLANEOUS WORK (SOIL CEMENT BANK PROTECTION) H= 25', TOP=8', BOTTOM=33'	LF	3450	\$ 500.00	\$1,725,000.00
9240350	RAILROAD CONSTRUCTION (CROSSING ON GRADE)	LS	1	\$ 10,000.00	\$ 10,000.00
				<b>TOTAL</b>	<b>\$3,732,458.00</b>

## **VI. PROJECT DEVELOPMENT CONSIDERATIONS**

### **A. ENVIRONMENTAL**

The disturbances that occur from the construction of the chosen alignment will require some level of mitigation. Mitigation will be required mainly for vegetation. Mitigation of Land Use and Visual Quality and Views will be minimal unless screening is required for the El Ranchos del Rio subdivision. It should also be noted that there are endangered fish species in the Santa Cruz River that will need to be addressed. To determine the level of mitigation that will be required for this project, Arizona Fish and Game, Arizona Department of Agriculture, and US Fish and Wildlife will need to be consulted.

For revegetation and mitigation of disturbed areas there are several procedures to follow. The first is field inventory for the entire affected area which will be surveyed for regulated native plants. This task includes field inventory and tagging of the regulated plants and preparing required graphic plans and calculations to determine mitigation requirements. Plants should be numbered, tagged, and inventoried for their species, viability, and transplantability.

In order to mitigate for these plants, an appropriate location must be determined that offers easy access for installation and watering, but also restores the overall vegetative quality of the area. Mitigation typically includes the use of transplants, nursery grown container plantings, and seed mixes in graded areas. The seed mixes may contain a wide variety of native seeds for trees, shrubs, and wildflowers. The mix can be specialized for a particular site and biotic community. Another important factor in any mitigation is irrigation. There are several methods that may be implemented such as truck watering, gel packs, as well as temporary and permanent irrigation systems. Water harvesting can be used to enhance any of these options.

### **B. ECONOMIC**

An all-weather roadway at Palo Parado connecting the residents living east of the Santa Cruz River and the UPRR with the I-19 corridor on the west can have a significant positive impact on future residential and business development in the area. This area has strong growth potential....

The community character is of a rural lifestyle with relatively low-density development. The project site, approximately five (5) miles north of Rio Rico, is part of the Central Santa Cruz County Character Area (Greater Rio Rico), as defined by Santa Cruz County 2004 Comprehensive Plan. This area is comprised of the unincorporated community of Rio Rico, and the large developments north, northeast, and east of Rio Rico and the San Cayetano Mountains. The Central County Character Area is bisected by Interstate 19 (I-19) which is part of the CANAMEX corridor. The Comprehensive Plan identifies the land along the frontage roads, on both sides of I-19, as an important area of potential commerce

for Santa Cruz County. The population increase in the area in recent years presents the prospect for an increase in local services and employment opportunities. Almost all of the Community Services Facilities, such as schools, fire department, Chamber of commerce and landfills are located within the community of Rio Rico (Novak Environmental, p 16).

### **C. PUBLIC INVOLVEMENT**

The consultant will prepare a presentation for a public meeting to be held by the County after the Design Concept Report is reviewed, and approved, by County staff. At this meeting, the consultant will inform the public about the project's purpose and need, solicit the public's comments on the roadway alternatives, review project considerations, and address public concerns.

### **D. AGENCY COORDINATION**

This project requires close coordination with a variety of agencies, and due to the multiple crossings – Santa Cruz River and UPRR – as well as connection to Interstate 19, many more agencies are involved.

Below is a summary of coordinating meetings held with these agencies over the course of work on this DCR. They are organized by agency and topic.

#### **1. Arizona Department of Transportation (ADOT)**

- a. **UPRR CROSSING/130 MONIES:** An important factor in the improvement of the UPRR crossing is the possibility of receiving Federal Section 130 monies for construction. Coordinating meetings have taken place with the Director of Utilities and Railroads with ADOT in Phoenix. He stated that 800 crossings in the State have already been prioritized for this fiscal year and that moving up the list is not feasible at this point.

Section 130 monies are for the “improvement of existing crossings,” and therefore if this crossing is classified as “new” it would not qualify for 130 monies. If, however, this crossing can be considered as replacing an existing crossing nearby which is being closed, then this crossing would be eligible for the monies. This crossing is private, so cannot be classified as “existing,” which only applies to public crossings.

