



## Design Memorandum

Interstate 10 Corridor: Koli Road Traffic Interchange

Maricopa and Pinal Counties, Arizona
ADOT Project No. F0701 01L
Federal Aid No. 888-A(219)S
Initial: June 09, 2025



[Placeholder - Project Determination Form.]

Design Memorandum Interstate 10 Corridor: Koli Road Traffic Interchange



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### 1 Introduction

### 1.1 Foreword

This Design Memorandum outlines the design requirements and implementation guide for the Interstate 10 (I-10)/Koli Road Traffic Interchange (TI) (referred to as the Koli Road TI in this memo). The intent is to comply with regulatory policies and further enhance the safety, reliability and long-term infrastructure along I-10 and in the adjacent area. The proposed Koli Road TI is located at milepost 163.5 between the existing Wild Horse Pass Boulevard (milepost 162.5) and State Route (SR) 347/Queen Creek Road (milepost 164.5) TIs. See Figure 1-1.

The proposed TI is located within the 26-mile segment of I-10 known as the I-10 Wildhorse Pass Corridor. This segment is part of the major interstate freeway connection between Phoenix and Tucson (known as the Sun Corridor) and is located completely within the limits of the Gila River Indian Community (the Community). I-10 is one of the five primary transcontinental east-to-west interstate corridors that cross the United States. I-10 is the southernmost route between the Pacific Ocean in Santa Monica, California, and the Atlantic Ocean in Jacksonville, Florida, with many connections to the south into Mexico. Consequently, this corridor is a major local, regional, national and international freight corridor.

From 2019 to 2024, the Arizona Department of Transportation (ADOT) conducted a study and completed a DCR and Environmental Assessment (EA) to increase I-10 capacity by adding a general-purpose (GP) lane and High-Occupancy Vehicle (HOV) lane in each direction and upgrading the Wild Horse Pass Boulevard and SR 347/Queen Creek Road TIs within the limits of DCR. These I-10 improvements, as detailed in the I-10 SR 202 to SR 387 DCR and EA, have been approved for construction. A separate EA is being conducted for the Koli Road TI for inclusion into the corridor project, specifically into the I-10 Gila River Indian Community "Design Build" Construction project. The Design Concept Report (DCR) of the 26-mile corridor can be found in the *Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report*, dated October 2023. It should be also noted that the Wild Horse Pass Boulevard TI configuration has been revised since the DCR.

At the time of this Design Memorandum, the EA for the Koli Road TI is currently being developed and expected to be completed by the end of 2025. The EA "study limits" are shown in Figure 1-1. For reference, the "project area construction limits" (defined as 0.5 miles east and west of I-10) used in this memorandum are separate from the EA study limits. The EA study limits are much larger than the anticipated project area construction limits as shown in Figure 1-1.

This document summarizes the following:

- Existing and projected physical and operating conditions for I-10
- Future programmed improvements along the I-10 corridor and at the Wild Horse Pass Boulevard and SR 347/Queen Creek TIs
- Build and no-build alternatives for the Koli Road TI in the context of the build alternatives for Wild Horse Pass and SR 347/Queen Creek Road TIs
- Consensus-based process used to develop various alternatives and selection of a recommended build alternative (RBA)
- Design features and cost estimate of the RBA

This Design Memorandum also includes an implementation strategy and other supporting engineering evaluations developed as part of the study process.

ADOT has assigned the project number for this study: F0701 01L. The Federal Aid number for this project is 888-A (219)S.

### 1.2 Purpose and Need for the Project

To accommodate the growth occurring in Maricopa, Pinal and Pima Counties, ADOT has expanded and modernized I-10 between Phoenix and Tucson for the last 20 years. This 26-mile segment is the last remaining piece of ADOT's overall vision for expanding I-10's capacity and improving and modernizing the I-10 route through the Sun Corridor between the state's two major metropolitan areas of Phoenix and Tucson, and more specifically within the Community. In addition to the I-10 improvements, ADOT and the Community and its stakeholders are proposing the new Koli Road TI. The Koli Road TI would be located between the existing Wild Horse Pass TI and the SR 347/Queen Creek Road TI. Independent from the Koli Road TI, Koli Road would extend east to connect with an extension of Kyrene Road and extend west to Maricopa Road, just south of the existing Firebird Lake. The Koli Road extensions would be funded and administered by the Community and its stakeholders.

Expected growth that will directly affect the area within the study limits are included in the *Wild Horse Pass Master Plan Index (Master Plan)*, as well as the planned redevelopment of land from Gila River Development (GRD), formerly Wild Horse Pass Development Authority (WHPDA), which includes the removal of Firebird Lake. The Wild Horse Pass area currently features the Gila River Resorts & Casinos – Wild Horse Pass, the Sheraton Grand at Wild Horse Pass resort, the Phoenix Premium Outlets shopping center, and the Rawhide Western Town event venue. Future developments in the area's Master Plan include apartments, hotels, casinos, office and retail space, restaurants, medical facilities, a museum, a stadium, sports facilities, a water park, outdoor festival venues, and a convention center.

The area is projected to have a 79% increase in employment and a 529% increase in visitor population. This is expected to greatly affect the traffic conditions and increase congestion on Wild Horse Pass TI and SR 347/Queen Creek TI. Data from the Maricopa Association of Governments (MAG) compares the expected increase in visitor populations and employment numbers in the Wild Horse Pass area from the years 2023 to 2050.

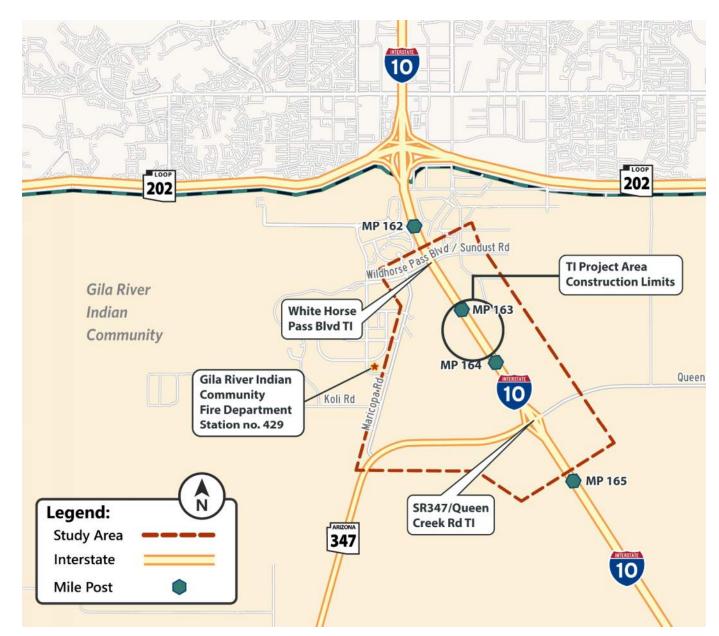


Figure 1-1 - Project Vicinity

The purpose of the proposed Koli Road TI is to address current and future traffic operations, congestion and travel demands, including:

- Providing the Community efficient access to and from the I-10 mainline
- Improving emergency vehicle response times during events
- Improving traffic ingress and egress during events
- Improving traffic operation management during incidents occurring on I-10 which result in detouring traffic from the I-10 mainline
- To accommodate current and future travel demand due to the projection in population and employment growth in the Wild Horse Pass area, specially defined in the Master Plan; furthermore, adding connectivity to

existing and future local attractions, including casinos, office spaces, shopping centers, restaurants, medical facilities, a museum, a stadium, outdoor venues, a convention center, a water park, and sports facilities

The project need identifies the specific and measurable transportation problems that exist today or are anticipated to exist by 2050. The conditions resulting in inadequacies or deficiencies in the roadway system, which require remedies, are:

- Traffic congestion from limited roadway capacity resulting in inefficient access to Community land.
- Delayed emergency vehicle response times during traffic surges from special events held at the Wild Horse Pass Entertainment area. These surge traffic events are expected to worsen due to the area's projected growth. The nearest fire station is located at the corner of Maricopa Road and 48th Street. Existing travel times to attractions in the surrounding area range from 4 to 8 minutes, but experience delays when event traffic is present.
- I-10 traffic operation issues during incidents, specifically those with subsequent diversion of traffic onto local Community roads.
- Projected future travel patterns and traffic demand on local Community roads due to population and employment growth.

### Characteristics of the Study Area

The Koli Road TI EA study limits span nearly three miles, extending from north of the Wild Horse Pass TI to just south of SR 347. According to the 2020 Census Bureau's Metropolitan Planning Organization (MPO) urban-rural delineation, the study area falls within a designated boundary. However, future delineations are expected to classify it as urban. Consequently, I-10 in the study area is primarily classified a fringe urban four-lane divided interstate corridor and lies entirely within the Community. Additional I-10 characteristics for the corridor can be found in Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report, dated October 2023.

The corridor characteristics can be summarized as follows:

Wild Horse Pass TI (milepost 162.0) to SR 347/Queen Creek Road TI (milepost 165.0): The corridor falls within Maricopa County and can be described as fringe urban, with future delineations expected to classify it as urban in nature because it is adjacent to the Phoenix/Chandler boundary at SR 202L and parallels the Price Road corridor to the east. The Community's Gila River Development (GRD) area fronts I-10 to the west of the corridor. The GRD area is a destination-style master-planned area that currently includes a casino, an outlet mall, a motorsports park, a hotel resort, and a golf course, to name just a few, and there are plans to expand dramatically over the next several decades, including sports/concert venues and other related land uses. The Lone Butte Industrial Park fronts I-10 to the east of the corridor. Both are primarily served by the Wild Horse Pass Boulevard TI. The SR 347/Queen Creek Road TI is included in this segment. and while it has the appearance of a rural setting, the operations are more reflective of urban TIs with pronounced peak-period congestion. This is due to the commuter traffic that uses the TI from the south Chandler/Sun Lakes area to the east, and the city of Maricopa to the southwest.

#### 1.3.1 Land Use

A Master Plan for the GRD was published in November 2019. The GRD plan showed a Koli Road extension from the Koli Road TI that went west and tied into the current W S Loop Road, traversing through the existing Firebird Lake, Firebird Motor Park and the Radford Racing School.

1-2 | June 2025 ADOT Project No. F0701 01L As part of ADOT's study, new options and alternatives that preserve the existing racing schools and motor park but traverse Firebird Lake were considered. The alignments on the eastern side of I-10 were developed to show alternatives that are compatible with the existing and potential future roadway networks and help to provide a passage to Lone Butte Casino, Lone Butte Industrial Park, and Kyrene Road.

### 1.3.2 Roadways

### Koli Road

Koli Road currently does not exist within the study limits or project area construction limits (0.5 miles east and west of I-10). Koli Road does exist west of the study limits. Koli Road is a paved, unmarked, two-lane Community road that extends west from Maricopa Road approximately 0.3 miles south of 48th Street.

The area surrounding the Koli Road TI has little to no development; To the west of the Koli Road TI location is Firebird Lake, which GRIC has drained and closed to accommodate GRD Planned Redevelopment of Land of this area. To the east of the TI is undeveloped land, and just northeast of the location are a few commercial buildings that include concrete suppliers, warehouses and storage units.

#### I-10

I-10 was initially constructed in the 1960s and has had numerous upgrades and additions in the years since. The existing Wild Hose Pass TI is located north of the study limits and SR 347/Queen Creek TI is located on the south end of the study limits. As-built record drawings used to compare and develop the alternatives and options are summarized in Table 1-1. The future existing conditions of the I-10 and the adjacent traffic interchanges within the study area can be referenced from the *Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report*, dated October 2023.

Table 1-1 - Adjacent TI as-built summary

As-built project number	Date	Description of work	Begin station	End station	Begin milepost	End milepost
IM-NH-10-C(204)T	2015	Wild Horse to Riggs	8572+96.00	1157+12.70	162.56	167.10
IR-10-3(325)	1992	Queen Creek TI	984+13.92	1049+75.00	163.81	165.06
IM-NH-10-C(204)T	2015	Wild Horse Pass to Queen Creek Road	8572+96.00	1157+12.70	162.56	167.10
STP-202-C(006)B	2005	Wild Horse Pass TI	8545+00.00	8625+40.00	162.09	163.52

Other principal roads in and around the study limits

- Maricopa Road is a paved two-lane road with a striped center turn lane and serves as the western study limits boundary.
- SR 347/Queen Creek Road is a paved four lane divided road with an open median and serves as the southern study limits boundary.
- Wild Horse Boulevard/Sundust Road is a paved four-lane road with a raised median and serves as the northern study limits boundary.

### 1.3.3 Right-of-way and Access Control

The existing right-of-way (ROW) in the Koli Road TI project area construction limits runs along I-10 and is a perpetual grant of easements from the Community and Bureau of Indian Affairs (BIA). The I-10 easement width is generally 300 feet centered on the median centerline. New ROW would be needed to accommodate the proposed entrance and exit ramps and extensions of Koli Road.

Table 1-2 - ROW summary

ROW project no.	Begin station	End station	Begin milepost	End milepost	ROW type	Date
I-10-3(16)155	558+60.23	946+66.31	155.65	163.09	Easement	1966
I-10-3(35)161	946+66.31	1241+46.21	163.09	168.66	Easement	1966

Access control generally follows the I-10 ROW line, although exceptions do exist at the crossroads and TIs, as noted in the plans in Appendix A.

ROW delineation along the crossroads was collected from a variety of sources of information including survey information provided by the Community, ROW documentation from the Maricopa County Department of Transportation (MCDOT) for Queen Creek Road, and from ADOT for SR 347.

Additional existing ROW information for the corridor can be found in the *Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report*, dated October 2023.

### 1.3.4 Drainage and Drainage Structures

The regional drainage in the area flows from east to west and eventually discharges into the Gila River located southwest of the project area. The existing topography does not show any major natural drainage features that pass through the project area. I-10 divides the area flows into two separate drainage systems. The runoff on the west side drains west away from I-10 and the runoff east of I-10 drains towards I-10. However, there is an adequate culvert system along I-10 to allow this runoff to pass through. The on-site runoff would be discharged along either side of the roadway into a roadside ditch, which would collect and convey it into the nearest outfall draining towards I-10 culverts or towards the Gila River. The existing Firebird Lake and subsequent filling of the lake will change minor local drainage but will not have a significant impact of the overall drainage patterns in the area.

### Koli Road TI

In the Koli Road TI project area construction limits, five structures convey on- and off-site flow beneath I-10 from east to west. On-site runoff generated from the westbound lanes flows to the east where it contributes to one of several cross culverts passing flows under I-10. Runoff generated from the eastbound lanes flows to the west. Runoff generated from within the open median is collected by one of several area inlets and conveyed to the west. Table 1-3 lists the culverts found along the segment of I-10 from mileposts 163.0 to 164.0.

Table 1-3 - Existing culvert summary (mileposts 163.0 to 164.0)

I-10 med station	LT/RT	Skew	No. of cells	Size	Length	Туре	Maximum capacity (cfs)
954+25	_	0°	1	30"	215'	CMP	52.80
959+00	_	0°	1	30"	227'	CMP	52.80
964+00	_	0°	1	30"	234'	CMP	52.80
984+00	_	0°	1	30"	226'	CMP	113.50
986+00	_	0°	1	30"	226'	CMP	113.50

Note: cfs = cubic feet per second

### 1.3.5 Drainage Models and Studies

State Route 202L (Milepost 161.3) to North of the Gila River (Milepost 172.6)

The Gilbert-Chandler Area Drainage Master Study (ADMS), performed by the Flood Control District of Maricopa County (FCDMC) in July 1993, covers an area of approximately 120 square miles in the southeast region of the Phoenix metropolitan area. The drainage study area is bounded by I-10 to the west, the Western Canal and U.S. Route 60 to the north, the Roosevelt Water Conservation District Canal to the east and Queen Creek Road to the south.

The city of Chandler 1998 Stormwater Master Plan Update, performed by Camp Dresser & McKee Inc. in June 1999, overlaps the Gilbert-Chandler ADMS with an additional study area south of Queen Creek Road. The study area is bounded by Price Road to the west, the city of Chandler boundary to the east and Hunt Highway to the south.

The Sun Lakes Master Drainage Plan, performed by B & R Engineering in May 1996, covers the census-designated Sun Lakes to the southwest of Chandler.

Together, these three studies characterize off-site flow to the east of the Community. The Gila River Indian Community Reservation-Wide Drainage Study, completed by Stantec on August 21, 2007, addresses Districts 1, 2, 4, 5, 6 and 7 of the Gila River Reservation. District 4 information pertains to this segment of I-10. No Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) reports or floodplain delineation studies were discovered for the area within the Community boundary.

In 2001, ADOT reconstructed the I-10/Maricopa Road (Wild Horse Pass Boulevard) TI, and WEST Consultants prepared a drainage report for the TI project. The report was completed in January 2001 and revised in April 2001.

In 2019, the GRD contracted Kimley-Horn and Associates to prepare a Wild Horse Pass ADMS.

### 1.3.6 Utilities

There are several existing and planned utilities within the study limits. Most cross I-10, but some exist longitudinally in the ADOT ROW without crossing I-10. Those that exist longitudinally in the ADOT ROW are limited to facilities that directly serve the freeway function (e.g., electrical lines for lighting and signals or ITS). All existing utilities in the project limits are listed in Table 1-4. The information provided in the table is based on asbuilt plans, mapping, and ADOT permit logs. The existing utilities within the Koli Road TI project area construction limits are highlighted in green in Table 1-4.

Additional existing utility and planned utility information for the corridor can be found in the *Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report*, dated October 2023.

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Table 1-4 - Existing utility summary

Utility type	Ownership	Begin station	Begin offset	End station	End offset	Begin milepost	End milepost	ADOT permit no.	As-built or record drawing no.	Inside ADOT ROW	Crossing I-10	ADOT constructed	Notes
Irrigation	PMIP	880+11.	335' Lt	899+10.	255' Rt	161.80	162.02	_	202L-MA-050 H4314 02C	Yes	Yes	Yes	84" Conc
FMS	ADOT	892+00.	110' Rt	892+01.	98' Lt	162.03	162.03	_	_	Yes	Yes	Yes	_
Fiber optic telephone	Gila River Telephone Industry	896+70.	437' Rt	898+28.	213' Lt	162.12	162.01	_	H5417 01C	Yes	Yes	Unknown	Abandoned according to as-builts
Irrigation	Community	897+28.	569' Rt	903+97.	962' Lt	162.13	162.11	_	10-3(36), H4314 02C	Yes	Yes	Yes	36" RCP Broadacres Canal – abandoned per Community scoping comments 20191002
Power (overhead)	San Carlos Irrigation Project	897+83.	1638' Lt	919+45.	357' Lt	162.14	162.41	94130	_	Yes	No	No	12kV, maybe GRICUA
Telephone (underground)	Unknown	900+01.	424' Rt	900+12.	245' Lt	162.04	162.04	_	_	Yes	Yes	No	_
Power (overhead)	Unknown	905+02.	939' Lt	909+70.	1832' Lt	162.13	162.22	_	_	No	No	No	_
Power (traffic)	ADOT	912+43.	108' Rt	1046+18.	94' Rt	162.27	164.99	_	10-MA-163	Yes	No	Yes	Lighting and signals
Irrigation	Salt River Project	915+21.	_	_	_	162.33	_	_	10-MA-163, H5417 01C	Yes	Yes	Yes	3-10'x7' CBC Gila Drain
Sanitary sewer	Lone Butte	918+06.	1047' Lt	927+71.	157' Lt	162.38	162.56	_	_	No	No	No	18" MJ DIP
Power (underground)	San Carlos Irrigation Project	919+45.	357' Lt	924+11.	328' Lt	162.41	162.50	94130	_	Yes	No	Unknown	4-6" PVC, maybe GRICUA
Sanitary sewer	City of Chandler	919+93.	2353' Rt	932+62.	913' Lt	162.42	162.66	_	10-3(36)	Yes	Yes	Yes	30" RGRCP
Natural gas	Unknown	920+51.	1901' Lt	930+10.	1020' Lt	162.43	162.61	_	H5417	No	No	No	_
Natural gas	Southwest Gas	921+42.	1282' Rt	921+99.	1523' Lt	162.44	162.46	_	H5417	Yes	Yes	No	8"
FMS	ADOT	922+01.	304' Rt	922+59.	259' Lt	162.46	162.47	_	_	Yes	Yes	Yes	_
Power (overhead)	Unknown	922+37.	790' Rt	924+61.	1044' Rt	162.46	162.51	_	_	No	No	No	_
Power (overhead)	San Carlos Irrigation Project	922+40.	1835' Lt	924+11.	328' Lt	162.46	162.50	94130	_	Yes	No	No	12kV, maybe GRICUA
Power (traffic)	ADOT	922+67.	261' Lt	923+29.	92' Rt	162.47	162.48	_	_	Yes	Yes	Yes	Lighting and signals
Power (underground)	GRICUA	922+72.	267' Lt	976+40.	144' Lt	162.47	163.69	_	_	No	No	Unknown	Power service to ADOT facilities
Power (underground)	GRICUA	923+05.	231' Lt	924+11.	328' Lt	162.48	162.50	_	_	No	No	Unknown	Power service to ADOT facilities
Natural gas	Unknown	923+07.	738' Lt	927+11.	560' Lt	162.48	162.55	_	H5417	No	No	No	_
Power (overhead)	Unknown	923+84.	1505' Rt	928+52.	374' Rt	162.49	162.58	_	_	No	No	No	_
Power (overhead)	San Carlos Irrigation Project	924+11.	328' Lt	927+93.	167' Lt	162.50	162.57	94130	_	No	No	No	12kV, maybe GRICUA
Telephone (underground)	Gila River Telephone Industry	924+20.	228' Rt	929+92.	169' Rt	162.50	162.61	_	_	No	No	No	_
TV (underground)	Cox Communications	924+21.	562' Rt	921+94.	1526' Lt	162.50	162.45	_	H5417	No	Yes	No	_

Table 1-4 - Existing utility summary

Utility type	Ownership	Begin station	Begin offset	End station	End offset	Begin milepost	End milepost	ADOT permit no.	As-built or record drawing no.	Inside ADOT ROW	Crossing I-10	ADOT constructed	Notes
Power (underground)	Unknown	924+61.	1044' Rt	924+22.	176' Rt	162.51	162.50	_	_	No	No	Unknown	Possible service line to ADOT facilities
Power (underground)	Unknown	924+61.	1044' Rt	924+22.	176' Rt	162.51	162.50	_	_	No	No	No	_
Power (underground)	Unknown	924+61.	1044' Rt	925+46.	1681' Rt	162.51	162.52	_	_	No	No	No	_
Power (overhead)	San Carlos Irrigation Project	927+93.	167' Lt	928+52.	374' Rt	162.57	162.58	94130	_	Yes	Yes	No	69kV, 3-lines, maybe GRICUA
Power (overhead)	San Carlos Irrigation Project	927+93.	167' Lt	930+37.	551' Lt	162.57	162.61	_	_	No	No	No	69kV and 12kV
Power (underground)	San Carlos Irrigation Project	927+93.	167' Lt	941+73.	156' Lt	162.57	163.03	_	_	No	No	No	Outside ADOT ROW, serves billboards
Power (overhead)	Unknown	928+52.	374' Rt	952+72.	651' Rt	162.58	163.24	_	_	No	No	No	—
Fiber optic telephone	Gila River Telephone Industry	929+00.	592' Rt	929+84.	441' Lt	162.59	162.60	80614	_	Yes	Yes	No	2-DB(120) with FO and T
Power (underground)	GRICUA	940+14.	162' Rt	972+61.	162' Rt	162.80	163.61	_	_	No	No	No	Outside ADOT ROW, serves billboards
Power (overhead)	Unknown	950+96.	954' Rt	952+72.	651' Rt	163.20	163.24	_	_	No	No	No	_
Power (underground)	Unknown	952+72.	651' Rt	953+34.	162' Rt	163.24	163.25	_	_	No	No	No	_
FMS	ADOT	972+59.	132' Lt	972+85.	135' Rt	163.61	163.62	_	_	Yes	Yes	Yes	_
Power (underground)	Unknown	975+59.	1102' Rt	977+94.	1691' Rt	163.67	163.71	_	_	No	No	No	_
Power (traffic)	ADOT	1002+23.	119' Rt	1002+24.	108' Lt	164.15	164.15	_	10-MA-163	Yes	Yes	Yes	Lighting
Power (overhead)	San Carlos Irrigation Project	1019+10.	1611' Rt	1019+74.	571' Rt	164.47	164.49	_	_	Yes	No	No	Possible GRICUA
Power (underground)	GRICUA	1019+74.	571' Rt	1020+23.	445' Rt	164.49	164.49	_	_	Yes	No	Unknown	1-3" PVC – provide service to ADOT facilities
Power (traffic)	ADOT	1020+05.	434' Lt	1020+30.	454' Rt	164.49	164.50	_	10-MA-163	Yes	Yes	Yes	May include 1-2" PVC and 3-3" PVC for signals and lighting
Power (traffic)	ADOT	1021+39.	440' Lt	2032+58.	592' Rt	164.52	183.65	_	10-MA-163	Yes	Yes	Yes	May include 1-2" PVC and 3-3" PVC for signals and lighting
Power (traffic)	ADOT	1033+55.	141' Lt	1038+86.	105' Lt	164.75	164.85	_	10-MA-163	Yes	No	Yes	Lighting
Power (traffic)	ADOT	1038+69.	107' Lt	1038+69.	111' Rt	164.84	164.84	_	10-MA-163	Yes	Yes	Yes	Lighting

### 1.3.7 Traffic Features

### Signing

### Main Line Guide Signs

Guide signing consists of overhead and ground-mounted signs along the corridor to convey navigational information to drivers. Four overhead sign structures within the Koli Road TI study limits could be affected. There is no existing sign lighting on the overhead sign structures.

### Grand Canyon State Logo Signs

There are Grand Canyon State logo signs on both the mainline and exit ramps within the study limits. These are located within the urban and fringe-urban areas (approximately mileposts 162 to 164).

### Crossroad Guide Signs

There are currently no existing crossroad guide signs within the Koli Road TI study limits.

### Private Property Billboard Signs

Private property billboard signs consist of ground-mounted signs along the I-10 corridor to convey advertisements or property signage to drivers. Three billboard signs currently located outside of the existing ROW within the Koli Road TI study limits could be affected.

### **Pavement Marking**

Since the Koli Road TI has not been constructed, there is no existing pavement marking along the proposed Koli Road.

### Signals

Since the Koli Road TI has not been constructed, there are no existing traffic signals along the proposed Koli Road.

### Freeway Management System

### Fiber Optic Trunk Line

Fiber optic conduits within the proposed Koli Road TI study limits are described in the *Interstate 10 Corridor:* State Route 202L to State Route 387, Design Concept Report, dated October 2023.

### Dynamic Messages Signs

There are two dynamic message sign (DMS) structures within the study limits; the DMS panel is on an overhead sign structure (see Figure 1-2). Table 1-5 summarizes the DMS locations in the study limits.



Figure 1-2 - DMS along westbound I-10, Sta 973+00, on a 4F structure approaching Wild Horse Pass

### **Table 1-5 - DMS structure summary**

I-10 med station	EB/WB	DMS no.	Structure type	Description
973+00	WB	112	4F	Overhead DMS Sign Bridge. Skyline Walk-in DMS.
976+25	EB	113	4F	Overhead DMS Sign Bridge. Skyline Walk-in DMS.

### Ramp Meters

Since the Koli Road TI has not been constructed, there are currently no existing ramp meters within the Koli Road TI limits. Ramp meter information for the adjacent traffic interchanges can be found in the *Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report*, dated October 2023.

#### Closed-circuit Television Cameras

There are currently no existing CCTV cameras within the Koli Road TI limits.

### Traffic Counter Stations and Loop Detection/Classifier Systems

Since the Koli Road TI has not been constructed, there are existing traffic counters or loop detector systems within the Koli Road TI study limits.

### Lighting

Since the Koli Road TI has not been constructed, there is currently no lighting equipment existing within the Koli Road TI study limits.

### 1.3.8 Structures

### Bridge Structures

Since the Koli Road TI has not been constructed, there are no existing bridge structures within the Koli Road TI study limits. Information for the bridges at the adjacent TIs can be found in the *Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report*, dated October 2023.

### **Retaining Walls**

No retaining walls independent of the bridge structures exist in the Koli Road TI limits.

### **Sound Barriers**

No sound barriers exist in the Koli Road TI limits.

#### **Box Culverts**

No box culverts were identified in the Koli Road TI limits.

### 1.3.9 Geotechnical

Available geotechnical data used to develop preliminary recommendations are based on information obtained from ADOT as-built construction documents, laboratory test data from representative samples in the study area, and recently performed geotechnical investigations adjacent to the study area. The following section provide excepts of the results of the subsurface exploration for the Koli Road TI. The project specific geotechnical report can be found in the *I-10 Koli Road Traffic Interchange Geotechnical Engineering Data Report*, Dated April 18, 2025.

Geology information for the I-10 corridor can be found in the *Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report*, dated October 2023.

#### **Geotechnical Conditions**

The project area is located in the Basin and Range physiographic province of the North American Cordillera of the southwestern United States. The southern portion of the Basin and Range province is situated along the southwestern flank of the Colorado Plateau and is bounded by the Sierra Nevada Mountains to the west. Formed during middle and late Tertiary time (100 to 15 million years ago), the Basin and Range province is dominated by fault-controlled topography. The topography consists of mountain ranges and relatively flat alluviated valleys. These mountain ranges and valleys have evolved from generally complex movements and associated erosional and depositional processes. Drainage flows to the Gila River during late Tertiary time, coupled with structural activity discussed above, are generally responsible for the present-day topography within the basin.

Typically, the mountain ranges in this area are of small areal extent but protrude significantly above adjacent wide alluviated plains and valleys. The basin rims are formed by the mountain ranges which consist of sedimentary, igneous and metamorphic materials which have been subjected to recurrent faulting and tilting, and in some places volcanic and intrusive events. As a result of erosion, the valleys have experienced partial infilling with sedimentary material which has been deposited as alluvial fans. Dominant features in the province consist of:

Table 1-6 - Dominant features summary

Feature	Description
Pediments	Gently dipping slopes formed due to an underlying rock erosional surface
Alluvial fans	Sediments deposited in outwash plains at areas of low water velocity
Bajadas	Alluvial fans which combine at the base of mountains
Inselbergs	Isolated hills or mountains, usually that maintain their relief after erosion of surrounding rock

### **Geologic Setting**

The mapped surficial geologic conditions indicates the I-10 Koli Road TI is generally within an area of Holocene surficial deposits. These Holocene surficial deposits generally consist of unconsolidated deposits associated with modern fluvial systems, and include fine-grained, well-sorted sediment on alluvial plains, but also include gravelly channel, terrace, and alluvial fan deposits on middle and upper pediments.

### Ground Subsidence and Earth Fissures

A review of published maps available from the Arizona Geological Survey (4AZGS, 2014), indicates the project site is located in a broad general area of central Arizona known for historic ground subsidence due to groundwater withdrawal. This has historically resulted in the formation of earth fissures in certain parts of the region. The AZGS is actively updating their database regarding earth fissuring. Based on review of the available AZGS geological information, the nearest earth fissure study area is mapped approximately 12 miles southeast of the proposed I-10 Koli Road TI. Evidence of earth fissures was not observed on the site during the field exploration or site reconnaissance. However, continued groundwater withdrawal in the area may result in additional ground subsidence and the formation of new fissures or the extension of existing fissures.

### **Groundwater Conditions**

Groundwater was observed at some of the test borings at the time of field exploration. These observations represent groundwater conditions at the time of field exploration and may not be indicative of other times, or at other locations. Groundwater conditions can change with varying seasonal and weather conditions, and other factors. The depth of groundwater was measured while drilling, and where possible at the completion of drilling. A summary of the groundwater depth/elevations obtained at the time of exploration is presented in the following table:

Table 1-7 – Groundwater Elevation/Depth summary

Proposed TIUP Bridge Improvement	Approximate Elevation (ft) / Depth (ft) (At time of field exploration)
I-10 & Koli Road (Borings B-20 through B-25)	1,075 to 1,090 / 62 to 76



### Soil Shrink/Swell Potential

The majority of improvements are anticipated to require embankment fill construction, and some reworking of the existing site soils may be necessary. Earthwork factors were estimated based on results of laboratory density tests on selected near surface ring samples obtained from the borings, as well as from past experience with similar soils. The shrinkage factors are based on a comparison of the in-situ dry densities to the density of selected bulk samples compacted to 95 percent of their maximum dry density as determined by ASTM D698 (Standard Proctor).

The tabulated results indicate an average of approximately 5 to 15 percent shrinkage. This estimate is general in nature and based on the limited data from our field exploration and the soil conditions encountered at the site. Earthwork factors may vary dependent upon the actual subsurface conditions, which may include variations in soil gradations and gravel contents. Earthwork values are also expected to be less in areas subjected to lower levels of compaction or where the existing natural soils are denser. Conversely, earthwork values are expected to be greater in areas subjected to higher levels of compaction or where the existing natural soils are looser.

New roadway embankment fills are planned to be constructed with heights of up to roughly 30 feet above the existing ground surface. The loading of the existing soils with new fills is anticipated to result in some settlement. The anticipated settlements due to the placement of new roadway embankment fills are excluded from the shrink/swell estimates shown above, and should be considered in the design, construction and cost estimates prepared for the project.

The former Firebird Lake area and the area of Boring Nos. R&C-45, R&C-47, and R&C-48 were inaccessible to the field exploration vehicles due to very loose/soft surficial soils. The earthwork shrink factors are anticipated to be greater in these very loose/soft surficial soil areas than those shrinkage factors outside of the Firebird Lake area.

#### Subsurface Geotechnical Profile

The *I-10 Koli Road Traffic Interchange Geotechnical Engineering Data Report*, Dated April 18, 2025 includes a Boring Location Summary Table providing the approximate boring locations, ground surface elevations, boring depths, boring designation/purpose, and drilling method. Specific conditions encountered at each boring location are indicated on the individual boring logs included in Appendix G of this report. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. The results of the field and laboratory testing indicated variations in subsurface conditions and engineering characteristics throughout the site.

### Existing Roadway Subgrade

Information regarding the existing roadway subgrade characteristics is provided in the *I-10 Koli Road Traffic Interchange Geotechnical Engineering Data Report*, Dated April 18, 2025. The geotechnical field exploration included boring explorations for the proposed traffic interchange performed with a truck-mounted drill rig (and a backhoe for 1 test pit in the former Firebird Lake area). Correlated R-values for these soils vary over a wide range, from 29 to 99. Areas of the proposed roadway alignment that include subgrade soils with an R-value of less than the requirement (unsuitable subgrade materials) will require over-excavation of these areas to a minimum depth of 3 feet below finished subgrade. The over-excavated areas should be replaced with suitable soils meeting the project R-value requirements.

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### 2 Traffic and Crash Data Analysis

This chapter summarizes the analysis of current and future traffic operations related to the I-10 Koli Road Traffic Interchange. As of March 2025, the Change of Access Report (COAR) is actively being developed. The COAR methodology has been documented and approved by FHWA in the COAR Methods and Assumptions document, signed on March 13, 2025.

### 2.1 Crash Analysis

- Crash analysis is documented within the Safety Analysis portion of the COAR.
- Sources of Data that provide traffic data for the report are defined in the COAR and the methodology for obtaining the data that has been documented in the COAR Methods and Assumptions document.
- Crash Data used for crash analysis is included in the COAR.

### 2.2 Traffic Analysis

- Traffic Operations Analysis is documented within the Traffic Operations Analysis portion of the COAR.
- Sources of Data that provide traffic data for the report are defined in the COAR and the methodology for obtaining the data that has been documented in the COAR Methods and Assumptions document.
- Additional analysis was performed and documented in the Traffic Analysis Memo, dated December 20, 2024, which was used as support documentation during ADOT's interagency consultation and coordination.

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### 3 Design Concept Alternatives

### 3.1 Introduction

In response to the public and agency scoping process, the subsequent development of the project's purpose and need, and the traffic analysis detailed in Chapter 2, five alternatives were developed to address the study objectives. This chapter presents the development and screening of five initial alternatives, further development of three viable alternatives and concludes with the selection of one recommended build alternative (RBA).

The following sections present information available and used at the time of the evaluation and selection process. Since that time, elements of the RBA have been further developed; therefore, information presented in Chapter 4, Major Design Features of the RBA, may be further developed than those presented in this chapter.

Two alternatives that were eliminated in the first phase of the evaluation are discussed in Section 3.2. The eliminated alternatives had a fatal flaw, impractical design, or did not address the project's purpose and need.

The second and final phase of the evaluation compares three viable alternatives using engineering, environmental, cost, and ROW criteria.

The three viable alternatives for the Koli Road TI consist of a no-build alternative and two TI alternatives (build alternatives). The results of this evaluation are summarized in a series of matrices. The final section of this chapter, Section 3.4, provides the results of the alternatives screening and identifies the RBA being carried forward. Note that the portions of the roadways that GRIC will be responsible for constructing and connecting to the Koli Road TI are not part of the ADOT project, and GRIC's design and alignment of these roadways may vary slightly from what is shown in this report.

Public Agencies and governmental entities involved in the alternative evaluation process included ADOT, MAG, BIA, the Community, Gila River Indian Community Utility Authority (GRICUA), Gila River Telecommunications, Inc. (GRTI) and the Federal Highway Administration (FHWA).

### 3.2 Design Concept Alternatives Considered and Eliminated

### 3.2.1 Alternatives Considered

Koli Road TI alternatives were evaluated based on the following criteria:

- conformance with adopted regional transportation plans and existing location studies;
- ability to improved traffic operations;
- conformance with engineering design standards;
- ability to minimize ROW, utility impacts, and environmental impacts;
- overall project cost; and
- ability to obtain agency, governmental (including an emphasis on tribal governments) and public support.

The development of alternatives began by considering various build alternatives that address the purpose and need. The build alternative includes the construction and operation of a new full-access TI at Koli Road and I-10. A wide range of TI types and configurations were initially considered for this study. Major considerations in the development of the initial five alternatives include:

Providing the Community efficient access to and from the I-10 mainline.

- Improving emergency vehicle response times during events.
- Improving traffic ingress and egress during events.
- Improving traffic operation management during incidents occurring on the I-10, which result in detouring traffic from the I-10 mainline.
- To accommodate current and future travel demand due to the projection in population and employment growth in the Wild Horse Pass area, as well as adding connectivity to existing and future local attractions, including casinos, office spaces, shopping centers, restaurants, medical facilities, a museum, a stadium, outdoor venues, a convention center, a water park and sports facilities.

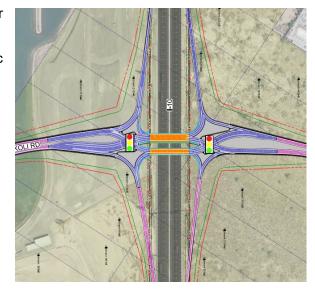
### Table 3-1 - Build Alternatives

Koli Road TI Alternatives							
Alternative K1	No-Build						
Alternative K2	Diverging Diamond Interchange (DDI)						
Alternative K3	Diamond Interchange						
Alternative K4	Single Point Urban Interchange (SPUI)						
Alternative K5	Displaced Left-Turn Diamond Interchange (DLT)						

A brief description and conceptual layouts of each alternative are as follows:

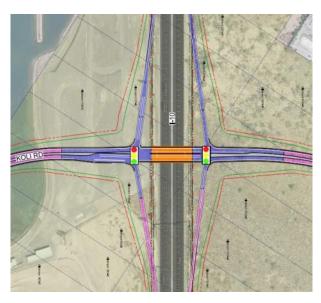
### Alternative K2: DDI:

- Alternative K2 provides a perpendicular elevated crossing of I-10. Koli Road east and westbound
  alignments are controlled by independent alignments along independent bridges. Traffic is controlled using
  traffic signals at ramp terminals. The TI would meet AASHTO Controlling Design Criteria. Due to the DDI
  geometry at on and off-ramps, wider lanes would need to be provided to accommodate oversized vehicles.
- Shifts traffic to the opposite side road at crossover points.
- Eliminates left-turn conflicts with oncoming traffic when entering or exiting a freeway.
- Effective in areas with heavy left-turn movements.



#### Alternative K3: Diamond:

- Alternative K3 provides a perpendicular elevated crossing of I-10. Koli Road east and westbound
  alignments are controlled by a single alignment along a single bridge. Traffic is controlled using traffic
  signals at ramp terminals. The TI would meet AASHTO Controlling Design Criteria. This interchange
  accommodates oversized vehicles.
- Meets driver expectations for TIs in the area.
- Manages moderate traffic volumes.



### Alternative K4: SPUI:

- Alternative K4 provides a perpendicular elevated crossing of I-10. Koli Road east and westbound alignments are controlled by a single alignment along a single bridge. Traffic is controlled using a single traffic signal at the center of the TI. The TI would meet AASHTO Controlling Design Criteria. This interchange would not easily accommodate oversized vehicles and would increase the bridge footprint.
- Reduces conflict points by allowing left-turn movements to proceed simultaneously in opposite directions.
- Effective in areas with high traffic volumes.



#### Alternative K5: DLT Diamond Interchange:

- Alternative K5 provides a perpendicular elevated crossing of I-10. In this alternative left-turning traffic is re-routed to opposite side of the road in advance of the interchange. The TI would meet AASHTO Controlling Design Criteria. This interchange would not easily accommodate oversized vehicles.
- Improves traffic flow by relocating left-turn movements away from the main intersection.
- Reduces congestion and improves safety by minimizing conflicts between left-turning and oncoming traffic.



### 3.2.2 Alternatives Eliminated from Further Study

Five potential TI alternatives were evaluated to determine if there was merit in advancing their development. Each alternative was examined for how well they met the criteria listed in Section 3.2.1.

On February 14, 2024, the five potential Koli Road TI alternatives were presented to stakeholders in an in-person meeting at ADOT Santan Field Office (7130 E Fairview St, Chandler, 85226). At the time of the meeting, traffic analysis was not completed on any of the concepts.

Based on the discussions in that in-person meeting, a broad review of the above criteria, including a heavy emphasis on coordination with state and tribal governments, and existing transportation plans and location studies, two design concepts were eliminated and determined to not meet the purpose and need: Alternative K4 (SPUI) and Alternative K5 (DLT).

### Alternative K4 (SPUI)

Notable reasons for elimination from further considerations include:

- This type of TI would require more ROW than other alternatives carried forward.
- A larger bridge structure over I-10 would be needed, increasing construction duration.
- This alternative would not adequately address future traffic demand.
- Larger environmental footprint and higher potential cost.

### Alternative K5 (DLT)

Notable reasons for elimination from further considerations include:

• This type of TI would require more ROW than other alternatives carried forward.

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- The DLT interchange is unfamiliar to drivers.
- This alternative would not adequately address future traffic demand.
- Larger environmental footprint and higher potential cost.

The SPUI and the DLT were considered and eliminated from further development because they would require large amounts of ROW, would not adequately address future traffic demand, have a larger environmental footprint and yield a higher construction cost.

### 3.2.3 Weave Section Evaluation

An important factor in the operational performance of a new TI is how the traffic entering and existing the highway merge into and out of mainline traffic and how they interact with vehicles entering and existing to and from adjacent TIs. This area of turbulence is referred to as a weaving section, in reference to vehicles weaving in and out of traffic to access their desired path.

Four weave section options were developed between Koli Road and the adjacent interchanges of Wild Horse Pass Boulevard and Queen Creek Road. These include:

- Standard auxiliary lane that connects consecutive on- and off-ramps and facilitates the weaving traffic over a short distance
- Continuous auxiliary lane that extends the standard auxiliary lane to provide a continuous lane with unrestricted access to and from the mainline between all of the adjacent interchange ramps
- Braided ramps that provide grade-separation between consecutive on- and off-ramps to eliminate the merging or weaving conflicts
- Collector-distributor roads that create physically separated roads where traffic can access the TIs while not impacting mainline traffic

Lane diagrams of each option are shown in Appendix C. Each weave section option would work with any of the Koli Road TI Alternatives. The main constraint on these options is that the design must provide a minimum weaving distance between successive ramp terminals of between 1,600 and 2,500 feet per FHWA guidance. The options also must support the purpose and need and operate acceptably with the projected 2050 traffic volumes.

As with the evaluation of TI Alternatives, the weave section evaluation focused on configurations that met the future traffic demand while minimizing ROW and environmental impacts. Based on these criteria, the braided ramps and collector-distributor roads were considered and eliminated because they would require large amounts of ROW, increase the environmental footprint, and cost more than other options. Ultimately, the standard auxiliary lane option was selected and the preferred option because it met the FHWA guidance, met the traffic operational requirements with 2050 traffic volumes, and resulted in the least impacts and required the least additional infrastructure.

Additional details on agency input received on the weaving concepts are presented in Appendix C.

### 3.2.4 Alternatives Carried Forward for Further Study

The two remaining build alternatives (listed below) and the no-build alternative were carried forward for detailed study.

### Alternative K1: No-Build Alternative

K1 is the no-build alternative, assuming no future improvements between Koli Road and I-10. It serves as the baseline condition for the 2050 design year in traffic comparisons and is used to assess the incremental impacts and benefits of the build alternatives.

### Alternative K2: DDI TI

Koli Road is a proposed new arterial road that would connect to the existing arterial road network within the Wild Horse Pass corridor. Alternative K2 proposes constructing a new DDI to provide access between Koli Road and I-10. DDIs utilize a crossover on each side of the TI so free-flow left turns would not conflict with opposing traffic to complete the turn movement.

### Alternative K3: Diamond TI

Koli Road is a proposed new arterial road that would connect to the existing arterial road network within the Wild Horse Pass corridor. Alternative K3 proposes constructing a new Diamond TI to provide access between Koli Road and I-10. Diamond interchanges are the standard TI configuration across Arizona.

The plan view schematics of each build alternative carried forward are presented in Figure 3-1 and Figure 3-2.

Figure 3-1 – DDI Alternative (K2)

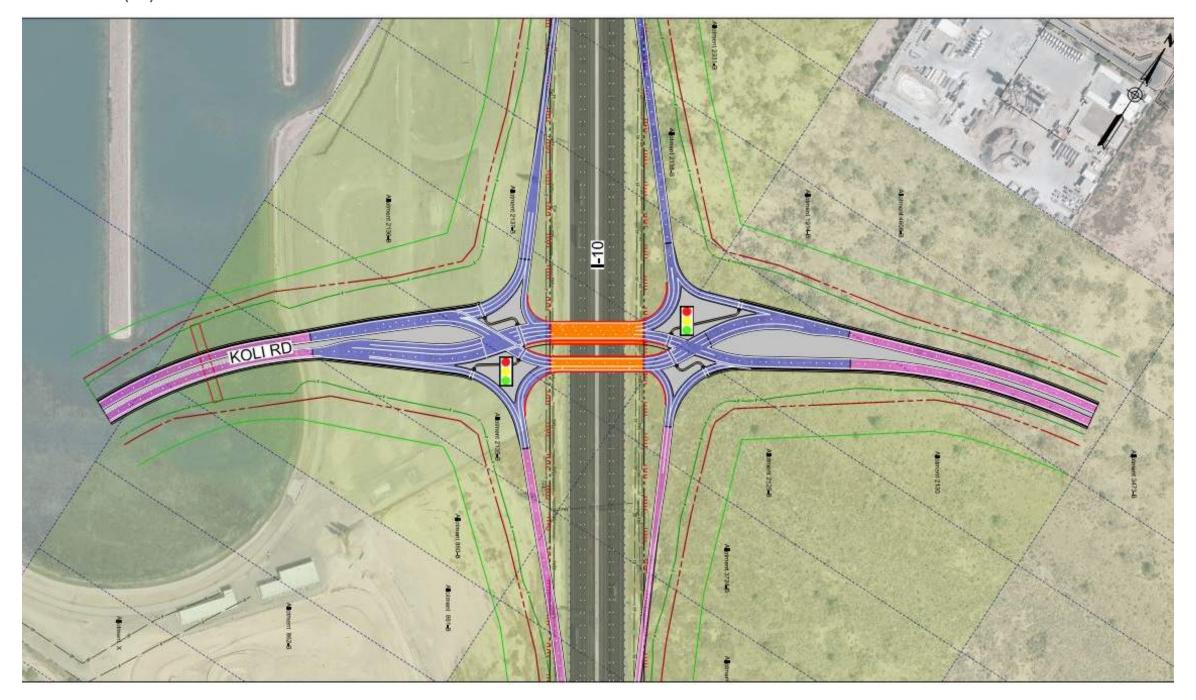
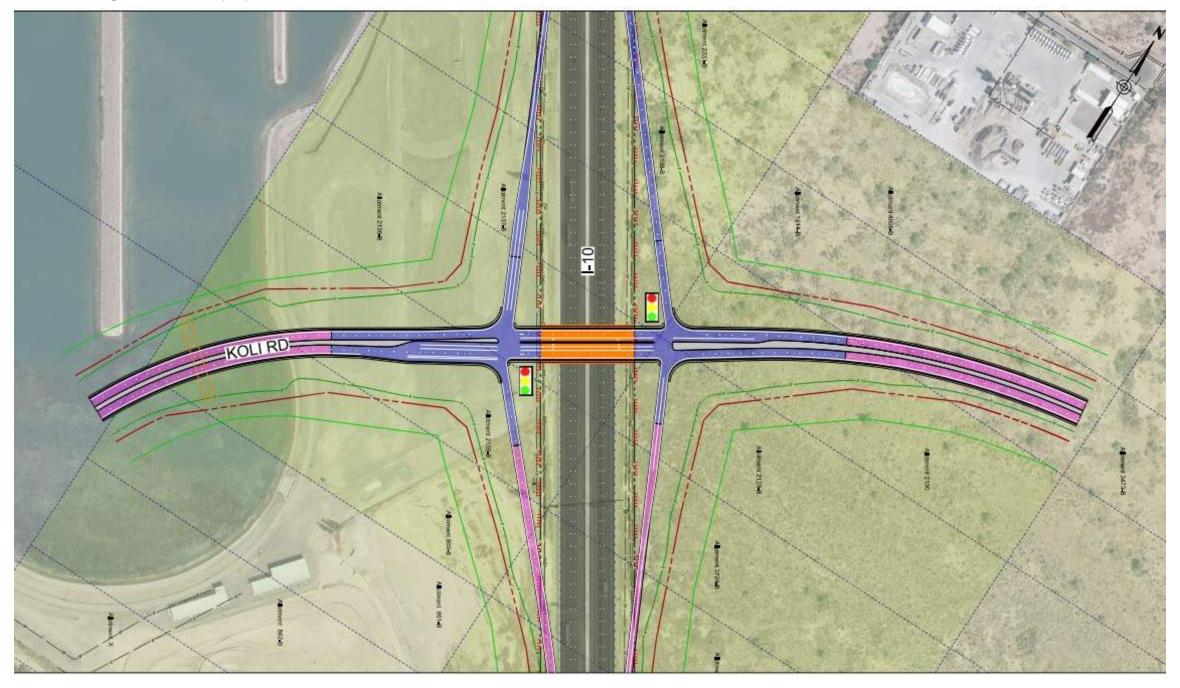


Figure 3-2 – Diamond Interchange Alternative (K3)



#### 3.3 Koli Road TI Alternatives Development and Screening

The three alternatives chosen to advance for further evaluation used five major screening categories:

- Engineering impacts
- Environmental impacts
- Cost impacts
- ROW/easement impacts
- Public feedback

The five major screening categories were divided into subcategories, and each alternative was evaluated based on screening subcategories. The following sections provide definitions of the screening categories and subcategories and explain the evaluation process.

The results of the evaluations were organized into two matrices, as shown in Figure 3-3 and Figure 3-4.

#### **Evaluation Criteria** 3.3.1

### **Engineering Impacts**

- Roadway design factors: Summary of highway design geometric features, including shoulder widths, weaving distance and clearance under bridges.
- Drainage considerations: Summary of impacts to the drainage culverts under I-10.
- Traffic operations in 2050: Summary of the modeled level of traffic operations in 2050.
- Safety: Indicators of anticipated safety implications for each alternative.
- Compatibility with adjacent land use: The ability for the alternative to provide additional access and local/regional connectivity to the surrounding area that would support emergency service access and planned development.
- Future I-10 expansion considerations: Summary of compatibility for future I-10 expansion projects.
- Constructability/maintenance of traffic: Ease of construction and the impacts on traffic during construction.
- Utility considerations: Summary of expected utility impacts and probability and/or severity of outages for relocations for each alternative.
- Maintenance/maintainability: Ease and relative cost of maintaining each alternative.
- Incident management: Ease of off-ramp to on-ramp through movement for I-10 closures.
- Pedestrian and cyclist access: Ease of pedestrian and cyclist movement for each alternative.
- I-10 mainline impacts: Summary of impacts due to weaving segments for each alternative.

#### Environmental

- Floodplain: Area of impact to floodplains, measured in acres.
- Jurisdictional waters of the U.S.: Area of impact to waters of the U.S. under the jurisdiction of the U.S. Army Corps of Engineers; can be canals, rivers or washes and measured in acres.

- Water resources: Impacts on features such as canals, irrigation channels and wells.
- Noise: Summary of whether noise from the proposed action is expected to exceed the FHWA Noise Abatement Criteria and, if so, what mitigation may be required.
- Air Quality: Determines whether the proposed action would conform to emission budgets of air pollutants not in attainment in the study area and if the proposed action would cause or contribute to new air quality violations; if the proposed action conforms and would not cause new violations, it is said to be in conformity.
- Visual: Assesses the degree of change of the proposed action's compatibility, which is the environment's ability to absorb the proposed project in scale, form and material; it also assesses viewer sensitivity (viewers to and in the project corridor and their duration of exposure) to the change the project creates.
- Hazardous materials: Summarizes the presence of known hazardous materials potentially impacted by the alternative.
- Land use: Identifies existing land use in the study area (e.g., residential, commercial) and evaluates future planned land use that may be needed for a long-term I-10 transportation use; future land use is based on Community land use plans in the study area.
- Local businesses: Identifies businesses in the study area (e.g., commercial, industrial) and evaluates whether any business would need to be fully or partially acquired or otherwise affected by the alternative (e.g., access, circulation).
- Socioeconomic factors: Identifies residential areas and Community facilities near the alternative/option (e.g., schools, churches, hospitals, parks) and evaluates whether any residences or Community facilities would need to be fully or partially acquired or would be otherwise affected by the improvements (e.g., access, circulation, noise, visual); in addition, the process identifies any minority or low-income populations near the proposed improvements and evaluates whether the proposed improvements would result in disproportionally high adverse impacts, as compared to the entire study area population.
- Biological resources: Assesses potential for, and impacts to, threatened and endangered species, specialstatus species (including tribal species) and these species' habitat; also evaluates impacts to native plants and migratory birds.
- Prime and unique farmlands: Identifies the impacts on important rural lands needed to produce food, feed, fiber, forage and oilseed crops, whether or not they are used for that purpose today.
- Archaeological resources: Assesses the magnitude of impacts for each alternative/option to archaeological resources determined eligible for listing on the National Register of Historic Places based on their potential to yield important information on the study area's history and/or prehistory.
- Traditional cultural properties: Assesses the magnitude of impacts for each alternative/option to properties eligible for listing on the National Register of Historic Places based on their associations with the cultural practices, traditions, beliefs, arts, crafts or social institutions of a living community.
- Section 4(f) and Section 6(f): Assesses impacts to Section 4(f) properties, which are publicly owned recreational resources, wildlife and waterfowl refuges and National Register-eligible archaeological and historic properties (these do not need to be publicly owned); also assesses impacts to Section 6(f) resources, which are recreational properties that receive Land and Water Conservation Fund grants.

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### Cost

- Design and construction costs: Estimated cost in 2024 dollars to design and construct the alternative.
- Utility costs: Estimated cost in 2024 dollars to relocate or adjust the impacted utilities summarized in the utility impacts criterion noted above.
- ROW/easement costs: Relative costs of additional ROW/easements needed to construct the alternative;
   ROW costs are not quantified at this point in the evaluation but are generally considered proportional to the quantity of new ROW/easement, summarized below.

#### ROW/Easement1

- New permanent easement or ROW: Area of additional new easement or ROW required for the proposed improvements of each alternative/option, measured in acres.
- Temporary easements: Area of additional new temporary easement required to construct the proposed improvements of each alternative/option, measured in acres; following construction, the temporary easement areas revert to the property owner.
- Residential relocations: Number of residential units that must be acquired and relocated to construct the alternative.
- Business/Billboard relocations: Number of businesses or billboards that must be acquired and relocated to construct the alternative.

### Public Input

A virtual public meeting and corresponding public comment period were held to gather public comments on the alternatives, and the evaluation results were shared. A summary of this public engagement process is provided in Section 3.3.4 of this document.

### 3.3.2 Evaluation of Alternatives

This section presents the evaluation results of Alternatives K1 (no-build), K2 (DDI), and K3 (Diamond TI). The evaluation considered their technical merits and environmental impacts and compared them against the evaluation criteria.

### Roadway Features

### No-Build Alternative:

No roadway improvements on I-10 would be required in the no-build alternative.

### K2 DDI Alternative:

A new grade-separated TI would be provided by elevating Koli Road over the existing I-10. Split horizontal alignments are provided: one alignment for each direction of traffic. The pavement limits extend approximately 1,000 feet to the east of I-10. Eventually, it is thought Kyrene Road would be extended south to this point; however, no formal planning has been documented for this extension. To the west, pavement limits extend approximately

900 feet toward Maricopa Road. The Community would construct Koli Road from Maricopa Road to the end of the pavement limits. The vertical profiles provide at least 16.5 feet of bridge vertical clearance over I-10, achieved using vertical curves. Two independent bridges would span I-10, one for each direction of traffic. To the west of I-10, sufficient vertical clearance is provided for a proposed Community underpass opening. There are no proposed changes to the horizontal or vertical alignment of I-10.

The proposed typical section would separate eastbound and westbound roadways with a curbed median. A normal crown would be provided from the median with a normal cross slope of 2% to the outside edge of the pavement. Twelve-foot lanes are used along the crossroad; however, the through crossover lanes are widened to 15 feet to help with oversized vehicle movements.

The eastbound bridge consists of two through lanes and two left-turn lanes, and the westbound bridge consists of two through lanes with one left-turn lane. Pedestrian access to the TI is provided with 5-foot-wide raised concrete sidewalks on both sides of the road. Within the core of the TI and in line with the preferred pedestrian treatment for DDIs, only one two-way sidewalk in the eastbound direction "between" the two traffic movements is proposed. This sidewalk would be 10-foot wide and would be separated from traffic by a 38" single slope bridge concrete barrier. Within the DDI islands, the sidewalk would be 8-feet in width. Auxiliary lane ramps are used in the design to direct traffic from I-10 into the proposed Koli Road DDI TI. The weaving distance between successive ramp terminals is greater than 1,600 feet.

### K3 Diamond TI Alternative:

A new grade-separated TI would be provided by elevating Koli Road over the existing I-10. Horizontal control of Koli Road is provided with a single alignment. The pavement limits extend approximately 1,000 feet to the east of I-10. Eventually, it is thought Kyrene Road would be extended south to this point; however, no formal planning has been documented for this extension. To the west, pavement limits extend approximately 900 feet toward Maricopa Road. The Community would construct Koli Road from Maricopa Road to the end of the pavement limits. The vertical profile provides at least 16.5 feet of bridge vertical clearance over I-10, achieved using vertical curves. A single bridge would span I-10. To the west of I-10, sufficient vertical clearance is provided for a proposed Community underpass opening. There are no proposed changes to the horizontal or vertical alignment of I-10.

The proposed typical section would separate eastbound and westbound roadways with a curbed median. A typical crown would be provided from the median with a normal cross slope of 2% to the outside edge of the pavement.

On the bridge, the eastbound direction consists of two through lanes and two left-turn lanes, and the westbound direction consists of two through lanes with one left-turn lane. Pedestrian access through the TI would be provided with five-foot-wide raised concrete sidewalks on both sides of the road and six-foot wide sidewalks on the bridge and approach/anchor slabs.

Auxiliary lane ramps are used in the design to direct traffic from I-10 into the proposed Koli Road Diamond TI. The weaving distance between successive ramp terminals is greater than 1,600 feet.

### **Drainage Features**

### No-Build Alternative:

No drainage improvements on I-10 would be required in the no-build alternative.

<sup>&</sup>lt;sup>1</sup> All four of the ROW/easement criteria will be calculated separately for tribal lands, allotted lands and off-Community land.

### K2 DDI Alternative/ K3 Diamond TI Alternative:

Similar facilities to handle off- and on-site drainage would be provided for both build alternatives. Both alternatives would require a new drainage system for the TI, including curb inlets and storm drain pipes. The existing offsite drainage facilities, which operate as a pass-through system, would be modified to accommodate the new TI and continue to operate as a pass-through system.

**Traffic Operations** 

### No-Build Alternative:

No traffic improvements on I-10 would be required in the no-build alternative.

### K2 DDI Alternative:

The K2 Alternative improves traffic flow by implementing a two-phase signal, allowing vehicles to move through the TI with fewer stops and improving efficiency. The DDI is also efficient in handling high left-turn volumes.

### K3 Diamond TI Alternative:

The K3 Alternative requires two sets of three-phase traffic signals at the ramp terminals. High left-turn volumes can cause congestion if the signals are not optimized. Left-turn movements must yield to or cross opposing traffic, which could create potential conflict points.

Both alternatives would improve traffic congestion on the Wild Horse Pass and SR 347/Queen Creek Road Tls. The geometry of a DDI is designed to substantially reduce collisions and wrong-way driving.

A summary of overall intersection delays for the existing AM and PM peak hour conditions is provided in Table 3-2. The intersection level of service (LOS) is computed from a microsimulation analysis and is therefore reported as an "estimated LOS." The estimated LOS is based on Highway Capacity Manual (HCM) criteria and thresholds for signalized intersections. The results of the VISSIM analysis indicate that the Koli Road and I-10 ramp terminal intersections are operating at LOS B or better for both build alternatives in the design year AM and PM peak periods.

Table 3-2 - Summary of intersection performance, Alternatives K2 and K3

	Troffic	DDI T	TI (K2)	Diamon	d TI (K3)
Intersection	Traffic Control	Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS
	20	50 AM Peak			
Koli Road & I-10 EB Ramps	Signalized	13.7	В	6.8	Α
Koli Road & I-10 WB Ramps	Signalized	1.4	Α	9.1	Α
	20	50 PM Peak			
Koli Road & I-10 EB Ramps	Signalized	10.4	В	10.8	В
Koli Road & I-10 WB Ramps	Signalized	1.2	Α	5.0	Α

Notes: Information is presented for AM (PM) peak hour. LOS = level of service.

### Bridge Features

### No-Build Alternative:

No bridge structures on I-10 would be required in the no-build alternative.

### K2 DDI Alternative:

Alternative K2 consists of individual bridges for eastbound and westbound due to the separation required between crossovers for a DDI. At the time of the comparison, the eastbound bridge would be 73 feet wide, and the westbound bridge would be 50 feet wide. Bridge piers would be located in the median of I-10, and the abutments would be located to allow for adding a fourth GP lane on I-10 in the future.

### K3 Diamond TI Alternative:

Alternative K3 consists of a single bridge over I-10. At the time of the comparison, the bridge would be 122 feet wide. Bridge piers would be in the median of I-10, and the abutments would be located to allow for a fourth GP lane on I-10 in the future.

### Safety

No safety improvements on I-10 would be required in the no-build alternative.

Alternative K2 reduces conflict points by 50% compared to a typical diamond interchange and eliminates many of the most severe crash types. Data suggests that total crashes would be reduced by 46%. The geometric design of a DDI discourages wrong-way drivers. The DDI also eliminates left-turn crossing conflicts, reducing the potential for collisions.

Alternative K3 configuration is more familiar to drivers; however, it has twice as many conflict points, many of which are associated with more severe crash types. The diamond interchange requires left-turning vehicles to cross opposing traffic, increasing the risk of right-angle crashes.

### Compatibility with Adjacent Land Use

The no-build alternative does not provide additional access and local/regional connectivity between I-10 and the surrounding area that would support emergency services access and planned development by the Community.

Both TI alternatives are compatible with the surrounding land uses in the Lone Butte and GRD development areas. The GRD Master Plan shows a new access point on I-10 at Koli Road to provide additional regional and local connectivity with I-10, an additional access point for emergency services, and access to planned development by the Community.

### Constructability and Maintenance of Traffic

No constructability issues or maintenance of traffic on I-10 would be required in the no-build alternative.

The new bridge and new TI would be built entirely offline for both build alternatives. Short-term I-10 lane closures would be necessary to set girders and pour the new bridge deck. Constructing the median pier would require the closure of the inside shoulder in each direction. No I-10 shoulder closures are anticipated to construct the new bridge abutments. Advance traffic control notification to the public would be needed prior to restrictions, closures or major traffic control changes.



### **Utility Impacts**

No utility impacts on I-10 would be required in the no-build alternative.

For both build alternatives, minor impacts to GRICUA and SCIP electrical systems, ADOT electrical systems, DMS and Freeway Management Systems (FMS) are anticipated.

During the Agency scoping process, the Community requested that ADOT allow Community utilities to cross I-10 using a casing or sleeve. As an alternative, new utilities could be suspended beneath the TI structure. Coordination between ADOT and the Community concerning the request would be required as the study/design progresses.

Maintenance/Maintainability

### No-Build Alternative:

No maintenance issues are anticipated in the no-build alternative.

### K2 Diverging Diamond Alternative:

A new TI with a new bridge and pavement would require maintenance which was not previously needed; however, it would be minimal for the first 20 years given that the TI is new.

#### K3 Diamond Alternative:

A new TI with a new bridge and pavement would require maintenance which was not previously needed; however, it would be minimal for the first 20 years given that the TI is new.

Incident Management

#### No-Build Alternative:

No incident management issues are anticipated in the no-build alternative.

### K2 DDI Alternative:

Alternative K2 does not allow the off-ramp to on-ramp through movement, sometimes utilized for incident management.

If an incident occurs on I-10 or I-10 is closed after the exit ramp gore, Alternative K2 would allow traffic to exit I-10 and either use the local road network to bypass the incident or make a U-turn and return in the direction from which they were coming.

#### K3 Diamond TI Alternative:

Alternative K3 allows for the off-ramp to on-ramp through movement sometimes utilized for incident management.

If an incident occurs on I-10 or I-10 is closed between the exit ramp gore and the entrance ramp gore, Alternative K3would allow traffic to exit I-10 and use the off-ramp to on-ramp through movement and not detour on the local arterial network. If an incident occurs on I-10 or I-10 is closed outside of the area between the exit ramp and entrance ramp gores, a new diamond interchange at Koli Road would allow traffic to exit I-10 and either use local arterial streets to bypass the incident or make a U-turn and return in the direction they were coming from.

### Pedestrian and Cyclist Access

No pedestrian and cyclist access improvements on I-10 would be required in the no-build alternative.

The DDI configuration, Alternative K2, is newer and may be unfamiliar to pedestrians and bicyclists. The diamond interchange configuration, Alternative K3, is common in the area and familiar to pedestrians and bicyclists.

For Alternative K2, pedestrians would cross to the middle of the interchange (crossing vehicles only traveling in one direction on Koli Road) when traversing the DDI. Between the crossovers, pedestrians would be on a 10-foot, barrier-protected sidewalk on both sides. At the TI on-ramps, pedestrians would have to cross free-flowing traffic turning right onto I-10 unless pedestrian-activated signals are installed. The DDI configuration would generally have more vehicle conflict points with pedestrians than a diamond configuration. However, when crossing to the other side of Koli Road, the crossings would be shorter since pedestrians would only cross one direction of traffic at a time.

For Alternative K3, pedestrians would stay outside the arterial when traversing the interchange and would only cross Koli Road if walking to the other side of the crossroad. If the interchange ramps have a free-flow right turn, pedestrians would have to cross free-flowing traffic unless pedestrian-activated signals are installed. A diamond interchange without free-flow right turns has fewer pedestrian conflicts with vehicles than a DDI.

In Alternative K2, bicyclists would stay to the right of vehicles when traversing through the DDI configuration. Between the crossovers, the bicyclists shift from outside of Koli Road to the inside of the road against the barrier-protected median sidewalk but are still on the right side of the vehicles. A bicyclist would have the option of using either the median 10-foot sidewalk or staying in the bike lane and having vehicles on their left and a concrete barrier on their right, which can lend itself to a trapped feeling.

For Alternative K3, bicyclists would stay to the right of vehicles when traversing through the diamond interchange. At the ramp terminals, bicyclists would have potential conflicts with right-turning and left-turning vehicles.

### I-10 Mainline Impacts

No mainline impacts on I-10 are anticipated in the no-build alternative.

For K2 and K3 Alternatives, an interchange on I-10 at Koli Road introduces new weaving segments between the adjacent interchanges (Wild Horse Pass Road and SR 347/Queen Creek Road). The new weaving segments have the potential to create more congestion as vehicles enter and exit I-10; however, since the traffic volumes projected going to and from Koli Road during peak hours are relatively low, the impacts of the Koli Road TI on I-10 are anticipated to be minimal (see Section 2, *Traffic*).

### **Environmental Impacts**

A preliminary review of potential environmental impacts related to air quality, biology, cultural and historic resources, environmental justice and Title VI populations, hazardous materials, land use and socioeconomics, noise, Section 4(f) resources, floodplains, and water resources indicated that a finding of no significant impacts would be likely under the two build alternatives. The no-build alternative would not result in any direct environmental impacts, but additional congestion at adjacent TIs could negatively affect air quality.

#### Costs

The cost of each action alternative was developed using similar assumptions related to the unit cost of materials labor, and equipment. The major construction items (earthwork, pavement, structures, traffic, and drainage) were designed consistent with the descriptions provided in the previous sections. Prior right utility relocations and

service agreements are included in the third-party utility cost. The construction and design cost, utility cost, ROW cost and total cost for each action alternative are presented in Table 3-3. The cost in the table below presents information related to the development and screening of alternatives. The cost presented was based on the concepts used during the evaluation process. Since that time, elements of the RBA have been further developed; therefore, values presented in Section 4.0, Major Design Features of the RBA, may not match those presented in this section.

Table 3-3 - Cost (2024 dollars), Interchange Alternatives

Alternative	Construction and Design Cost	Utility Cost (3 <sup>rd</sup> Party)	ROW/Easement Cost	Total Cost
K2, Diverging Diamond Interchange	\$69,500,000	\$1,400,000	**	\$70,900,000
K3, Diamond Interchange	\$66,500,000	\$1,400,000	**	\$67,900,000

<sup>\*\*</sup> Impacted utilities are GRIC entities, and ADOT has granted Prior Rights

### **ROW Requirements**

Alternatives K2 and K3 would require new ROW to construct the proposed TI. The amount and types of takes are presented in Table 3-4. The ROW impacts are directly related to the subsequent discussion of environmental impacts and costs. Without the TI (No-Build Alternative), no new ROW would be needed, and no displacements would occur.

At the time of the evaluation, Alternative K2 would require approximately 35 acres of new long-term freeway easements, as shown in Figure 3.1. Nine-tenths acres of new easements would be acquired from tribal land, while the remaining 34.1 acres would come from at least 14 allotted parcels. At the time of the evaluation, Alternative K3 would require approximately 33.2 acres of new long-term freeway easements, as shown in Figure 3.2. Ninetenths acres of new easements would be acquired from tribal land, while the remaining 32.3 acres would come from at least 14 allotted parcels.

**Table 3-4 - ROW Requirements** 

	ROW (Triba	al Land)	ROW (Allotment Land)			
Alternative	New Long- Term Freeway Easement (Acres)	Billboard Relocations	New Long- term Freeway Easement (Acres)	Billboard Relocations	Allotted Land Parcels Affected	
K2, DDI	0.9	0	35.0	3	14	
K3, Diamond Interchange	0.9	0	33.2	3	14	

### Public Input

Refer to the public information and alternative evaluation meeting summary report for the October 8, 2024, meeting, found on the following website, for detailed feedback from the public on the alternative evaluation.

https://azdot.gov/koliroad

#### 3.3.3 **Evaluation Matrix Summary**

The last phase of the alternatives development and screening process focused on organizing the comparative analysis between Alternatives K2 and K3 and the No-Build Alternative.

Each alternative was further developed to enhance the comparison, including the creation of preliminary plans. Additionally, horizontal and vertical geometry were refined to improve the understanding of the project scope, define the area of impact for each alternative and increase the accuracy of cost estimates.

A detailed evaluation matrix is presented in Figure 3-3, Figure 3-4 and Figure 3-5. The detailed evaluation matrix was then used to rate each alternative as "least desirable" or "more desirable" for each evaluation criterion. Figure 3-6 and Figure 3-7 presents the rating criteria used.

Under the no-build alternative, none of the improvements identified in the local and regional governmental plans would be implemented to provide a system linkage. No additional freeway access would be provided to support higher-intensity land uses planned in the study area. The Wildhorse Pass Boulevard and Queen Creek Road TIs would become increasingly congested over time without the Koli Road TI available to distribute traffic over this segment of I-10.

A summary of the screening results is presented in Figure 3-8 and Figure 3-9. Notable observations from the table include:

- Alternatives K2 and K3 operate at LOS B or better for traffic operational performance. Both alternatives show similar results, but the DDI demonstrates a lower delay for the I-10 westbound ramps.
- Alternative K3 is a standard Diamond TI similar to most TIs along I-10, providing consistency to local and out-of-town travelers. The Diamond TI design allows travel through the interchange to continue in the same direction along I-10 and allows vehicles to complete a U-turn to reverse direction along I-10. This benefits emergency response, traffic incident management, and driver expectancy.
- Alternative K2 DDI has fewer conflict points, which would reduce the potential for crashes, especially from oncoming traffic and left-turn movements.
- Alternative K2 DDI has a shorter pedestrian crossing, which would, in turn, reduce pedestrians' exposure to oncoming traffic. The protected pedestrian and bicycle path in the center of the interchange is also a benefit to this type of interchange.

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# I-10/Koli Rd Traffic Interchange (TI) Alternatives Evaluation Matrix - Engineering

									EVALUATION IVIATION ENGINEER	ING IMPACTS				
		RNATIVES	Roadway Design Factors	Drainage Corsiderations	Traffic Operations in 2050	Safety	Compatibility with adjacent land use	Future i-10 Squarsion. Considerations	Constructability/ Maintenance of Traffic During Construction	VIIIy impacts	Maintenance / Maintenana bility	incdent Management	Pedestran and Cyclist Access	b-10 Maint ne impacts
	K1 I	ange Alternatives	N/A		that would use the Koli Rd TI would need to use the adjacent WHP and SR.	entering 1-10 from the surrounding area to use the adjacent Wild Horse Pass or SR 347/Queen Creek Tis. By 2050, those Tis will be congested during the peak hours with no close	and local/regional connectivity between i-10 and the surrounding area that would support emergency services access and planned	No impact	No impact	No impact	No ampacts	Net applicable	Not applicable	No impact
Interchange Alternatives		Diverging Dismond Interchange (DD4)	becoming commonplace across the US. Utilizes a crossover on each side of the TI so that left- turning traffic can have free-flow, left-turns	be needed with first flush requirements.  The existing offsite drainage facilities which operate as a pass through system will be modified to accommodate the new TI and continue to operate as a pass.	Year 2050 expected Level of Service (LOS) is A or 8 for the intersections in both AM and PM peak periods.	access point to 1:0 from the local arterial network reducing congestion as adjacent. This and potentially improve incident response time for emergency services located within WHPDA. Compared to a diamond Ti, a DO reduces conflict points by SIWs and	development areas. The WHPPA Master Plan shows a new access point on 1-10 at Kolt Rd to provide additional regional and local connectivity with 1-10, provide an additional access point for emergency services, and provide access to planned development by the Gila	match the adjacent interchange bridge spans (Widd Horse Pass Shid & S.R. 347/Queen Creek Rd), sol-10 will not be limited more than existing.  1-10/Koi Rd Ti ramp may need to be reconstructed at the gore depending on the scope of the future 1-10 expansion.	Abcal crosscend does not exist at this time so the majority of the 11 construction will be offline with the exception of the bridge over !- 10. Some short term 1:00 dosures will be necessary for sering forms, terting griders, and for deck pours for the new bridges.  Constructing the median pier will require the closure of the inside shoulder and 1:01 HOV lane in each direction unless the construction of the pier can be advanced in the 1-10 Wild lorse Pass Corridor widering project and constructed when the HOV lanes are being added to 1:10.  No 1-10 shoulder closures are anticipated to build the new bridge abuttments.	outages to each could be expected.  Minor impacts to GRICUA electrical power service to nearby billboards.  Community requested during the Agency scoping process	maintenance which was not previously needed; however, it will be minimal for probably the next 20 years given that the 11 is new.  DOI configuration eliminates the off-ramp to on-ramp through movement sometimes utilized during incident management, bridge maintenance, or over height vehicle passage.	off-ramp to on-ramp through movement sometimes utilized for incident management, bridge maintenance, or over height vehicle passage.  If an incident occurs on I-10 or I-10 is closed after the exit ramp gore, a new DDI at 508 Rd on I-10 would allow traffic.	may be unfamiliar to pedestrians and bicyclists.  Pedestrians would cross to the middle of the interchange (crossing vehicles only travelling in one direction on Koli Rd) when traversing the DDL Between the crossover, pedestrians would be on a 10-11 sidewalk fish, is betwee protected on both sides. At the 11 on-ramp, pedestrians would have to cross treedowing traffic turning right croto-120 unless pedestrians activated signals are installed. The DOL configuration would in general have more vehicle conflict points with pedestrians than a diamond configuration. In lowever, when crossing to the other side of Koli configuration in crossing to the other side of Koli	weaving segments have the potential to create more congestion as vehicles
	кз	Diamond Interchange	Standard Ti configuration in AZ. Not as efficient when handling turning movements as the DD. The surning movement must cross the through movement traffic.  12 lanes with 12' outside lanes. Cross section on the bridge is two through lanes in two left-turn lanes in the EB direction and swo through lanes in one left-turn lane in the WB direction. Standard shoulders and vertical clearance. Would divide the existing two-mile weave between Wild Horse Pass Trand SR 347/Queen Croek Ti into two 1 mile weaves.	be needed with first flush requirements.  The existing offsite drainage facilities which operate as a pass through system will be modified to accommodate the new 11 and	(LOS) is A or 8 for all the intersections in both AM and PM peak periods.	access point to 1:10 from the local arterial network reducing congestion at adjacent traffic interchanges and posterially improve insident response. Unrefor emergency services located within VH1PDA. Compared to a DDI, the diamond TI configuration is more familiar to drivers, however, it has twice as may conflict points many of which are	Master Plan shows a new access point	match the adjacent interchange bridge spans (wild force 3 pass Blod & S.R. 347/Cureen Creek #dl), so H10 will not be limited more than existing.  1-10/Koli #d Ti ramp may need to be reconstructed at the gore depending on the	the majority of the Ti construction will be offline with the exception of the bridge over 1- 10. Some short term 1-10 closures will be necessary for setting forms, setting girders, and for deck pours for new bridge.		maintenance which was not previously needed, however, it will be minimal for probably the next 20 years given that the Ti ki new.  Diamond configuration allows for the off-ramp to on-ramp through movement sometimes utilized during incident management, bridge maintenance, or over height vehicle passage.	exit rangiger and the entrance rangigers, a new diamond interchange at Kolk Iden in 10 would allow traffic to exit in 10 and use the the off-ranging on many through movement and not delibure in the local attential network. If an incident occurs on I-10 or I-10 is closed outside of the large between the exit ranging and entrance ranging gores, a		weaving segments have the potential to create more congestion as vehicle

Figure 3-3 - Alternatives Evaluation Matrix - Engineering

	I-10/Koli Rd Interchange Alternatives Evaluation Matrix - Environmental (Criteria 1-8 of 15)								
	ALTERNATIVES					Environmental Impa	ncts		
		Floodplain (Acres)	Jurisdictional Waters (Acres)	Water Resources	Noise	Air Quality	Visual	Hazardous Materials	Land Use (Existing and Future)
0.0	57			<u> </u>	K	Coli Rd Interchange Alto	ernatives	b	
к	1. No Build	No impact. The environmental impact area is within FEMA. FIRM 04013C2715L (effective date 10/16/2013). The environmental impact area within the Community is Flood Zone D where no flood hazard analysis has been conducted and flood hazards are undetermined (undelineated).	US, wetlands, or riparian vegetation were identified in the environmental impact	No impact. There are no water resources in the environmental impact area.	No impacts	Potential increase in traffic and traffic congestion could worsen air quality over time.	No impact Continued planned development in surrounding area would affect views from the freeway and from off-site locations.	No impact	No impact:
к	2 Diverging Diamond Interchange (DDI)	No impact. The environmental impact area is within FEMA FIRM 04013C2715L (effective date 10/16/2013). The environmental impact area within the Community is Flood Zone D where no flood hazard analysis has been conducted and flood hazards are undetermined (undelineated).	US, wetlands, or riparian vegetation were identified in the environmental impact	No impact. There are no water resources in the environmental impact area.	No impacts There are no sensitive receptors within 1,800 feet of the environmental impact area.	There are no sensitive receptors within 1/2 mile of the environmental impact area.	Moderate impact from the introduction of an approximately 25-foot- high structure, associated ramps, and auxiliary lane connection. The DDI alternative (K2) would be similar to the DDIs planned at the adjacent Wild Horse Pass Boulevard and Queen Creek Road/SR 347 traffic interchanges.  From the freeway: Moderate impact From off-site: Moderate impact	concern	Land use category and its conversion to a transportation corridor:  "Existing other employment/future other employment: 21.33 acres  "Existing vacant/future industrial: 29.61 acres  "Existing water/future water: 6.10 acres  Total conversion of land to a transportation corridor = 57.04 acres
к	3 Diamond Interchange	No impact. The environmental impact area is within FEMA FIRM 04013C2715L (effective date 10/16/2013). The environmental impact area within the Community is Flood Zone D where no flood hazard analysis has been conducted and flood hazards are undetermined (undelineated).	US, wetlands, or riparian vegetation were identified in the environmental impact	No impact. There are no water resources in the environmental impact area.	No impacts There are no sensitive receptors within 1,800 feet of the environmental impact area.	There are no sensitive receptors within 1/2 mile of the environmental impact area.	Moderate impact from the introduction of an approximately 25-foot- high structure, associated ramps, and auxiliary lane connection. While K3 is not the same type of Ti as Wild Horse Pass Boulevard and Queen Creek Road/SR 347, it is still Ti infrastructure that would not change the driver's perspective of the viewshed.  From the freeway: Moderate impact From off-site: Moderate impact	concern	Land use category and its conversion to a transportation corridor:  "Existing other employment/future other employment: 20.59 acres  "Existing vacant/future industrial: 27.86 acres  "Existing water/future water: 6.07 acres  Total conversion of land to a transportation corridor = 54.52 acres

Figure 3-4 - Alternatives Evaluation Matrix (Criteria 1 through 8) - Environmental



		ALTERNATIVES	I-10/Koli Rd Interchange Alternatives and Options Evaluation Matrix - Environmental (Criteria 9-15 of 15)								
		ALTERNATIVES			Envi	ronmental Impacts					
			Local Businesses (including impacts on billboards and parking)	Socioeconomic Factors (Environmental Justice, local communities)	Biological Resources	Prime and Unique Farmlands	Archaeological Resources	Traditional Cultural Properties (TCP)	Section 4(f) and Section 6(f)		
					Koli Rd In	terchange Alternatives					
к	1 N	lo Build	No impact	Community members and users of amenities in the area would have less efficient access to employment, shopping, and recreation opportunities.  No construction impacts  No construction-related traffic impacts	No impact	No impact  Note: Prime and unique farmlands are related to soil types. Additionally, areas slated for development are typically excluded from consideration as potential farmland.  There is no prime farmland in the environmental impact area.	No impact		There are no Section 4(f) or 6(f) properties within 1/4 mile of the environmental impact area.		
к	2 0		No direct business impacts 5 billboards removed 473,000 sq ft of parking lot removed	No impact related to displacements or relocations. Minor impacts related to traffic during construction, but such impacts would be borne equally by all populations in the area and/or travelers destined for the area.  Community members and users of amenities in the area would benefit from a new I-10 interchange that would provide access to employment, shopping, and recreation opportunities in the area.  The DDI (K2) and diamond interchange (K3) alternatives are equal with respect to potential socioeconomic impacts.	The environmental	no indication of recent past farming.	No archaeological resources impacted. The alternative includes areas that have been previously surveyed by GRIC CRMP or are in areas where survey is impracticable due to development.	impact area	There are no Section 4(f) or 6(f) properties within 1/4 mile of the environmental impact area.		
K	3 D		No direct business impacts 5 billboards removed 515,000 sq ft of parking lot removed	No impact related to displacements or relocations. Minor impacts related to traffic during construction, but such impacts would be borne equally by all populations in the area and/or travelers destined for the area.  Community members and users of amenities in the area would benefit from a new I-10 interchange that would provide access to employment, shopping, and recreation opportunities in the area.  The DDI (K2) and diamond interchange (K3) alternatives are equal with respect to potential socioeconomic impacts.	The environmental	no indication of recent past farming.	No archaeological resources impacted. The alternative includes areas that have been previously surveyed by GRIC CRMP or are in areas where survey is impracticable due to development.	impact area	There are no Section 4(f) or 6(f) properties within 1/4 mile of the environmental impact area.		

Figure 3-5 - Alternatives Evaluation Matrix (Criteria 9 through 15) - Environmental

Figure 3-6 - Alternatives Evaluation Matrix Rating Criteria (1 through 8)

			Rating Criteria	
	Description	Less Desirable	Average Desirability	More Desirable
Roadway Design Factors	Evaluates the alternative geometry, lane configurations, lane widths, and use of standards (minimum vs desirable). Does the alternative meet drivers' expectations. Ramp layout and configuration. (Qualitative)	Alternative has elements at minimum standards <u>and</u> does not meet driver expectations.	Alternative has elements at minimum standards <u>or</u> does not meet driver expectations.	Alternative elements are all at desirable standards and it meets driver expectations.
Evaluates the constructability and maintainability of the corridor drainage options such as size of drainage Dr facilities and complexity of the drainage facilities.  (Qualitative)		Drainage system is complex and difficult to construct and is not easily maintained	Drainage system is complex and difficult to construct <u>or</u> is not easily maintained	Drainage system is conventional <u>and</u> does not pose unusual construction challenges and is easily maintained
Traffic Operations in 2050 (Interchange)	Does the alternative provide an acceptable level of service for 2050 volumes? (Quantitative)			The LOS for the alternative is LOS A or LOS B.
Traffic Operations in 2050 (I-10 weave)	Does the alternative provide an acceptable level of service for 2050 volumes? (Quantitative)	The LOS for the alternative is worse than LOS D <u>and</u> the I-10 operations does not improve compared to No Build.	The LOS for the alternative is LOS D or better <u>or</u> the I- 10 mainline operations improves compared to No- Build.	The LOS for the alternative is LOS D or better <u>and</u> the I-10 mainline operations improves compared to No-Build.
	Is the interchange configuration familiar to drivers? (Yes/No)	No	N/A	Yes
Safety (Interchange)	Number of conflict points? (#)	N/A	Number of conflict points (#)	N/A
	Desirable lane widths? (Yes/No)	No	N/A	Yes
	Is weaving on I-10 eliminated for this segment? (Yes/No)	No	N/A	Yes
Safety (I-10 weave)	Is weaving for I-10 shifted to a lower speed facility? (Yes/No)	No	N/A	Yes
	Desirable lane widths and shoulders? (Yes/No)	No	N/A	Yes
Utility Considerations	Assesses whether the alternative impacts existing utilities (Qualitative)	Large impacts to existing utilities.	Minimal impacts to existing utilities	No impacts to existing utilities.
Assesses whether the alternative is compatible with the current future planned land development and uses in WHPDA and Lone Butte. (Qualitative)		The alternative negatively impacts (physically, operationally, or access) adjacent land uses in WHPDA and Lone Butte.	N/A	The alternative provides access to and supports adjacent land uses in WHPDA and Lone Butte.



Figure 3-7 - Alternatives Evaluation Matrix Rating Criteria (9 through 17)

	Description		Rating Criteria		
		Less Desirable	Average Desirability	More Desirable	
Constructability / Maintenance of Traffic	Assesses the relative constructability of each alternative. (Qualitative)	Alternative has features that are unusually difficult to construct and require complex maintenance of traffic.	Alternative has features that are slightly more complicated to construct than average <u>and</u> do not require complex maintenance of traffic.	Alternative has features that are not difficult to construct and can be completed primarily offline.	
Maintenance / Maintainability	Assesses the relative maintainability of each alternative. (Qualitative)	Alternative has features that are unusually difficult to maintain	Alternative has features that are slightly more complicated to maintain than average.	Alternative maintenance is conventional or simpler than average.	
Cost (Design and Construction)	Design and construction cost in millions of dollars.	N/A	\$ (Millions)	N/A	
Cost (Utilities)	Utility relocation cost in millions of dollars.	N/A	\$ (Millions)	N/A	
Right of Way - New Permanent Easement (Tribal Land)	Number of acres of new permanent easement on Tribal land.	N/A	Number of Acres	N/A	
Right of Way - Temporary Easements (Tribal Land)	Number of acres of temporary easements on Tribal land.	N/A	Number of Acres	N/A	
Right of Way - New Permanent Easement (Allotment Land)	Number of acres of new permanent easement on Allottee land.	N/A	Number of Acres	N/A	
Right of Way - Temporary Easements (Allotment Land)	Number of acres of temporary easements on Allottee land.	N/A	Number of Acres	N/A	
Right of Way - Business/Billboard Relocations (Allotment Land)	Number of business or billboard relocations on Allottee land.	N/A	Number of Relocations	N/A	

Figure 3-8 - Alternatives Evaluation Matrix Summary – Engineering

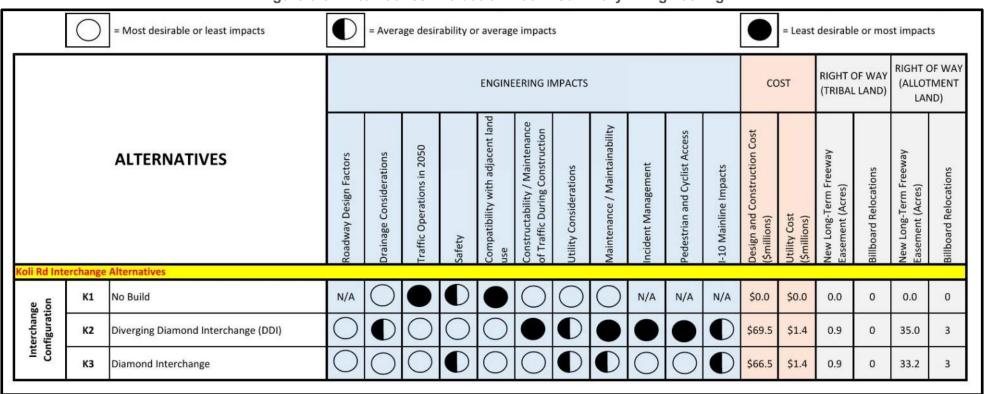
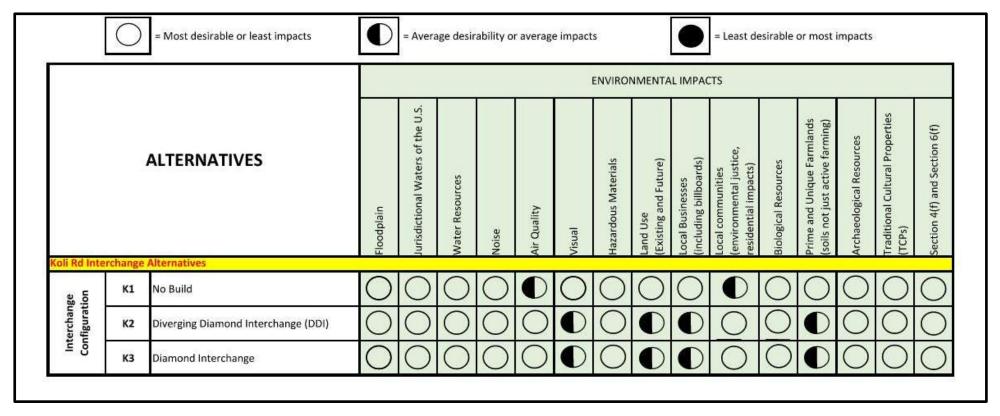


Figure 3-9 - Alternatives Evaluation Matrix Summary - Environmental





### 3.3.4 Public and Agency Feedback on Alternatives

Following the completion of the project's alternative development and evaluation phase the public and agencies were provided an opportunity to comment on that evaluation so that feedback could be considered before selecting a RBA.