The Railroad Liason for ADOT, however, who was also contacted, concerning 130 monies was a bit more encouraging and in a meeting with the individual who actually manages the 130 monies program.

He estimated about \$50,000 to upgrade the crossing to concrete and another \$250,000 to install the signal system. He said that there is only an annual appropriation of \$2 million statewide from the Federal Government, and that the process includes a County agreement with the railroad first for construction and maintenance. Then ADOT will conduct an inventory and prioritize the crossings. Usually the top one-third become eligible for 130 monies. He reiterated that the railroads are under a lot of pressure by the Federal Government to close at-grade crossings due to the extensive liability issues for the railroads. He says the 130 monies will usually fund 100% of the crossing although there may be County match required.

- b. **PALO PARADO INTERCHANGE:** In a March 13, 2008, meeting with the ADOT Assistant District Engineer in Tucson it was stated that ADOT has no current plans to upgrade the Palo Parado Interchange. However, ADOT will require a Traffic Impact Analysis to demonstrate that the Interchange will be able to maintain a Level of Service “C” traffic capacity (it is now operating at Level of Service “A”) once the new intersection is constructed.

The District Engineer believes that traffic signals will be required at the frontage road and the off-ramp, however the required 660’ spacing for signals does not now exist. One possible solution is to merge the frontage road and the off-ramp together. Another solution would be to move the frontage road itself east the required distance. Moving the frontage road appears to be the preferred choice with ADOT.

ADOT is currently conducting an I-19 frontage road study, and the State has no funds targeted right now for TI improvements. Santa Cruz County would have to pay its ultimate share through the State’s encroachment permit process.

And briefly, concerning the UPRR crossing, the ADOT Engineer stated that ADOT worked out a deal in the Marana area with the Railroad to close two existing crossings in exchange for allowing one new at grade crossing.

c. **PROJECT DEVELOPMENT AND REPORT**

**REQUIREMENTS:** Project development, design and public/agency involvement process follows the state's project development process.

Required reports to be submitted for approval prior to design-ADOT requires the following reports to be submitted for approval prior to design of improvements:

- Design Concept Report
- Traffic Report/Impact Analysis
- Environmental documentation and report
- Geotechnical report
- Drainage report
- Bridge Selection report
- Change of Access report
- Proposed Development/Design/Construction Schedules
- Public Involvement Plan/Report
- Right-of-Way Requirements
- Utility and Railroad requirements

2. **Union Pacific Railroad**

- a. **UPRR CROSSING:** According to a representative for the UPRR, the railroad is closing down the existing crossing because it is private and unsafe, and the RR says that it cannot even find records that allowed a private crossing at that location. The UPRR does not now support at-grade crossings and neither does the ACC.

The UPRR is aware, however, of the public pressure for access in this location, and in the end the ACC can overrule the Railroad. There would not be any participation from UPRR in the construction of an "at-grade" crossing because it is technically not replacing an existing crossing (the existing crossing is private, not public.) There is cost sharing on grade separations. Currently, Santa Cruz County and the UPRR are in the process of negotiating an easement at the present crossing location, and have applied for the Section 130 funding available for the construction of a new at-grade, gated crossing.

### 3. Fire Districts

- a. **RIO RICO FIRE DISTRICT:** The Rio Rico Fire District encompasses 42 square miles of area with 2 stations and 36 fire fighters. This District does not use the Palo Parado crossing since it is located approximately two miles north of the District's boundary. However, if Palo Parado is improved, the Rio Rico Fire District can do a better job helping the Tubac Fire District thru their mutual aid agreements when the existing station nearby at Peck Road Interchange is occupied with another call.
  
- b. **TUBAC FIRE DISTRICT:** The Tubac Fire District encompasses 142 square miles with only 2 stations, none east of the railroad although the District boundaries extend some 4 miles east of the tracks.

At the present time, the Tubac Fire District uses the Palo Parado, Santa Gertrudis and Tubac Bridge railroad crossings extensively. The bond package on November 3 includes relocation of Station #1 at Tubac about 2 miles north to Chavez Siding Road on the west frontage road. Station #2 is located on the west frontage road at Peck Canyon which is less than a mile north of the Palo Parado interchange.