Beginning Oct. 1, 2024, the public was able to provide feedback on the proposed Koli Road Tl. A summary of the in-person and virtual public meetings can be found on the ADOT project website, <a href="https://azdot.gov/koliroad">https://azdot.gov/koliroad</a>

In June of 2024, ADOT requested feedback from the Community on the Koli Road TI Alternatives Development and Screening. The evaluation matrices for engineering and environmental and the alternative exhibits were provided to the Community for review. The design exhibits showed the 5% design layout for the DDI and diamond interchange.

The Community provided a formal response in November 2024. By Official Motion, the Litigation Team directed the Office of General Counsel to inform ADOT that the Community supports the Diverging Diamond TI for the SR 347/Queen Creek Road and Koli Road TIs.

### 3.4 Conclusion

Phase One of the study identified five alternatives for the Koli Road TI—four build options and one no-build option. This initiated the evaluation phase to determine conformance with regional transportation plans, existing location studies, and engineering design standards. The evaluation also considered improvements to traffic operations, minimizing ROW and utility impacts, minimizing environmental impacts, and minimizing project cost while achieving support from agencies, governmental entities (focus on tribal governments), and the public.

On February 14, 2024, the four initial build alternatives were presented to ADOT Management in an in-person meeting at ADOT Santan Field Office (7130 E Fairview St, Chandler, 85226). At the time of the meeting, traffic analysis was not completed on any of the concepts. Based on this presentation and the input received, two initial build alternatives were eliminated from further consideration.

The remaining two build alternatives and one no-build alternative were carried forward into a detailed alternative evaluation. A summary of the alternative evaluation is found in Table 3-5.

On March 7, 2024, the technical findings of the alternative evaluation were submitted to ADOT Management via email. Based on presentation and agreement with ADOT Management, the following alternatives were advanced to Community and public review:

- Alternative K1 No-Build
- Alternative K2 Diverging Diamond TI
- Alternative K3 Diamond TI

ADOT collaborated with the Community and its representatives from the study's inception, including over 18 months of bi-weekly meetings, presentations to the Community Litigation Team and performance of two Community outreach meetings held on October 1, 2024, and October 8, 2024.

On November 18, 2024, the Community Litigation Team notified ADOT via email and a signed letter indicating its support and preference for **Alternative K2 – Diverging Diamond TI**.

### 3.4.1 Selection of the RBA

The no-build alternative was determined to not meet the project's purpose and need to provide adequate access to this area of the Community.

The selection of RBA was overwhelmingly guided by the Community and ADOT's preference for the TI type at Koli Road.

Comparisons of "most desirable" selection in Table 3-5 Screening Summary between Alternative K2 and Alternative K3 follows:

- Neutral 10 Categories
- K2 (DDI) 4 Categories
- K3 (Diamond) 2 Categories

K3 (Diamond) graded favorably in drainage, incident management and cost. However, those slight advantages are marginal compared to the Community preference for TI type. It is possible the potential of future left-turn capacity would mitigate event traffic congestion and provide better access to I-10 westbound lanes. The construction of the TI is intended to meet the Community's plan for future growth and the stakeholders agree with selecting Alternative K2 – Diverging Diamond TI as the RBA.

The study team determined that Alternative K2 provides desirable safety and traffic operational benefits compared to Alternative K3; Alternative K2, DDI, should be carried forward as the RBA. The DDI also has Community support as the RBA versus the diamond interchange. Appendix E includes meeting notes and materials presented to the study team during the alternative's development and screening process.

Table 3-5 - Screening Summary, Alternatives K2 and K3

		Most D	esirable	Data
Evaluation Category	Screening Criteria	K2 (DDI)	K3 (Diamond)	Supports
Roadway Design Factors	Meets highway design standards?	•	•	Neutral
Drainage	Avoids impacts on existing I-10 drainage patterns and median drainage impacts?		•	К3
Traffic Operation	Meets traffic operations in 2050?	•	•	Neutral
Cofoh	Reduces conflict points?	•		K2
Safety	Discourages wrong-way drivers?	•		K2
Compatibility with adjacent land use	Compatible with surrounding land uses.	•	•	Neutral
Constructability / MOT During Construction	Ability to utilize entrance/exit ramps for construction detour activities.	•	•	Neutral
Utility Considerations	Anticipated impacts to ADOT and GRICUA facilities and avoid major utility relocations?	•	•	Neutral
Maintenance / Maintainability	Introduces new facilities for maintenance?	•	•	Neutral
Incident Management	Provides exit ramp to entrance ramp through movement or Uturn on I-10?		•	К3
Pedestrian and Cyclist Access	Reduces conflict points between pedestrians and vehicles?	•		K2
I-10 Mainline Impacts	Traffic volume on I-10 due to new Koli Road TI.	•	•	Neutral
Environmental	Avoids major environmental issues?	•	•	Neutral
Cost	Meets funding expectations?	•	•	Neutral
ROW	Avoids full takes of commercial properties?	•	•	Neutral
Public and Agency Input	ADOT and Community recommendation for the preferred TI.	•		K2

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# 4 Major Design Features (Recommended Build Alternative)

### 4.1 Introduction

This chapter describes the design features and controls for the RBA for the Koli Road TI, including service ramps, bridges, and drainage features within the project area construction limits.

### 4.2 Design Controls

As a proposed new roadway and TI, there is no existing GRD or Gila River Indian Community Department of Transporation (GRIC DOT) classification of Koli Road in the project area construction limits; however, *GRD's Master Plan* provides the proposed transportation network for buildout conditions. The Master Plan includes a 110-foot ROW, four-lane road from Maricopa Road to the TI and 130-feet ROW and six-lane road on the west side of I-10. Coresponding MCDOT classifications are urban minor arterial and urban principal arterial, respectively.

From SR202L to Riggs Road, I-10 is classified as an urban/fringe urban interstate (<u>ADOT 2023 Functional Classification</u>).

This project would not provide capacity improvements to I-10; however, new service ramps are proposed connecting to I-10. A summary of the design controls for I-10 mainline is provided in Table 4-1, for reference. A summary of design controls for Koli Road TI ramps is provided in Table 4-2. A summary of design controls for Koli Road is provided in Table 4-3.

### 4.2.1 Design Standards

The design criteria were developed in accordance with the ADOT Roadway Design Guide (RDG) and standard drawings (all with current revisions and updates as of the publication date of this document), as well as the MCDOT Roadway Design Manual (latest update March 2024), AASHTO A Policy on Geometric Design of Highways and Streets (2018) (Green Book) and Roadside Design Guide (2011, with 2015 errata).

Table 4-1 – Design Controls for I-10 Mainline (For Reference - No Proposed Mainline Improvements)

Item	Description
Typical section	See Appendix A
Design year	2050
Design vehicle	WB-67
Design speed	65 mph (SR 202L to milepost 165.22)
Superelevation	0.06 feet/feet (maximum)
Minimum vertical curve length	800 feet
Maximum horizontal angle break	0° 45' 00"
Maximum gradient	3% (level terrain)
Horizontal curve	Minimum length = 1,125 feet (15 times the design speed [75 mph]; see RDG Section 203.5) (Spiral transitions are not used.)
Lane width	12 feet
Median shoulder width	12 feet (no additional shy distance added)
Outside shoulder width	12 feet (no additional shy distance added)
Recovery area	ADOT RDG Section 303.2
Cross slope	1.5% (match existing)
Barrier type	Outside: Concrete barrier (per ADOT Construction Standards) Median: Concrete median barrier
Access control	Full
ROW	300 feet (minimum)
Tapers	65:1 – dropping mainline lanes added by on-ramp lane Design speed:1 – dropping mainline lane or shoulder 25:1 – adding lane or shoulder

Table 4-2 - Design controls for Koli Road TI entrance and exit ramps

Item	Entrance ramp – description	Exit ramp – description
Typical section	See Appendix A	See Appendix A
Design year	2050	2050
Design vehicle	WB-67	WB-67
Design speed	55 mph (gore area) 50 mph (ramp body) 20 mph (DDI Ramp Terminal Turning Roadways)	60 mph (gore area) 50 mph (ramp body) 20 mph (DDI Ramp Terminal Turning Roadways)
Superelevation	0.06 feet/feet (maximum)	0.06 feet/feet (maximum)
Minimum vertical curve length	200 feet at crossroad terminus 400 feet elsewhere	200 feet at crossroad terminus 400 feet elsewhere
Maximum horizontal angle break	0° 45' 00"	0° 45' 00"
Maximum gradient	4% upgrade/5% downgrade	4% upgrade/5% downgrade
Horizontal curve	Max Dc at gore area is controlled by minimum superelevation breakover criteria of 2% (ADOT RDG Section 504.3) Max Dc for 50 mph is 6° 53' . Length = 500 feet minimum for $\Delta$ = 5°; increase length by 100 feet for each 1° decrease in $\Delta$	Max Dc at gore area is controlled by minimum superelevation breakover criteria of 2% (ADOT RDG Section 504.3) Max Dc for 50 mph is 6° 53'. Length = 500 feet minimum for $\Delta$ = 5°; increase length by 100 feet for each 1° decrease in $\Delta$
Min Lane width	12 feet	12 feet
Recovery area	ADOT RDG Section 303.2	ADOT RDG Section 303.2
Cross slope (Typ)	2%	2%
Pavement design life	20 years (to be confirmed during final design)	20 years (to be confirmed during final design)
Drainage (pavement)	10 years (to be confirmed during final design)	10 years (to be confirmed during final design)
Barrier type	Concrete per ADOT Construction Standards	Concrete per ADOT Construction Standards
Access Control	Full	Full
ROW	As required; 12 feet min from Toe of Slope to ROW	As required; 12 feet min from Toe of Slope to ROW

Table 4-3 - Design controls for Koli Road

Item	Description
Typical section	MCDOT Urban Minor Arterial
Design year	2050
Design vehicle	WB-67
Design speed	30 mph (ADOT Jurisdiction); 40 MPH (Community DOT Jurisdiction)
Superelevation	ASHTO Table 3-13 Minimum Radii and Superelevation for Low Speed Streets in Urban Areas
Minimum vertical curve length	Design Minimum = 200' (800' Vertical Curve for main Crest Curve over I-10)
Maximum horizontal angle break	0° 45' 00"
Maximum gradient	5%
Horizontal curve (Min Radius)	Design = 333' (from AASHTO Table 3-13)
Road width	Varies
Number of through lanes	4 Lanes
Number of left-turn lanes	2 to WB I-10; 1 to EB I-10
Number of right-turn lanes	1 to WB I-10; 1 to EB I-10
Sidewalk	5 feet 10 feet (multiuse bike and pedestrian path between road at Koli Road TI)
Pavement design life	20 years (to be confirmed during final design)
Drainage (pavement)	10 years (to be confirmed during final design)
Access control	Per ADOT RDG at interchanges; N/A at grade separations
ROW	Varies
Min lane width	12 feet
Road foreslope	4:1 Max 3:1 (grade separations)
Barrier type	Guardrail per ADOT Construction Standards

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# 4.3 Horizontal and Vertical Alignment

### 4.3.1 Basis of Horizontal Bearings and Vertical Controls

An aerial survey was performed based on GPS satellite measurements. As such, the Basis of Horizontal Bearings are Grid North, NAD 83 State Plane and AZ Central Zone, as established by GPS.

No vertical control effort was performed; vertical elevations are based on GPS satellite measurements.

# 4.3.2 Koli Road Alignments

Horizontal and vertical alignments for the proposed Koli Road are included in the 15% roll plot exhibits provided in Appendix A.

The Koli Road TI DDI configuration provides generally symmetrical and independent horizontal control for each direction of travel. Both eastbound and westbound alignments cross I-10 at perpendicular angles, and vertical alignments are set high enough to achieve a minimum vertical clearance of 16.5 feet from I-10. The split-direction roadway is crowned centered in the dividing median using a typical 2% cross slope. The high side of the roadway is rotated about its axis of rotation at the DDI crossover intersection and through the bridge crossing.

The proposed typical section would be a split roadway, with four eastbound lanes across the new bridge and three westbound lanes across the new bridge, with shoulders across both bridges. A 5-foot bike lane would be provided for both directions throughout the TI. Pedestrian access through the TI would be provided with 5-footwide raised concrete sidewalks on both sides of the road except across I-10, where the sidewalk would be at least 10 feet. This sidewalk would be two-way, located between the two roadways (the preferred pedestrian treatment within DDIs), and would be separated from traffic by 32-inch-tall roadway barriers. All the existing and new sidewalks and curb ramps would be ADA-compliant. Raised median infield areas shall incorporate decomposed granite.

# 4.3.3 Interchange Ramp Alignments

The Koli Road TI ramps would be constructed to accommodate the DDI configuration. Independent horizontal and vertical alignments control the proposed ramps. The vertical alignment profiles tie into the back of the gore locations along mainline I-10.

The eastbound exit ramp would consist of a single-lane exit from an auxiliary lane flaring to three lanes near the crossroad. The eastbound entrance ramp would transition from two lanes on the ramp to a single-lane entrance into an auxiliary lane along mainline I-10.

The westbound exit ramp would consist of a single-lane exit from an auxiliary lane flaring to two lanes near the crossroad. The westbound entrance ramp would transition from two lanes on the ramp to a single-lane entrance into an auxiliary lane.

The weaving distance between successive ramp terminals is presented below. Per FHWA guildlines, a minimum of 1600 feet between interchange ramps is recommend for weaving. The available weaving distance was measured based on criteria presented in the ADOT "Interim" Auxiliary Lane Design Guidelines, November 1996.

Table 4-4 - Weaving Distance Between Successive Ramp Terminals

Location	Weave Location	Min Distance	Weave Distance Provided	
	WB Entrance Koli TI	1,600 feet	2,480 feet	
Kali Daad TI	EB Exit Koli TI	1,600 feet	2,550 feet	
Koli Road TI	WB Exit Koli TI	1,600 feet	1,950 feet	
	EB Entrance Koli TI	1,600 feet	2,470 feet	

# 4.3.4 Summary of Koli Road Alignments by Community DOT

To the west of the project limits, between the TI and Maricopa Road, the Community (GRD and GRIC DOT) will design and construct Koli Road. The planned alignment begins near 48th Street and Maricopa Road and ends at the Koli Road TI construction limit, approximately at eastbound Koli Road station 121+24.83 and westbound Koli Road station 221+68.94. The 48th Street and Maricopa Road extension is expected to open in July 2027, an ADOT-Community intergovernmental agreement (IGA) will outline project limits. As noted above, GRIC's design and alignment of GRIC's segment of Koli Road may vary slightly from what is shown in this report.

# 4.4 ROW and Access Control

New ROW and access control would be required for the RBA. Additional ROW would be needed in all four quadrants of the TI and along the crossroad approaches. Approximately 28.5 acres of new ROW would be required and split among all four quadrants of the TI. All the new ROW would be acquired from 11 allotted parcels. No tribal parcels are impacted for the TI construction limits.

New access control limits at the Koli Road TI would extend along the crossroad to protect the integrity of the intersection operations. On the west side along Koli Road, full access control would impact seven parcels. On the east side along Koli Road, full access control would impact eight parcels. All access control would be acquired from allotted parcels, which are all impacted by the new ROW acquisition. The access control location would match the new ROW limits.

Table 4-5 lists the location, ownership, quantity and type of ROW/easement required for the RBA.

Design Memorandum Interstate 10 Corridor: Koli Road Traffic Interchange

Table 4-5 - ROW and TCE requirements for the RBA

			Number			Control of access		
Location		Ownership	Number of parcels	of allotted fractional owners	Type of easement	Quantity (acres)	Full/ Restricted <sup>a</sup> needed	Variance required
Koli Road TI		Tribal	0	N/A	N/A	0	N/A	N/A
Koli Road TI		Allottee	11		ROW	28.50	Yes/Yes	Yes
	Total	_	11	_	_	28.50	_	_

a one right-in, right-out access only for 1,320 feet

#### 4.5 Drainage

Drainage improvements would primarily consist of installing a new on-site drainage system for the traffic interchange. Improvements to the Koli Road on-site crossroad drainage would include curb and gutter with ADOT Standard C-15.92, C-15.91 and C-15.20 inlets, which would control spread and depth within the roadway and ramp configurations in accordance with the ADOT RDG throughout the TI.

Ramp construction would extend the fill slopes farther beyond the existing I-10 fill slope limits but ultimately would not significantly change existing off-site flow patterns. The existing condition of using pipe culverts as a pass-through system from east to west under the ramps and the mainline would be perpetuated in the RBA.

A new culvert would be installed under Koli Road, east of the westbound I-10 mainline, to prevent water from accumulating and causing ponding in the southeast quadrant of the TI. This culvert would allow water to flow from the south side of the TI to the north. By facilitating this movement, the culvert would help maintain existing flow patterns and prevent water from ponding beyond the ADOT ROW. The proposed culvert location is presented in Table 4-6.

Table 4-6 – Proposed pipe culverts for Koli Road TI

Koli Road station	Cells (no.)	Size	Length
132+15 (EB Cst CL) 233+05 (WB Cst CL)	1	30 inch	360 foot

#### On- and Off-site Drainage Design Criteria 4.5.1

The drainage evaluation for the I-10 improvements is based on the requirements of Chapter 600 of the ADOT RDG. Notable items include:

• As presented in the ADOT RDG Table 603.2B, the pavement drainage systems shall be designed for a 50-year storm frequency at depressed road locations. For nondepressed roads, the storm drain system shall be designed for a 10-year frequency. While these storms are the design standard for this type of interstate system, the cross-culvert system under I-10 would be replaced with an in-kind capacity to avoid upstream and downstream ponding changes from what has occurred during the last 55 years.

- As presented in Table 603.2C, allowable spread on all roads shall not exceed the road gutter width, shoulder and/or distress lane. On roads with more than one lane in each direction, the spread may encroach upon on-half of the adjacent lane for a 10-year storm frequency.
- The allowable spread should meet the criteria given in Table 603.2C; one-lane ramps shall have a 12-foot un-ponded width. Allowable spread on two-lane ramps shall not exceed the road gutter width, shoulder and on-half of the adjacent lane for a 10-year storm frequency.
- Allowable ponding depth on highways shall not exceed the curb height for a 10-year storm frequency.
- The capacity of detention basins and ditches parallel to the road and convey road drainage should be designed to meet the requirements of the 10-year storm frequency. Detention basins and ditches intercepting off-site flows should be designed for a 50-year storm frequency except where other conditions require a greater storm frequency.
- The 100-year storm frequency is also checked to ensure no adverse impacts to properties adjacent to the freeway ROW.
- As needed, existing culverts would be replaced with a culvert, or culverts, of the same capacity to avoid materially altering the culvert capacity crossing I-10.

Off-site drainage improvements in the study area would be constructed as part of the Wild Horse Pass Corridor, specifically the I-10 Community project (Milepost 161 - 172). Construction is scheduled to begin in mid-2026 and last until late 2028. (Website: I-10 Gila River Indian Community Project: ADOT I-10 Wild Horse Pass Corridor)

#### Existing Pipe Culvert Conditions and Suggested Replacements 4.5.2

Table 4-7 provides an excerpt from the I-10 Wild Horse Pass Corridor DCR "Table 4-10 Existing Pipe Culvert Inventory and Suggested Replacements." The table provides the location of all circular, elliptical or arch pipe culvert crossings and provides suggested sizes and number of circular replacement culvert pipes that could be installed via trenchless methods like jack and bore. I-10 pipe culvert improvements will be provided with the I-10 Community project (I-10 Gila River Indian Community Project: ADOT I-10 Wild Horse Pass Corridor). Construction of the Koli Road TI ramps would consider the pipe culvert improvements and would be built to avoid direct conflicts.

Additional pipe culvert replacement information for the corridor can be found in the Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report, dated October 2023.

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Table 4-7 - Existing pipe culvert inventory and suggested replacements

I-10 med station	Exist, cells (no.)	Existing size	Existing length	Existing type	New cells (no.)	New circular size	New culvert length <sup>a</sup>	New jack and bore casing length <sup>b</sup>	Median inlet C-15.80	
954+41	1	30 inch	216 foot	C.M.P.	No changes needed					
959+17	1	30 inch	228 foot	C.M.P.	No changes needed					
964+15	1	30 inch	235 foot	C.M.P.		No changes needed				
984+15	1	30 inch	226 foot	C.M.P.	2	30 inch	226 foot	120 foot	0	
986+17	1	30 inch	226 foot	C.M.P.	2	30 inch	226 foot	120 foot	0	
996+17	1	30 inch	218 foot	C.M.P.	2	30 inch	218 foot	120 foot	1	

Note: Culvert stationing is to the existing culvert crossing. New culverts may have to shift for constructability.

### 4.5.3 Existing Box Culvert Extensions

No significant impacts are expected to existing box culverts as the RBA did not impact any existing box culverts. During final design, the existing culverts would be inspected to identify any needing replaced.

# 4.5.4 Stormwater Water Quality and Permitting

Applicable state, local, and tribal agency criteria for stormwater municipal separate storm sewer system permitting must be met for the proposed improvements. The proposed improvements would need to be protected from construction activity, sediment runoff, and post-project condition pollutants like suspended solids and hydrocarbons. The construction phase of the project would use best management practice (BMP) temporary soil erosion protection measures like embankment waddles, straw logs, rock check dams, soil blankets, sediment basins, and other soil stabilization measures to prevent sediment movement outside of the work areas of the project.

Post-project BMP stormwater quality measures like infiltration ditches and infiltration basins located in the ROW to control post-construction runoff and treat stormwater for water quality benefits before discharging to the local waterways were discussed in detail with the Community. It was noted that no water treatment facilities currently exist in the I-10 corridor. It was also noted that the RBA improvements would not disturb most areas outside of I-10 and that adding water quality treatment facilities along the freeway would greatly increase the project footprint. The Community has concurred that such treatment for this project would be limited to infield areas only of disturbance and would not be added to the corridor otherwise. Therefore, along the I-10 mainline corridor, stormwater treatment would not be required. See *Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report*, dated October 2023, Appendix I for the technical memorandum and consensus by the Community regarding this water quality coordination effort.

#### 4.5.5 NPDES Permit

The project would disturb one or more acres of land area, and a National Pollutant Discharge Elimination Systems (NPDES) general permit would be required from the U.S. Environmental Protection Agency (EPA) as directed by Section 402(p) of the Clean Water Act.

### 4.6 Earthwork

The proposed crossroad and TI were modeled to determine earthwork quantities. A summary of the estimated earthwork quantities is shown in Table 4-8.

Overall, the project would be a borrow project with over 504,000 cubic yards of borrow needed to construct the TI. It is assumed that all the excavation from the project is acceptable material and can be reused as embankment on the project. There is an assumed overall shrink of 15% for all excavations sourced from the mainline and crossroads.

A specific borrow source has not been identified; however, commercial sand and gravel sources are available in the vicinity of the I-10 corridor along the Gila River. Consequently, it is not anticipated that the borrow would have to be transported any more than 20 miles one-way, and all haul is expected to occur with legal loads.

**Table 4-8 -** Estimated project earthwork quantities

Location	Total excavation (roadway/over- excavation/ drainage) (cubic yards)	Shrink (-15%)/ swell (10%) (cubic yards)	Embankments (cubic yards)	Net in-place borrow (+) or waste (-) (cubic yards)
Koli Road TI	75	(11)	504,970	504,906
Total	75	(11)	504,970	504,906

# 4.7 Construction Sequencing

This section discusses the potential construction sequencing plans for the proposed TI. A description of each construction phase is included in Table 4-9. The ramps and TI area could could be used to detour I-10 mainline traffic during short overnight closures to complete the bridge construction across I-10, including placing precast girders and pouring concrete for the deck and barriers. Detailed construction sequencing plans would be developed during the final design. Advance traffic control notification to the public would be needed prior to restrictions, closures, or major traffic control changes, such as when the DDI crossover goes active.

Table 4-9 - Construction Phasing

Koli Road Tl Alternatives							
Phase 1	Construction of I-10 bridge pier and abutments, median signing, guide signs						
Phase 2	Construction of entrance and exit ramps, retaining walls, drainage facilities						
Phase 3	Construction of remainder of bridge						
Phase 4	Construction of Koli Road within access control limits						

<sup>&</sup>lt;sup>a</sup> Multiply the number of barrels by the culvert length to get the total replacement length for quantities.

<sup>&</sup>lt;sup>b</sup> Multiply the number of barrels by the jack and bore casing length to get the total casing length for quantities.

# 4.8 Traffic Design

The following sections describe the proposed concepts for guide signs, pavement marking, traffic signals, lighting, FMS, and vehicle counting system elements. The traffic design concepts were developed based on the guidelines presented in the following documents:

- Manual on Uniform Traffic Control Devices (MUTCD) (FHWA 2009)
- Arizona Supplement to the MUTCD (ADOT 2009)
- ADOT Traffic Signals and Lighting Standard Drawings (2021, with updates)
- ADOT Signing and Marking Standard Drawings (2019, with updates)
- ADOT ITS Design Guide (current edition)
- ADOT *Traffic Engineering TGP* (2015, with updates)

This document provides only a high-level overview of the project's traffic design features because they would continue to be refined through the final design.

# 4.8.1 Traffic Signals

New traffic signals would be installed at the following TI ramp and crossroad intersections:

Koli Road TI (DDI)

The final signal design, including ownership and maintenance responsibilities, would be determined during the final design and documented in IGAs.

# 4.8.2 Guide Signs

The proposed traffic interchange location would affect the cantilever sign structure just north of the eastbound exit and westbound entrance ramp to SR 347/Queen Creek Road. Guide signs mounted on crossroad bridges would be replaced or relocated as necessary. Koli Road would require overhead guide signs. New signs would also be needed for the freeway route number with cardinal directions, destination cities, and lane assignments at entrance ramp approaches.

# 4.8.3 Other Signs

All required sign locations would be verified during final design for entrance and exit ramps and on crossroads and TIs within the corridor.

# 4.8.4 Pavement Marking

The conceptual pavement marking plan for delineating the freeway mainline GP, HOV, entrance and exit ramps and the crossroad lanes is included in the 15% project roll plot PDF and as shown in the exhibits in Appendix A.

# 4.8.5 Lighting

Lighting within the project would adhere to ADOT's standards, including pole and fixture types. Luminaries not on traffic signal poles would be powered from a standard ADOT type IV load center, which energizes using 480 volts, single phase power and is controlled by an on-cabinet photocontrol unit. Crossroad lighting should be installed on traffic signal poles and no additional lighting beyond.

#### 4.8.6 FMS

The FMS infrastructure would include a continuous fiber optic backbone to relocate the existing backbone through the TI footprint envisioned to be installed inside the proposed west side ROW fence connecting the existing FMS fiber backbones endpoints located between the Wild Horse Pass and SR 347/Queen Creek TI. In addition, the existing EB DMS would be relocated to a location north of the proposed Koli Road bridge, and CCTV cameras would be installed per ADOT's design guidelines.

### 4.9 Utilities

Construction activities related to the Koli Road TI RBA could potentially affect an existing ADOT FMS fiber optic line and an existing underground electrical line.

The construction of the Koli Road TI may impact several existing utilities in the area, including electric power lines from San Carlos Irrigation Project (SCIP) and the GRIC Utility Authority, which may require relocation or protection of underground distribution lines.

If the I-10 widening project is completed before the Koli Road TI, utility relocations may not be necessary. However, if the widening is not completed and the Koli Road TI is constructed, utility relocations would still be required for the poposed TI. A more detailed utility impact assessment would need to be completed as the project design advances.

Items to be aware of/avoid include:

- Future improvements on Koli Road west of I-10.
- Final design refinement could alter the geometry, intersection layouts, drainage conveyances, etc., to optimize constructability, improve traffic operations and maintainability or avoid or minimize utility impacts.
- During the final design, utility relocation plans would be developed according to the Policy for Accommodating Utilities on Highway Rights-of-Way (ADOT 2009c). Utility companies would be provided with the preliminary design plans (see Appendix A) to identify any utilities that need to be relocated and/or adjusted prior to construction.

See Appendix A for plan exhibits and the separate and more detailed 15% level Stage I roll plot PDF file accompanying this report depicting the RBA.

Future GRICUA / GRTI Facilities (By Other Project)

ADOT, Community DPW, GRICUA and GRTI would enter into an IGA detailing a proposal for ADOT's contractor to provide new 30" utility casings and/or ITS sleeves and conduit casings across I-10 for future use. The scope and location would be coordinated as part of the I-10 Community project (Milepost 161 – 172). The I-10 Community project construction is scheduled to begin in mid-2026 and last until late 2028. (Website: I-10 Gila River Indian Community Project: ADOT I-10 Wild Horse Pass Corridor).

# 4.10 Structures

This section describes the initial bridge study for the new bridge structures proposed as part of the RBA. The proposed TI would be a new DDI with two separate bridges located between the existing Wild Horse Pass Boulevard/Sundust Road TI and the existing SR 347/Queen Creek Road TI. The 15% bridge plans are presented in Appendix A. It is anticipated final bridge concepts will be present and selected as part of the design build procurement.



## 4.10.1 Summary of the Recommended Bridges

A summary of the new bridges associated with the RBA is presented in Table 4-10. A preliminary feasible alternative was selected at each location for cost estimating and preliminary drawing purposes. It is based upon the information known at the time of this report.

**Table 4-10 –** Summary of Recommended Alternative Bridges

	Location	Structure name	No. of spans	Total structure width *widening width **deck replacement width	Structure length	Proposed type	Proposed minimum vertical clearance
	Koli Road TI	Koli Road TI eastbound (new)	2	86 foot – 9.5 inch	224 foot - 0 inch	Precast prestressed concrete girder	16.5 foot
		Koli Road TI westbound (new)	2	60 foot – 10 inch	224 foot - 0 inch	Precast prestressed concrete girder	16.5 foot

The drawings of the recommended alternatives can be found in Appendix A, and a detailed cost estimate can be found in Appendix B.

### 4.10.2 Design Assumptions

Design assumptions, such as vertical clearance, concrete strength, design codes and design loads, are discussed in Section 4.5.4 of the DCR for the I-10 Corridor, Loop 202 to SR 387.

## 4.10.3 Site Specific Issues

The proposed interchange would require new ROW on the east and west sides of I-10. The timing for obtaining the new ROW is uncertain. To avoid delays in constructing the bridges due to ROW acquisition timing, the proposed bridge abutments would be located inside the existing ADOT ROW. Each bridge, minus the approach slabs and retaining walls, can be constructed in its entirety in advance of obtaining the ROW. The approach slabs, retaining walls and the rest of the TI can be constructed once the new ROW is obtained.

The existing underground power and FMS utility lines located on each side of and running parallel to I-10 are anticipated to be removed or relocated, and therefore, conflicts would be mitigated by relocating the facilities.

# 4.10.4 Proposed Typical Section

I-10

I-10 will have three 12-foot GP lanes, one 12-foot HOV lane, one 12-foot auxiliary lane and two 12-foot shoulders in each direction.

#### Eastbound Koli Road

Looking in the eastbound direction (direction of travel), the travel way on the bridge would consist of an 8-foot left shoulder, four 15-foot lanes and a 5-foot right shoulder (bike lane), yielding a clear roadway width of 73 feet-0 inches. The bike lane would be separated from a 10-foot sidewalk by a modified 38-inch single-slope bridge concrete barrier. A 38-inch single-slope bridge concrete barrier with special bridge fence would be located

beyond the left/north 8-foot shoulder, while a combination pedestrian traffic bridge railing with fence would be located beyond the right/south 10-foot sidewalk. The total out-to-out bridge width would be 86 feet-9.5 inches.

#### Westbound Koli Road

Looking in the westbound direction (direction of travel), the travel way on the bridge would consist of an 8-foot left shoulder, three 15-foot travel lanes and a 5-foot right shoulder (bike lane), yielding a clear roadway width of 58 feet-0 inches. A 38-inch single-slope bridge concrete barrier with special bridge fence would be located beyond both shoulders, yielding a total out-to-out bridge width of 60 feet-10 inches.

# 4.10.5 Proposed Geometry

I-10

Both directions of the existing I-10 through the TI are on a tangent horizontal alignment. The alignments will remain for this project.

The existing vertical profile for both directions of I-10 through the TI consists of a tangent. The profiles will remain for this project.

#### Eastbound Koli Road

The proposed horizontal alignment will consist of a tangent over the entire superstructure length, yielding a constant-width bridge with the exception of the NE quadrant of the eastbound bridge. The bearing of the horizontal alignment is set at 90 degrees to I-10, resulting in a non-skewed bridge. Horizontal curves for eastbound Koli Road and the TI ramps are introduced on the approaches, resulting in variable width approach slabs and anchor slabs. The proposed vertical profile across the bridge will consist of a crest vertical curve. When progressing in the direction of travel, the bridge will have a 2% cross slope to the left/north.

#### Westbound Koli Road

The proposed horizontal alignment will consist of a tangent over a portion of the superstructure length. The bearing of the horizontal alignment is set at 90 degrees to I-10, resulting in a non-skewed bridge. Horizontal curves for westbound Koli Road and the TI ramps are introduced within the limits of the bridge, resulting in a variable width superstructure when measured along the abutments, approach slabs and anchor slabs. The proposed vertical profile across the bridge will consist of a crest vertical curve. When progressing in the direction of travel, the bridge will have a 2% cross slope to the left/south.

# 4.10.6 Proposed Bridge Layout (Both Bridges)

The bridge abutments were placed so that they are beyond the 30-foot clear zone of the I-10, L202 to Gila River Bridge projects outside I-10 lane but within the existing ADOT ROW. This placement would accommodate an additional outside lane with barrier, providing a total of five 12-foot lanes and two 12-foot shoulders in each direction of I-10 should it ever be needed. With a center pier located in the median along the I-10 centerline, the proposed bridges would have two equal spans of 109 feet-6 inches. The resulting bridge length is 224 feet-0 inches.

To align with the State Route 202L to State Route 387, Design Concept Report, dated October 2023 and supporting documents and to be consistent with other new and proposed bridges in the I-10 corridor, the proposed bridge superstructure is shown using precast prestressed concrete Bulb-Tee girders (UBT 66).

The structure aesthetics DCR produced for the corridor specifies the treatments for the proposed outside (furthest north and furthest south) bridge barriers and fences. That DCR also specifies round columns and associated treatments for the Koli Road TI piers and abutments. To comply with the DCR, the center pier would consist of a dropped cap supported on 3-foot-6-inch diameter round columns founded on drilled shafts. The abutments would be mechanically stabilized earth (MSE) style, with the MSE wall located behind the abutment. The abutments in front of the MSE wall would look similar to the center pier and include round columns founded on drilled shafts.

The gap between the bridges would vary between approximately 61 feet and 65 feet. It is recommended that the MSE walls run continuously and parallel to the I-10 between each bridge abutment.

# Miscellaneous Structure (Retaining Walls, Sound Walls, and Concrete Box Culverts)

### 4.11.1 Retaining Walls

MSE retaining walls that continue from the new bridge wingwall would be relatively short if needed, therefore the cost is included in the bridge cost estimate.

#### 4.11.2 Sound Walls

No noise receivers exist along or within the project's limits, therefore no new sound barriers have been identified as necessary.

## Reinforced Concrete Box Culvert (RCBC)

No existing RCBCs were identified within the limits of the project. Any existing RCBC structures within the project limits would require modification as necessary to support the features of the RBA.

Additional information can be found in the Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report, dated October 2023.

# 4.11.4 Equipment Underpass

GRIC DOT/GRD has requested an equipment underpass beneath Koli Road on the west side of I-10.

The use of a box culvert versus a more typical bridge was discussed during stakeholder meetings from November 2024 to February 2025. Although a wider and more typical bridge such as a superbox would have been more functional for moving vehicles, equipment and people, it was ultimately eliminated from consideration by the Community. Additionally, the future users of the underpass remain unknown. The Community will fund, or identify a funding source, for the equipment underpass.

A 14-foot high by 16-foot wide underpass, in accordance with ADOT SD 6.07, is currently proposed. A minimum fill height of 2 feet shall be placed between the top of the structure and the bottom of the subgrade. The box shall have a maximum length of 295 feet and include headwalls and wingwalls as needed beyond that length. The box must include a reinforced concrete skylight port located in the median of Koli Road that matches the width of the box, has a length along the box of 12 feet, and includes metal grates matching the grade of the finished median. The grates, supporting metal structures, and hardware must be galvanized in accordance with ASTM A153. The grates and supporting structures must be rated for HL-93 live loading.

#### 4.11.5 Geotechnical Recommendations

The project specific geotechnical engineering data report can be found in the I-10 Koli Road Traffic Interchange Geotechnical Engineering Data Report, Dated April 18, 2025.

The geotechnical engineering data report excludes recommendatons, opinons or conclustions and is limited to presenting geotechnical information and generalized geotechnical considerations. The geotechnical engineering recommendations for the design and construction of the project will be developed by the awarded design-build team for the project.

# 4.11.6 Roadway / Roadway Embankment

The proposed improvements would require the construction of a new roadway embankment and preparation of subgrade for pavement. A geotechnical investigation will provide the suitability of site soils for embankment and pavement subgrades. The geotechnical investigation will identify areas requiring more extensive subgrade preparation and over-excavation and will provide preliminary earthwork shrink or swell and compaction factors. The investigation will reference the ADOT Geotechnical Project Development Manual.

In locations near the decommissioned Firebird Lake, additional mitigations could be provided to ensure acceptable subgrade conditions for pavement.

# 4.11.7 New Bridge Structure Foundations

The geotechnical investigation will provide recommendations for foundations for constructing the new Koli Road Bridge. Spread footing or drilled shaft foundations could be recommended based on nearby bridges.

Additional geotechnical design considerations for the corridor can be found in the Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report, dated October 2023, the 202L to Gila River Bridge Geotechnical Engineering Data Report, dated April 2024, and the 202L to Gila River Bridge Priliminary Geotechnical Foundation Report, dated January, 2025.

# 4.11.8 Pavement Design Considerations

The project specific geotechnical engineering data report can be found in the I-10 Koli Road Traffic Interchange Geotechnical Engineering Data Report, Dated April 18, 2025.

The geotechnical engineering data report excludes recommendatons, opinons or conclustions and is limited to presenting geotechnical information and generalized geotechnical considerations. The geotechnical engineering recommendations for the design and construction of the project will be developed by the awarded design-build team for the project.

Along I-10, the existing pavement for nearly all of the corridor consists of asphaltic concrete (AC) pavement. Existing Portland cement concrete pavement extends from the Loop 202 to approximately milepost 163.52 on I-10 eastbound and to milepost 163.14 on I-10 westbound.

Based on the available pavement history data obtained from ADOT, the existing AC pavement section thickness varies along the corridor, and the existing AC pavement component thicknesses are unclear.

Thus, it is recommended that at the ramp construction adjacent to the I-10 improvemnts, the ramp structural section will be AC pavement for all Koli Road TI ramps.

The pavement section recommendations will be based on ADOT pavement guidelines.

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# 4.12 Maintenance of Traffic

Traffic would be managed through detailed traffic control plans, procedures and guidelines specified in Part VI of the *Manual of Uniform Traffic Control Devices*, 2023 Version, and by the *Arizona Supplement to the Manual of Uniform Traffic Control Devices*. The final construction phasing and traffic control plans would be developed during the final design.

# 4.13 Multimodal Considerations

There are currently no existing multimodal facilities or services within the project limits other than at the Wild Horse Pass Boulevard TI, where pedestrian facilities exist and possibly Community vanpools. The RBA would construct pedestrian facilities and make accommodations for bicyclists at all the crossroads within the limits of the ADOT ROW. These facilities would primarily be walkways or raised sidewalks for pedestrians and roadway shoulders for bicyclists.

The proposed RBA would only add to or enhance multimodal features and would in no way discourage those multimodal options that exist or operate today.

# 4.14 Design Exceptions and Deviations

The Koli Road Ramp A, B, and C would utilize taper exit/entrance ramps in lieu of parallel exit/entrance ramps due to the continuous auxiliary lanes that is to remain between the Wild Horse Pass Boulevard TI and SR347/Queen Creek Road TI. Koli Road Ramp D, EB entrance ramp, is proposed to have a parallel entrance ramp. Access control variances is anticipated for the RBA.

See Chapter 7 for a more complete discussion on design exceptions.

# 4.15 Intergovernmental Agreements

The total number of IGAs has not yet been determined and would need to be finalized for the project through planning and development and final design activities. The following is a summary of what is known at the time this memo is being written or what we speculate could be needed:

#### Koli Road TI Study/Project Agreements

- GRICUA JPA: ADOT and the GRICUA are proposing a JPA/IGA to define the procurement and delivery
  of Community-owned utility crossings at I-10 near Koli Road and the Wild Horse Pass Corridor Tls. The
  agreement is based on ADOT-compliant utility carrier pipe casings. The Koli Road Tl crossing is
  expected to be included in a corridor-wide JPA/IGA.
- I-10 / Koli Road Responsibility IGA: ADOT and the Community are proposing an agreement to define
  the design, environmental and FWHA compliance, construction and maintenance responsibilities related
  to the Koli Road TI Study and proposed construction project.
- GRTI JPA: ADOT and the GRTI are proposing a JPA/IGA to define ADOT installation of ITS conduits
  and pullboxes for GRTI, including crossings under I-10 at Wild Horse Pass corridor TIs. The Koli Road
  TI crossing is expected to be included in a corridor-wide JPA/IGA.

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Federal Aid No. 888-A(219)S



#### 5 Itemized Cost Estimate

A detailed itemized construction cost estimate was prepared for each of the build alternatives and options considered (See Appendix B). Section 5.1 discusses the currently programmed funding for the Koli Road TI. Section 5.2 provides the cost estimate for the RBA developed in February 2025 using the ADOT General Engineering Consultant's latest cost estimate template and unit price information (used as applicable). Future maintenance costs are discussed in Section 5.3.

#### **Programmed Funding** 5.1

Funding for this project is anticipated to come from the Regional Area Road Fund (RARF). Table 5-1 lists the funding that has been allocated to date. It is important to note that this program changes regularly and thus could change at any time.

Table 5-1 - Programmed funding

Segment	Funding type	Fiscal years	Funding amount
Interchange on I-10 at I-10 and Koli Road (Design)	RARF	Prior to 2025	\$3,832,291
Interchange on I-10 at I-10 and Koli Road (ROW)	RARF	2025	\$18,852,419
Interchange on I-10 at I-10 and Koli Road (Construction)	RARF	2025	\$54,955,303
		Total	\$77,640,013

#### Cost Estimate of the Recommended Build Alternative/Options 5.2

The estimated cost in 2024 dollars for the RBA, which is described in detail in Chapter 4 of this document, can be found in Table 5-2. Note that a detailed cost estimate for the anticipated ROW is not included in this estimate. Acquiring ROW and easements across a sovereign Native American nation is challenging and complex from a legal and valuation perspective. Therefore, no ROW estimate is attempted for this document; however, acreage is provided instead as a proxy metric for context.

Table 5-2 - Cost estimate of the Recommended Build Alternative (FY 2024 \$)

Build alternative/	Construction cost (2024 \$)	Utility relocation cost (2024 \$)	Design cost (2024 \$)	New ROW including TCE (acres); cost unknown	Total project cost (2024 \$), excluding ROW
Koli Road TI	\$61,672,000	\$774,000	\$4,240,000	28.50	\$66,686,000

<sup>&</sup>lt;sup>a</sup> acreage to be returned to the Community

#### **Estimate of Future Maintenance Costs** 5.3

Information for future maintenance costs for the corridor can be found in the Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report, dated October 2023.

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# 6 Implementation Plan

# 6.1 Overview

As noted in Chapter 5, the Koli Road TI Project is funded by ADOT's Reginal Area Road Fund (RARF). This funding is independent from the broader I-10 Wild Horse Pass Corridor Construction Projects. The I-10 Wild Horse Pass Corridor is divided into four fully funded construction projects. Below is a summary of those projects and more details can be found on the project website (<a href="Horse-Fass Corridor">Horse-Fass Corridor</a>), A list of major Corridor considerations can be found in the Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report, dated October 2023.

- I-10 Gila River Indian Community (Community) Project, SR 202L to Gila River Bridge (Milepost 161-172)

   expected construction is mid-2026 to late 2028
- I-10 Bridges Over the Gila River Project (Milepost 172-174) construction started in 2024 and is expected to finish in 2026
- I-10 Gila River to Gas Line Road (Milepost 174-177) expected construction is late 2026 to mid-2028
- I-10 Gas Line Road to South of SR387 (Milepost 177-187) -expect construction late 2025 to mid-2027.

The implementation for construction of the Koli Road TI Project is to incorporate its scope into the I-10 Community Project, contingent upon successful environmental clearance and issuance of a Finding of No Significant Impact (FONSI).

Given that the Koli Road TI and I-10 improvements have secured full funding, an implementation plan was developed to serve as a roadmap for inclusion with the I-10 Community Project assuming the completion of this Design Memo and the corresponding FONSI. Consensus on an implementation plan helps the project stakeholders identify I-10 construction segments to advance if there were a delay to the Koli Road TI implementation timeline.

# 6.2 Sequencing & Phasing

The I-10 Community Project is being delivered as a design-build project. The Final Request for Proposals was issued in February 2025. Proposals are currently due in July 2025 and its anticipated that an agreement will be executed before the end of 2025.

After the release of the RFP, ADOT will provide design schematics, including the location and configuration of the Koli Road TI, as part of the bid package. However, construction of the Koli Road TI will only be contractually required if the study successfully receives an approved FONSI and the implementation plan is successfully completed.

Discussions are underway with proposing teams about potential phasing of the I-10 Community Project, including sequencing and closure schedules for the project TIs. However, at this time, contractual obligations have not yet been finalized.

Figure 6-1 provides an overview of the current I-10 Community Project limits, with the Koli Road TI planned for inclusion pending an approved FONSI.



Figure 6-1 – I-10 Gila River Indian Community Project

# 6.3 Coordination with Adjacent Projects

The selected Design-Build team would be responsible for coordinating all proposed design and construction activities with adjacent and overlapping projects in the project area. This includes regular communication and consensus with stakeholders to avoid conflicts and meet project goals. It is anticipated that the GRD and GRIC DOT will be the primary coordination parties for the Koli Road Extension projects referenced in Chapter 1.



# 7 AASHTO Controlling Design Criteria and Design Decisions

The RBA would construct a new TI with associated crossroads using the design criteria listed in Chapter 4 of this document, which are based on AASHTO guidance and ADOT's RDG criteria.

Design criteria and exceptions information for the corridor and adjacent Tls can be found in the *Interstate 10 Corridor: State Route 202L to State Route 387, Design Concept Report*, dated October 2023.

There are no known AASHTO design exceptions needed for the proposed TI.

No ADOT RDG non-conforming design elements are anticipated for the proposed TI.

No ADOT design exceptions are anticipated for the proposed TI.

No improvements are being made to existing facilities. AASHTO design exceptions are generally not anticipated on I-10 or the proposed TI.

With the exception of the eastbound entrance ramp, taper ramps are recommended for the Koli Road TI in lieu of parallel entrance/exit ramps due to the continuous auxiliary lanes that is to remain between the Wild Horse Pass Boulevard TI and SR 347/Queen Creek Road TI. Access control variances is anticipated for the RBA. Table 7-1 documents where ADOT design variances would be required for control of access.

Table 7-1 - Control of access requirements for the Recommended Build Alternative

Location	Quadrant	Exit/Entrance	Standard distance in feet (Full/RIRO <sup>a</sup> )	Design distance in feet (Full/RIRO <sup>b</sup> )	Variance required (Full/RIRO ª)
Koli Road TI	NW	Exit	990/1,320	408/0	Yes/Yes
	SW	Entrance	330/1,320	424/0	No/Yes
	NE	Entrance	330/1,320	600/0	No/Yes
	SE	Exit	990/1,320	490/0	Yes/Yes

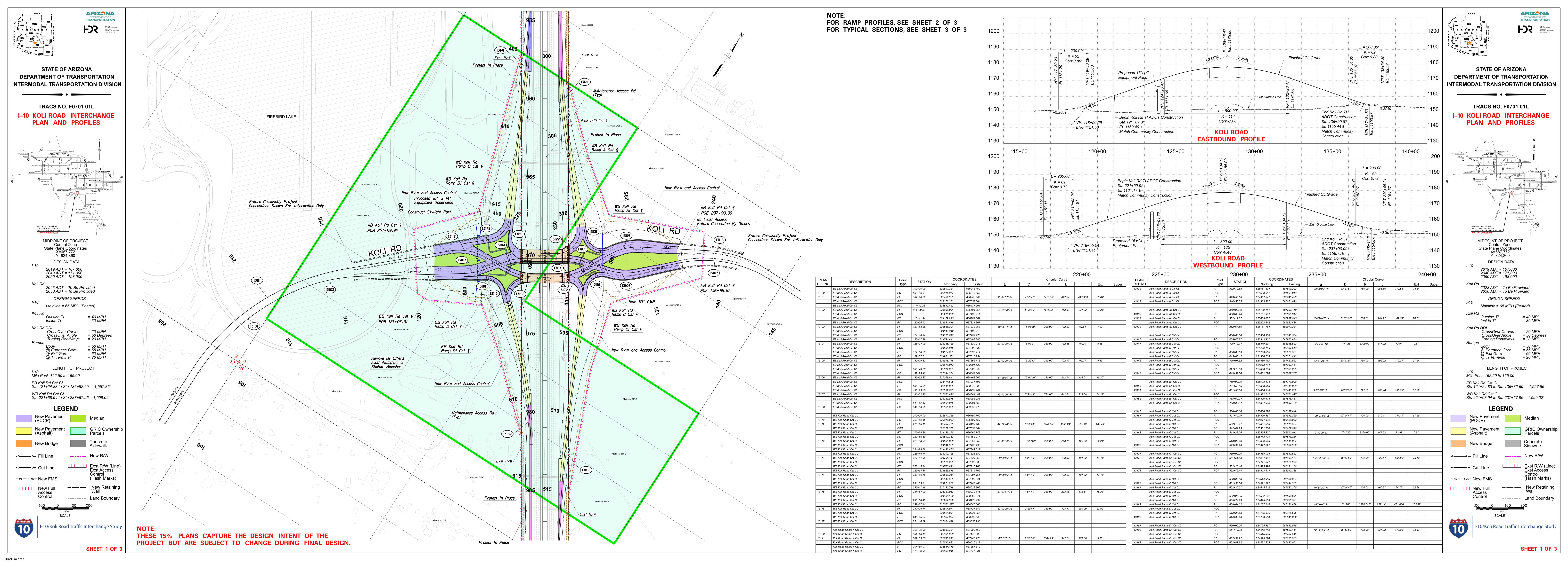
<sup>&</sup>lt;sup>a</sup> Distances measured from ramp radius returns at Diamond TI and measured from begin/end of ramp centerline on DDI's. See ADOT Roadway Design Guidelines (RDG) Section 506 for more information on required distances.

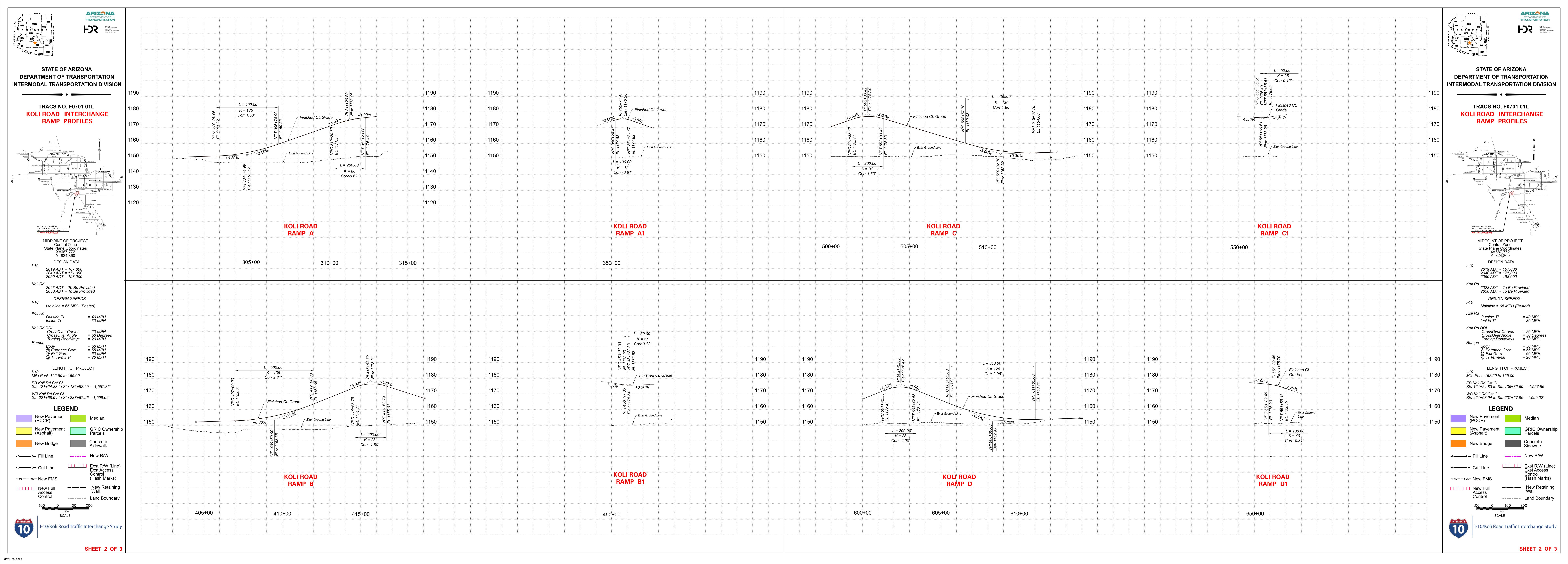
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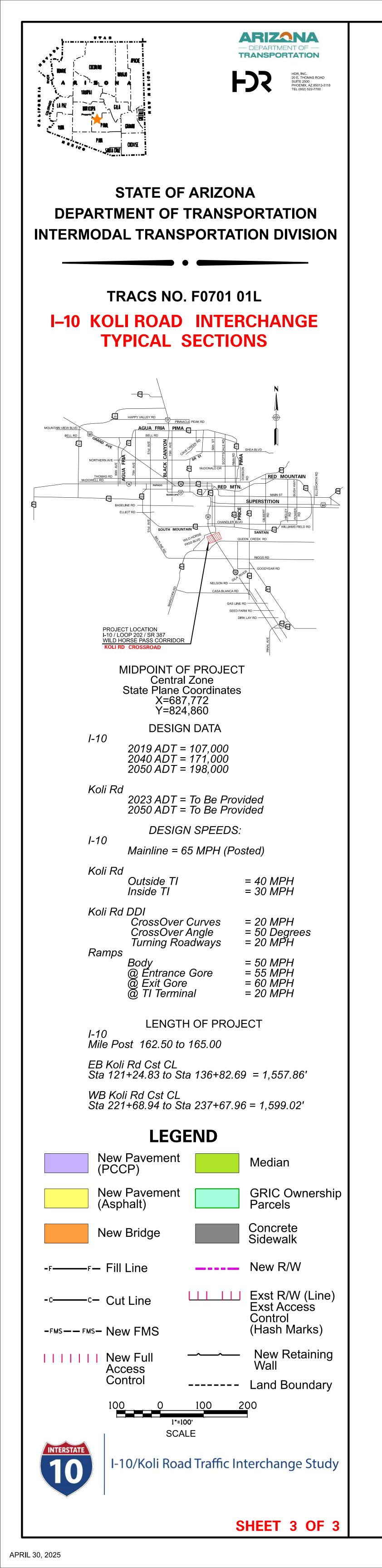
<sup>&</sup>lt;sup>b</sup> RIRO = right-in/right out access only; distance noted as the total distance from radius return (Diamond) or begin/end ramp centerline (DDI) to the extent of RIRO Limit.

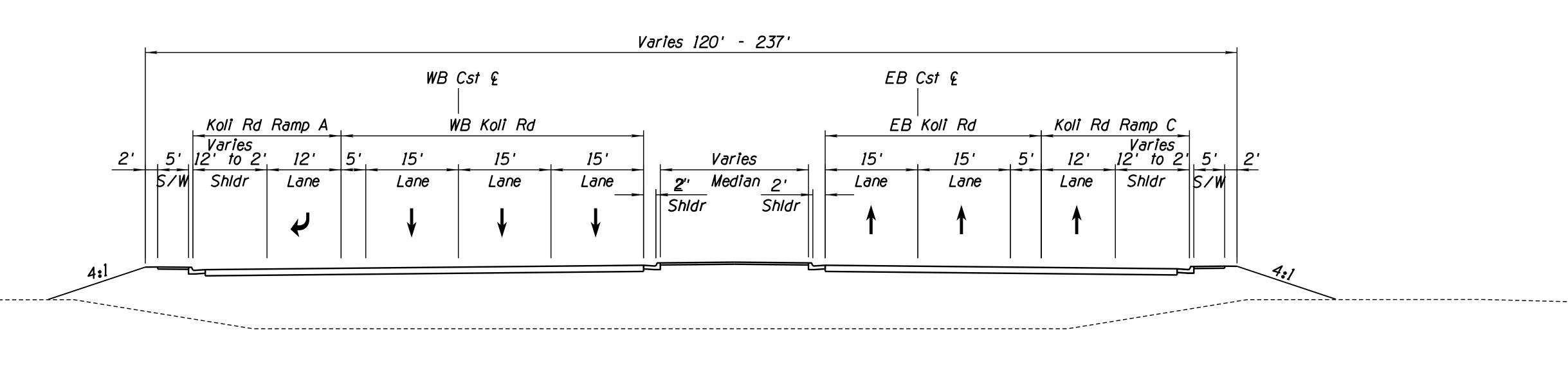


# Appendix A. Recommended Build Alternative Plans

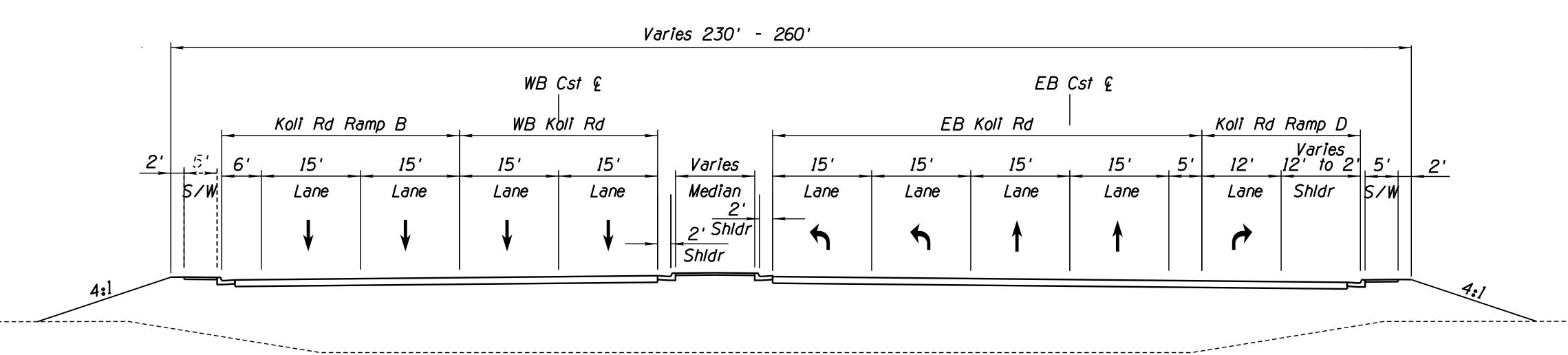




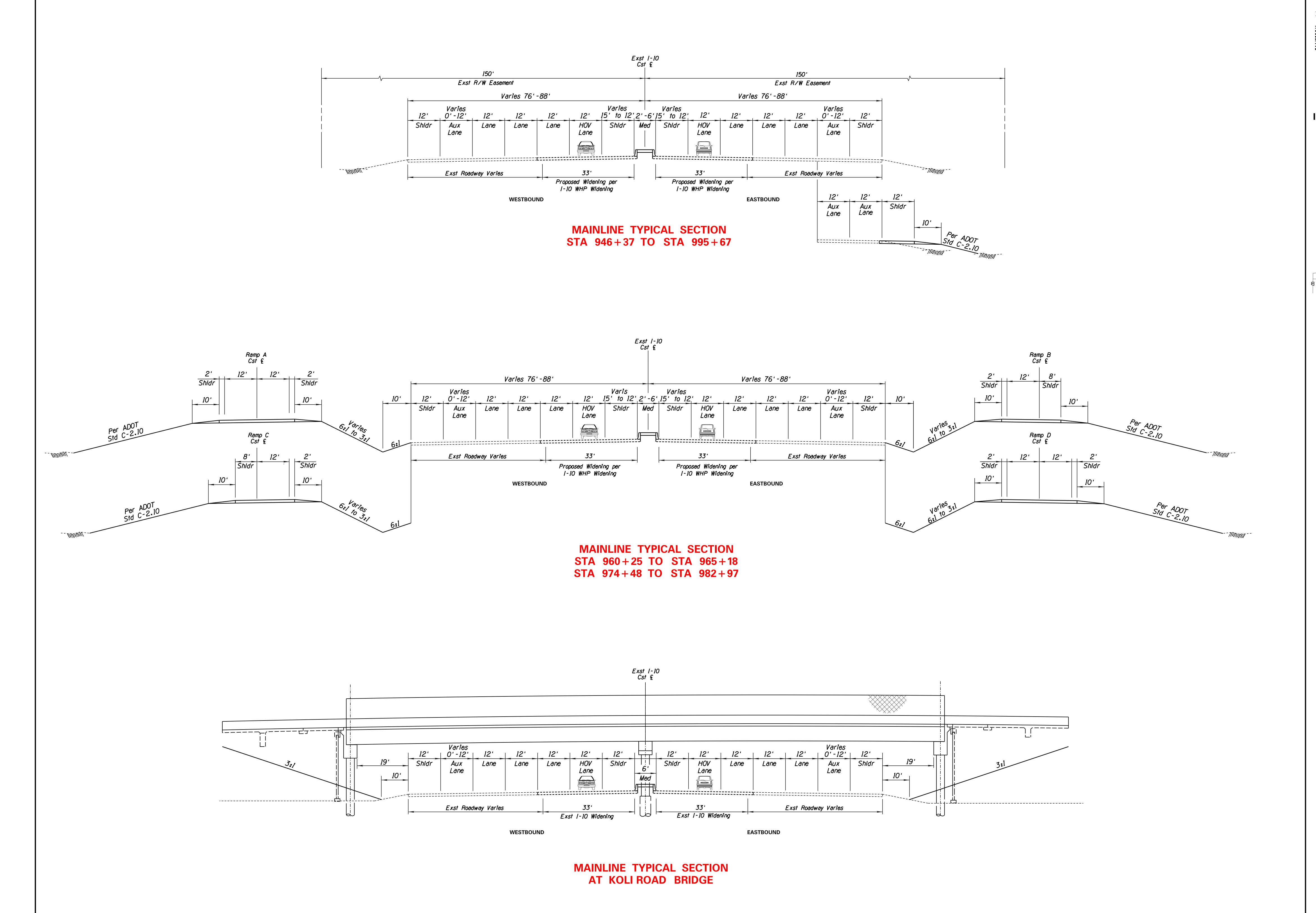


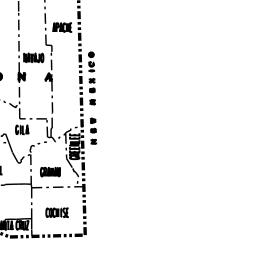


**KOLI ROAD TYPICAL SECTION** EAST OF BRIDGE (LOOKING EAST) EB KOLI RD CL STA 132+41 TO STA 134+54 WB KOLIRD CL STA 223+57 TO STA 235+72



KOLI ROAD TYPICAL SECTION WEST OF BRIDGE (LOOKING EAST) EB KOLI RD CL STA 121+24 TO STA 124+77 WB KOLIRD CL STA 221+35 TO STA 222+84

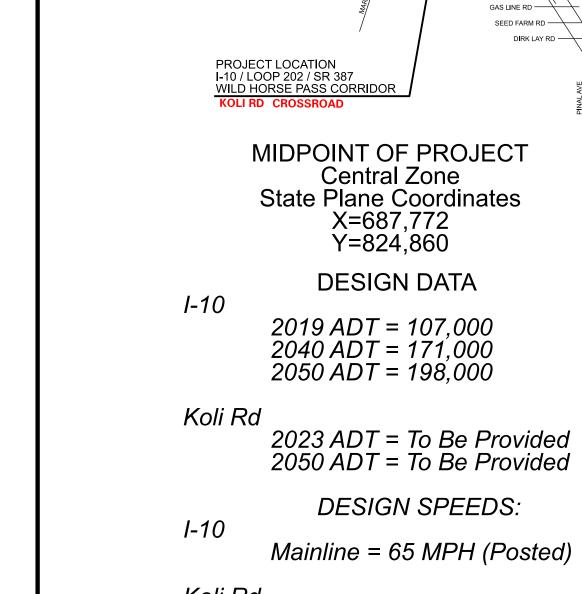






STATE OF ARIZONA **DEPARTMENT OF TRANSPORTATION** INTERMODAL TRANSPORTATION DIVISION

**TRACS NO. F0701 01L** I-10 KOLI ROAD INTERCHANGE



I-10 Mile Post 162.50 to 165.00 EB Koli Rd Cst CL Sta 121+24.83 to Sta 136+82.69 = 1,557.86'

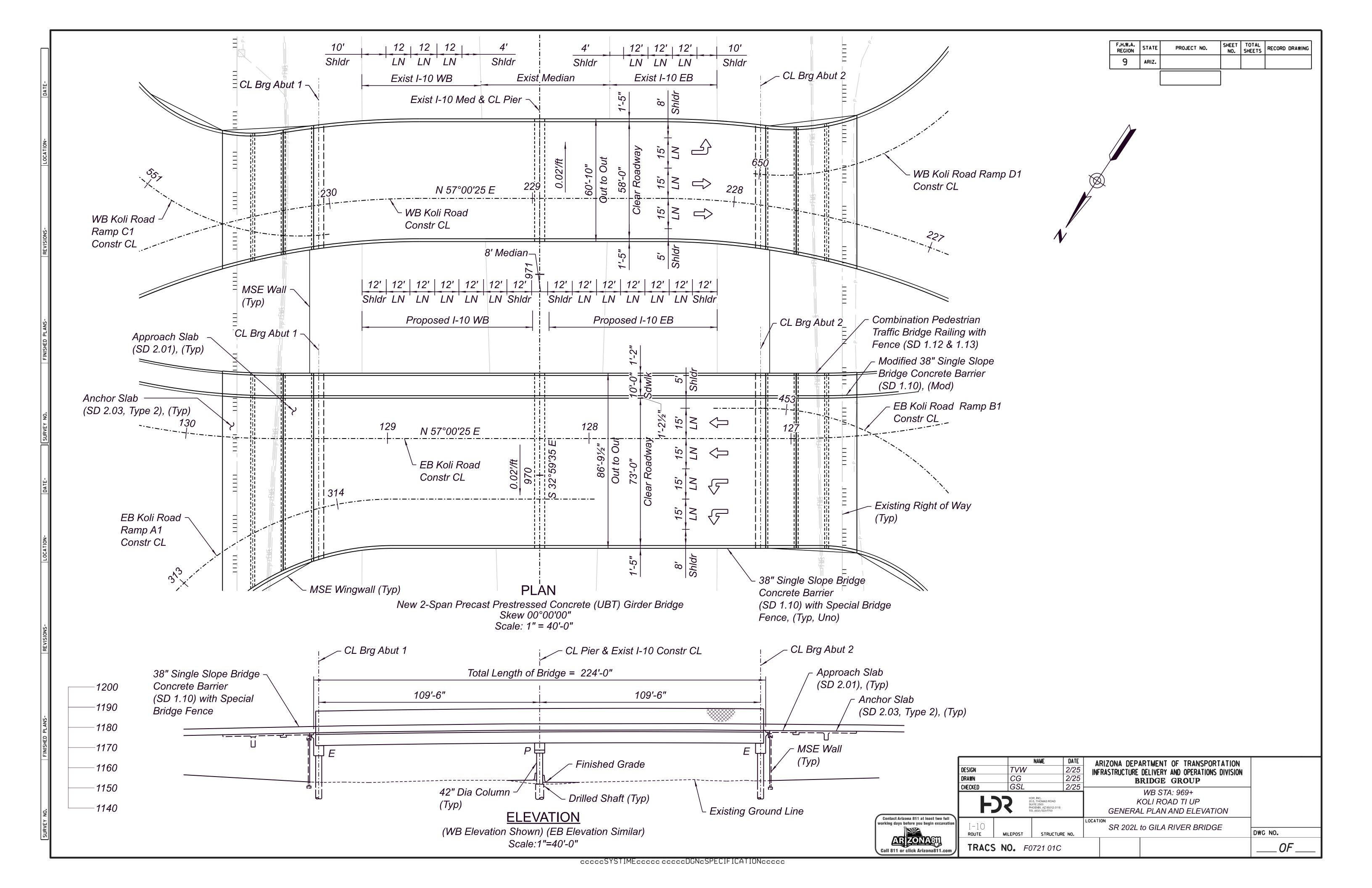
WB Koli Rd Cst CL Sta 221+68.94 to Sta 237+67.96 = 1,599.02' **LEGEND** 

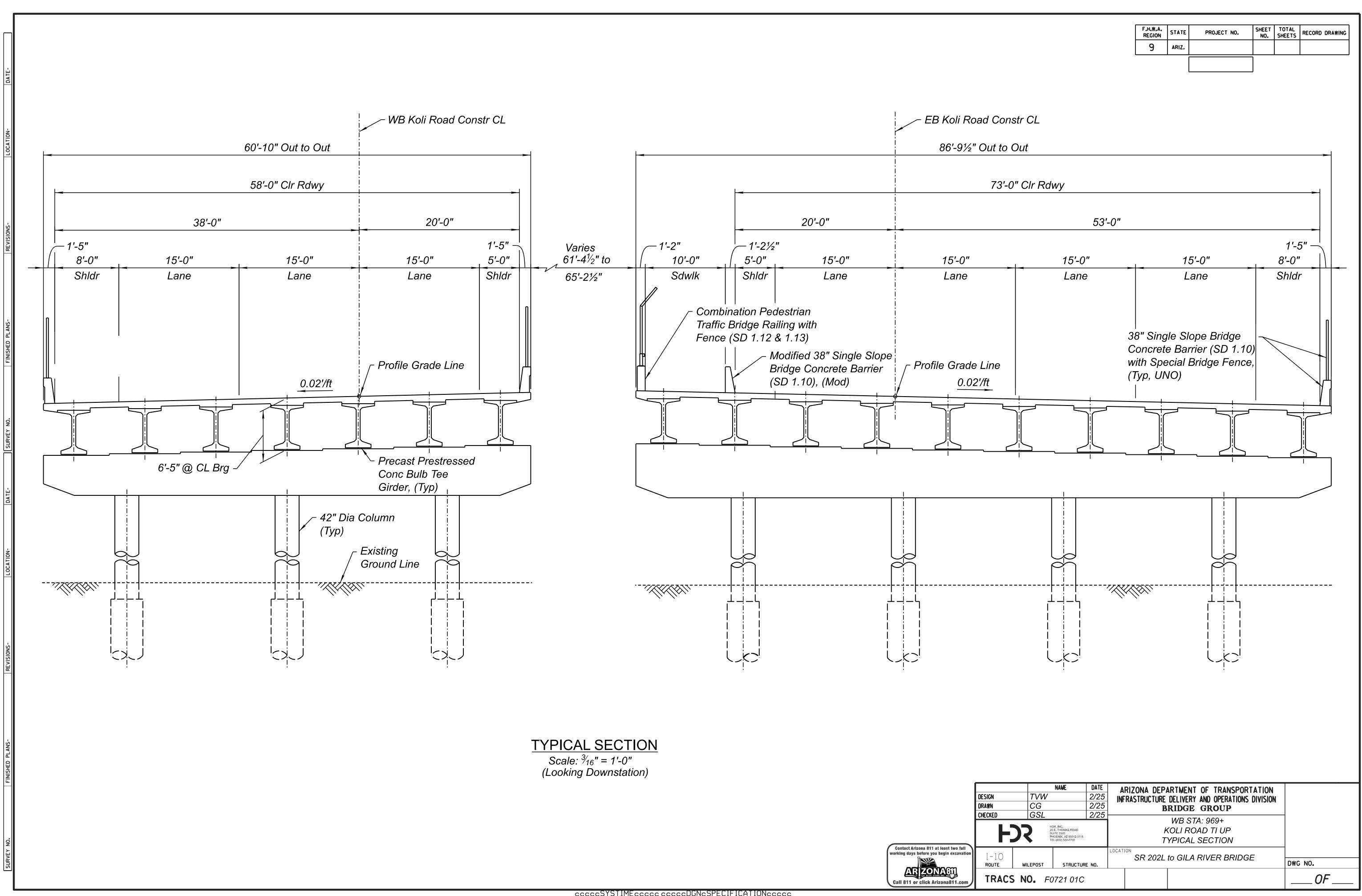


-F--Fill Line

-c——c— Cut Line -FMS--FMS- New FMS









# Appendix B. Recommended Build Alternative Detailed Cost Estimate

# ARIZONA DEPARTMENT OF TRANSPORTATION CONSTRUCTION COST ESTIMATE SUMMARY

ROUTE: I-10 MARICOPA PROJECT DESCRIPTION: Koli Rd TI - Preferred Build Alternative SEGMENT: KH - Koli Road DDI ESTIMATE LEVEL: 15%

LENGTH:	0.6 miles ADOT PROJECT NO.:	O.: F0701 DATE: 6/6/25		6/6/25			
ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST		
200	EARTHWORK						
	CLEARING & REMOVALS	L.SUM	1	\$ 288,000.00	288,000		
	ROADWAY EXCAVATION	CU.YD.	75	\$ 20.00	1,500		
	DRAINAGE EXCAVATION	CU.YD.	0	\$ 20.00	0		
	BORROW	CU.YD.	530,000	\$ 20.00	10,600,000		
	SUBGRADE TREATMENT	SQ.YD.	0	\$ -	0		
	FURNISH WATER	MGAL	24,000	\$ 12.00	288,000		
	MISCELLANEOUS ITEMS	L.SUM	0	\$ -	0		
	TOTAL ITEM 200				11,177,500		
300 & 400	BASE AND SURFACE TREATMENT						
	AGGREGATE BASE	SQ.YD.	43,298	\$ 12.00	519,580		
	CONCRETE PAVEMENT	SQ.YD.	23,743	\$ 78.00	1,851,950		
	ASPHALT PAVEMENT	SQ.YD.	19,555	\$ 55.00	1,075,530		
	AR-ACFC SURFACE	SQ.YD.	0	\$ 11.00	0		
	MILLING & OVERLAY (1" AR-ACFC)	SQ.YD.	0	\$ 13.00	0		
	MISCELLANEOUS ITEMS (mill & replace 3" AC)	SQ.YD.	0	\$ 28.00	0		
	TOTAL ITEM 300 & 400				3,447,060		
500	DRAINAGE						
	DRAINAGE SYSTEM (CLOSED)	L.SUM	1	\$ 500,000.00	500,000		
	DRAINAGE SYSTEM (OPEN)	L.FT.	0.00	\$ -	0		
	DRAINAGE SYSTEM (CONVEYANCE CHANNEL)	L.FT.	0	\$ -	0		
	PUMP STATION (NEW)	EACH	0	\$ -	0		
	PIPE CULVERTS (Remove & Replace or Jack & Bore)	L.FT.	0	\$ 1,000.00	0		
	PIPE CULVERTS (New Installation)	L.FT.	360	\$ 350.00	126,000		
	MISCELLANEOUS ITEMS (Culvert end sections)	EACH	0	\$ 1,500.00	0		
	TOTAL ITEM 500				626,000		
600	STRUCTURES						
	FLYOVER RAMP (NEW SYSTEM TI)	SQ.FT.	0	\$ -	0		
	FLYOVER HOV RAMP	SQ.FT.	0	\$ -	0		
	OVERPASS TI BRIDGE (CONCRETE GIRDER)	SQ.FT.	33,068	\$ 260.00	8,597,680		
	RIVER CROSSING BRIDGE	SQ.FT.	0	\$ -	0		
	PEDESTRIAN BRIDGE	SQ.FT.	0	\$ -	0		
	BRIDGE WIDENING (STEEL GIRDER)	SQ.FT.	0	\$ 350.00	0		
	BRIDGE REHABILITATION	SQ.FT.	0	\$ 200.00	0		
	BOX CULVERT	L.FT./CELL	0	\$ 2,800.00	0		
	SIGN STRUCTURES (CANTILEVER)	EACH	4	\$ 75,000.00	300,000		
	ITS SIGN BRIDGE AND DMS PANEL	EACH	0	\$ 250,000.00	0		
	O&M CROSSING	EACH	1	\$ 1,900,000.00	1,900,000		
	MISCELLANEOUS ITEMS (BARRIER REPLACEMENT)	L.SUM	0	\$ 180,000.00	0		
	TOTAL ITEM 600				10,797,680		
700	TRAFFIC ENGINEERING						
	SIGNING (FREEWAY)	MILE/DIR	2.00	* ,	100,000		
	SIGNING (CROSS STREET)	MILE	4.00		320,000		
	PAVEMENT MARKING	LANE-MILE	5.24	\$ 5,000.00	26,200		
	LIGHTING	L.SUM	1	\$ 500,000.00	500,000		
	TRAFFIC SIGNAL	EACH	2	\$ 400,000.00	800,000		
	INTELLIGENT TRANSPO. SYSTEM (ITS) RELOCATIONS	EACH	0.00		0		
	MISCELLANEOUS ITEMS (ITS Multiduct)	L.FT	0	\$ 15.00	0		
	TOTAL ITEM 700				1,746,200		
800	ROADSIDE DEVELOPMENT	00.170	150.000	e 12.00	1 000 000		
	LANDSCAPING AND TOPSOIL	SQ.YD.	150,000		1,800,000		
	UTILITY RELOCATION	L.SUM	I	\$ 100,000.00	100,000		
	MISCELLANEOUS ITEMS (SEEDING)	ACRE	0	\$ 5,000.00	1 000 000		
000	TOTAL ITEM 800				1,900,000		
900	INCIDENTALS  DETAINING WALLS	CO ET	2.500	0 150.00	410 500		
	RETAINING WALLS	SQ.FT.	2,790		418,500		
	SOUND WALLS	SQ.FT.	0	\$ 60.00	0		
	ROADWAY APPURTENANCES	L.SUM	l	\$ 600,000.00	600,000		
	ADA IMPROVEMENTS	EACH	16	\$ 4,000.00	64,000		
	TRANSIT APPURTENANCES	L.SUM	0	\$ -	0		
	RAILROAD ACCOMMODATIONS	L.SUM	0	\$ -	0		
	MISCELLANEOUS ITEMS	L.SUM	0	\$ -	0		
	TOTAL ITEM 900				1,082,500		
	SUBTOTAL A (ITEM SUBTOTAL)				\$30,776,900		

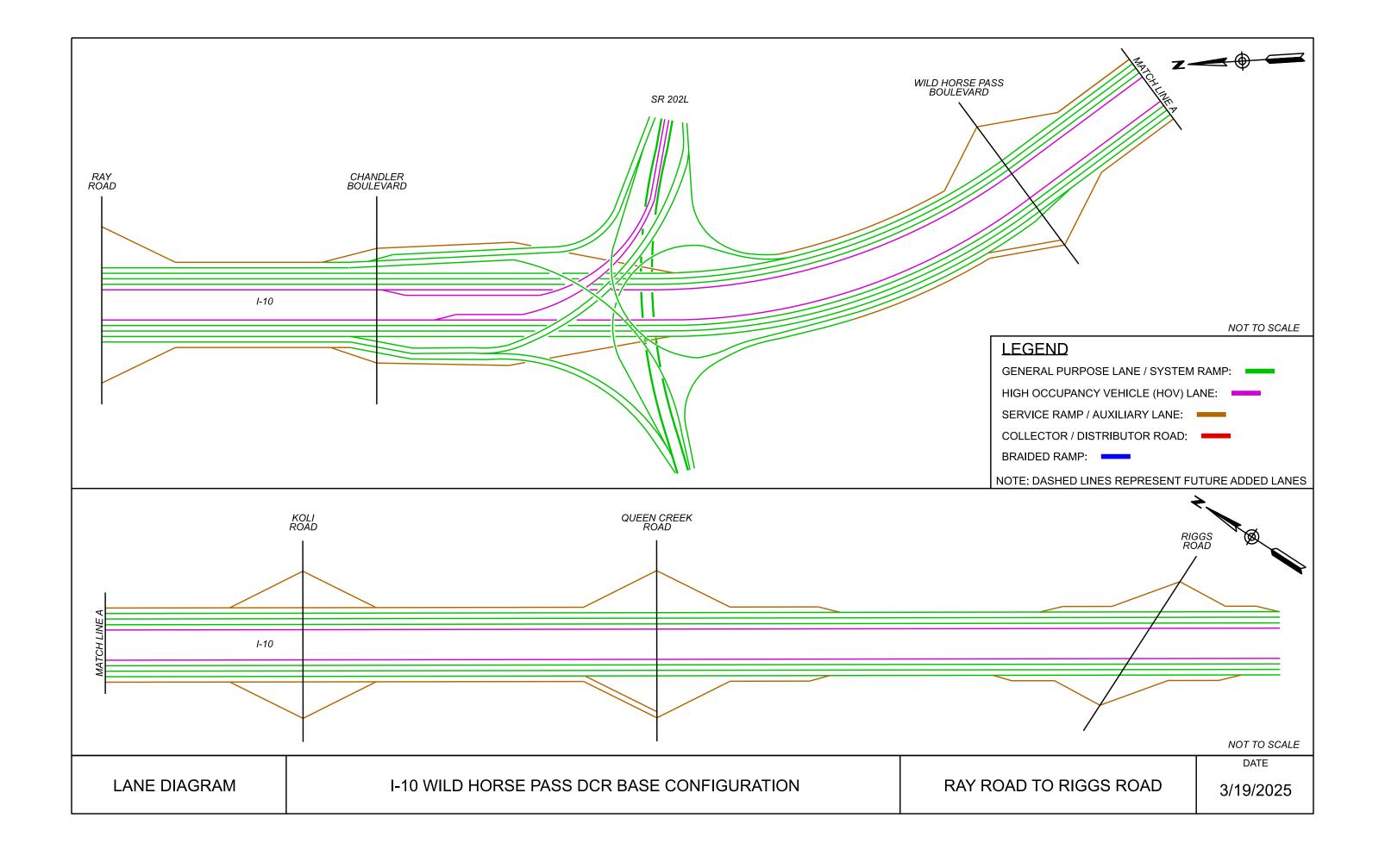
# ARIZONA DEPARTMENT OF TRANSPORTATION CONSTRUCTION COST ESTIMATE SUMMARY

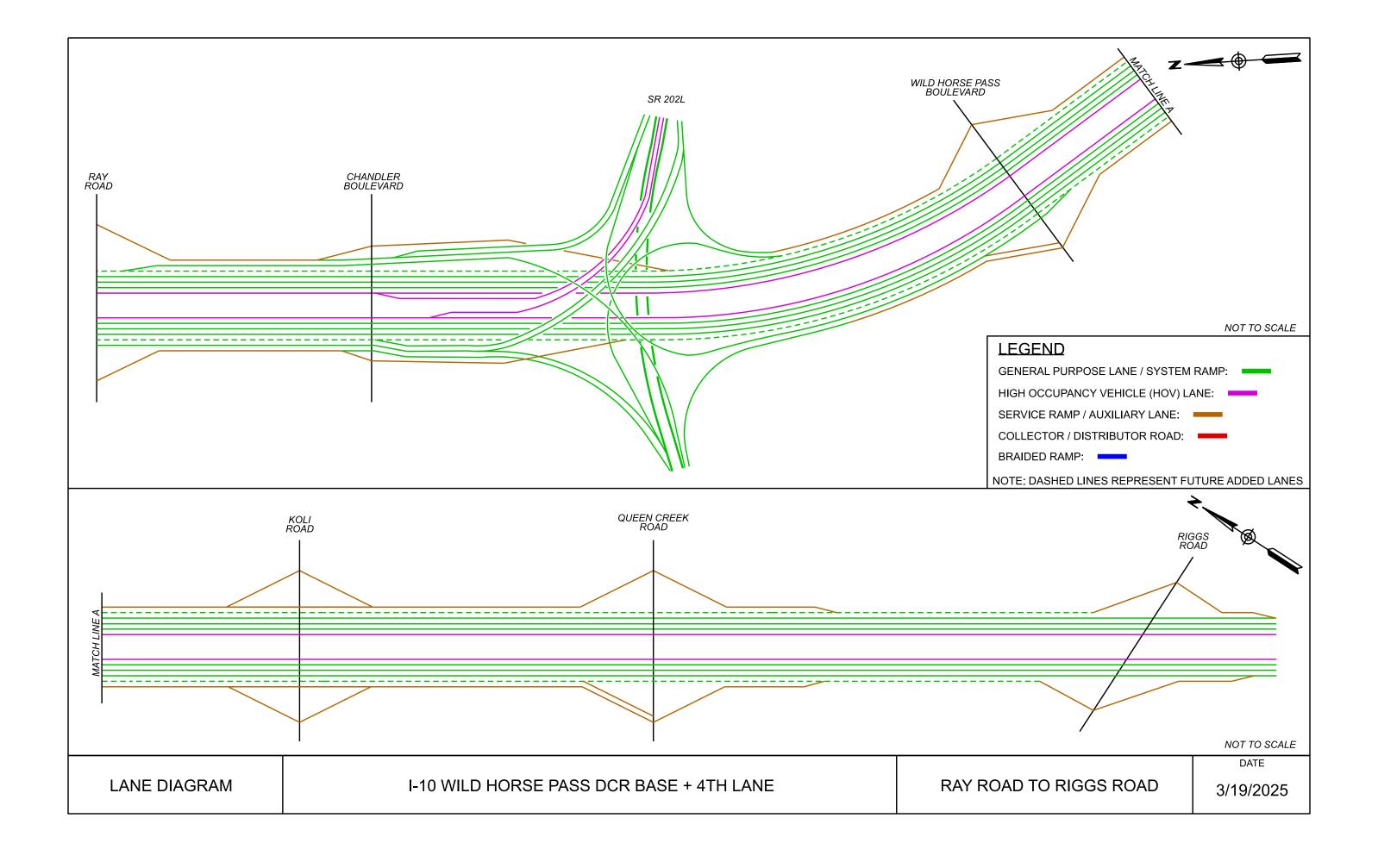
ROUTE: I-10 MARICOPA PROJECT DESCRIPTION: Koli Rd TI - Preferred Build Alternative SEGMENT: KH - Koli Road DDI ESTIMATE LEVEL: 15%