The bond package also includes funds for 2 new stations east of the railroad. One would be located on the east side of the District on Camino Josefina (about 3 to 6 miles SE of Tubac) and another would be located south on Pendleton near the Palo Parado crossing. This District also provides ambulance service for all of Santa Cruz County except the City of Nogales and the Rio Rico Fire District. Obviously, the District urgently needs an all weather, safe crossing over the Santa Cruz River and the UPRR at Palo Parado.

### 4. Santa Cruz Valley Unified School District 35

- a. **UPRR CROSSING:** The Santa Cruz Valley Unified School District boundaries extend from Amado on the north to one mile south of Ruby Road on the south, and has three elementary schools, one middle school and one high school at two sites. None of their sites are located east of the railroad although the district boundaries do extend to the east beyond the UPRR. Mt. View Elementary, San Cayetano Elementary

and Sahuarita High School are located on the west frontage road at the Peck Canyon Interchange. Pena Blanca Elementary and Calabasas Middle School are both located south at the Ruby Road interchange.

There is another elementary school under construction on the east side of the tracks but south of Rio Rico Road at 490 Avenida Coatimundi. The District is planning for another elementary and high school in the heavily populated areas around Calle Josefina. Currently the Josefina students travel 35 to 40 minutes (more than an hour round trip) from this area to Rio Rico Road and I-19 to access the west side schools. The District cannot use the existing railroad crossings because they are not safe.

A safe, all weather crossing at Palo Parado would reduce travel time each way by 15 to 20 minutes. District 35 has recently experienced enrollment growth of 4% enrollment per year.

## **5. Arizona Corporation Commission (ACC)**

- a. **PRIVATE CROSSINGS:** In a discussion with the Railroad Safety Supervisor at the ACC, it was stated that the ACC has no authority to keep private crossings open, however a public access crossing is another matter. When he was informed that the County was working on making the crossing public, he agreed to transmit the “Procedures for Requesting a New Crossing or Upgrading of an Existing Crossing.” See summary below.
  
- b. **SUMMARY OF “PROCEDURES” DOCUMENT FROM ACC:** First, an on-sight meeting must take place which includes all parties involved. Issues such as exact location of crossing, financing of project, discussion of grade separation, and ACC staff recommendations will be discussed.

Second, an application must be submitted which includes location and reasons for crossing, maintenance and funding of project, a signed agreement with the Railroad for the crossing, a conceptual drawing of crossing and all warning devices and pavement markings.

Once the application is received, the following data may be requested by the ACC Rail Safety Staff: average daily traffic counts, train movement information, traffic studies and concept reports.

**6. Arizona Game and Fish Department**

In a letter from the State of Arizona Game and Fish Department, dated September 9, 2002, by Sherry Ruther, and included in the “Rio Rico Corridor Study” by Tetra Tech, “... the Palo Parado site seems to be the site where construction of an all-weather crossing would result in the least amount of resource damage. A dry crossing currently exists at the Palo Parado site and it supports a poorer quality of vegetative community.”

**7. Federal Highway Administration (FHWA)**

Conformance with design standards of ADOT will ensure that the design also conforms to the FHWA.

**8. Army Corps of Engineers**

The Corps of Engineers / 404 review process is not required as part of this DCR phase, however, once the recommended alternative from this DCR is adopted, coordination with the Corps of Engineers will be necessary to initiate the 404 permit application/approval process.

**E. PROJECT SCHEDULING**

The County should allow approximately 1 ½ to 2 years to complete the designs on this project. This design period would include the anticipated environmental documentation, plans, specifications, and bid documents. Virtually unknown, and in the critical path, is the level of effort that will be required during the environmental documentation process. Therefore, the County should begin the design and environmental documentation as early in the process as practical.

It is anticipated that the County should allow between 270 and 365 calendar days for construction. A period of 365 calendar days is more likely and would allow for unforeseen delays such as weather related delays, contractor mobilization, final inspections, and project closeout.

There are no anticipated seasonal factors that would affect the construction of this project other than weather considerations.

**F. FUNDING ALTERNATIVES**

At present, no funding alternatives have been identified or appropriated. Funding options may include County funds, Flood Control District funds for the bridge portion, Developer contributions, 130 Monies for UPRR crossing, Federal and State funding, School District participation, and the formation of an Improvement District.