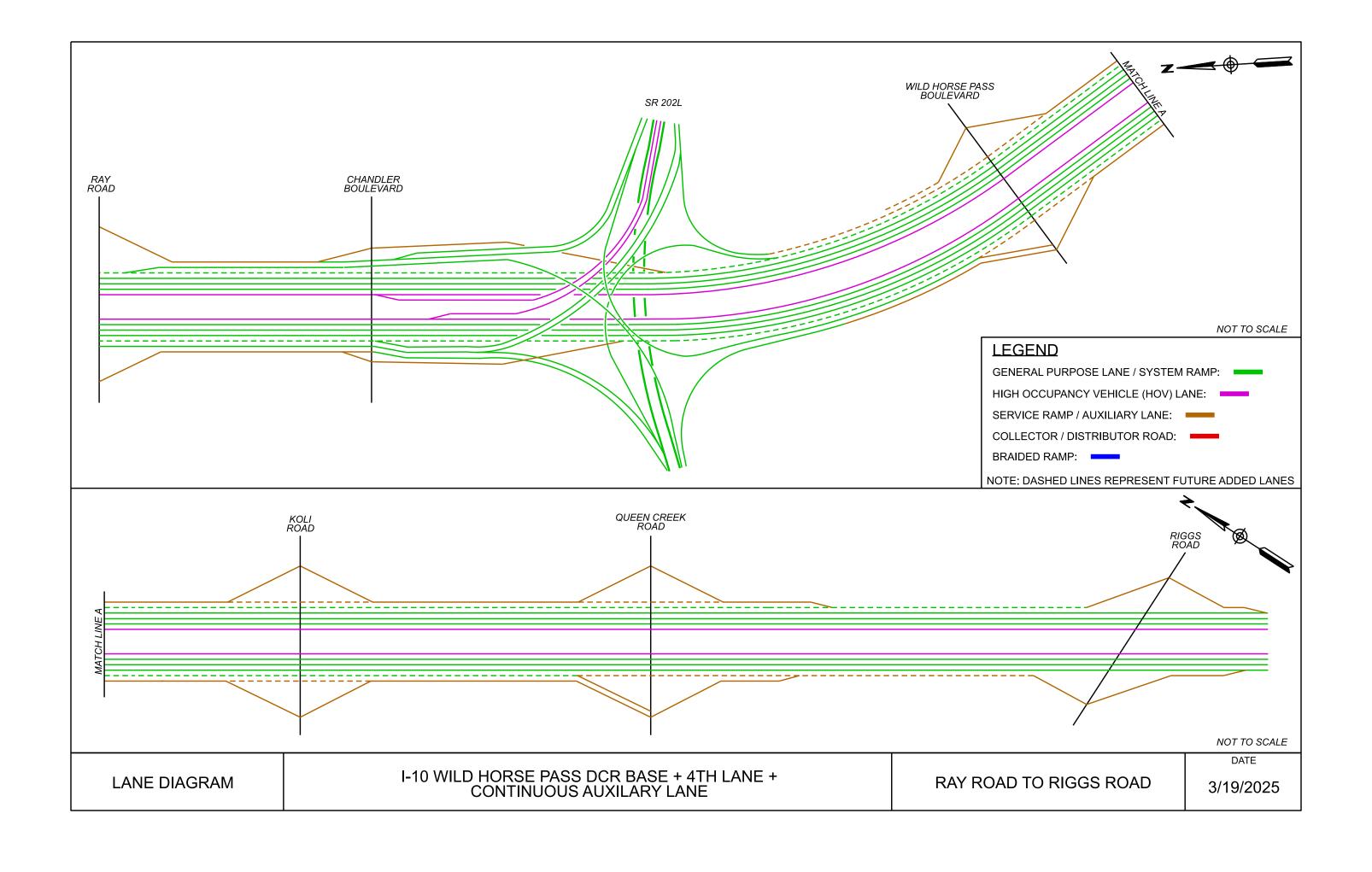
lles ADOT PROJECT NO.:  MAJOR ITEM DESCRIPTION  CT WIDE  FIC CONTROL (8% OF SUBTOTAL A)  PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FUR  ITY CONTROL (1% OF SUBTOTAL A)  FRUCTION SURVEYING (1.5% OF SUBTOTAL A)	HOTO1 UNIT	DATE: 6 QUANTITY	UNIT COST	TOTAL COST
CT WIDE FIC CONTROL (8% OF SUBTOTAL A) PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FUR ITY CONTROL (1% OF SUBTOTAL A)		QUANTITY	<u> </u>	TOTAL COST
FIC CONTROL (8% OF SUBTOTAL A) PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FUR ITY CONTROL (1% OF SUBTOTAL A)	RNISH WATER)		0.00/	
PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FUR ITY CONTROL (1% OF SUBTOTAL A)	RNISH WATER)			
ITY CONTROL (1% OF SUBTOTAL A)	RNISH WATER)			2,462,20
,				
TRUCTION SURVEYING (1.5% OF SUBTOTAL A)				307,80
				461,70
				307,80
				2,462,20
			20.0%	6,155,40
				\$42,934,00
PROJECT COSTS				
RAFFIC CONTROL	HOUR	0	\$ 80.00	
PROJECT AGREEMENT ITEMS				
TRIBAL TAX (6% OF SUBTOTAL B)			6.0%	2,576,04
RACTOR INCENTIVES	L.SUM			80,00
ONMENTAL MITIGATION			\$ 500,000.00	920,00
	JTILITIES & R/W	)		\$46,510,04
TION AND BELOW THE LINE ITEMS				
DESIGN SERVICES (1% OF SUBTOTAL A)			1.0%	465,10
TRUCTION CONTINGENCIES (11% OF SUBTOTAL A)			11.0%	5,116,10
TRUCTION ENGINEERING (8% OF SUBTOTAL A)			8.0%	3,720,80
OTAL BASE YEAR CONSTRUCTION				55,812,04
			10.50%	5,860,30
RUCTION YEAR DEPARTMENT CONSTRUCTION CO	OST (EXCLUDING	UTILITIES & R/W)		\$61,672,34
			0.000	
	,			116,30
· ·	OSTS)		10.50%	12,20
				128,50
· ·				3,720,80
,	S.		10.50%	390,70
				4,111,50
LIATIVE (0% OF SUBTOTAL A) (INCLUDED IN FURNISH WATER)   0.0%	\$4,240,00			
V DELOCATION				
	ENTC	1	700.000	700,00
		1	,	73,50
	15)		10.5070	\$773,50
ZOTIMITED CITETIT COOT				\$770,00
OF-WAY			-	
'-OF-WAY / EASEMENT	ACRE	0.0	\$ -	
ECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WA	AY COSTS)		10.50%	
SITION YEAR RIGHT-OF-WAY COSTS	•			\$
ESTIMATED PROJECT COST				\$66,686,00
	SIGN AND FINAL DESIGN ESIGN/NEPA/PI SERVICES (0.25% OF CONSTRUCTION OF CONSTRUCTION OF CONSTRUCTION OF ALL PREDESIGN OF CONSTRUCTION YEAR CONSTRUCTION OF ALL DESIGN COST OF ALL DESIGN COST OF TALLOCATION OF ALL DESIGN COST OF THE CONSTRUCTION OF ALL UTILITY COST OF THE COST ALLOCATION (10.5% OF ALL UTILITY COST OF THE COST	SIGN AND FINAL DESIGN ESIGN/NEPA/PI SERVICES (0.25% OF CONSTRUCTION YEAR COST) ECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) OTAL PREDESIGN . DESIGN SERVICES (8% OF CONSTRUCTION YEAR COST) ECT COST ALLOCATION (10.5% OF ALL DESIGN COSTS) OTAL FINAL DESIGN ESTIMATED DESIGN COST  Y RELOCATION . RIGHT UTILITY RELOCATIONS & SERVICE AGREEMENTS ECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) ESTIMATED UTILITY COST  OF-WAY -OF-WAY -OF-WAY / EASEMENT ACRE ECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) SITION YEAR RIGHT-OF-WAY COSTS	SIGN AND FINAL DESIGN ESIGN/NEPA/PI SERVICES (0.25% OF CONSTRUCTION YEAR COST) ECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) OTAL PREDESIGN DESIGN SERVICES (8% OF CONSTRUCTION YEAR COST) ECT COST ALLOCATION (10.5% OF ALL DESIGN COSTS) OTAL FINAL DESIGN ESTIMATED DESIGN COST  Y RELOCATION ERIGHT UTILITY RELOCATIONS & SERVICE AGREEMENTS 1 ECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) ESTIMATED UTILITY COST  OF-WAY 1-OF-WAY / EASEMENT ACRE COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) SITION YEAR RIGHT-OF-WAY COSTS	SIGN AND FINAL DESIGN ESIGN/NEPA/PI SERVICES (0.25% OF CONSTRUCTION YEAR COST) 0.25% ECT COST ALLOCATION (10.5% OF ALL PREDESIGN COSTS) 10.50% OTAL PREDESIGN DESIGN SERVICES (8% OF CONSTRUCTION YEAR COST) 8.0% ECT COST ALLOCATION (10.5% OF ALL DESIGN COSTS) 10.50% OTAL FINAL DESIGN ESTIMATED DESIGN COST  Y RELOCATION ERIGHT UTILITY RELOCATIONS & SERVICE AGREEMENTS 1 700,000 ECT COST ALLOCATION (10.5% OF ALL UTILITY COSTS) 10.50% ESTIMATED UTILITY COST  OF-WAY -OF-WAY -OF-WAY / EASEMENT ACRE 0.0 \$ - ECT COST ALLOCATION (10.5% OF ALL RIGHT-OF-WAY COSTS) 10.50% SITION YEAR RIGHT-OF-WAY COSTS

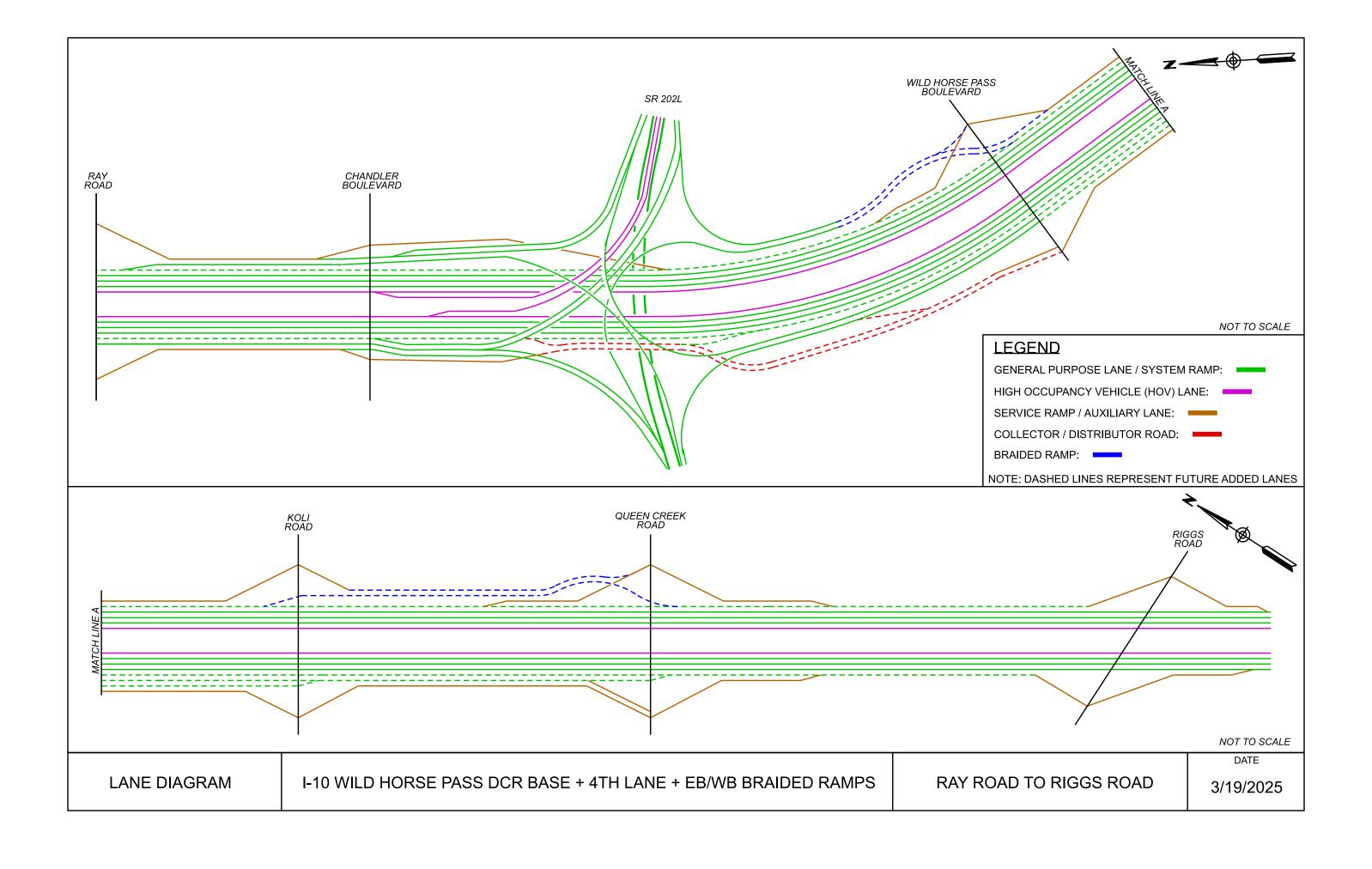


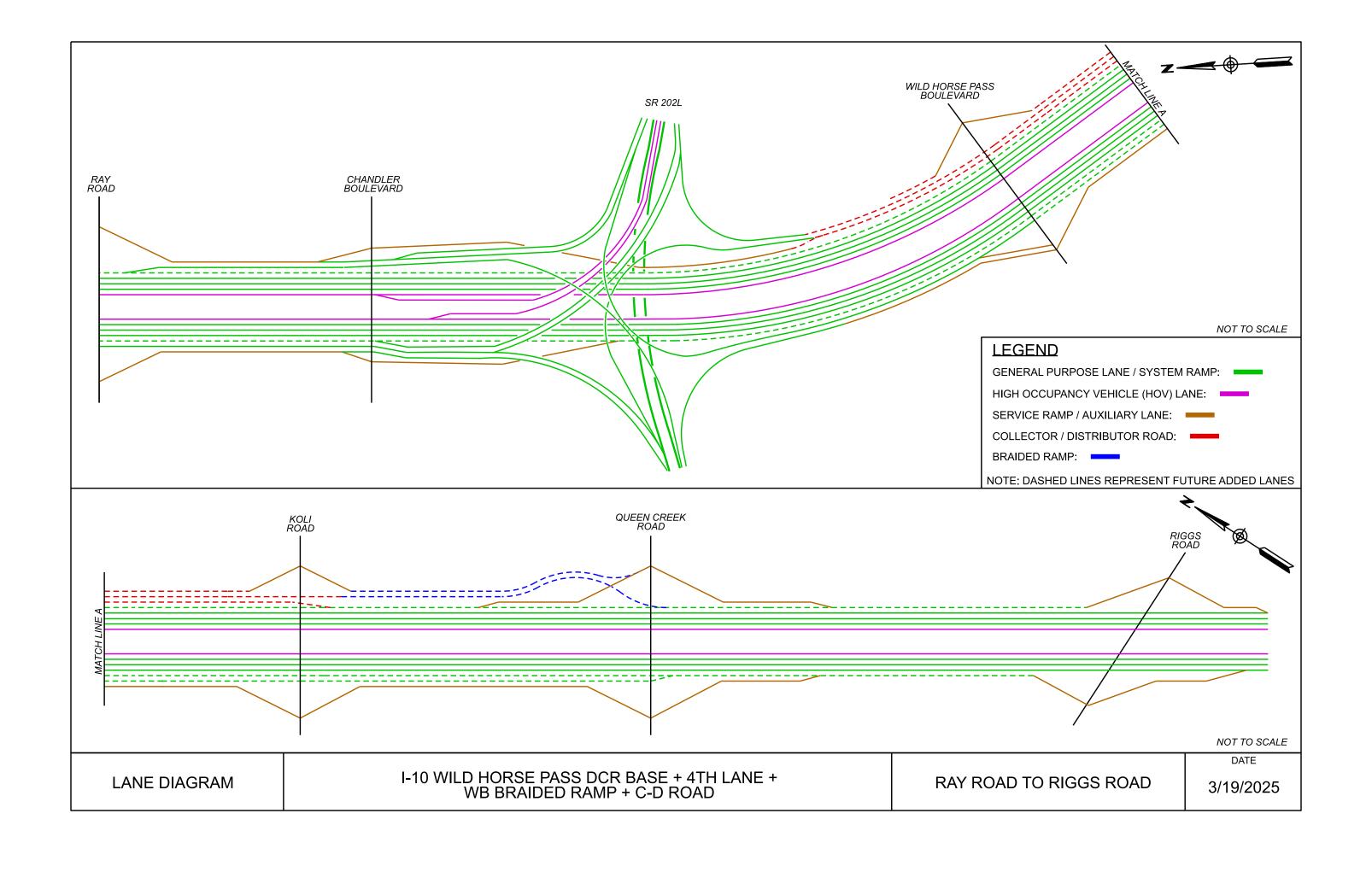
# Appendix C. Weaving Concepts and Evaluation











ADOT's Comment	HDR's Response
On the 4th lane CONTINUOUS AUX LANE OPTION - on the WB I-10 on ramp @ WHP when it ties into L202 WB-EB split, can we not have an option lane on the new 4th lane from the WB I-10 to L202? Initially, we thought the new 4th lane should be committed to only the WB I-10 by this point! The extended WHP aux lane would be only be a direct aux lane connected to L202 WB/EB at the point. There needs to be an added tapered parallel lane just outside the aux lane entrance of the L202 split to create the L202 EB lane. The intent was to get the L202 traffic committed as early as possible and let the L202 flow on its own.  ADOT has done this at EB I-10 & L202 @ 59th ave and L101 NB @ Bell exit.	The configuration you have described is definitely a possible option. It would allow vehicles to be committed to SR 202L as you described. A potential issue with this configuration is that any traffic entering I-10 WB from WHP that wants to stay on I-10 WB will have to make two lane changes in 2,600-ft causing a significant amount of friction during peak hours. We will need to evaluate this area further with traffic analysis to see which configuration makes the most sense.
4th lane + WB/EB BRAIDED RAAMPS - Between I-10 WB QC to GERMANN do we need these dual braided ramps, taking traffic off WB I-10 and allowing them in enter back on WB I-10 after going under the QC on ramp? Also, this on ramp option, takes away about 1-1/4 miles from the existing QC aux lane merging which was all the way to the WHP off ramp gore? With a DDI this would be a very heavy on ramp consistent flow that would create problems! The braided ramps at WB I-10 do good job of separating WB I-10 and L202 traffic!	You are correct. There is no need for there to be an I-10 entrance with the braided ramp. That was a hold over from a C-D road option that was drawn up.  The SR 347/QC aux lane can be carried further north. It can be carried to the Germann Rd crossing for only the cost of additional ROW and pavement which would make the aux lane length about 3/4 of a mile. Depending on the traffic volumes for the I-10 WB/Germann Rd on ramp, we can extend the SR 347/QC aux lane further to the north and make the Germann Rd on-ramp a taper type entrance ramp or a short aux lane.
4th lane + C-D ROAD OPTION - WB I-10 QC to GERMANN braided dual ramps same as comment #2 and WB I-10 WHP on ramp has too many lanes (8) and requires WHP traffic to merge 3 times! Thanks, AA	This was one of the least preferred options. It was an attempt to use a continuous C-D road between SR 347/Queen Creek. It poses many issues but wanted to show a potential layout.  Please note that the red dashed lines would be barrier separated from the I-10 mainline so there would not be as much weaving as it appears. WHP traffic would only change lanes twice to exit to I-10 WB on a slip ramp and then there would be an additional lane change to not exit to Chandler Blvd.



# Appendix D. Traffic Data



# Appendix E. Agency and Stakeholder Input



# GILA RIVER INDIAN COMMUNITY

# **Governance Center Office of the General Counsel**

Trent Kelso, PE
Project Manager
Arizona Department of Transportation
205 S. 17th Ave.
Phoenix, AZ 85007
Via email: tkelso@azdot.gov

Mr. Kelso,

The Gila River Indian Community Council has delegated certain decision-making authority for the Arizona Department of Transportation's (ADOT) Interstate 10 (I-10) and Koli Road Traffic Interchange projects to the Community's Litigation Team. On November 14, 2024, the Litigation Team met to identify the traffic interchange designs that the Community would support for the SR 347/Queen Creek Road and Koli Road Traffic Interchanges. By Official Motion, the Litigation Team directed the Office of General Counsel to inform ADOT that the Community supports Diverging Diamond Traffic Interchanges for the SR 347/Queen Creek Road and Koli Road traffic interchanges.

Thank you,

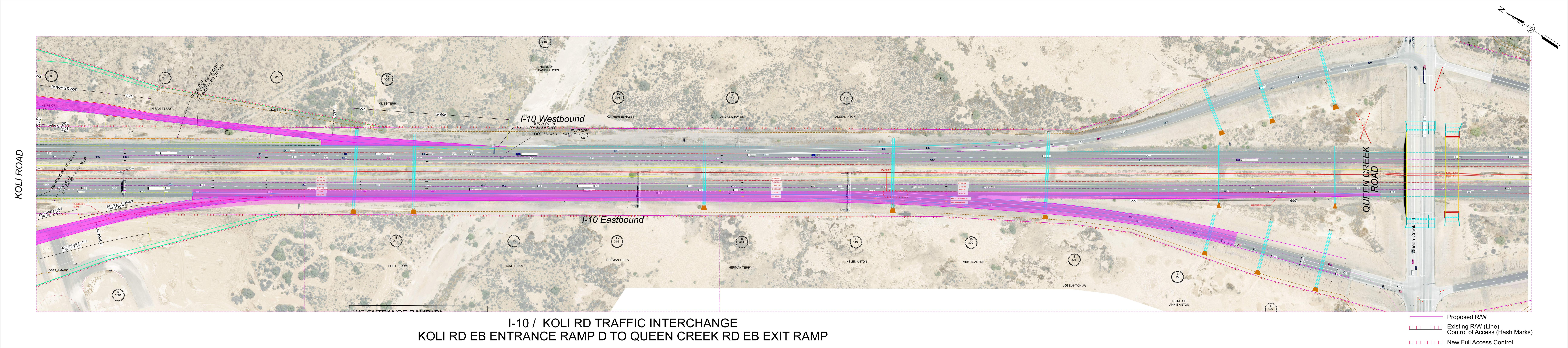
Javier Ramos General Counsel

Gila River Indian Community



# Appendix F. May 2025 Ramp Design Refinement

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## Appendix G. Koli Road TI Geotechnical Engineering Data Report

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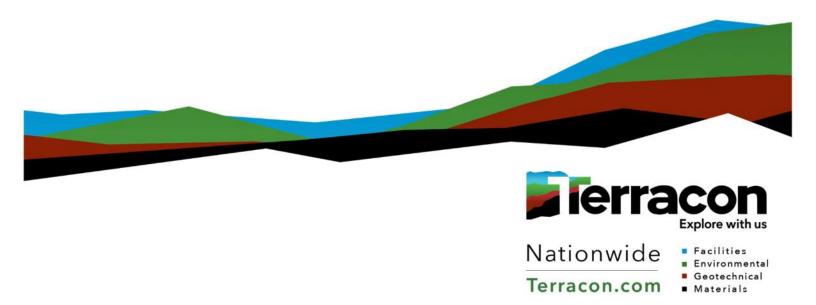
I-10 Gila River Indian Community Design-Build Project
I-10 Koli Road Traffic Interchange
ADOT General Engineering Consultant
Geotechnical Engineering Data Report

April 18, 2024 | Terracon Project No. 65225282

#### Prepared for:

HDR Engineering, Inc. 20 E. Thomas Road, Suite 2500 Phoenix, Arizona 85012

# DRAFT Final Report will be Stamped and Signed





4685 S. Ash Avenue, Suite H-4

Tempe, Arizona 85282

Phone: (480) 897-8200

Terracon.com

April 18, 2024

HDR Engineering, Inc. 20 E. Thomas Road, Suite 2500 Phoenix, Arizona 85012

Attn: Mr. Nick LaFronz, P.E.

Phone: (602) 522-7728

Email: nick.lafronz@hdrinc.com

Re: Geotechnical Engineering Data Report

I-10 Gila River Indian Community Design-Build Project

I-10 Koli Road Traffic Interchange (TI) ADOT General Engineering Consultant

Terracon Project No. 65225282

Dear Mr. LaFronz:

Terracon Consultants, Inc. (Terracon) has completed the Geotechnical Engineering Services for the above referenced project in general accordance with Terracon Change Order No. 1 for Geotechnical Engineering Services – Revision 2, dated August 17, 2023. This geotechnical engineering data report presents the findings of the subsurface exploration and provides generalized geotechnical engineering information and considerations for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon

# DRAFT Final Report will be Stamped and Signed

Eddy F. Ramirez, P.E. Geotechnical Department Manager Ramon Padilla, P.E. Geotechnical Services Manager

Reviewed By: Donald R. Clark, P.E., Senior Consultant / Senior Principal



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Land Subsidence and Earth Fissures	
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Typical Exploration Photographs	



## Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering Services performed as part of the General Engineering Consultant (GEC) services for the Arizona Department of Transportation (ADOT) Interstate Highway 10 (I-10) Gila River Indian Community (GRIC) Interstate Widening planned from SR202 (Santan / South Mountain) to SR387 (Phoenix to Casa Grande) in Arizona. The overall project limits extend from approximately I-10 Milepost (MP) 161 to MP 187. Terracon previously performed a geotechnical exploration for the overall project limits and presented the results in a report titled Geotechnical Engineering Data Report, I-10 Gila River Indian Community Design-Build Project, 202L to Gila River Bridge, ADOT General Engineering Consultant (Terracon Project No. 65225282, final report dated April 2, 2024).

The I-10 Koli Road Traffic Interchange (TI) was added to the project and is planned between the I-10 traffic interchanges at Wild Horse Pass Boulevard and Queen Creek Road. Terracon performed additional geotechnical exploration for the proposed I-10 Koli Road TI and this report was prepared for the proposed new I-10 Koli Road (TI).

The purpose of these additional geotechnical engineering services for the proposed I-10 Koli Road TI was to support HDR Engineering, Inc. (HDR) as the ADOT GEC for the project for the planned improvements. The geotechnical information presented in this report is based on the results of the field and laboratory testing, our experience with similar soil conditions, and our understanding of the proposed project. Our geotechnical engineering scope of work for this project included performing the following explorations:

- 12 Ramps & Crossroad Borings at the I-10 Koli Road TI
- 1 Ramps & Crossroad Test Pit at the I-10 Koli Road TI
- 6 Bridge Borings at the I-10 Koli Road TI

Appendix A of this report includes a Site Vicinity Map (Exhibit A-1), Site Plan and Exploration Locations (Exhibits A-2), and logs of the borings and test pit. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included in Appendix B of this report. Descriptions of the field exploration and laboratory testing are included in their respective appendices. A photographic log of selected pictures taken during the field exploration at the site is also included in Appendix C of this report.



## **Project Description**

Our initial understanding of the project was provided in our change order proposal and our final understanding of the project conditions is as follows:

Item	Description	
Information Provided	This report was prepared based on the following information provided to Terracon:  Information communicated by HDR and Google Earth KMZ files of the proposed I-10 and Koli Road traffic interchange sent on 5/11/2023; as well as subsequent updated files provided by HDR.	
Project Description	Based on the information provided, we understand the project will include widening I-10 with 1 general purpose lane and 1 High-Occupancy Vehicle (HOV) lane in each direction from SR202L to Riggs Road. The I-10 section between Riggs Road and the end of the project at MP 187 will include a general-purpose lane in each direction. As previously mentioned, the overall project extends from approximately MP 161 to MP 173, and this report is limited to the proposed new I-10 and Koli Road Traffic Interchange (TI) planned between the I-10 traffic interchanges at Wild Horse Pass Boulevard and Queen Creek Road.	
I-10 and Koli Road Traffic Interchange Bridge Structures	The new I-10 and Koli Road Traffic Interchange is planned to consist of a Diverging Diamond Interchange (DDI). Based on the information provided, the proposed bridge structures for the scope of work presented in this report consist of the following:  I-10 & Koli Road Traffic Interchange (TI) Underpass (UP)  New 2 span bridge for Koli Road WB traffic.  New 2 span bridge for Koli Road EB traffic.	
Pavements	New pavements consisting of both asphalt and portland cement concrete pavements are anticipated in order to integrate the proposed improvements with the existing roadway. Based on the information provided, the new pavement areas within the I-10 Koli Road TI limits for this report consist of the following:  I-10 Koli Road TI ramps  I-10 Koli Road TI crossroad improvements within the ADOT ROW	
Retaining and Noise Barrier Wall Structures	Retaining wall and noise barrier wall structures may or may not be incorporated into the design and construction of the project. At this time, geotechnical engineering services for retaining wall and noise barrier wall structures are excluded from Terracon's scope of work.	
Drainage	No significant drainage basins or drainage improvements are anticipated. At this time, geotechnical engineering services for stormwater retention basins, culvert drainpipes, and drainage box culverts are excluded from Terracon's scope of work.	
Grading/ Slopes	Minor cuts and fills are generally anticipated for the project. As an exception, the traffic interchange improvements are anticipated to include the construction of new embankments (or earthwork modifications to existing embankments) to elevate the new alignments of on- and off-ramps to the crossroad underpass bridge structures.	



## Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration:

Item	Description		
Location	The project consists of planned improvements to I-10 extending from SR202 (Santan / South Mountain) to SR387 between Phoenix and Casa Grande, Arizona. The overall project limits for Terracon's scope of work extend from approximately I-10 Milepost (MP) 161 to MP 173; and the project limits for this report are limited to the proposed I-10 Koli Road TI planned between the I-10 traffic interchanges at Wild Horse Pass Boulevard and Queen Creek Road. See Exhibit A-1 (Site Vicinity Map) for additional site location information.		
Existing Improvements	The I-10 corridor at the proposed I-10 Koli Road TI consists of a 6-lane freeway. The planned I-10 Koli Road TI beyond the existing freeway consist of native desert land to the east, and of vacant land, gravel paved areas, and portions of a former lake-racetrack to the southwest.		
Current Ground Cover	The majority of the existing pavements across the I-10 freeway consist of asphalt concrete pavements. The ground cover across the eastern portion of the I-10 Koli Road TI consists of native desert with a sparse to moderate growth of desert vegetation. The ground cover across the southwestern portion of the I-10 Koli Road TI includes bare soil, areas with approximately 6 inches of gravel cover, and softened surficial soils from the former lake-racetrack.		
Existing Topography	The topography along the I-10 and Koli Road TI area appears to be fairly flat, but overall the ground surface increases in elevation from south to north. Based on boring survey data obtained from the EPS Group, the ground surface elevation in the area of the I-10 Koli Road TI is roughly 1,147 feet above mean sea level (AMSL) to 1,153 AMSL.		



#### **Existing Site Conditions**

The overall project consists of the I-10 corridor extending from approximately SR202L (Santan) to SR387 between Phoenix and Casa Grande, Arizona. The overall study area limits will extend from approximately Interstate 10 Milepost 161 to Milepost 187; and the project limits for this report consist of the proposed I-10 Koli Road Traffic Interchange planned between the I-10 traffic interchanges at Wild Horse Pass Boulevard and Queen Creek Road.



The I-10 corridor at the proposed I-10 Koli Road TI consists of a 6-lane freeway. The planned I-10 Koli Road TI beyond the existing freeway consists of native desert land to the east, and of vacant land, gravel paved areas, and portions of a former lake-racetrack to the southwest (with softened surficial soils).







#### Project Alignment Overview

The project limits of this report are comprised of the planned new I-10 Koli Road TI. The following provides a general overview of the site by showing photographs of I-10 at the approximate location of the proposed I-10 Koli Road TI area. The following photographs shown in this section are extracted images compiled from Google Earth Pro Street View.

I-10 facing south at the location of the proposed I-10 Koli Road TI:



I-10 facing north at the location of the proposed I-10 Koli Road TI:



#### Previous ADOT Projects

A summary of previous ADOT projects is presented in the previously referenced report titled Geotechnical Engineering Data Report, I-10 Gila River Indian Community Design-Build Project, 202L to Gila River Bridge, ADOT General Engineering Consultant (Terracon Project No. 65225282, final report dated April 2, 2024).



## Geotechnical Characterization

## Regional Geology

The project area is located in the Basin and Range physiographic province (1Cooley, 1967) of the North American Cordillera (2Stern, et al, 1979) of the southwestern United States. The southern portion of the Basin and Range province is situated along the southwestern flank of the Colorado Plateau and is bounded by the Sierra Nevada Mountains to the west. Formed during middle and late Tertiary time (100 to 15 million years ago), the Basin and Range province is dominated by fault-controlled topography. The topography consists of mountain ranges and relatively flat alluviated valleys. These mountain ranges and valleys have evolved from generally complex movements and associated erosional and depositional processes. Drainage flows to the Gila River during late Tertiary time, coupled with structural activity discussed above, are generally responsible for the present-day topography within the basin.

Typically, the ranges in this area are of small areal extent but protrude significantly above adjacent wide alluviated plains and valleys. The basin rims are formed by the mountain ranges which consist of sedimentary, igneous and metamorphic materials which have been subjected to recurrent faulting and tilting, and in some places volcanic and intrusive events. As a result of erosion, the valleys have experienced partial infilling with sedimentary material which has been deposited as alluvial fans. Dominant features in the province consist of:

Feature	Description
Pediments	Gently dipping slopes formed due to an underlying rock erosional surface
Alluvial fans	Sediments deposited in outwash plains at areas of low water velocity
Bajadas	Alluvial fans which combine at the base of mountains
Inselbergs	Isolated hills or mountains, usually that maintain their relief after erosion of surrounding rock

<sup>&</sup>lt;sup>1</sup> Cooley, M.E., 1967, Arizona Highway Geologic Map, Arizona Geological Society.

<sup>&</sup>lt;sup>2</sup> C.W. Stern, R.L. Carroll, T.H. Clark, et al, 1979, Geological Evolution of North America, John Wiley & Sons, Santa Barbara, California.



#### Site Specific Geology

The red outline shown on the following figure includes the approximate location of the proposed I-10 Koli Road TI. The mapped surficial geologic conditions (3Richard, et al, 2000) indicates the I-10 Koli Road TI is generally within an area of Holocene surficial deposits. These Holocene surficial deposits generally consist of unconsolidated deposits associated with modern fluvial systems, and include fine-grained, well-sorted sediment on alluvial plains, but also include gravelly channel, terrace, and alluvial fan deposits on middle and upper piedmonts.



#### Land Subsidence and Earth Fissures

A review of published maps available from the Arizona Geological Survey (4AZGS, 2014), indicates the project site is located in a broad general area of central Arizona known for historic ground subsidence due to groundwater withdrawal. This has historically resulted in the formation of earth fissures in certain parts of the region. The AZGS is actively

<sup>&</sup>lt;sup>3</sup> S.M. Richard, S.J. Reynolds, J.E. Spencer, and P.A. Pearthree, 2000, "Geologic Map of Arizona", Map 35.

<sup>&</sup>lt;sup>4</sup>Arizona Geological Survey (AZGS) 2014, Earth Fissure Map of Pinal County, Digital Map Series Earth Fissure Map 21, DM-EF-21.



updating their data base regarding earth fissuring. Based on our review of the available AZGS geological information, the nearest earth fissure study area is mapped at approximately 12 miles southeast of the proposed I-10 Koli Rd TI. Evidence of earth fissures was not observed on the site during the field exploration or site reconnaissance. However, continued groundwater withdrawal in the area may result in additional subsidence and the formation of new fissures or the extension of existing fissures. The following figure includes earth fissure study areas surrounding the site. The areas outlined with light blue lines are AZGS earth fissure study areas, and the site is shown within the red outlined polygon.



#### **Subsurface Conditions**

Appendix A of this report includes a Boring Location Summary Table providing the approximate boring locations, ground surface elevations, boring depths, boring designation/purpose, and drilling method. Specific conditions encountered at each boring location are indicated on the individual boring logs included in Appendix A of this report. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. The results of the field and laboratory testing indicated variations in subsurface conditions and engineering characteristics throughout the site. The subsurface conditions for the project can be generalized as listed in the following table:



Generalized Subsurface Soil Conditions Summary				
Planned I-10 Koli Road Traffic Interchange & Ramps & Crossroad				
Description	Approx. Depth to Bottom of Stratum (feet)	Material Encountered	Relative Density / Consistency	
Stratum 1	4 to 14	Coarse-Grained Soils with variable amounts of Gravel, Silt and Clay; and stratified with Fine Grained Soils	Loose to Medium Dense / Stiff to Very Stiff	
Stratum 2	49 to 59	Stratified deposits of Lean Clay, Sandy Lean Clay, Fat Clay, Silt, and Coarse-Grained Soils with variable amounts of Gravel	Variable Medium Dense to Very Dense / Variable Stiff to Hard	
Groundwater at approx. 62 to 76 feet deep (approx. Elev. 1,075 to 1,090 ft. a			5 to 1,090 ft. amsl)	
Stratum 3 A	120½ (maximum depth explored)	Coarse-Grained Soils with variable amounts of Silt, Gravel and Cobbles	Dense to Very Dense	

A. Auger refusal encountered in Stratum 3 soils due to gravels and possible cobbles at a depth of approximately 101½ feet and 109 feet at the location of Boring B-21 and Boring B-24, respectively.

#### Summary of Laboratory Test Results

Laboratory tests were performed on selected soil samples and the test results are presented in Appendix B of this report. The results of the laboratory testing of soil samples obtained from the borings will be used for geotechnical engineering analysis for the proposed project. Individual and detailed laboratory test reports are presented in Appendix B of this report (and are followed by Summary of Laboratory Results tables). The following tables provide a brief summary of laboratory test results:

Koli Road Ramps & Crossroad at I-10 (Borings R&C-39 through R&C-53 and Test Pit TP-1)		
Laboratory Tests Summary of Test Results		
Atterberg Limits ASTM D4318 (29 Tests)	Plasticity Index (PI) ranged from 0 to 27 (with an average of 8)	
Grain Size / Gradation ASTM D422 and C136 (29 Tests)	Gravel content ranged from 0% to 20% Sand content ranged from 8% to 94% Fines content ranged from 1% to 92% (with an average of 41%)	
One-Dimensional Remolded Swell ASTM D4546 (3 Tests)	Expansion potentials ranged from 0.1 to 0.9%	



Koli Road Ramps & Crossroad at I-10 (Borings R&C-39 through R&C-53 and Test Pit TP-1)		
Laboratory Tests	Summary of Test Results	
Moisture-Density Relationships ASTM D698 (3 Tests)	Maximum Dry Density ranged from 122.3 to 123.5 pcf Optimum Water Content ranged from 9.6 to 11.5%	
One-Dimensional Consolidation ASTM D2435 (6 Tests)	Compression (%) at a 4 ksf surcharge ranged from 2.3 to 3.3%, and subsequent hydro-compaction/collapse (%) ranged from 1.1 to 5.8%	
Direct Shear ASTM D3080 (2 Tests) (Samples not inundated and tested at as- sampled or in-situ moisture contents)	Maximum Shear Stress Values: Internal Friction Angle ranged from 15° to 28° (with an avg. of 22°) Cohesion intercept values ranged from 538 to 825 psf (with an avg. of 682 psf) Maximum Displacement Values: Friction Angle ranged from 13° to 30° (with an average of 22°) Cohesion intercept values ranged from 108 to 646 psf (with an avg. of 377 psf)	

I-10 Traffic Interchange Underpass Bridge at Koli Road (Borings B-20 through B-25)		
Laboratory Tests	Summary of Test Results	
Atterberg Limits ASTM D4318 (22 Tests)	Plasticity Index (PI) ranged from 0 to 53 (with an average of 14)	
Grain Size / Gradation ASTM D422 and C136 (21 Tests)	Gravel content ranged from 0% to 32% Sand content ranged from 4% to 76% Fines content ranged from 8% to 92% (with an average of 53%)	
One-Dimensional Consolidation ASTM D2435 (10 Tests) (near surface soils)	Compression (%) at a 4 ksf surcharge ranged from 1.4 to 3.5%, and subsequent hydro-compaction/collapse (%) ranged from 0.3 to 5%.	
One-Dimensional Consolidation ASTM D2435 (10 Tests) (deeper clay soils)	Compression (%) at a 8 ksf surcharge ranged from 3.6 to 4.5%, and Subsequent wetting resulted in hydro-compaction/collapse and swelling. Hydro-compaction/collapse (%) ranged from 0 to 0.1%, and swelling ranged from 0 to 0.7%.	
Direct Shear ASTM D3080 (3 Tests) (Samples not inundated and tested at as- sampled or in-situ moisture contents)	Maximum Shear Stress Values: Internal Friction Angle ranged from 2° to 35° (with an avg. of 23°) Cohesion intercept values ranged from 352 to 1,433 psf (w/ avg. of 719 psf) Maximum Displacement Values: Friction Angle ranged from 0° to 34° (with an average of 21°) Cohesion intercept values ranged from 48 to 1,371 psf (with an avg. of 495 psf)	



#### **Groundwater Conditions**

Groundwater was observed at some of the test borings at the time of our field exploration. These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times, or at other locations. Groundwater conditions can change with varying seasonal and weather conditions, and other factors. The depth to groundwater was measured while drilling, and where possible at the completion of drilling. A summary of the groundwater depth/elevations obtained at the time of exploration is presented in the following table:

Groundwater Elevation / Depth Summary		
Proposed TIUP Bridge Improvement	Approx. Elevation (ft) / Depth (ft) At time of field exploration	
I-10 & Koli Road (Borings B-20 through B-25)	1,075 to 1,090 / 62 to 76	

Additional groundwater level information was obtained from the Arizona Department of Water Resources (ADWR). Based information obtained from the ADWR Groundwater Data website (https://gisweb.azwater.gov/waterresourcedata/GWSI.aspx), the depth to regional groundwater in the vicinity of the site is summarized in the following table:

Well Reg. I.D. / Local I.D.	Depth to Groundwater (ft)	Water Elevation (ft MSL)	Date Last Checked	Comment
331553111574501 Local ID: D-02-04 08DDA	73	1,078	1/12/2023	Approx. 525 feet NW of Boring R&C-52

#### Seismic Considerations

Based on our subsurface explorations, the Seismic Site Class classifications were determined in general accordance with Table 3.10.3.1-1 of the American Association of State Highway and Transportation Officials (AASHTO) Load-and-Resistance Factor Design (LRFD) Bridge Design Manual (5AASHTO, 2012). The following table presents the seismic site classification and site coefficients based on the AASHTO LRFD Bridge Design Manual:

Description	Values
Site Class	D
Approx. Latitude	33.2671°
Approx. Longitude	-111.9572°



Description	Values
PGA	0.0442
$S_s$	0.098
S <sub>1</sub>	0.033
$F_{pga}$	1.6
Fa	1.6
F <sub>v</sub>	2.4

Note: AASHTO's recommended PGA maps have a return period of 1000 years, which corresponds to a 7% probability of exceedance in 75 years.

The Design Response Spectrum for the bridge structures should be constructed based on the information presented in the table above and the procedure outlined in Section 3.10.4.1 of the AASHTO LRFD Bridge Design Manual.

#### **Corrosion Characteristics**

Laboratory testing was performed on select samples obtained from selected borings along the alignment. The results of the laboratory testing are summarized in the following tables:

Summary of Chemical Laboratory Testing <sup>1</sup>										
Koli Road Tl Ramps & Crossroad										
Exploration Depth Latitude / Designation (ft) Latitude / Longitude PH Resistivity (ohm-cm) (mg/kg) (mg/kg)										
R&C-39	0.5 - 6	33.267°/-111.958°	9.3	2,349	268	43				
R&C-46	2 - 8	33.266°/-111.955°	8.3	268	562	1,264				
R&C-50	2 - 7	33.266°/-111.959°	8.6	483	666	555				
R&C-52	0.5 - 6	33.263°/-111.962°	8.6	2,013	1,251	397				

Summary of Chemical Laboratory Testing <sup>1</sup>										
I-10 Traffic Interchange Underpass Bridge at Koli Road										
Exploration Depth Latitude / Designation (ft) Latitude / Designation (ft) Longitude PH Resistivity Sulfates Chlorides (ohm-cm) (mg/kg)										
B-20	0 - 4	33.267°/-111.958°	8.2	315	1,392	2,719				
B-21	1 - 6	33.267°/-111.957°	8.5	872	253	156				
B-25	0 - 5	33.267°/-111.957°	9.6	1,879	78	400				

Note 1: Test results indicate the site soils have variable low to significant concentrations of both soluble sulfates and chlorides. The minimum electrical resistivity test results indicate the site soils are variable moderately to very corrosive.



These values should be used to help determine potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction. Refer to Appendix B of this report for the complete results of the corrosivity testing performed on the site soils in conjunction with this geotechnical exploration. The corrosion information presented is specific to the samples tested. If the actual soils that will be in contact with the structures at the site are different than those tested, then additional corrosion testing should be performed. Terracon is not a corrosion engineer, and our scope of work was limited to performing corrosion laboratory tests on selected samples, presenting these results, and providing a brief comparison of the results to selected criteria. A qualified corrosion engineer should be consulted if corrosion of underground utilities and structures is a concern. Concrete and other materials used for the construction of the project should be designed to meet the specifications and requirements for the project. Provisions for concrete are included in the ACI Building Code Requirements for Structural Concrete, Section 318, Chapter 19.

## Geotechnical Overview

This Geotechnical Engineering Data Report was prepared to provide geotechnical information for the project based upon the results of the test borings performed by Terracon (the logs of which are presented in Appendix A) and laboratory testing (which is presented in Appendix B), and the following sections of this report are limited to providing a geotechnical overview of the site and general geotechnical considerations for the project. Based on the information provided, we understand the geotechnical engineering recommendations for the design and construction of earth connected phases of the project will be developed by the awarded design-build team for the project. The geotechnical engineering recommendations for the design and construction of earth connected phases of the project should be performed in accordance with the ADOT Standard Specifications and requirements, as amended by any project special provisions or other project requirements and specifications. The General Comments section provides an understanding of the report limitations.

## Pavement Subgrade Parameters

Terracon's scope of work for this project includes the preparation of this Geotechnical Engineering Data Report, as well as the preparation of the Initial and Final Pavement Design Summary (PDS) and Initial and Final Materials Design Report (MDR), which are presented under separate covers. We understand that the preparation of addenda to the Final PDS and MDR will be the responsibility of the awarded design-build team for the project.



#### R-Values and Correlated R-Values

The geotechnical field exploration included boring explorations for the proposed traffic interchange performed with a truck-mounted drill rig (and a backhoe for 1 test pit in the former racetrack lake area). The field explorations performed are listed in the Boring Location Summary Tables in Appendix A, and are shown in the attached Site Plan and Exploration Locations (Exhibit A-2) in Appendix A. The boring logs and laboratory test results performed for the project are included in Appendices A and B of this report. The following table outlines the field and laboratory test results and provides correlated R-values for comparison with the subgrade acceptance criteria for the project:

	Summary of Correlated R-Values									
	<u>Koli Ro</u>	ad Ramps & Cro	ssroads a	at I - 1	<u>O</u>					
Exploration Designation	Approx. Existing Ground Surface Elevation (ft)	Latitude / Longitude	Depth (ft)	LL	PI	-#200	Correlated R-Value 1 / Tested R-Value			
			0.5 - 6	19	3	33	56 /			
R&C-39	1,150.86	33.267°/ -111.958°	7 - 8	0	0	8	90 /			
		111.730	9 - 10	0	0	59	44 /			
R&C-40	1,150.98	33.267°/ -111.958°	1 - 6	22	8	37	44 /			
R&C-41	1,151.41	33.266°/ -111.955°	1 - 6	22	10	38	40 /			
R&C-42	1,151.59		0 - 3	0	0	59	44 /			
		33.265°/ -111.956°	3 - 8	26	9	52	34 /			
			4 - 5	31	14	50	29 /			
			9 - 10	0	0	35	61 /			
R&C-43	1,149.01	33.270°/	0 - 4	24	9	40	41 /			
NGO 43	1,147.01	-111.959°	2 - 3	22	5	57	37 /			
R&C-44	1,151.37	33.268°/ -111.957°	2 - 7	0	0	27	69 /			
R&C-45		S	ee Note 2							
			0 - 2	0	0	37	60 /			
R&C-46	1,152.63	33.266°/ -111.955°	2 - 8	19	6	32	51 /			
		111.700	4 - 5	21	2	33	59 /			
R&C-47		S	ee Note 2							
R&C-48		S	ee Note 2							
R&C-49	1,150.02	33.266°/ -111.959°	3 - 8	25	9	29	47 /			
R&C-50	1,150.30	33.266°/ -111.959°	2 - 7	27	15	36	34 / 21			
R&C-51	See Note 3	33.265°/ -111.960°	3 - 8	24	7	31	50 /			

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#### Summary of Correlated R-Values Koli Road Ramps & Crossroads at I-10 Correlated Approx. Existing Exploration Latitude / Depth R-Value 1 -#200 **Ground Surface** LL РΙ Designation (ft) / Tested Longitude Elevation (ft) R-Value 0.5 - 6 23 9 35 43 / 35 33.263°/ R&C-52 See Note 3 4 - 5 10 42 38 / --26 -111.962° 9 - 10 99 / --0 0 1 33.263°/ R&C-53 9 1,147.11 25 47 37 / --1 - 6 -111.962° 2 - 4 33 15 29 37 / --33.266°/ TP-1 See Note 3 -111.960° 8 - 10 38 24 35 / --

Summary of Correlated R-Values										
I-10 Traffic Interchange Underpass Bridge at Koli Road										
Exploration Designation	Approx. Existing Ground Surface Elevation (ft)	Approx. Station and CL Offset	Depth (ft)	LL	PI	-#200	Correlated R-Value <sup>1</sup> / Tested R-Value			
B-20	1,151.32	970+00; 115R±	0 - 4	19	6	39	46 /			
	,		5 - 7	20	5	30	54 /			
B-21	1,152.38	970+00; CL±	1 - 6	20	5	30	55 /			
B-22	1,151.57	970+00; 115L±	2 - 6	19	5	29	55 /			
D-22	1,131.37	770+00, TISE±	7 - 8	0	0	8	90 /			
B-23	1,151.15	971+00; 115R±	0 - 5	21	7	48	39 /			
D-23	1,131.13	771+00, 113K±	5 - 10	22	8	38	43 /			
B-24	1,152.10	971+00; CL±	2 - 7	20	3	27	62 /			
B-25	1,151.36	971+00; 115L±	0 - 5	26	12	39	37 /			
D-23	1,131.30	//ITOU, ITOLE	4 - 5	0	0	30	66 /			

Note 1: The correlated R-Values are in general accordance with Section 2.1.5.1 (Correlated R-value) and Table 2-3 (Correlated R-value at 300 psi) of the ADOT Pavement Design Manual (2017).

Note <sup>2</sup>: Boring exploration pending additional environmental clearance.

Note 3: Planned exploration location not accessible due to soft surficial soils from the former race lake area, and exploration location was moved to the edge of the lake area and was not surveyed.



#### Potential Unsuitable Subgrade Materials

Terracon's scope of work for this project included the preparation of this Geotechnical Engineering Data Report, as well as the preparation of the Initial and Final Pavement Design Summary (PDS) and Initial and Final Materials Design Report (MDR), which are presented under separate covers. The preparation of addenda to the Final PDS and Final MDR will be the responsibility of the awarded design-build team for the project. Once a minimum R-value requirement is determined for the project, areas of the proposed roadway alignment that include subgrade soils with an R-value of less than the requirement (unsuitable subgrade materials) will require over-excavation of these areas to a minimum depth of 3 feet below finished subgrade. The over-excavated areas should be replaced with suitable soils meeting the project R-value requirements. Other mitigations for unsuitable subgrade may be possible provided they are approved by ADOT and the GEC, and provided the requirements and specifications for the project are met.

#### Earthwork Factors

Though the majority of improvements will be made with the addition of fills, some reworking of the existing site soils will be necessary. Earthwork factors were estimated based on laboratory density tests on selected near surface ring samples obtained from the borings, as well as from past experience with similar soils. The shrinkage factors are based on a comparison of the in-situ dry densities to the density of selected bulk samples compacted to 95 percent of their maximum dry density as determined by ASTM D698 (Standard Proctor). Earthwork factors along with the results of our field and laboratory testing are presented in following table:

	Loc	cation	Field Test	Lab Test	95%	Shrink /
Boring No.	Depth (ft)	Latitude / Longitude	Dry Density	Proctor Dry Density	Proctor Dry Density	Swell at 95% Compaction
			(pcf)	(pcf)	(pcf)	(%)
R&C-39	1 to 2'	33.267°/-111.958°	115.0	123.5	117.3	2
R&C-39	4 to 5'	33.207 7-111.930	106.4	123.5	117.3	9
R&C-40	1 to 2'	33.267°/-111.958°	105.9	122.3	116.2	9
R&C-40	4 to 5'	33.207 7-111.930	107.9	122.3	116.2	7
R&C-41	1 to 2'	33.266°/-111.955°	104	122.3	116.2	10
R&C-42	2 to 3'	33.265°/-111.956°	102	122.3	116.2	12
R&C-42	4 to 5'	33.203 /-111.930	98	122.3	116.2	16
R&C-43	2 to 3'	33.270°/-111.959°	108	122.3	116.2	7
R&C-43	4 to 5'	33.270 /-111.939	106	122.3	116.2	9
R&C-44	1 to 2'	33.268°/-111.957°	110	123.5	117.3	7



	Loc	cation	Field Test	Lab Test	95%	Shrink /			
Boring No.	Depth (ft)	Latitude / Longitude	Dry Density	Proctor Dry Density	Proctor Dry Density	Swell at 95% Compaction			
			(pcf)	(pcf)	(pcf)	(%)			
R&C-44	4 to 5'		107	123.5	117.3	9			
R&C-45			See No	ite <sup>A</sup>					
R&C-46	2 to 3'	33.266°/-111.955°	105	123.5	117.3	11			
R&C-46	4 to 5'	33.200 /-111.933	104	123.5	117.3	11			
R&C-47	See Note <sup>A</sup>								
R&C-48			See No	ote <sup>A</sup>					
R&C-49	1 to 2'	33.266°/-111.959°	114	122.3	116.2	2			
R&C-49	4 to 5'	33.200 /-111.939	110	122.3	116.2	5			
R&C-50	1 to 2'	33.266°/-111.959°	97	122.3	116.2	16			
R&C-50	4 to 5'	33.200 /-111.939	107	122.3	116.2	8			
R&C-51	1 to 2'	33.265°/-111.960°	109	123.5	117.3	7			
R&C-51	4 to 5'	33.203 /-111.900	109	123.5	117.3	7			
R&C-52	1 to 2'	33.263°/-111.962°	107	122.3	116.2	8			
R&C-52	4 to 5'	33.203 /-111.902	106	122.3	116.2	9			
R&C-53	1 to 2'	33.263°/-111.962°	109	122.3	116.2	6			
R&C-53	4 to 5'	33.203 /-111.902	103	122.3	116.2	11			
		Overall Ave	erage of Tab	ulated Data	a (Shrink):	9			

General Note: Positive values are shrink and negative values are swell. Standard Proctor from a nearby exploration location was used for exploration locations that excluded Proctor testing.

Note <sup>A</sup>: Boring exploration pending additional environmental clearance.

The tabulated results indicate an average on the order of approximately 5 to 15 percent shrinkage. This estimate is general in nature, and based on the limited data from our field exploration, the soil conditions encountered at the site, and our experience. Earthwork factors may vary dependent upon the actual subsurface conditions, which may include variations in soil gradations and gravel contents. Earthwork values are also expected to be less in areas subjected to lower levels of compaction or where the existing natural soils are denser. Conversely, earthwork values are expected to be greater in areas subjected to higher levels of compaction or where the existing natural soils are looser.

The shrink/swell information shown above are estimates based on removal of the surface and near surface soils and the placement of these soils at 95 percent compaction. New roadway embankment fills are planned to be constructed with heights of up to roughly 30 feet above the existing ground surface. The loading of the existing soils with new fills is



anticipated to result in some settlement. The anticipated settlements due to the placement of new roadway embankment fills are excluded from the shrink/swell estimates shown above, and should be considered in the design, construction and cost estimates prepared for the project.

Note: The surficial soils in the former race lake area and in the area of Boring Nos. R&C-45, R&C-47, and R&C-48 were inaccessible to the field exploration vehicles due to very loose/soft surficial soils. The earthwork shrinkage factors are anticipated to be greater in these very loose/soft surficial areas than those shrinkage factors outlined above.

## **General Comments**

This geotechnical engineering data report excludes recommendations, opinions or conclusions and is limited to presenting geotechnical information and generalized geotechnical considerations. The information and generalized considerations presented in this report are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be notified to provide further evaluation and develop supplemental information and considerations. The geotechnical engineering recommendations for the design and construction of the project will be developed by the awarded design-build team for the project.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

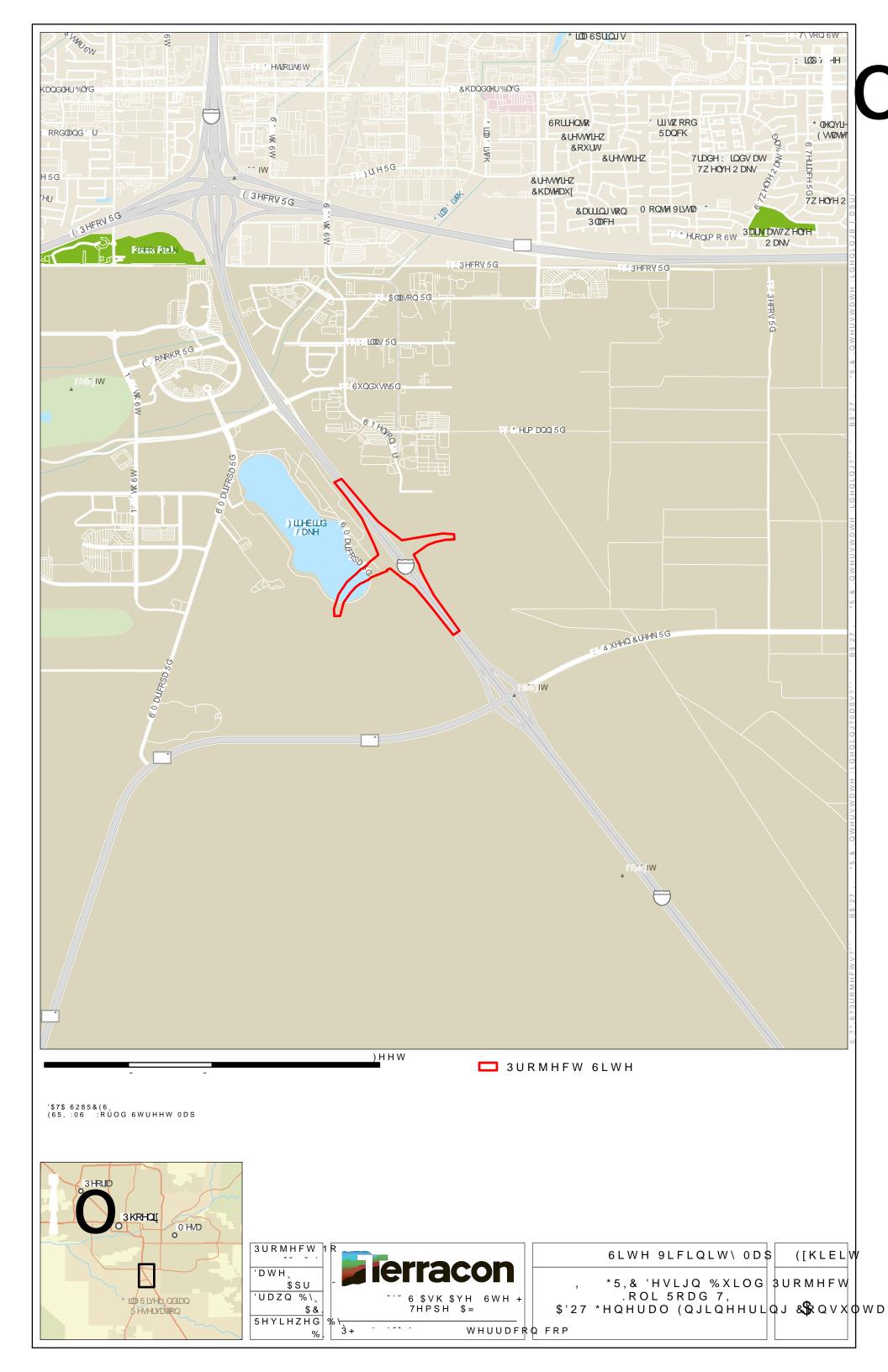
Site characteristics as provided are for informational purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in

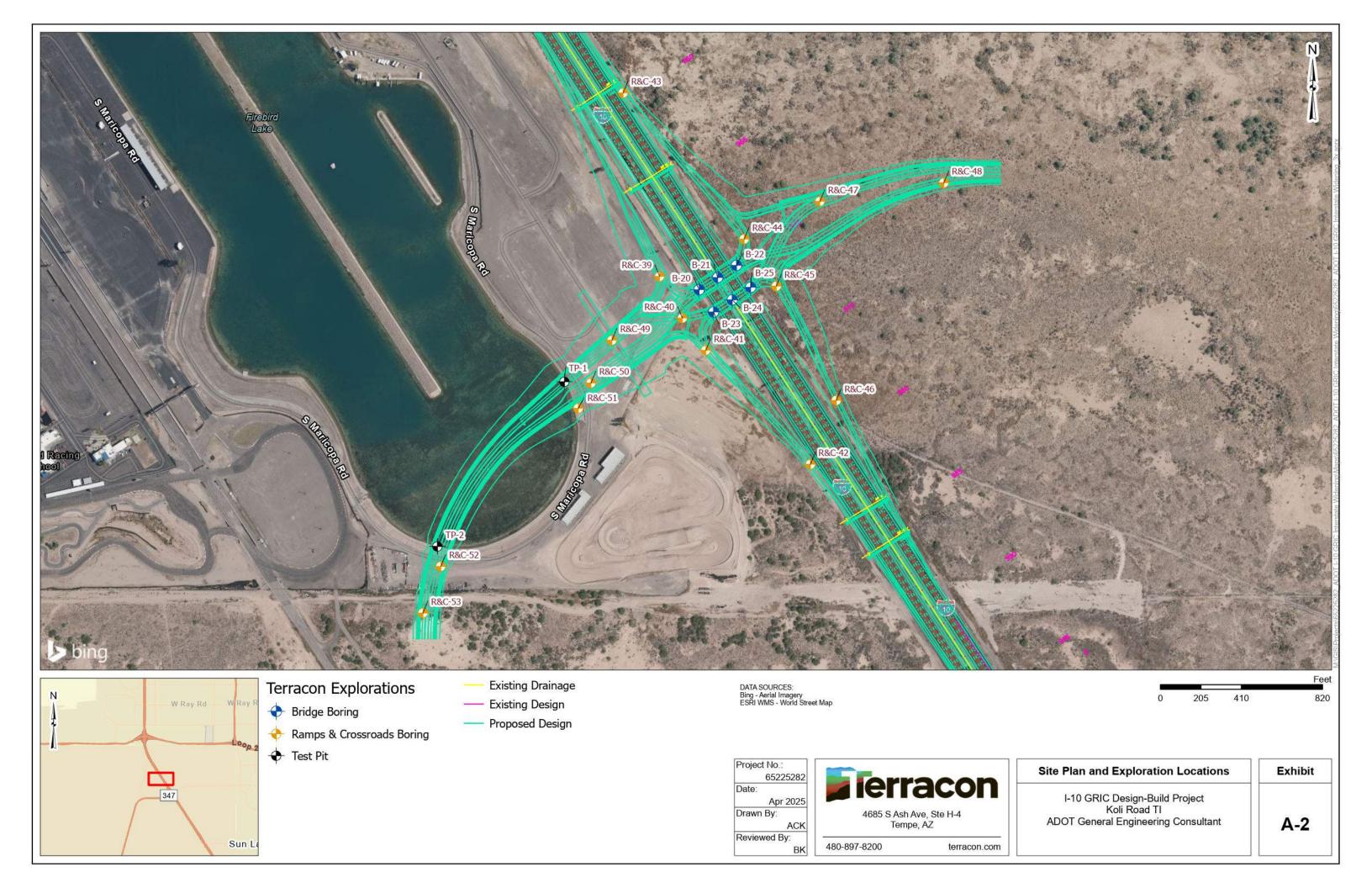


the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.



## APPENDIX A







## Field Exploration and Testing Procedures

A total of 18 test borings were drilled, and 1 test pit was excavated for the proposed Koli Road TI between February 17, 2025 and February 28, 2025. The approximate boring and test pit locations at the project site are shown on the Site Plan and Exploration Locations map (Exhibit A-2), and the locations and depths of the borings and test pit are summarized in the following table:

Number of Explorations	Boring ID Nos.	Approximate Exploration Depths (feet)	Location
12 Borings	R&C-39 through R&C-44, R&C-46, R&C-49 through R&C-53	20½ to 50½	Proposed Ramps & Crossroads
3 Borings	Boring Nos. R&C-45, R&C-47 a additional environmental clearar	, ,	Proposed Ramps & Crossroads
6 Borings	gs B-20 through B-25 101½ to 120½		Proposed Bridge Structures
1 Test Pit	TP-1	10	Proposed Ramps & Crossroads

<sup>1.</sup> Auger refusal was encountered in sand, gravel, and possible cobbles at a depth of approximately 101½ feet and 109 feet at Borings B-21 and B-24, respectively.

Boring and Test Pit Layout and Elevations: The boring and test pit locations were surveyed by the EPS Group prior to the field exploration. The survey information (latitude, longitude and elevation) for the boring locations was provided by EPS Group and is included on the boring and test pit logs. The original planned exploration locations at Borings R&C-51 and R&C-52 and Test Pit TP-1 were not accessible due to the existing lake; therefore, the borings and test pit were moved to the edge of the lake and were not surveyed. The logs for Borings B-20 through B-25 also include the approximate I-10 centerline (CL) station and offset.

Subsurface Exploration Procedures: The borings were advanced with a truck-mounted CME-75 drill rig utilizing 7-inch outside diameter hollow-stem augers. At selected intervals, samples of the subsurface materials were taken at each boring location by driving splitspoon (SPT) or ring-lined barrel samplers in general accordance with ASTM Standards. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. A 3-inch O.D. split-barrel sampling spoon with a 2.5-inch I.D. ring lined



sampler was also used for sampling the soil borings. Ring-lined, split-barrel sampling procedures are similar to the standard split spoon sampling procedure; however, blow counts are typically recorded for 6-inch intervals for a total of 12 inches of penetration. Bulk samples of subsurface materials were obtained from the borings.

Groundwater was encountered at the bridge borings during the field exploration. Groundwater depths and elevations are tabulated in this report and are shown on the Bridge boring logs. Borings that encountered groundwater were backfilled in accordance with the approved ADWR permit requirements, including grouting the upper 20 feet of the borehole. The borings were backfilled with auger cuttings. Borings performed in developed/parking areas were backfilled with auger cuttings mixed with cement in the upper 15 feet of the borehole.

The test pit was excavated using a John Deere backhoe excavator equipped with a 24-inch wide bucket. Groundwater was not encountered during excavation. The test pit was backfilled with excavated soils upon completion.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring and test pit logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring and test pit logs as part of the drilling and excavation operations. These field logs included visual classifications of the materials observed during drilling and excavation, and our interpretation of the subsurface conditions between samples. Final boring and test pit logs were prepared from the field logs. The final boring and test pit logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.



## **Boring Location Summary Tables**

	<u>Kol</u>	i Road Ramps & Cro	ossroads at	<u>I -10</u>	
Boring / Test Pit No.	Latitude / Longitude	Approx. Existing Ground Surface Elevation (ft)	Approx. Depth (ft)	Designation	Drilling / Excavation Method
R&C-39	33.2672°/ -111.9582°	1151	50.5	Ramps & Crossroads	Hollow Stem Auger
R&C-40	33.2667°/ -111.9579°	1151	50.5	Ramps & Crossroads	Hollow Stem Auger
R&C-41	33.2663°/ -111.9548°	1151	50.5	Ramps & Crossroads	Hollow Stem Auger
R&C-42	33.2647°/ -111.9558°	1152	30.5	Ramps & Crossroads	Hollow Stem Auger
R&C-43	33.2699°/ -111.9588°	1149	30.5	Ramps & Crossroads	Hollow Stem Auger
R&C-44	33.2678°/ -111.9569°	1151	50.5	Ramps & Crossroads	Hollow Stem Auger
R&C-45		S	ee Note 1		
R&C-46	33.2655°/ -111.9554°	1153	30.5	Ramps & Crossroads	Hollow Stem Auger
R&C-47		S	ee Note 1		
R&C-48		S	ee Note 1		
R&C-49	33.2664°/ -111.9590°	1150	50.5	Ramps & Crossroads	Hollow Stem Auger
R&C-50	33.2658°/ -111.9594°	1150	29	Ramps & Crossroads	Hollow Stem Auger
R&C-51	33.2655°/ -111.9596°	See Note 2	50	Ramps & Crossroads	Hollow Stem Auger
R&C-52	33.2632°/ -111.9619°	See Note 2	20.5	Ramps & Crossroads	Hollow Stem Auger
R&C-53	33.2626°/ -111.9622°	1147	20.5	Ramps & Crossroads	Hollow Stem Auger
TP-1	33.2657°/ -111.9599°	See Note 2	10	Ramps & Crossroads	24-inch Bucket

<sup>1.</sup> Boring exploration pending additional environmental clearance.

<sup>2.</sup> Planned exploration location not accessible due to soft surficial soils from the former race lake area, and the exploration location was moved to the edge of the lake area and was not surveyed.

#### Geotechnical Engineering Data Report

I-10 Gila River Indian Community Design-Build Project | I-10 Koli Road Traffic Interchange (TI) April 18, 2024 | Terracon Project No. 65225282



	I-10 Koli Road Traffic Interchange Bridge Borings										
Boring No.	Approx. Station and CL Offset	Approx. Existing Ground Surface Elevation (ft)	Approx. Depth (ft)	Designation	Drilling Method						
B-20	970+00; 115R ±	1151	119.5	Bridge	Hollow Stem Auger						
B-21	970+00; CL ±	1152	101.5	Bridge	Hollow Stem Auger						
B-22	970+00; 115L ±	1152	120.5	Bridge	Hollow Stem Auger						
B-23	971+00; 115R ±	1151	120.5	Bridge	Hollow Stem Auger						
B-24	971+00; CL ±	1152	109	Bridge	Hollow Stem Auger						
B-25	971+00; 115R ±	1151	119.5	Bridge	Hollow Stem Auger						

#### **General Notes**

Sampling	Water Level	Field Tests
TT M	Water Initially Encountered	N Standard Penetration Test Resistance (Blows/Ft.)
Auger Ring Cuttings Sampler	Water Level After a Specified Period of Time	(HP) Hand Penetrometer
Standard Penetration	Water Level After a Specified Period of Time	(T) Torvane
Test	Cave In Encountered	(DCP) Dynamic Cone Penetrometer
	Water levels indicated on the soil boring logs are the levels measured in the borehole at the times	UC Unconfined Compressive Strength
Note: Bullnose penetration test noted as blows per foot on boring log,	indicated. Groundwater level variations will occur over time. In low permeability soils, accurate	(PID) Photo-Ionization Detector
where performed.	determination of groundwater levels is not possible with short term water level observations.	(OVA) Organic Vapor Analyzer

#### **Descriptive Soil Classification**

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

#### **Location And Elevation Notes**

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

<b>Relative Density o</b> (More than 50% ret Density determined Res	e.)									
Relative Density	Standard Penetration or N-Value (Blows/Ft.)	Ring Sampler (Blows/Ft.)	Consistency	Unconfined Compressive Strength Qu (psf)	Standard Penetration or N-Value (Blows/Ft.)	Ring Sampler (Blows/Ft.)				
Very Loose	0 - 3	0 - 5	Very Soft	less than 500	0 - 1	< 3				
Loose	4 - 9	6 - 14	Soft	500 to 1,000	2 - 4	3 - 6				
Medium Dense	10 - 29	15 - 44	Medium Stiff	1,000 to 2,000	4 - 8	7 - 12				
Dense	30 - 50	45 - 75	Stiff	2,000 to 4,000	8 - 15	13 - 23				
Very Dense	> 50	> 75	Very Stiff	4,000 to 8,000	15 - 30	24 - 45				
			Hard	> 8,000	> 30	> 45				

Strength Terms

#### **Relevance of Exploration and Laboratory Test Results**

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.



### Unified Soil Classification System

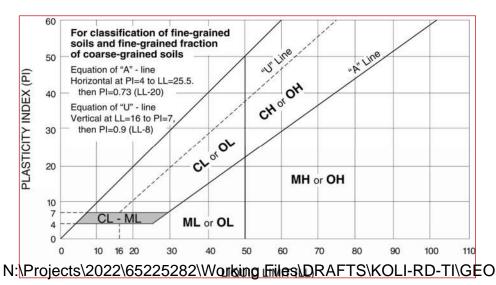
Criteria for As	ssianina Group	Symbols and G	roup Names Using	Soil Classification		
		atory Tests <sup>A</sup>		Group Symbol	Group Name <sup>B</sup>	
	Gravels:	Clean Gravels:	Cu≥4 and 1≤Cc≤3 <sup>E</sup>	GW	Well-graded gravel F	
	More than 50% of	Less than 5% fines <sup>c</sup>	Cu<4 and/or [Cc<1 or Cc>3.0] $^{\rm E}$	GP	Poorly graded gravel F	
	coarse fraction retained on No. 4	Gravels with Fines:	Fines classify as ML or MH	GM	Silty gravel F, G, H	
Coarse-Grained Soils:	sieve	More than 12% fines <sup>c</sup>	Fines classify as CL or CH	GC	Clayey gravel F, G, H	
More than 50% retained on No. 200 sieve		Clean Sands:	Cu≥6 and 1≤Cc≤3 <sup>E</sup>	SW	Well-graded sand <sup>1</sup>	
	Sands: 50% or more of	Less than 5% fines D	Cu<6 and/or [Cc<1 or Cc>3.0] <sup>E</sup>	SP	Poorly graded sand <sup>1</sup>	
	coarse fraction passes No. 4 sieve	Sands with Fines:	Fines classify as ML or MH	SM	Silty sand G, H, I	
	p	More than 12% fines D	Fines classify as CL or CH	SC	Clayey sand G, H, I	
		Inorganic:	PI > 7 and plots above "A" line J	CL	Lean clay <sup>K, L, M</sup>	
	Silts and Clays: Liquid limit less than	morganic.	PI < 4 or plots below "A" line J	ML	Silt K, L, M	
	50	Organic:	$\frac{LL \ oven \ dried}{LL \ not \ dried} < 0.75$	OL	Organic clay K, L, M, N	
Fine-Grained Soils: 50% or more passes the		Organic.	LL not dried 0.75	OL	Organic silt K, L, M, O	
No. 200 sieve		Inorganic:	PI plots on or above "A" line	СН	Fat clay <sup>K, L, M</sup>	
	Silts and Clays: Liquid limit 50 or	morganic.	PI plots below "A" line	MH	Elastic silt K, L, M	
	more	Organic:	$\frac{LL \ oven \ dried}{LL \ not \ dried} < 0.75$	ОН	Organic clay K, L, M, P	
		Organic.	LL not dried < 0.75	ОП	Organic silt <sup>K, L, M, Q</sup>	
Highly organic soils:	Primarily of	organic matter, dark in d	color, and organic odor	PT	Peat	

- A Based on the material passing the 3-inch (75-mm) sieve.
- <sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
- <sup>c</sup> Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
- Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

<sup>E</sup> 
$$Cu = D_{60}/D_{10}$$
  $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ 

- F If soil contains ≥ 15% sand, add "with sand" to group name.
- <sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

- <sup>H</sup> If fines are organic, add "with organic fines" to group name.
- $^{1}$  If soil contains ≥ 15% gravel, add "with gravel" to group name.
- If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
- K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
- L If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
- M If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
- N PI ≥ 4 and plots on or above "A" line.
- OPI < 4 or plots below "A" line.
- P PI plots on or above "A" line.
- <sup>o</sup> PI plots below "A" line.

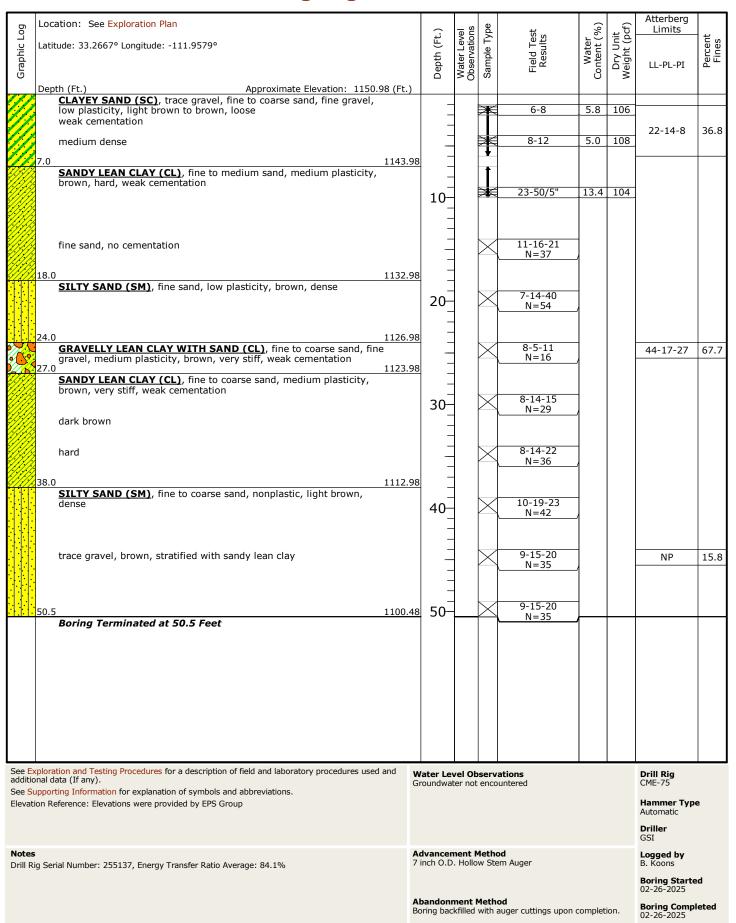


Facilities | Environmental | Geotechnical | Materials

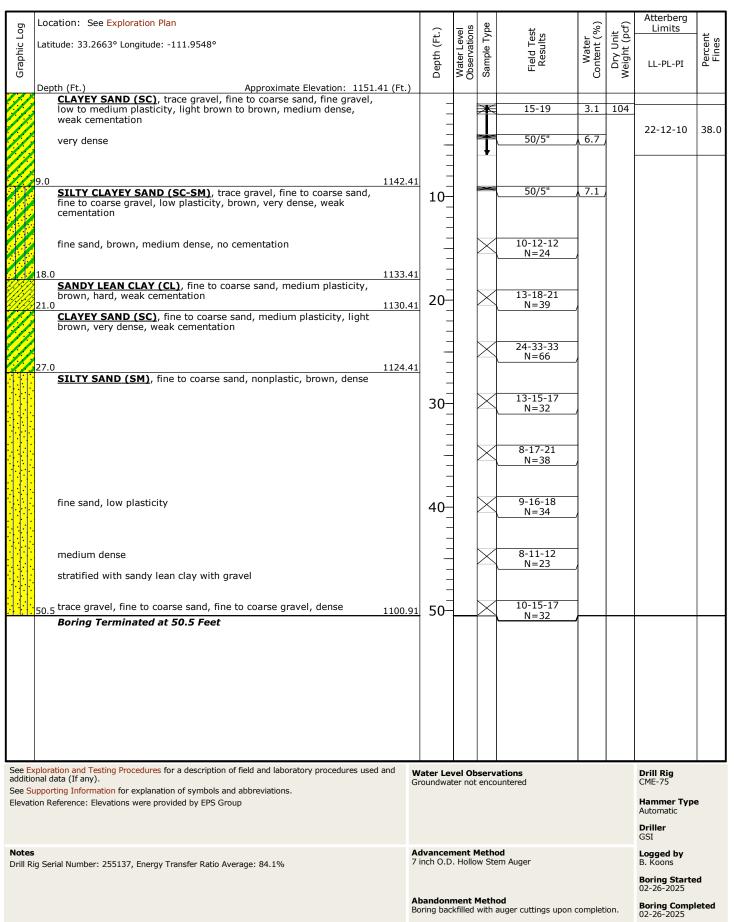


									,	
50	Location: See Exploration Plan		<u></u>	el sus	ype	s st	(%)	it od)	Atterberg Limits	٠,
Glap	Latitude: 33.2673° Longitude: -111.9582°		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Dry Unit Weight (pcf)	LL-PL-PI	Percent
	Depth (Ft.) Approximate Elevation: 1150. 0.5√ FILL - SILTY GRAVEL (GM), coarse sand, nonplastic, dark brown		_		<b>.</b>					
	to black, surface covered with approx. 2-inches of pea gravel  SILTY SAND (SM), trace gravel, fine to coarse sand, low	<i>(</i>	_		*	10-15	7.2	115	19-16-3	33.
	plasticity, brown, loose to medium dense, no to weak cementation		_		$\mathbb{X}$	3-5	8.4	106	19-10-3	33.
	stratified with well around early with all		_		<b>▼</b>	4-5	7.5	105	NP	7.9
	stratified with well-graded sand with silt 9.0  SANDY SILT (ML), trace gravel, fine to coarse sand, fine to coarse	1141.86	1 -		$\stackrel{\frown}{\times}$	12-17	16.7	103	NP	59
	gravel, nonplastic, brown, very stiff		10-			12 17	10.7	102	- 141	33
	14.0  LEAN CLAY (CL), fine sand, medium plasticity, brown, hard,	1136.86	_		$\times$	9-34-50/5"	1			
	stratified with sandy lean clay		<u>-</u>							
	very stiff		20_		$\times$	4-10-14 N=24				
			<u>-</u>							
	trace gravel, fine to coarse sand, fine gravel, stiff		_		$\times$	3-6-9 N=15	\		39-21-18	92
			_							
	very stiff, stratified with silty clayey sand with gravel		30_		$\times$	6-11-12 N=23				
			_							
					$\times$	4-7-10 N=17				
	39.0	1111.86	_ 							
	SILTY SAND (SM), fine sand, low plasticity, brown, dense	1111100	40_		$\times$	10-17-21 N=38				
			_							
	fine to coarse sand, medium dense		_		$\times$	8-12-12 N=24				
			_							
	50.5 stratified with silty clayey sand	1100.36	50-		$\times$	8-12-14 N-26	1			
	Boring Terminated at 50.5 Feet					N=26				
	This Double for the state of th									L
ioi	ploration and Testing Procedures for a description of field and laboratory procedures used nal data (If any). pporting Information for explanation of symbols and abbreviations.	•	later Lev roundwat						<b>Drill Rig</b> CME-75	
	on Reference: Elevations were provided by EPS Group								Hammer Typ Automatic	e
									Driller	
es			dvancen						Logged by	
Rig	g Serial Number: 255137, Energy Transfer Ratio Average: 84.1%	,	inch O.D	. 110110	w Ste	an Auger			B. Koons  Boring Starte	ed
			bandonr				15 to 50	5	02-27-2025 Boring Comp	
		fe	oring bac et, auger et upon o	cuttin	igs mi	auger cuttings from 1 ixed with cement from	m 0 to 1	.5	02-27-2025	
									Exhibit	. Δ

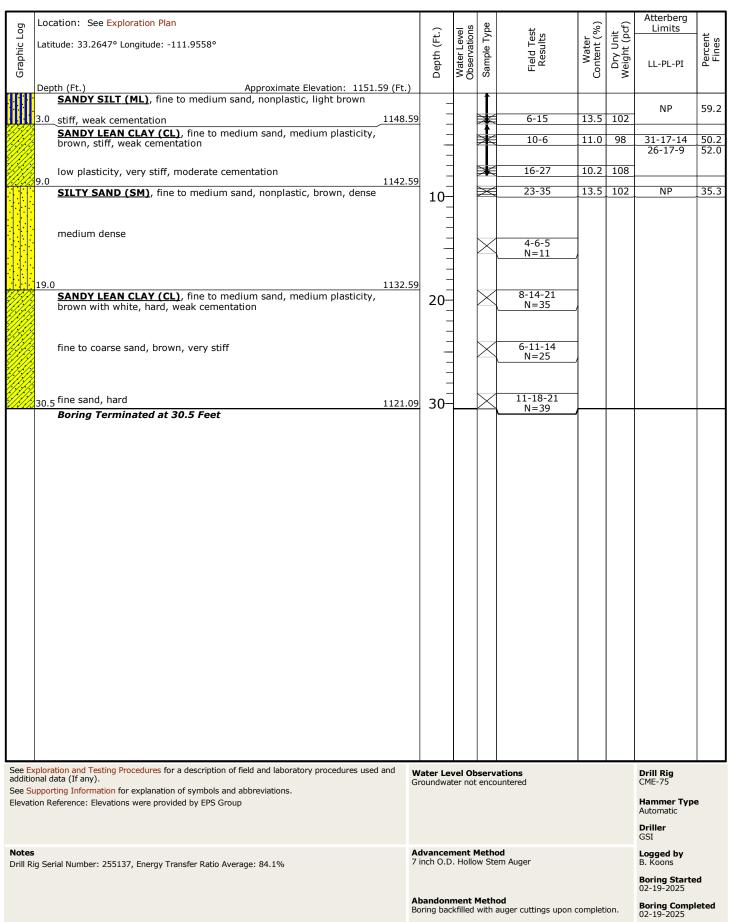




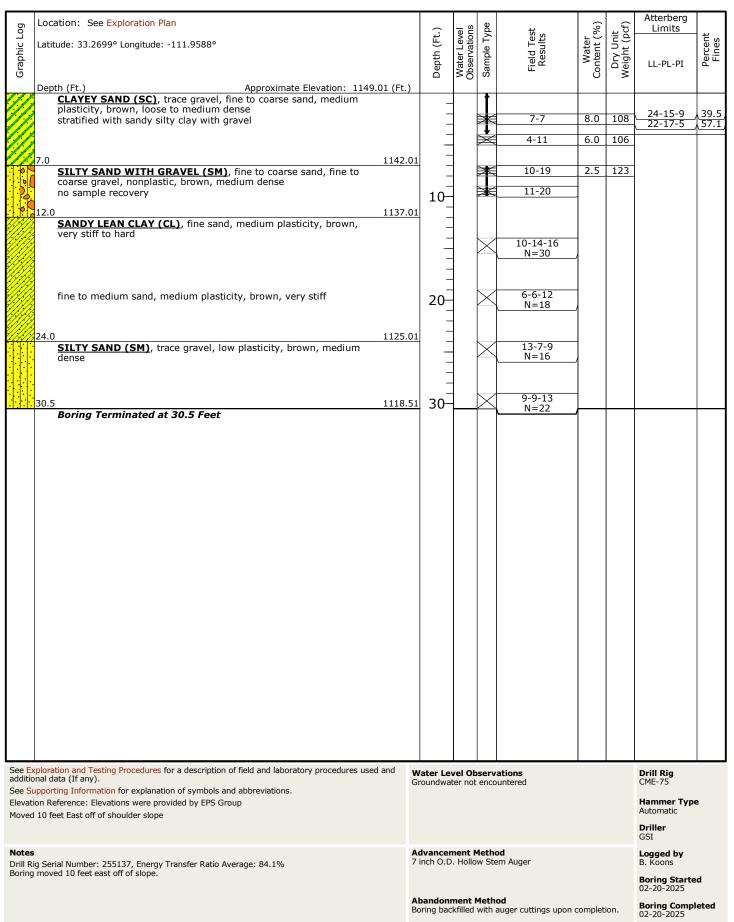




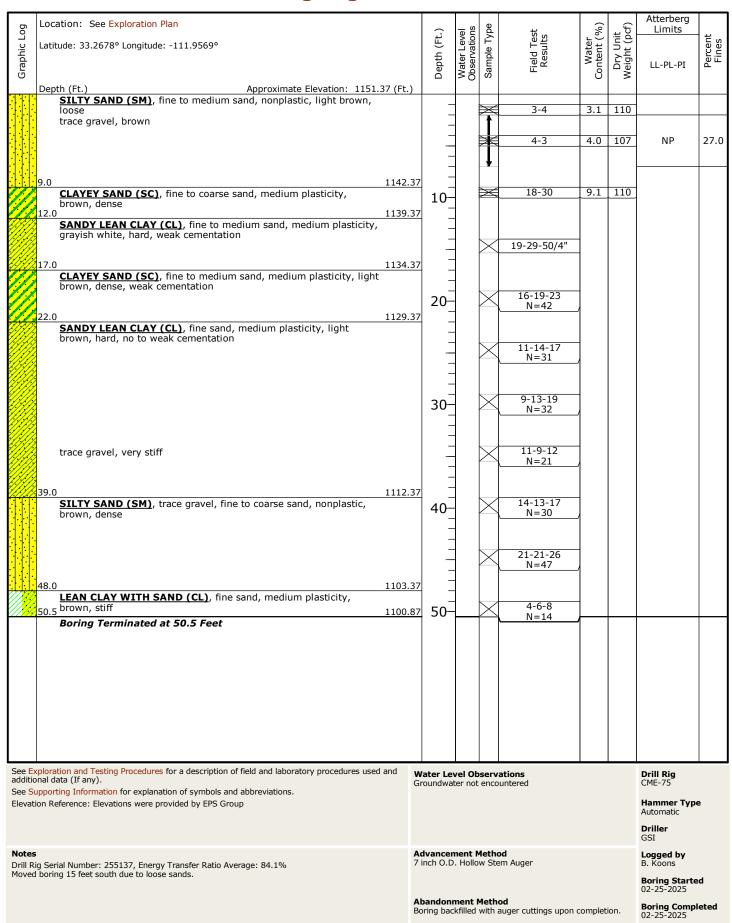




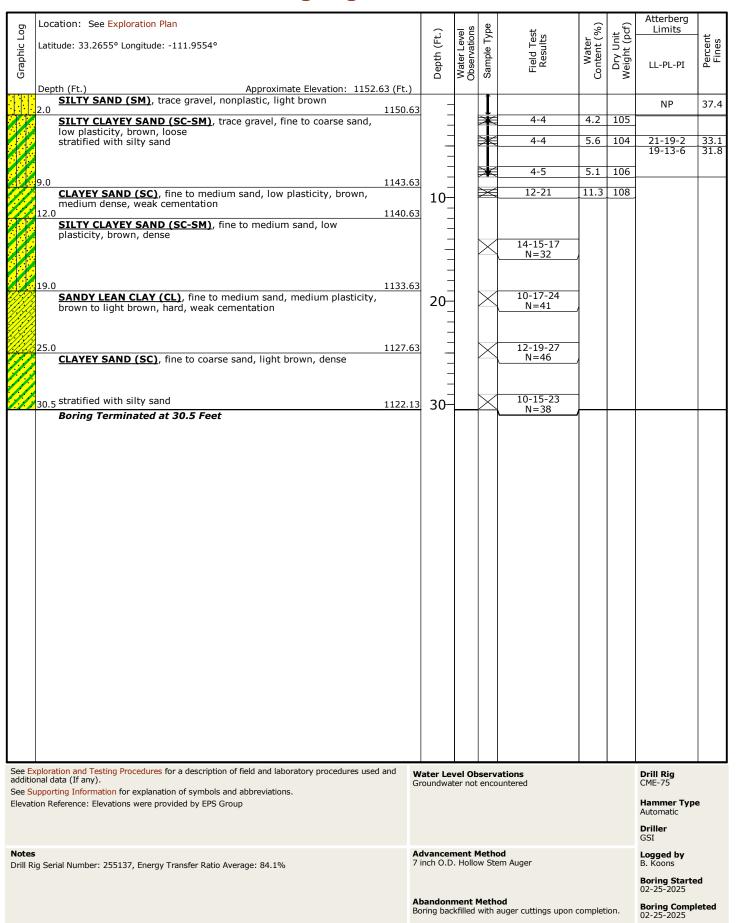




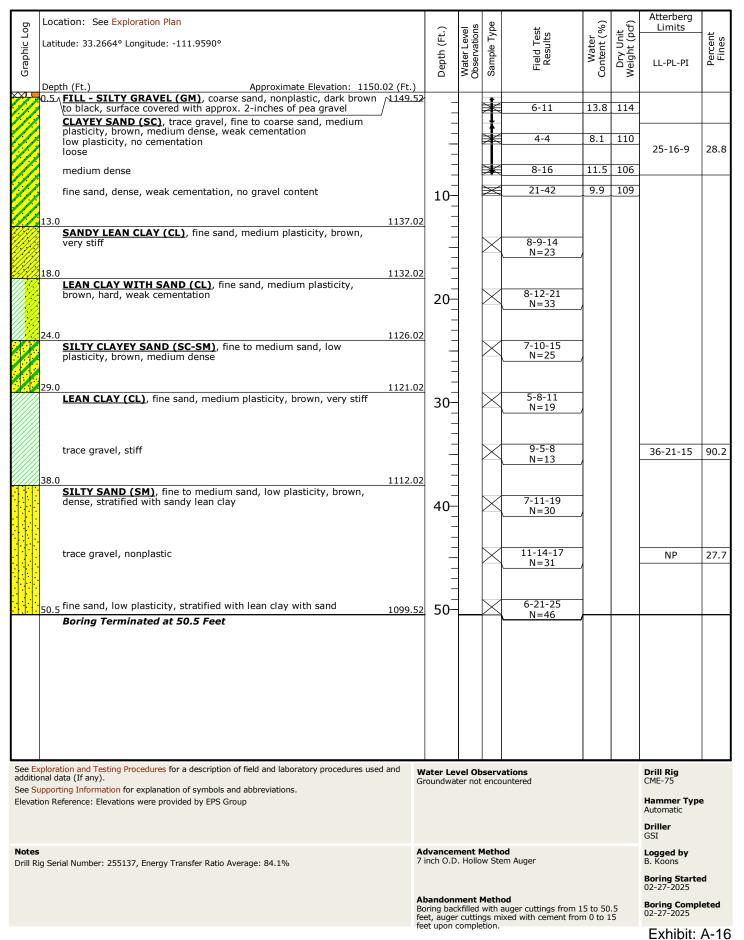




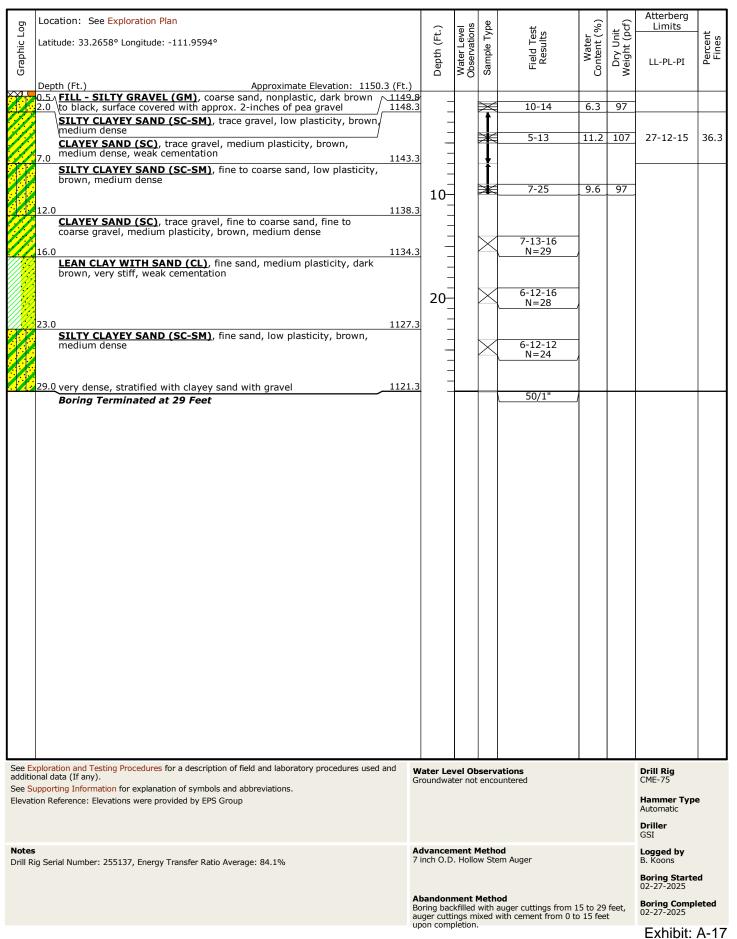














Leaving Co. E. L. W. B.	1							Atterberg	
Location: See Exploration Plan		ř.)	Water Level Observations	ype	sst	Water Content (%)	Dry Unit Weight (pcf)	Limits	يإ
Latitude: 33.2655° Longitude: -111.9596°		Depth (Ft.)	r Le vatic	Sample Type	Field Test Results	ater	/ Un		Percent
		ept	Vate bser	amp	Re	onte	Dr.) /eig	LL-PL-PI	Pe
Depth (Ft.)	(Ft.)		>0	σ			>		
SILTY CLAYEY SAND (SC-SM), trace gravel, fine to coarse sand,	(. c.)	_		I			100		
fine to coarse gravel, low plasticity, light brown to brown, loose		_		$\times$	6-7	8.1	109		
fine gravel, brown medium dense		_		1	7-21	13.8	109		
medium dense		_	[		,	13.0	105	24-17-7	31.
		_		Į.					
orangish brown, weak cementation				$\times$	12-28	14.8	113		
orangion promi, mean comonidation		10-				1			
13.0		_							
SANDY LEAN CLAY (CL), fine to medium sand, medium plasticity, brown, very stiff, weak cementation		_	}		5-8-11				
		_		$\hookrightarrow$	N=19	4			
		_							
fine sand, hard		20 <del>-</del>	}	$\checkmark$	7-12-18				
		20_			N=30	1			
		_							
very stiff		_	1	$\times$	4-9-14				
26.0 LEAN CLAY WITH SAND (CL), fine sand, medium plasticity,		_			N=23	1			
brown, very stiff, weak cementation		_							
stratified with non-plastic sandy silt		30 <del>-</del>		$\times$	5-9-11			NP	62
		50_			N=20	1			
34.0		_							
SILTY SAND (SM), fine to coarse sand, nonplastic, light brown,		_		$\times$	6-15-25 N=40				
. dense		_			N=40	1			
		-	-						
low plasticity, brown, medium dense stratified with lean clay with sand		40-		$\times$	7-7-8 N=15				
. Straumed with lean clay with Sand		_		1		1			
		_							
fine to medium sand, dense		_		$\times$	10-18-20 N=38				
		_				1			
		_							
50.0 very dense, stratified with silty sand with gravel  Boring Terminated at 50 Feet		50-		$\stackrel{\sim}{\rightarrow}$	25-50/3"	1			
Johns Formmated at 50 Feet									
xploration and Testing Procedures for a description of field and laboratory procedures used a onal data (If any).	•••	ater Le						Drill Rig CME-75	
supporting Information for explanation of symbols and abbreviations.	Gr	ounuwai	lei IIOť	enco	untereu				
								Hammer Typ Automatic	е
								Driller	
		d		lati-				GSI	
<b>s</b> Rig Serial Number: 255137, Energy Transfer Ratio Average: 84.1%		dvancen inch O.D			nd m Auger			<b>Logged by</b> B. Koons	
g relocated outside of mud/lake area and no ground surface elevation obtained.								Boring Starte	ed
		bandoni						02-27-2025	lot-
					auger cuttings upon	complet	ion.	<b>Boring Comp</b> 02-27-2025	etec

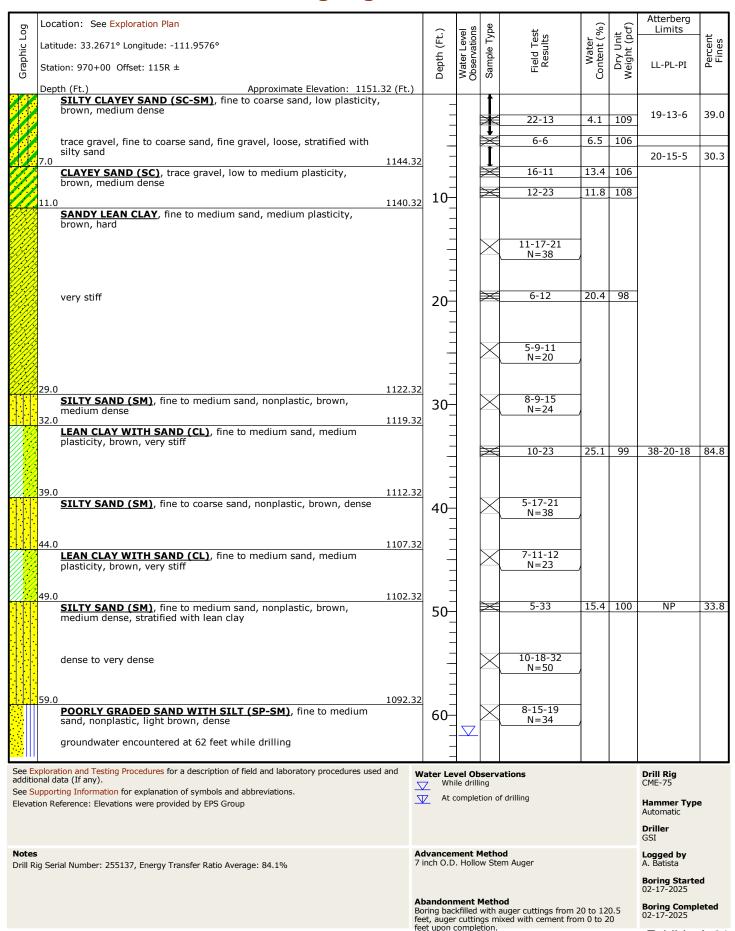


	Borning Log No.			_					
9	Location: See Exploration Plan			ē		(0	f)	Atterberg Limits	
Graphic Log	Latitude: 33.2632° Longitude: -111.9619°	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Dry Unit Weight (pcf)	LIIIIICS	sut is
Phic	Latitude: 33.2632° Longitude: -111.9619°	+ +	erL	aldı	ld T	Vate	B소		Percent Fines
Gra		Oep	Wat	San	Fie A	000	Vei.	LL-PL-PI	9
L	Depth (Ft.) (Ft.								
	0.5 FILL - SILTY GRAVEL (GM), nonplastic, dark brown to black	┥ -		$\bigstar$	6-8	10.9	107		
	CLAYEY SAND (SC), trace gravel, fine to coarse sand, low to medium plasticity, brown, loose	_			0.0	10.5	107	23-14-9	35.1
		-		$\star$	6-7	9.4	106	26-16-10	41.9
	stratified with silty clayey sand	-		+					
	8.0	_		$\times$	6-7	6.7	107		
	<b>POORLY GRADED SAND (SP)</b> , trace gravel, fine to coarse sand, fine gravel, nonplastic, brown, medium dense	10-		$\times$	7-10	6.7	100	NP	0.9
	12.0	10-				1			
	SANDY LEAN CLAY WITH GRAVEL (CL), fine to coarse sand, fine								
1/32	gravel, medium to high plasticity, brown with white, hard, weak cementation	-			13-18-18	-		48-24-24	51.8
		-			N=36	1		10 21 21	52.0
		-							
	<sub>20.5</sub> brown	20-			7-21-27	-			
<u>(///</u> ////	Boring Terminated at 20.5 Feet	<del></del>		$\cap$	N=48	$\vdash$			
	<b>g</b>								
Sac F	valeration and Testing Procedures for a description of field and I-level and I								Щ
additio	cploration and Testing Procedures for a description of field and laboratory procedures used and an all data (If any).	Water Le Groundwa						<b>Drill Rig</b> CME-75	
See S	upporting Information for explanation of symbols and abbreviations.							Hammer Type	e
								Automatic	-
								<b>Driller</b> GSI	
Notes		Advance 7 inch O.D						Logged by B. Koons	
Boring	ig Serial Number: 255137, Energy Transfer Ratio Average: 84.1% relocated outside of mud/lake area and no ground surface elevation obtained.	, men O.L	, i ioile	, vv 3te	an Augei			Boring Starte	ed
		<b>Abandon</b> Boring bad	ckfilled	with a	auger cuttings from :	15 to 20	.5	Boring Comp 02-27-2025	leted
		feet, auge feet upon	r cuttir	ngs m	ixed with cement fro	m 0 to 1	15	Exhibit:	A-19

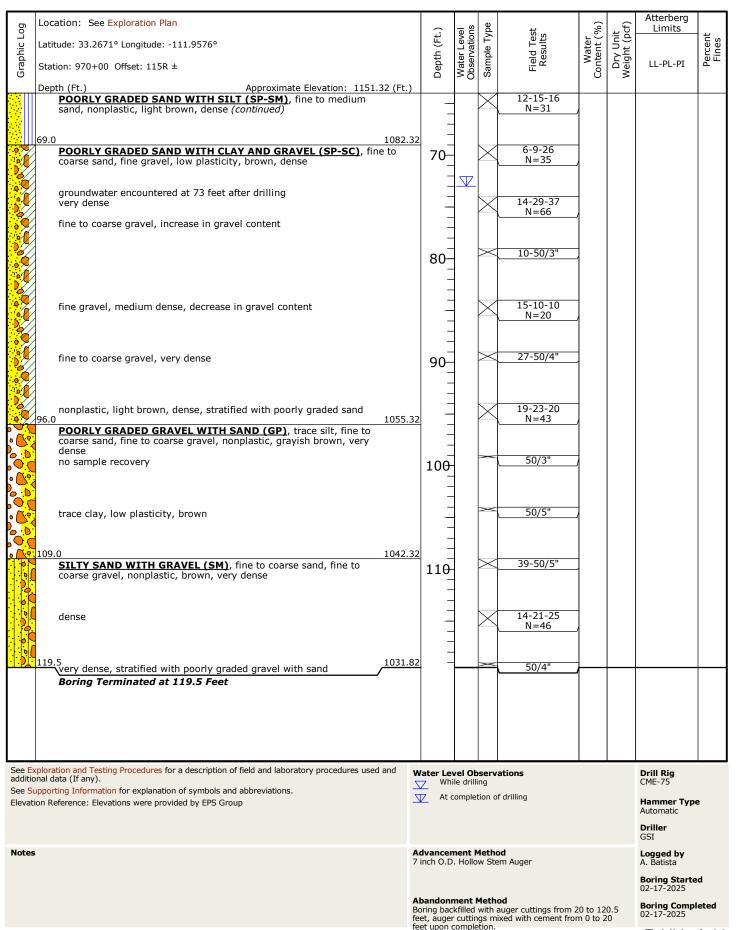


	ı	1	Λ++la - · · · ·	1	
Location: See Exploration Plan	(%	£.	Atterberg Limits	J	
Tail	ater nt (	L C		cent	
Poptic Cocation: See Exploration Mater Level Observations  Sample Type  Results  Results	Water Content (%)	Dry Unit Weight (pcf)	LL-PL-PI	Percent Fines	
	8	>			
Depth (Ft.)  Approximate Elevation: 1147.11 (Ft.)  CLAYEY SAND (SC), trace gravel, fine to coarse sand, low					
plasticity, brown, dense, weak cementation 26-28	6.7	109	-		
medium dense	5 8.0	103	25-16-9	47.1	
medium dense	, 0.0	103			
9.0 1138.11 SANDY LEAN CLAY (CL), fine to coarse sand, medium plasticity, because with light brown bard weak compatition stratified with	5" 17.2	95	-		
SANDY LEAN CLAY (CL), fine to coarse sand, medium plasticity, brown with light brown, hard, weak cementation, stratified with silty clayey sand					
fine to medium sand, stratified with clayey sand	0/5"				
20.5 1126.61 20 15-17-1 N=40					
Boring Terminated at 20.5 Feet N=40					
			<u> </u>		
See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).  Water Level Observations  Groundwater not encountered			Drill Rig		
See Supporting Information for explanation of symbols and abbreviations.  Groundwater not encountered			CME-75		
Elevation Reference: Elevations were provided by EPS Group			Hammer Type Automatic	е	
			Driller		
			GSI		
Notes Advancement Method Drill Rig Serial Number: 255137, Energy Transfer Ratio Average: 84.1% 7 inch O.D. Hollow Stem Auger			<b>Logged by</b> B. Koons		
Boring location moved 5 feet south due to loose sands.	Borin				
			02-26-2025		
Abandonment Method			Boring Comp		

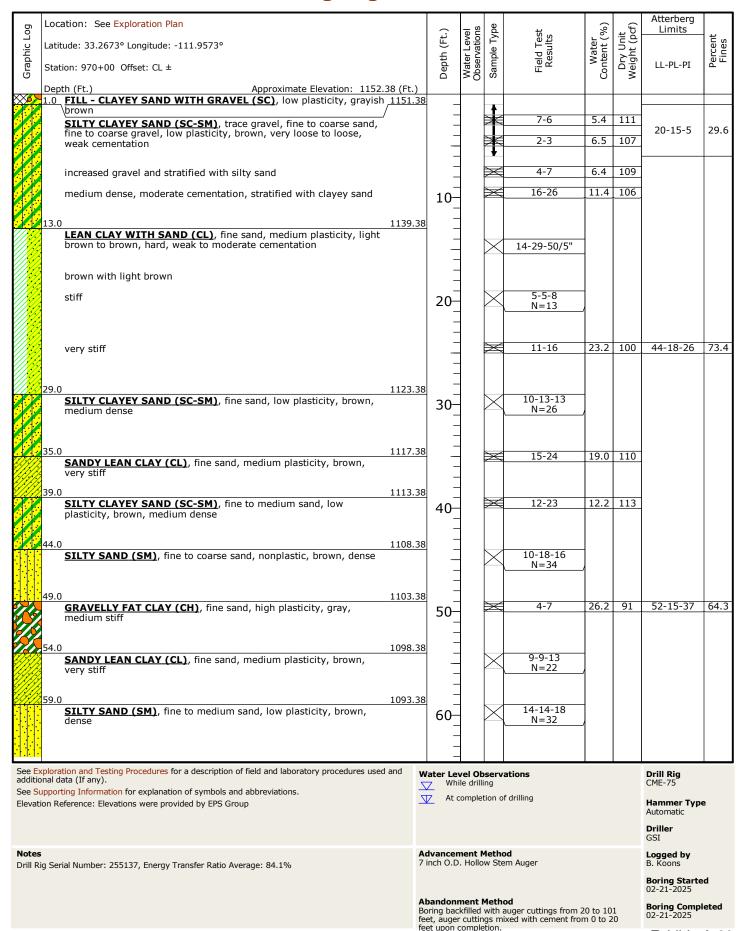








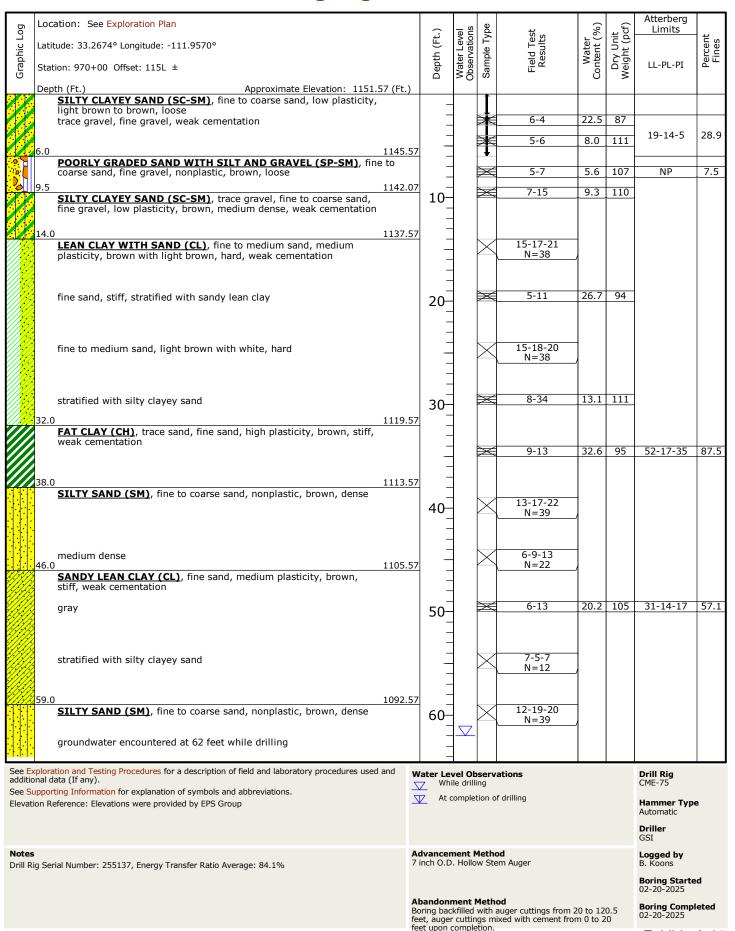




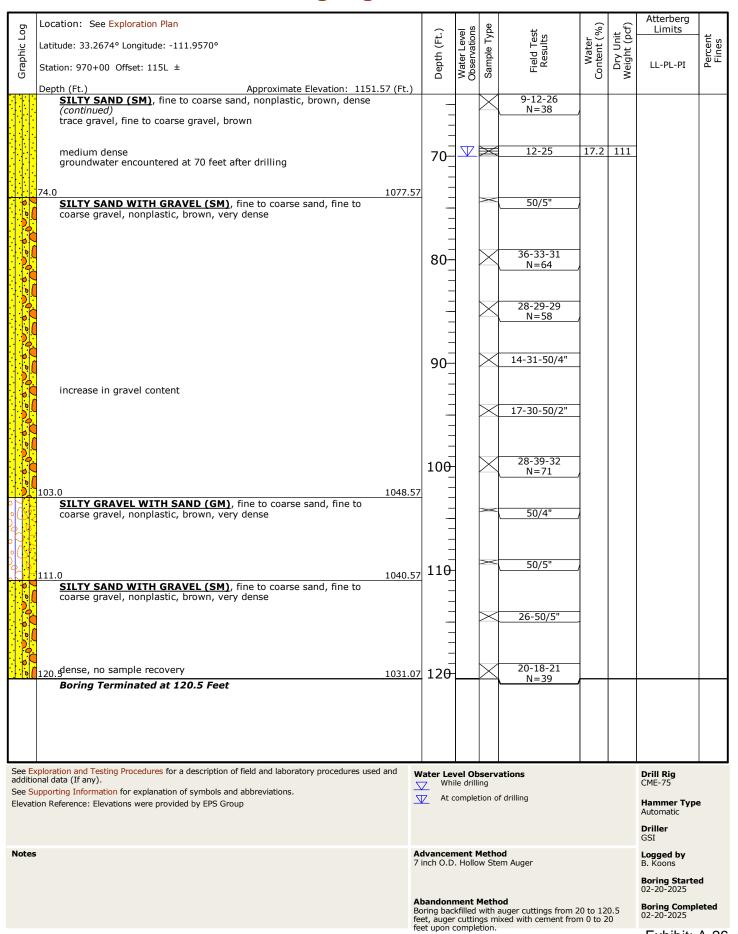


ρς	Location: See Exploration Plan		- s	e o	т	(%	ЭĘ)	Atterberg Limits	
ic Lc	Latitude: 33.2673° Longitude: -111.9573°	Ft.	Leve	le Typ	Field Test Results	Water ntent (%	Unit It (po	Limits	Percent Fines
Graphic Log	Station: 970+00 Offset: CL ±	Depth (Ft.)	Water Level Observations	Sample Type	Field	Water Content (%)	Dry Unit Weight (pcf)	LL-PL-PI	Per
	Depth (Ft.)  SILTY SAND (SM), fine to medium sand, low plasticity, brown, dense (continued) fine to coarse sand, nonplastic groundwater encountered at 65 feet while drilling groundwater encountered at 68 feet after drilling trace gravel, fine to coarse gravel, stratified with poorly graded sand with silt	70-	\tag{\tag{\tag{\tag{\tag{\tag{\tag{		10-16-23 N=39 6-17-25 N=42				
	stratified with clayey sand with gravel	-		X	16-19-20 N=39	_			
	low plasticity, stratified with clayey sand	80-		×	14-19-28 N=47	<u> </u>			
	88.0 1064.3	8 8		X	7-17-32 N=49	<u> </u>			
	<u>SILTY GRAVEL (GM)</u> , fine to coarse sand, fine to coarse gravel, nonplastic, brown, very dense, possible cobbles	90-			50/1"				
	increase in gravel content	-		×	31-50/4"				
	101.5  Auger Refusal on Sand, Gravel and Possible Cobbles at 101.5 Feet	100			50/1"	—			
additio See Su	nal data (It any).  Inporting Information for explanation of symbols and abbreviations.		ile dril	ling	<b>ations</b> f drilling			Drill Rig CME-75 Hammer Type Automatic Driller	e
Notes		Advance						GSI Logged by	
		/ Inch O.E	. Holl	ow Ste	em Auger			B. Koons  Boring Starte	ed
		eet, auge	kfilled r cutti	with	auger cuttings from 2 ixed with cement from	20 to 10 n 0 to 2	1	02-21-2025 Boring Compl 02-21-2025	
	1	eet upon	compl	etion.				Exhibit:	۸ ၁

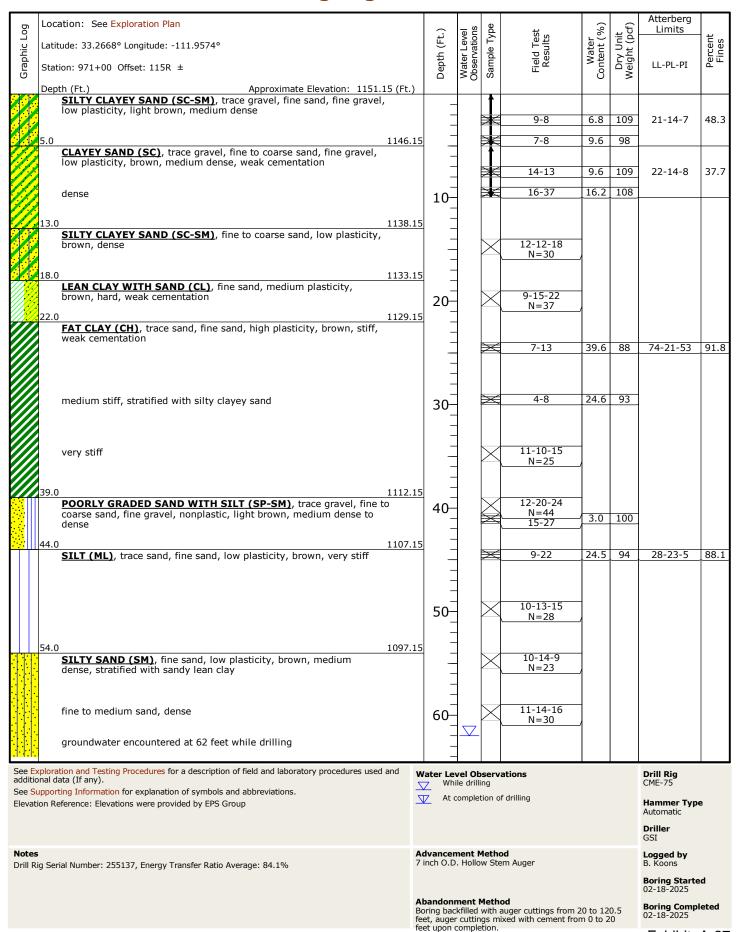




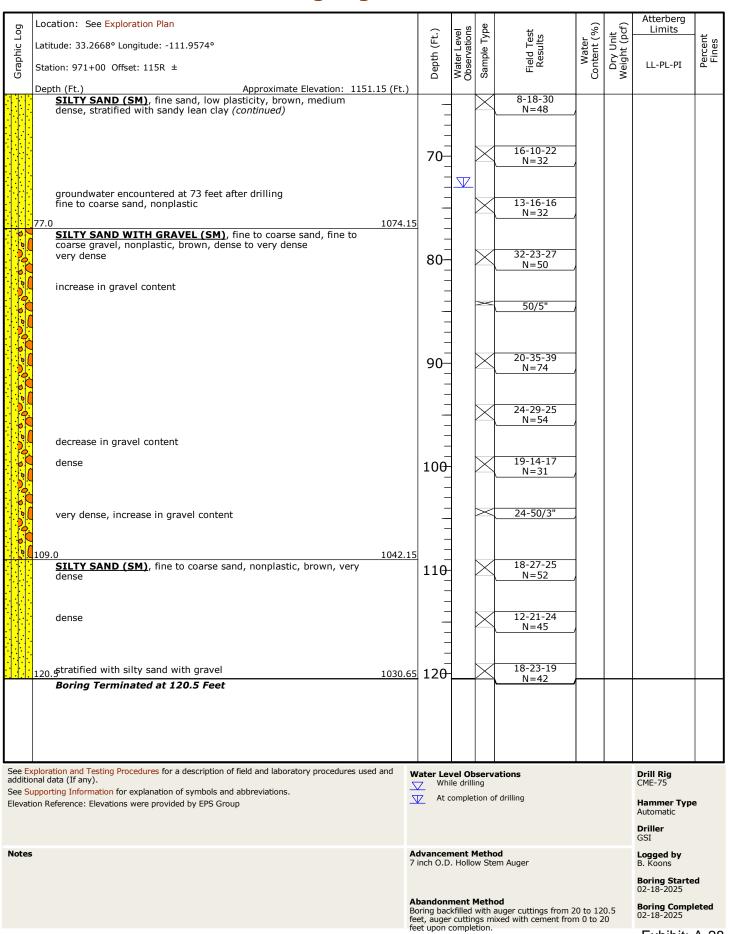




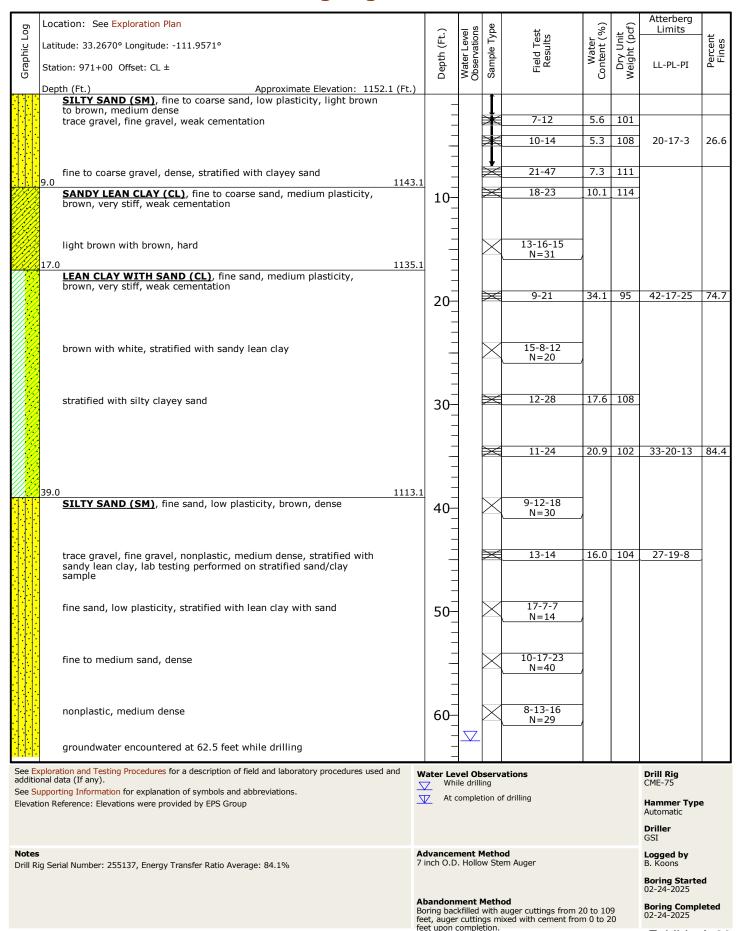




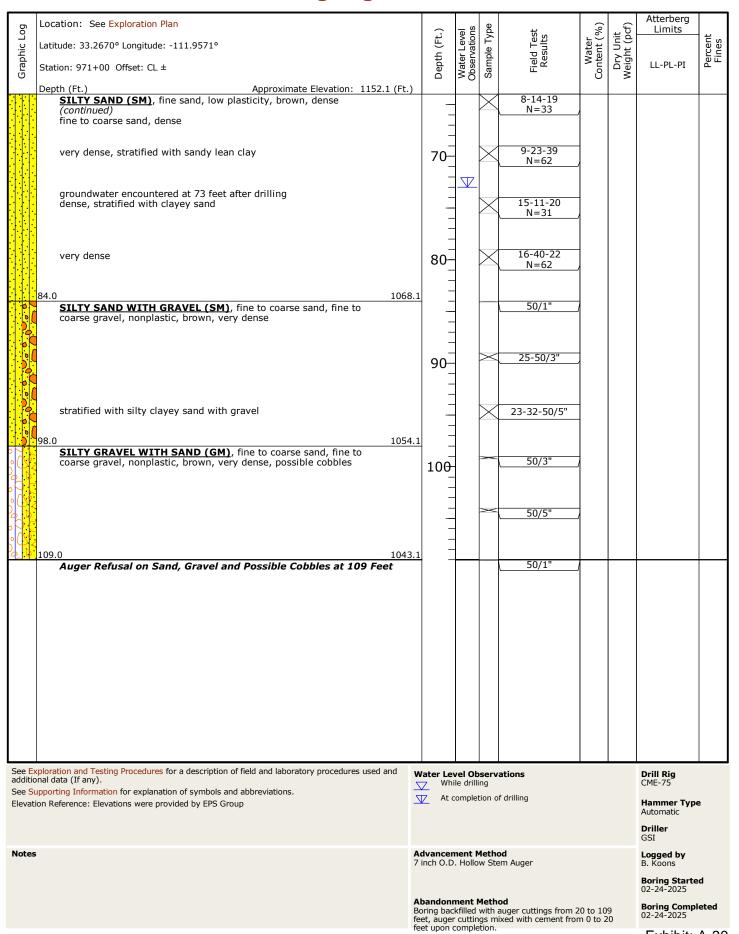




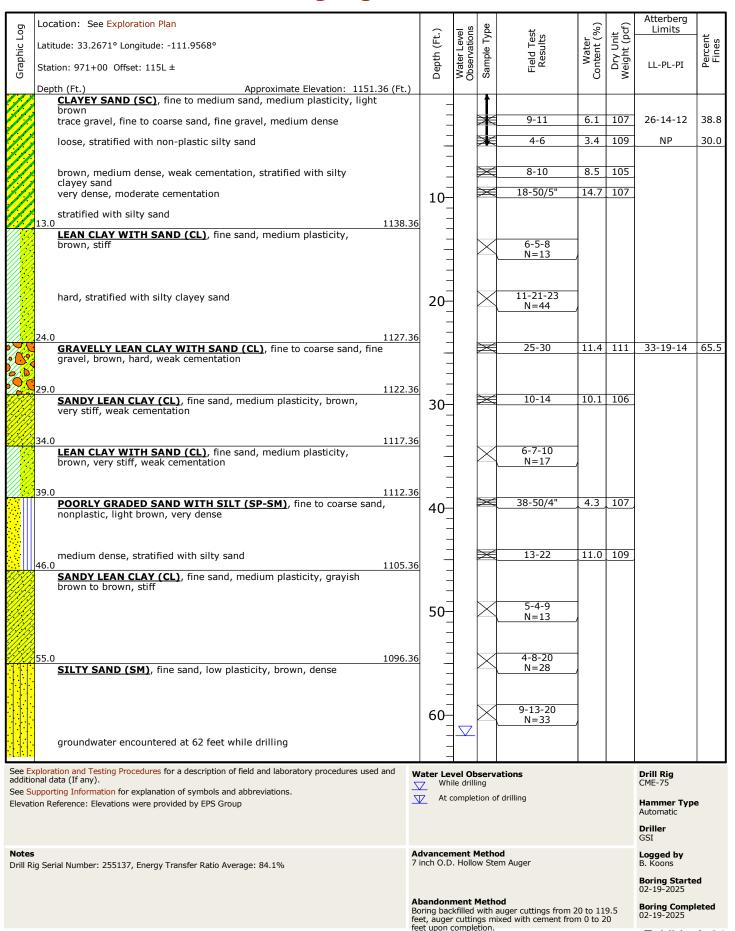




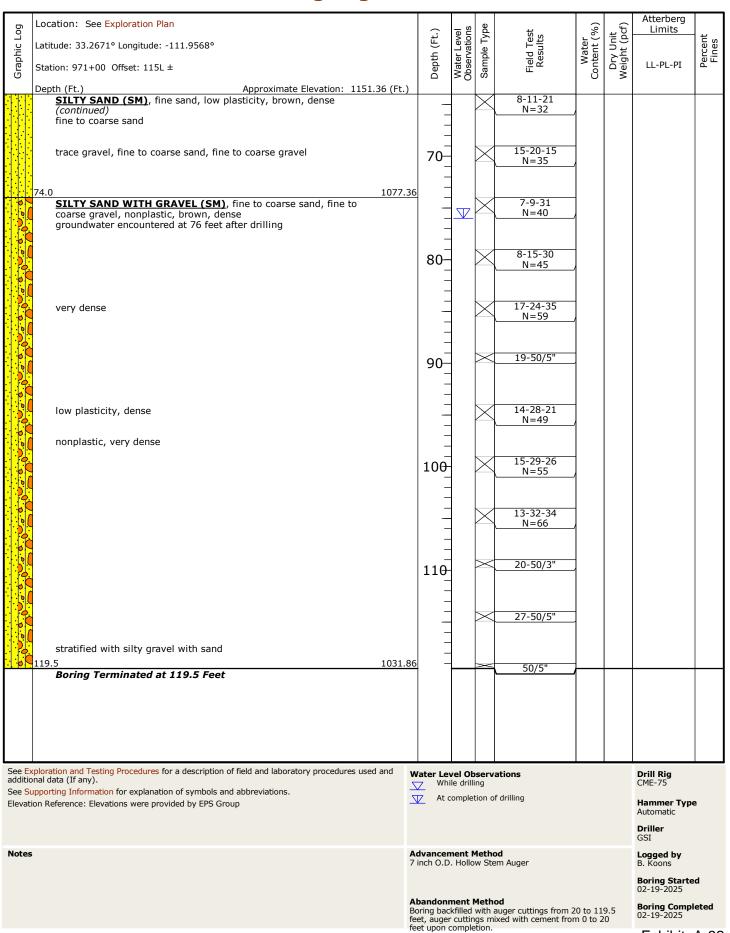














# Test Pit Log No. TP-1

	Location: See Exploration Plan	1		an an				Atterberg	
Graphic Log	Latitude: 33.2657° Longitude: -111.9599°	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Dry Unit Weight (pcf)	Limits	ent
aphic	Editade. 55.2657 Edityllade. 111.5555	pth (	ater L	mple	eld <sup>-</sup> Resu	Wat	Jry L ight	LL-PL-PI	Percent Fines
, Q		De	ŏg	Sal	臣一	Š	We		
×× <mark>///</mark>	Depth (Ft.) (Ft.)  FILL - SANDY LEAN CLAY (CL), medium plasticity, gray								
	1.0 brownish green, moist								
	FILL - LEAN CLAY WITH SAND, medium plasticity, dark gray, moist, plastic liner encountered at approximately 2 feet								
/20	<u>CLAYEY SAND WITH GRAVEL (SC)</u> , fine to coarse sand, fine to coarse gravel, medium plasticity, brown, ring sample advanced				23-40	9.6	98		
1/2	manually weak cementation	-						33-18-15	29.4
1/20	low plasticity, no cementation	-		+					
1/2		5-							
//20									
12		-							
//20		-	-						
1/2	8.0	╛_							
	WELL GRADED SAND WITH CLAY AND GRAVEL (SW-SC), fine to coarse sand, fine to coarse gravel, medium plasticity, brown			↑					
	, , , , , , , , , , , , , , , , , , , ,	-						38-14-24	9.0
	10.0 Test Pit Terminated at 10 Feet	10-		<b>↓</b>					
	rest Pit Terminated at 10 reet								
	TO STATE OF THE PARTY OF THE PA								
	65225282								
	I-10 GRIC KOLJROTI								
	IP-I								
	DEPTH: IOFT								
	EQUIPMENT AND LIGHT STATE P. STATE OF A STAT								
<u> </u>									
See Exaddition		<b>Water Le</b> Groundwa						Excavator John Deere Ba	ckhoe
	pporting Information for explanation of symbols and abbreviations.		1101					Hammer Type	
								Automatic	_
								<b>Operator</b> GSI	
Notes		<b>Advance</b> 24-inch w			od			<b>Logged by</b> B. Koons	
								Test Pit Start 02-28-2025	ed
		Abandon Fest pit ba			od spoils upon complet	ion		Test Pit Comp 02-28-2025	oleted

#### **SPT CAL**

SPT HAMMER

**MEASUREMENTS** 

Prepared for;

ENERGY

Geomechanics Southwest, Inc. 5839 South Belvedere Avenue

Tucson, Arizona 85706

Service Requested by:

Prepared by;

**SPT CAL** 

5512 Belem Dr

Chino Hills, CA 91709

Energy Measurement Test for Dynamic Penetrometers

Steve Bradshaw, Operations Manager - Tucson

Standard Penetration Tests (SPT)

909-730-2161 bc@sptcal.com

Date: 09/22/24

Location: Phoenix, AZ Drill Rig Model: CME 75

Drill Rig Serial Number: 255137

Drill Rig ID: 120

Blows Per Minute Average: 57.7

**Energy Transfer Ratio Average: 84.1%** 

Hammer Energy Measurements were performed per ASTM D4633 using an approved and calibrated SPT Analyzer 8G from Pile Dynamics, Inc., meeting the criteria of ASTM D4633-05 and per the process defined in ASTM D4633-05. The process and equipment requirements followed per ASTM D4633-05 meet the criteria of ASTM D4633-16.

#### PRESENTATION OF SPT ANALYZER TEST DATA

#### 1. Introduction

This report presents the results of SPT Hammer Energy Measurements, recorded with an SPT Analyzer 8G from Pile Dynamics, was carried out on September 22, 2024 in Phoenix, AZ

#### 2. Field Equipment and Procedures

The drill used was a CME 75 truck mounted drill. It is known as Rig 120 by Geomechanics. It has a mounted CME auto hammer. The operator was Shea of Geomechanics. The serial number of the drill is 255137

The auto hammer uses a 140 lb. weight dropped 30" on to an anvil above the bore hole. Drill drill rod connects the anvil to a split spoon type soil sampler inside an 8" o.d. hollow stem auger at the designated sample depth. After a seeding blow the sampler is driven 18". The number of blows required to penetrate the last 12" is referred to as the "N value", which is related to soil strength.

The first recording was taken at 2.5' below ground surface and then every 2.5' to final recording at 12.5'.

#### 3. Instrumentation

An SPT Analyzer Model 8G recorded, processed and displayed the dynamic data to meet the objectives of auto hammer calibration. The measurements and analysis were conducted in general accordance with ASTM D4945 and ASTM D6066 test standards.

The SPT Analyzer is fully compliant with the minimum digital sampling frequency requirements of ASTM D4633-05 (50 kHz) and EN ISO 22476-3:2005 (100 kHz), as well as with the low pass filter, (cutoff frequency of 5000 Hz instead of 3000 Hz) requirements of ASTM D4633-05. All equipment and analysis also conform to ASTM D6066.

A 2' instrumented section of drill rod, with two sets of accelerometers and strain transducers mounted on opposite sides of the drill rod, connects just below the anvil. It measures strain and acceleration of every hammer blow. The SPT Analyzer then calculates the amount of energy transferred to the rod by force and velocity measurements.





#### 4. Observations

The drill and sample equipment looked to be well operated and maintained.

#### 5. Results

Results from the SPT Hammer Energy Measurements are summarized below. It shows the Energy Transfer Ratio (ETR) at each sampling depth. ETR is the ratio of the measured maximum transferred energy to rated energy of the hammer which is the product of the weight of the hammer times the height of the fall. 140 lb x 30" = 4200 lb-in = 0.350 kip-ft.

#### 6. Recommendations

Recalibration of the auto hammer is recommended every 6 months to 1 year. Recalibration is also recommended for change of operator, engine modifications and repair, hydraulic system modifications and repair, auto hammer adjustments and repair and anything else that may affect speed, function and weight of the autohammer

#### **Energy Transfer Ratio = 84.1% @ 57.7 blows per minute**

N60=(ETR/60)N

Depth	ETR%	ВРМ
2.5	56.6	83.3
5	56.9	84.1
7.5	57.2	84.4
10	56.7	85,1
12.5	57.8	84.7
Average	57.0	84.1

The reported average value is a weighted average based on the number of blows at each sample interval.

If you have any questions please do not hesitate to call or email.

Thank you,

Brian Serl
Calibration Engineer
SPT CAL
909-730-2161
bc@sptcal.com



# **APPENDIX B**



## **Laboratory Testing Procedures**

Samples retrieved during the field exploration were classified in accordance with the Unified Soil Classification System (USCS) and taken to the laboratory for further observation by the project geotechnical engineer. At that time, the field descriptions were confirmed or modified as necessary, and an applicable laboratory testing program was formulated to determine the engineering properties of the subsurface materials.

Laboratory tests were conducted on selected soil samples and the test results are presented in Appendix B of this report. These results provide engineering soil characteristics of the samples tested. Laboratory tests were performed in general accordance with the applicable ASTM, ADOT, local, or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

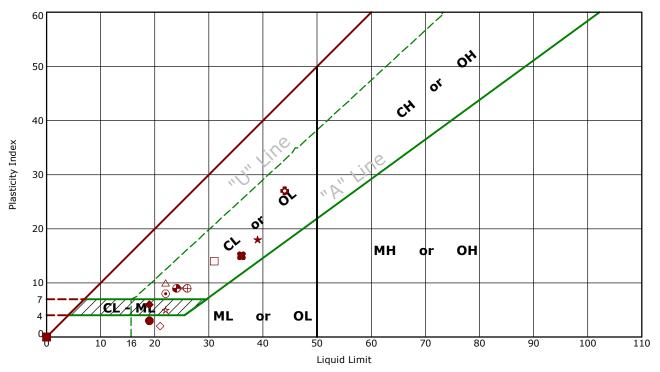
- Moisture Content
- Dry Unit Weight
- Atterberg Limits
- Grain Size Analysis
- Laboratory Moisture-Density Relationships (Standard Proctor)
- One-Dimensional Consolidation
- Direct Shear
- R-Value
- Remolded Swell
- Soil Corrosivity (pH, Minimum Electrical Resistivity & Soluble Sulfate & Chloride)

Facilities | Environmental | Geotechnical | Materials



## **Atterberg Limit Results**

### **ASTM D4318**

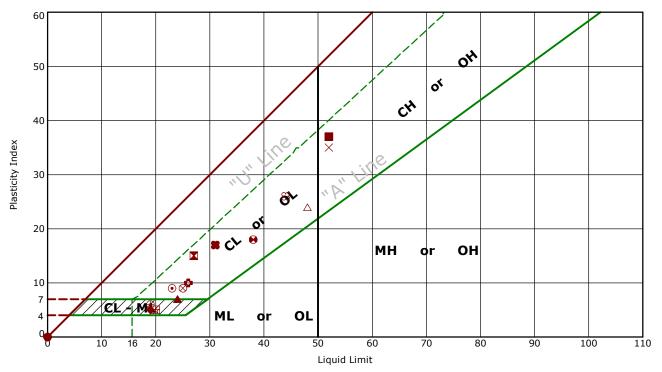


	Boring ID	Depth (Ft)	LL	PL	PI	Fines	AASHTO	Description
•	R&C-39	0.5 - 6	19	16	3	33.0	A-2-4 (0)	SILTY SAND
×	R&C-39	7 - 8	NP	NP	NP	7.9	A-1-b (0)	WELL-GRADED SAND with SILT
•	R&C-39	9 - 10	NP	NP	NP	59.0	A-4 (0)	SANDY SILT
*	R&C-39	24 - 25.5	39	21	18	92.3	A-6 (17)	LEAN CLAY
•	R&C-40	1.1 - 6	22	14	8	36.8	A-4 (0)	CLAYEY SAND
٥	R&C-40	24 - 25.5	44	17	27	67.7	A-7-6 (16)	GRAVELLY LEAN CLAY with SAND
0	R&C-40	44 - 45.5	NP	NP	NP	15.8	A-1-b (0)	SILTY SAND
Δ	R&C-41	1.1 - 6	22	12	10	38.0	A-4 (0)	CLAYEY SAND
8	R&C-42	0 - 3	NP	NP	NP	59.2	A-4 (0)	SANDY SILT
Ф	R&C-42	3 - 8	26	17	9	52.0	A-4 (2)	SANDY LEAN CLAY
	R&C-42	4 - 5	31	17	14	50.2	A-6 (4)	SANDY LEAN CLAY
•	R&C-42	9 - 10	NP	NP	NP	35.3	A-2-4 (0)	SILTY SAND
•	R&C-43	0 - 4	24	15	9	39.5	A-4 (0)	CLAYEY SAND
*	R&C-43	2 - 3	22	17	5	57.1	A-4 (0)	SANDY SILTY CLAY with GRAVEL
83	R&C-44	2 - 7	NP	NP	NP	27.0	A-2-4 (0)	SILTY SAND
	R&C-46	0 - 2	NP	NP	NP	37.4	A-4 (0)	SILTY SAND
•	R&C-46	2.1 - 8	19	13	6	31.8	A-2-4 (0)	SILTY, CLAYEY SAND
<b>♦</b>	R&C-46	4 - 5	21	19	2	33.1	A-2-4 (0)	SILTY SAND
×	R&C-49	3 - 8	25	16	9	28.8	A-2-4 (0)	CLAYEY SAND
	R&C-49	34 - 35.5	36	21	15	90.2	A-6 (14)	LEAN CLAY



## **Atterberg Limit Results**

### **ASTM D4318**



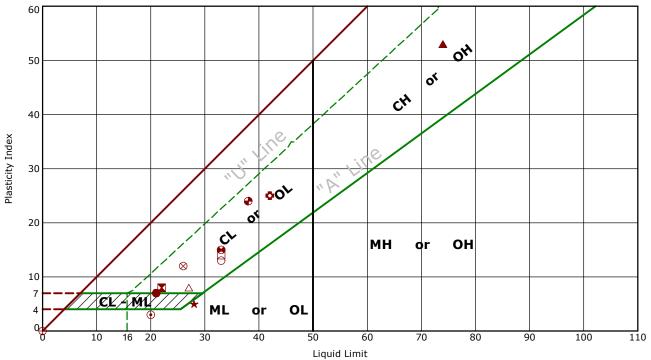
	Boring ID	Depth (Ft)	LL	PL	PI	Fines	AASHTO	Description
•	R&C-49	44 - 45.5	NP	NP	NP	27.7	A-2-4 (0)	SILTY SAND
	R&C-50	2 - 7	27	12	15	36.3	A-6 (1)	CLAYEY SAND
•	R&C-51	3 - 8	24	17	7	31.0	A-2-4 (0)	SILTY, CLAYEY SAND
*	R&C-51	29 - 30.5	NP	NP	NP	62.6	A-4 (0)	SANDY SILT
•	R&C-52	0.5 - 6	23	14	9	35.1	A-2-4 (0)	CLAYEY SAND
٥	R&C-52	4 - 5	26	16	10	41.9	A-4 (1)	CLAYEY SAND
0	R&C-52	9 - 10	NP	NP	NP	0.9	A-1-b (0)	POORLY GRADED SAND
Δ	R&C-52	14 - 15.5	48	24	24	51.8	A-7-6 (9)	SANDY LEAN CLAY with GRAVEL
8	R&C-53	1.1 - 6	25	16	9	47.1	A-4 (1)	CLAYEY SAND
Ф	B-20	0 - 4	19	13	6	39.0	A-4 (0)	SILTY, CLAYEY SAND
	B-20	5 - 7	20	15	5	30.3	A-2-4 (0)	SILTY, CLAYEY SAND
•	B-20	34 - 35	38	20	18	84.8	A-6 (15)	LEAN CLAY with SAND
•	B-20	49 - 50	NP	NP	NP	33.8	A-2-4 (0)	SILTY SAND
*	B-21	1 - 6	20	15	5	29.6	A-2-4 (0)	SILTY, CLAYEY SAND
83	B-21	24 - 25	44	18	26	73.4	A-7-6 (18)	LEAN CLAY with SAND
	B-21	49 - 50	52	15	37	64.3	A-7-6 (21)	GRAVELLY FAT CLAY
•	B-22	2 - 6	19	14	5	28.9	A-2-4 (0)	SILTY, CLAYEY SAND
<b>♦</b>	B-22	7 - 8	NP	NP	NP	7.5	A-1-b (0)	POORLY GRADED SAND with SILT and GRAVEL
×	B-22	34 - 35	52	17	35	87.5	A-7-6 (32)	FAT CLAY
	B-22	49 - 50	31	14	17	57.1	A-6 (6)	SANDY LEAN CLAY

Laboratory tests are not valid if separated from original report.



## **Atterberg Limit Results**

#### **ASTM D4318**

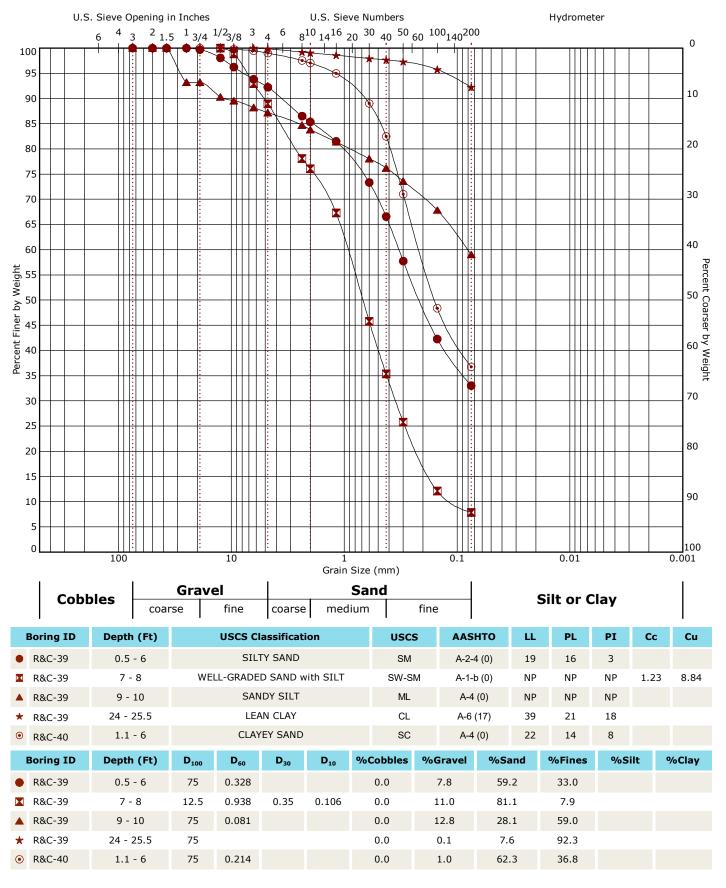


	Boring ID	Depth (Ft)	LL	PL	PI	Fines	AASHTO	Description
•	B-23	0 - 5	21	14	7	48.3	A-4 (0)	SILTY, CLAYEY SAND
	B-23	5 - 10	22	14	8	37.7	A-4 (0)	CLAYEY SAND
•	B-23	24 - 25	74	21	53	91.8	A-7-6 (54)	FAT CLAY
*	B-23	44 - 45	28	23	5	88.1	A-4 (4)	SILT
•	B-24	2 - 7	20	17	3	26.6	A-2-4 (0)	SILTY SAND
٥	B-24	19 - 20	42	17	25	74.7	A-7-6 (17)	LEAN CLAY with SAND
0	B-24	34 - 35	33	20	13	84.4	A-6 (10)	LEAN CLAY with SAND
Δ	B-24	44 - 45	27	19	8			SANDY LEAN CLAY
8	B-25	0 - 5	26	14	12	38.8	A-6 (1)	CLAYEY SAND
Ф	B-25	4 - 5	NP	NP	NP	30.0	A-2-4 (0)	SILTY SAND
	B-25	24 - 25	33	19	14	65.5	A-6 (7)	GRAVELLY LEAN CLAY with SAND
•	TP-1	2.1 - 4	33	18	15	29.4	A-2-6 (1)	CLAYEY SAND with GRAVEL
•	TP-1	8 - 10	38	14	24	9.0	A-2-6 (0)	WELL-GRADED SAND with CLAY and GRAVEL



### **Grain Size Distribution**

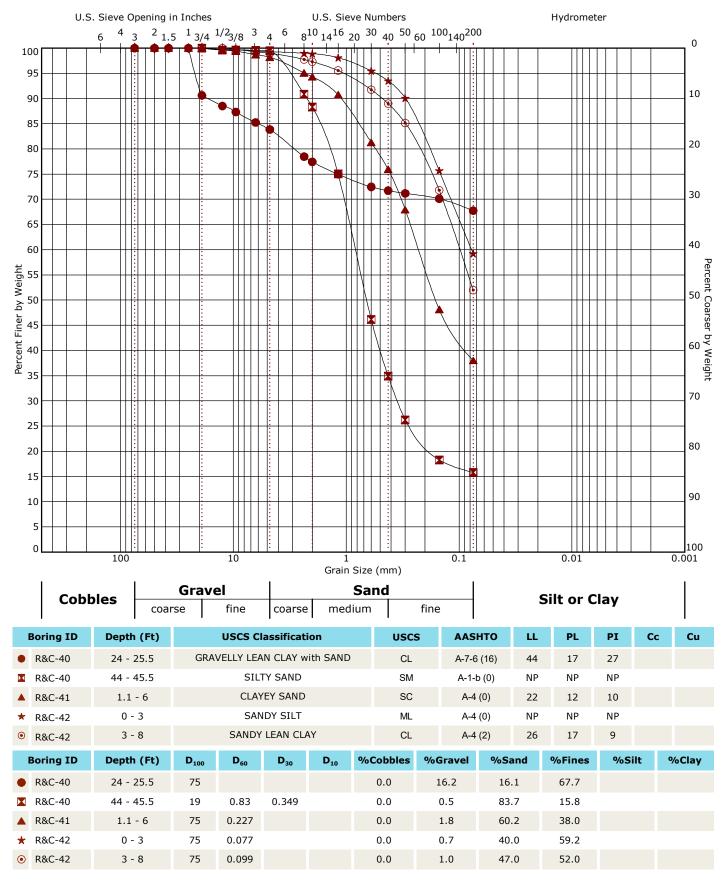
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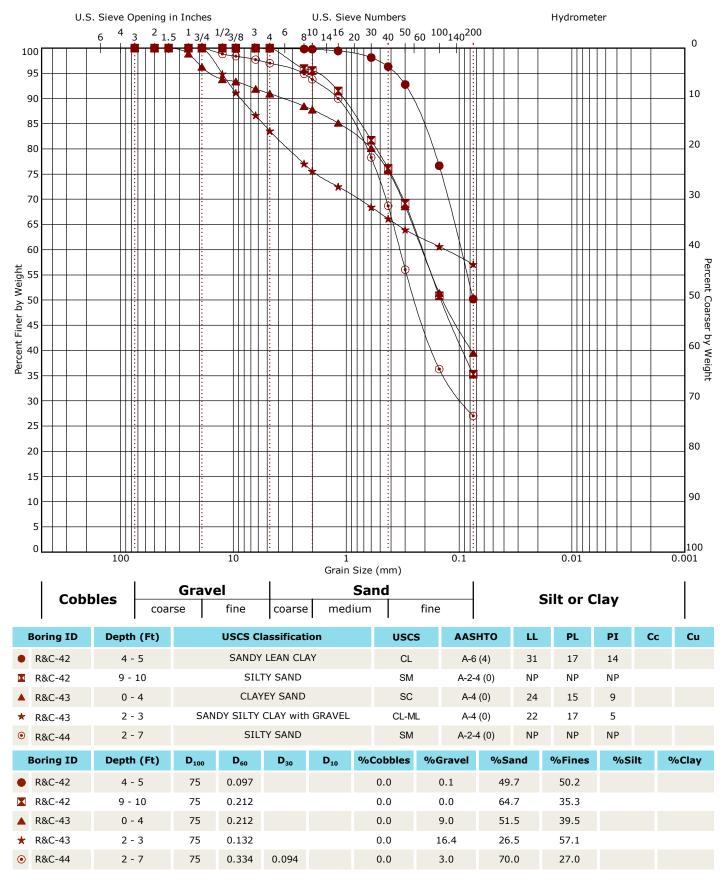


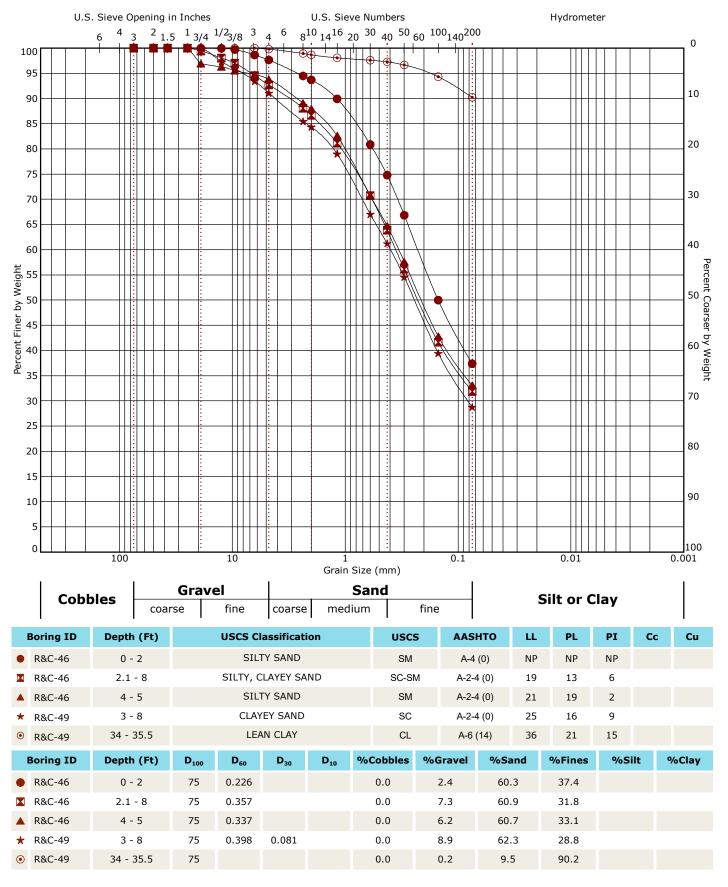
### **Grain Size Distribution**

#### **ASTM D422 / ASTM C136**

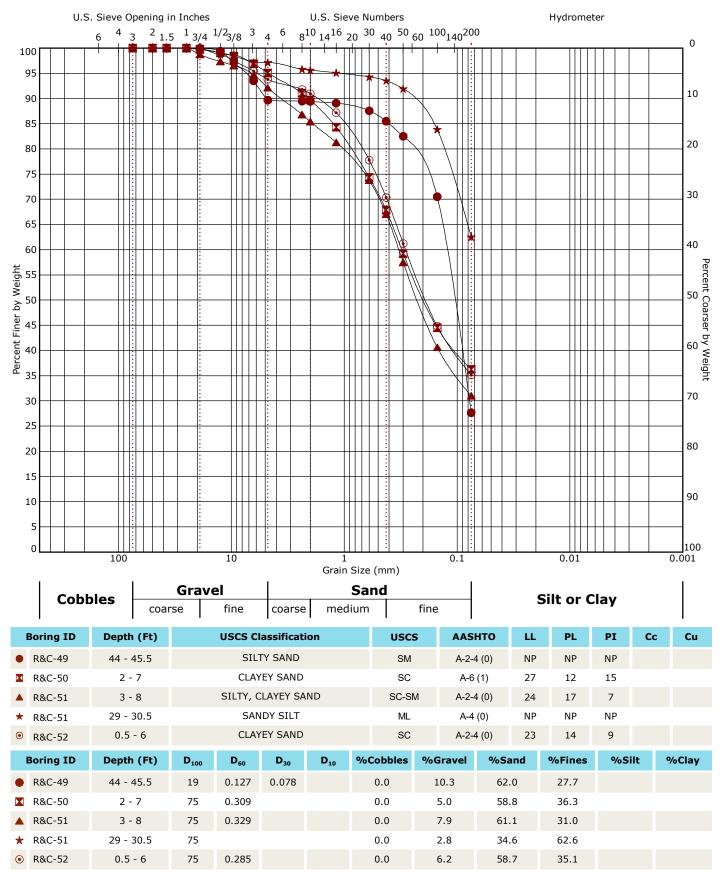




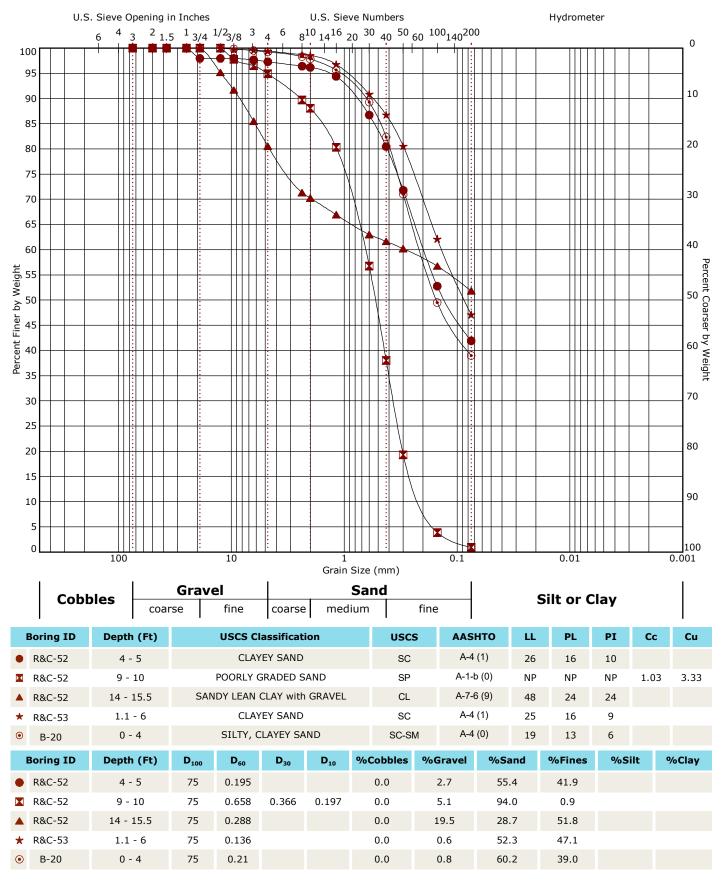




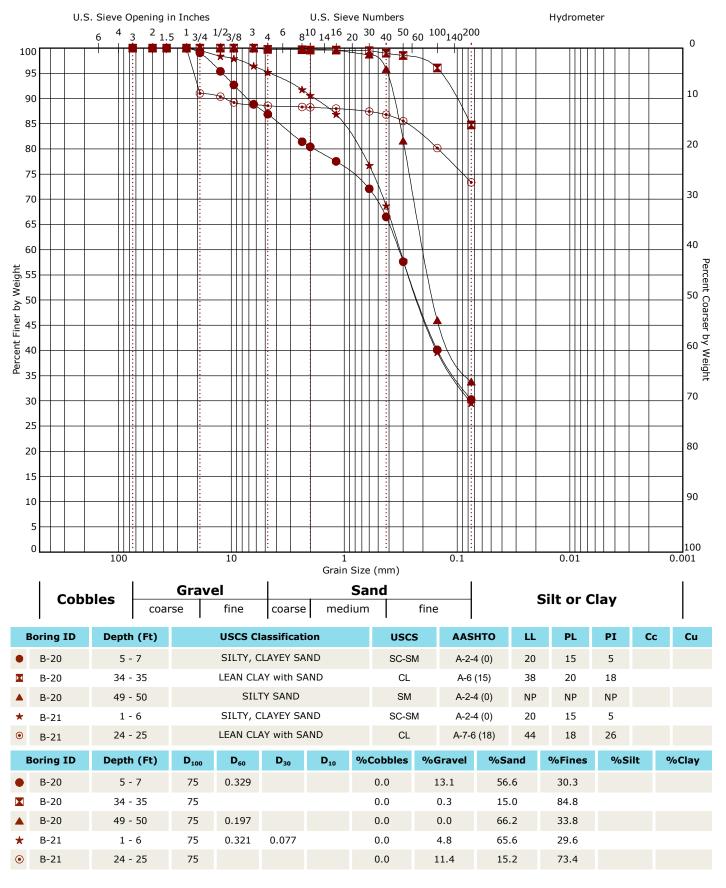




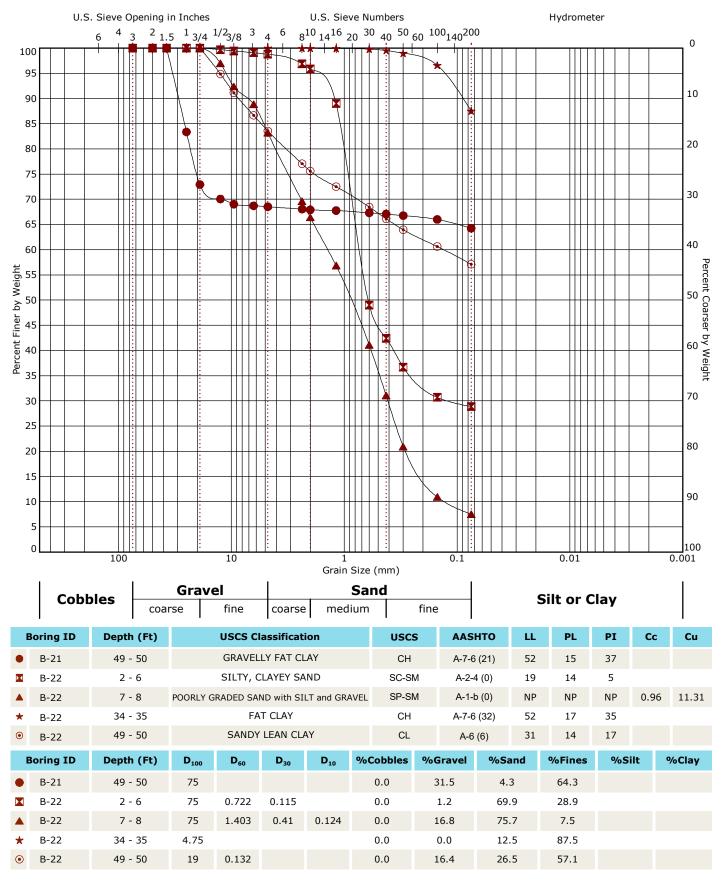




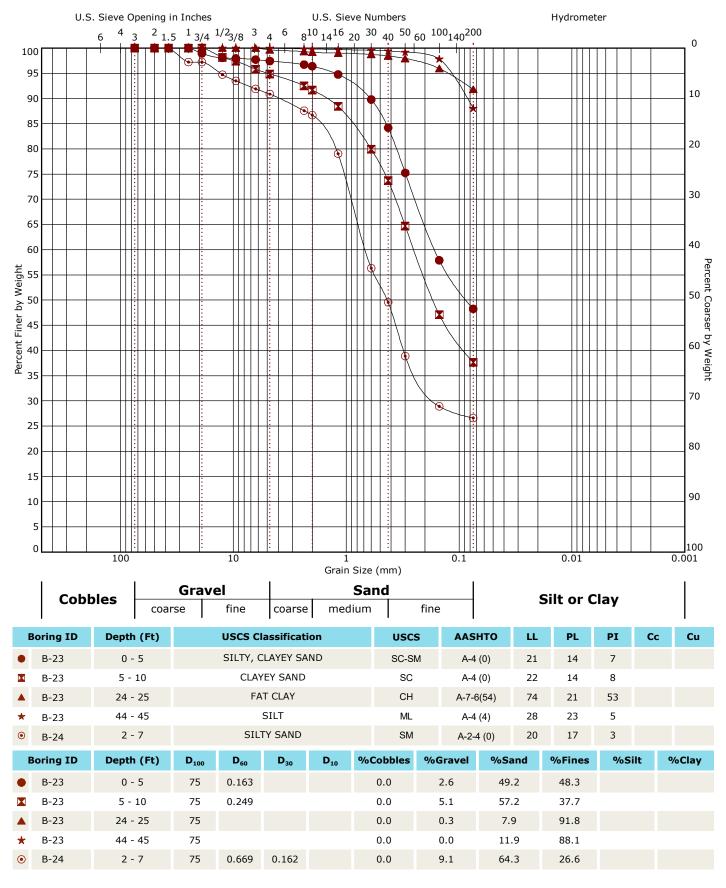




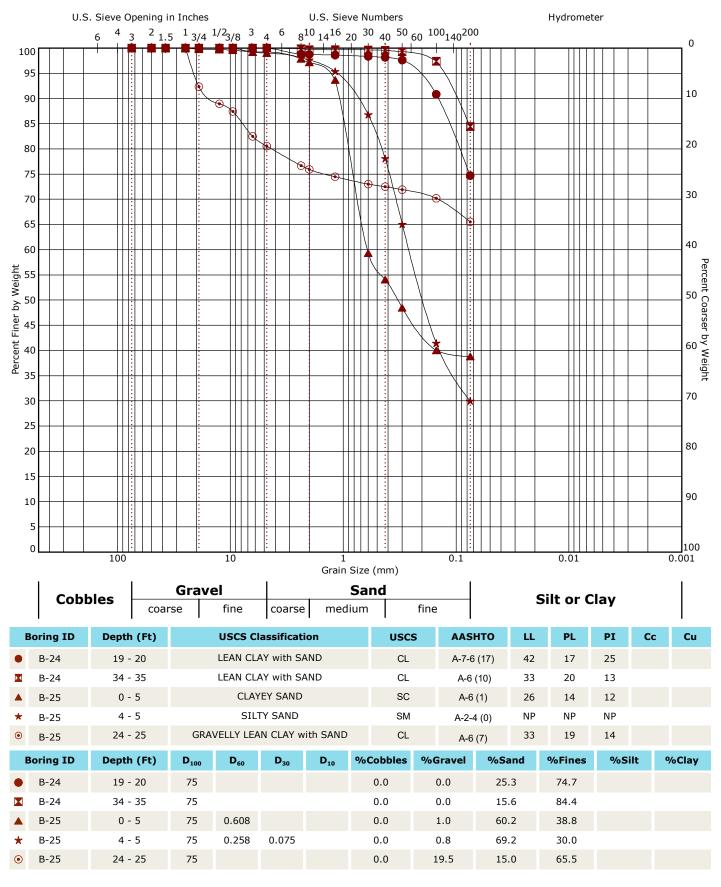




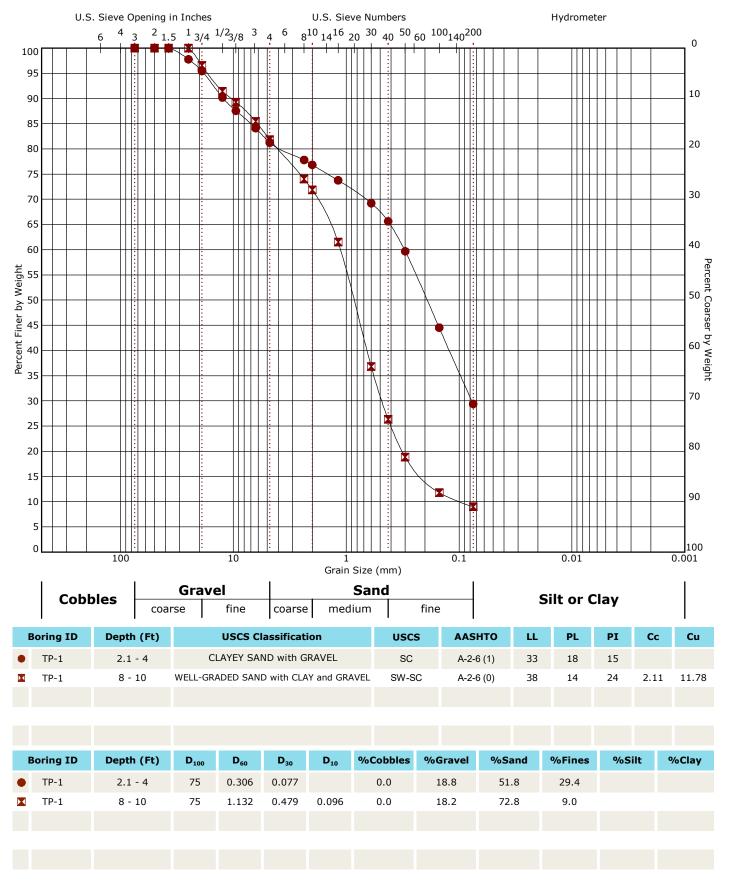








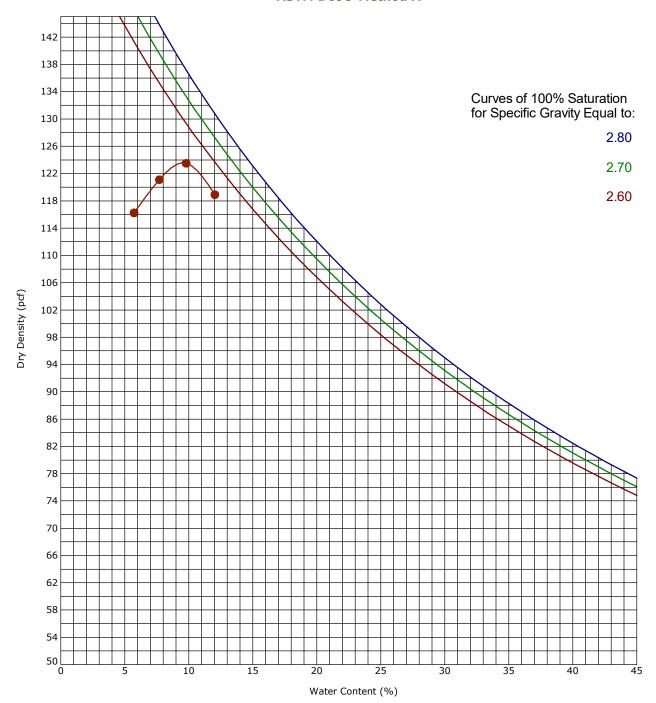






### **Moisture-Density Relationship**

**ASTM D698-Method A** 

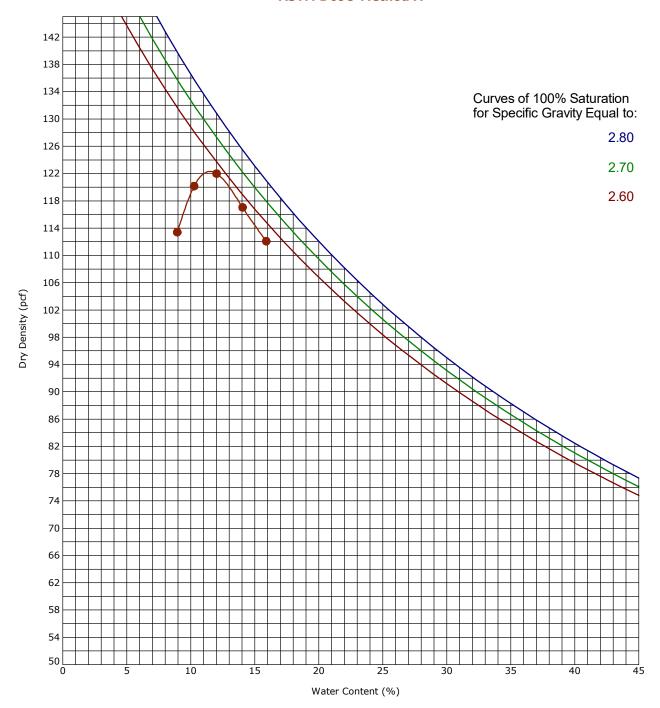


Вс	oring ID	Depth	(Ft)		ם	escription of Materials					
F	R&C-46	2.1 -	8		SIL	TY, CLAYEY SAND(SC-SM)					
Fines (%)	Fraction >4.75 mm siz	e LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)				
32	7.3	19	13	6	6 ASTM D698-Method A 123.5 9.6						



### **Moisture-Density Relationship**

**ASTM D698-Method A** 

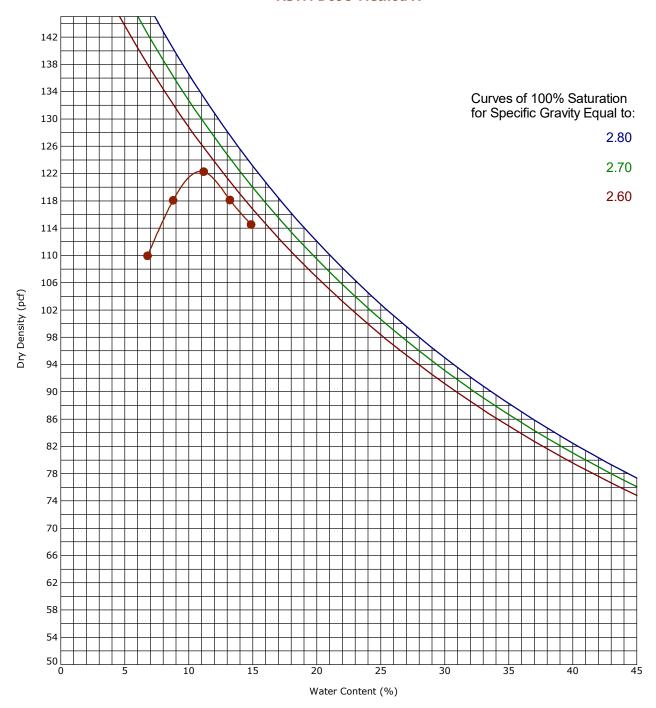


Вс	oring ID	Depth	(Ft)		D	escription of Materials				
F	R&C-50	2 - 7	7			CLAYEY SAND(SC)				
Fines (%)	Fraction >4.75 mm siz	e LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)			
36	5.0	27	12	15	.5 ASTM D698-Method A 122.3 11.5					



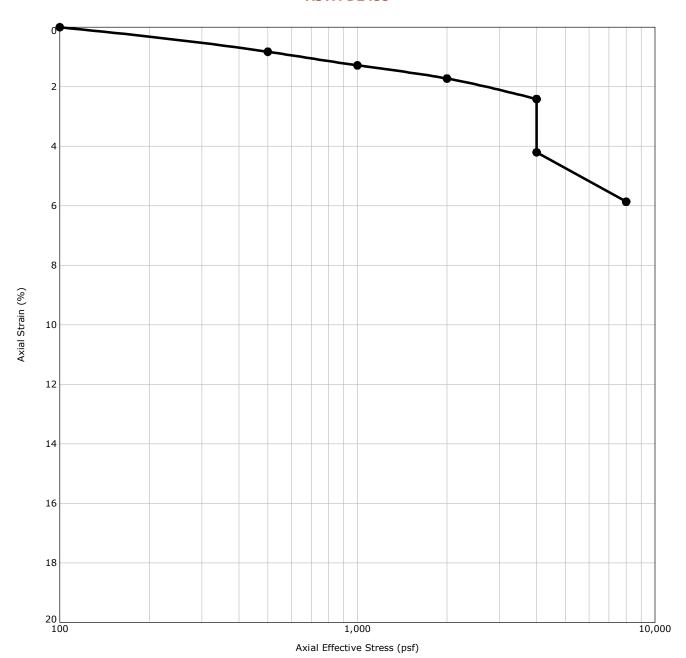
### **Moisture-Density Relationship**

**ASTM D698-Method A** 



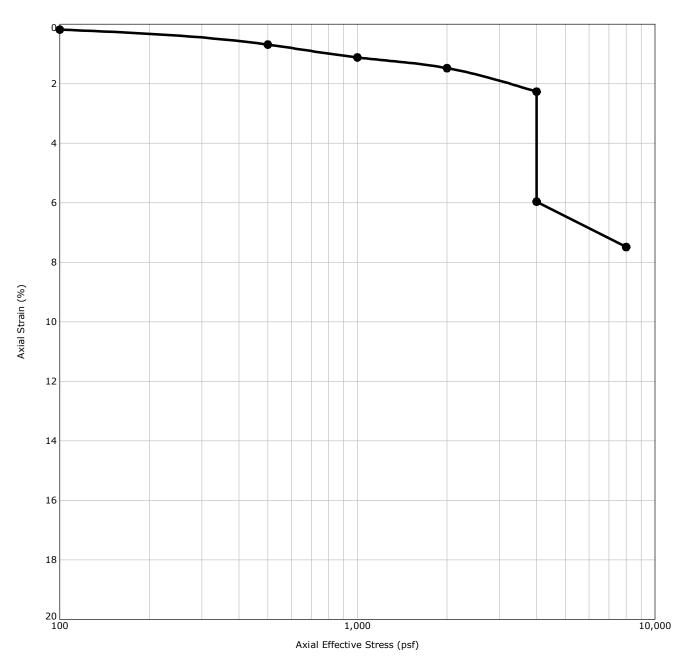
Вс	oring ID	Depth	(Ft)		ם	escription of Materials				
F	R&C-52	0.5 -	6			CLAYEY SAND(SC)				
Fines (%)	Fraction >4.75 mm siz	ze LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)			
35	6.2	23	14	9	9 ASTM D698-Method A 122.3 10.9					





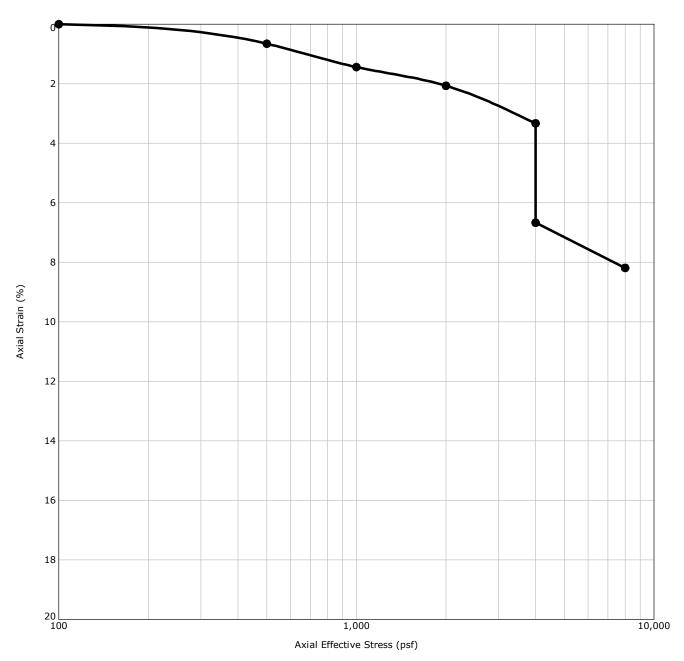
Boring ID	Depth (Ft)	Specimen #			Mate	erial Descr	iption			USCS	AASHTO
R&C-39	4 - 5					SILTY SAN	D			SM	
	Natural		Initial Dry Density		DT	Specific	Overburden	P <sub>c</sub>	C <sub>c</sub>	C <sub>r</sub> (% / log	Initial Void Ratio
Saturation	າ (%)	Moisture (%)	(pcf)			Dry Density LL PI Specific Overburden P <sub>c</sub> (% /					
		8.5	108.9							,	





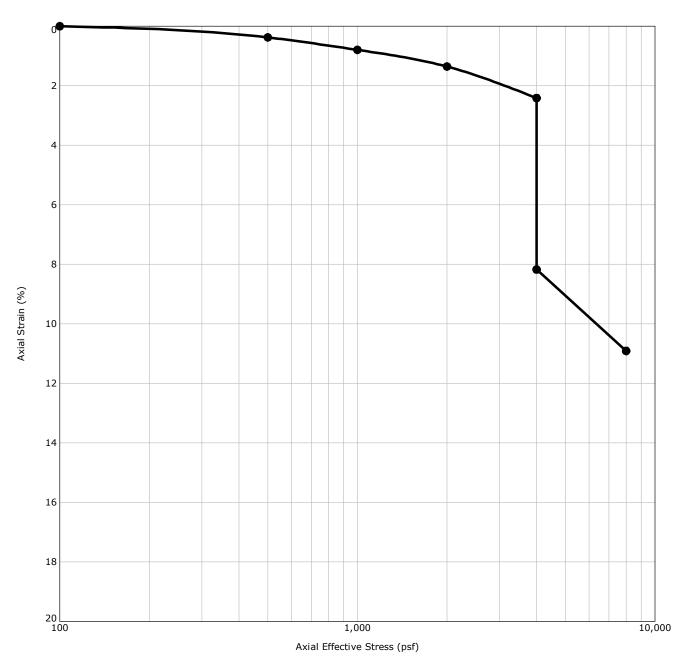
Boring ID	Depth (Ft)	Specimen #			Mate	erial Descr	iption			USCS	AASHTO
R&C-40	4 - 5			CLAYEY SAND SC							
	Natura	ıl	Initial Dry Density								
Saturation	າ (%)	Moisture (%)	(pcf)			Gravity	(psf)	(psf)	stress)	stress)	Ratio
		6.1	106.6								
Notes: Wate	er added at 4	,000 psf		106.6							





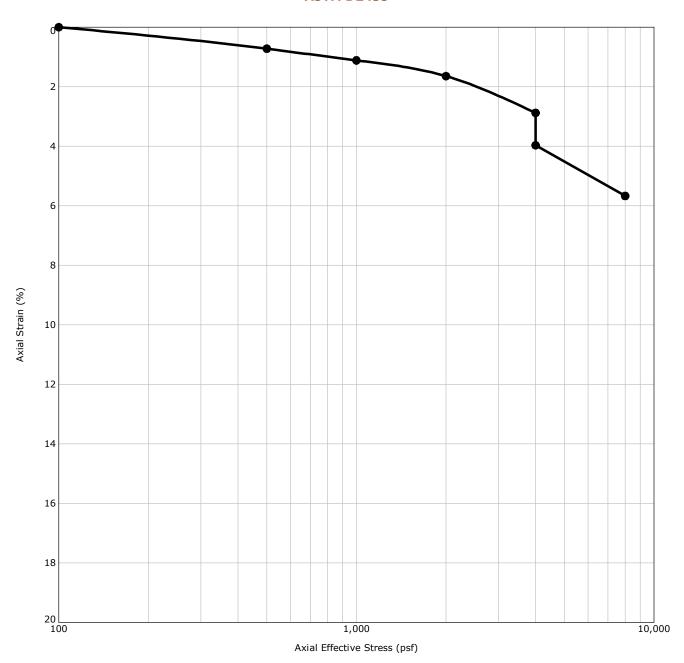
Boring ID	Depth (Ft)	Specimen #			Mate	erial Desci	ription			USCS	AASHTO
R&C-44	4 - 5			SILTY SAND SM							
	Natura		Initial Dry Density	LL	ΡI	Specific Gravity	Overburden (psf)	P <sub>c</sub> (psf)	C (% / log	C, (% / log	Initial Void Ratio
Saturation	n (%)	Moisture (%)	(pcf)			J. 2.1.1,	(60.)	(60.)	stress)	stress)	10.0.0
		4.8	105.0								
Notes: Wate	er added at 4	,000 psf	105.0								





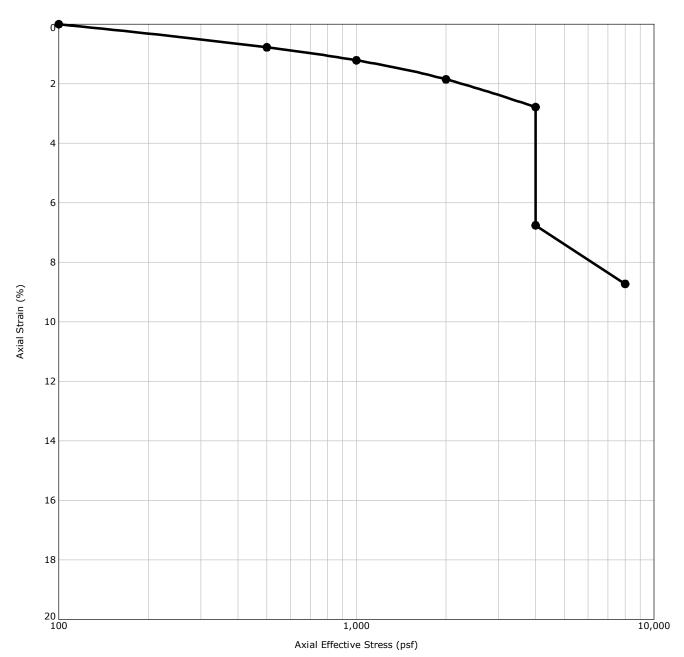
Boring ID	Depth (Ft)	Specimen #			Mate	erial Descr	iption			USCS	AASHTO
R&C-46	2 - 3		SILTY, CLAYEY SAND							SC-SM	
	Natural		Initial Dry Density	LL	ΡI	Specific	Overburden	Pc	C.	C, (% / log	Initial Void
			Dry Density LL PI Specific Overburden P <sub>c</sub> (% /								
Saturation	າ (%)	Moisture (%)	(pcf)			Gravity	(psf)	(pst)	`stress)	stress)	Ratio
Saturation	າ (%)	Moisture (%) 5.6				Gravity	(psf)	(pst)	stress)	stress)	Ratio





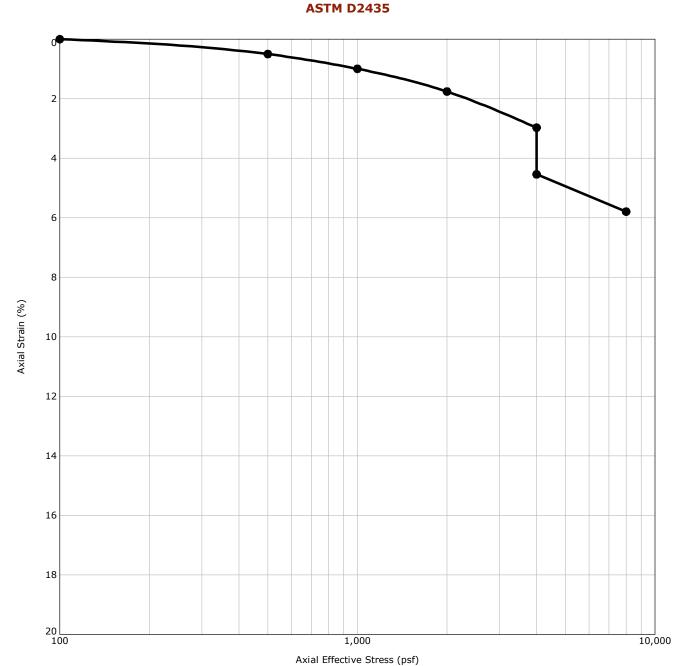
Boring ID	Depth (Ft)	Specimen #			Mate	erial Desci	ription			USCS	AASHTO
R&C-50	4 - 5			CLAYEY SAND SC							
	Natura	ıl	Initial Dry Density	LL	ΡI	Specific	Overburden	P <sub>c_</sub>	C.	C, (% / log	Initial Void
Saturation	n (%)	Moisture (%)	(pcf)		• -	Gravity	(psf)	(psf)	stress)	stress)	Ratio
		10.8	108.5								
Notes: Wate		000 6	108.5								





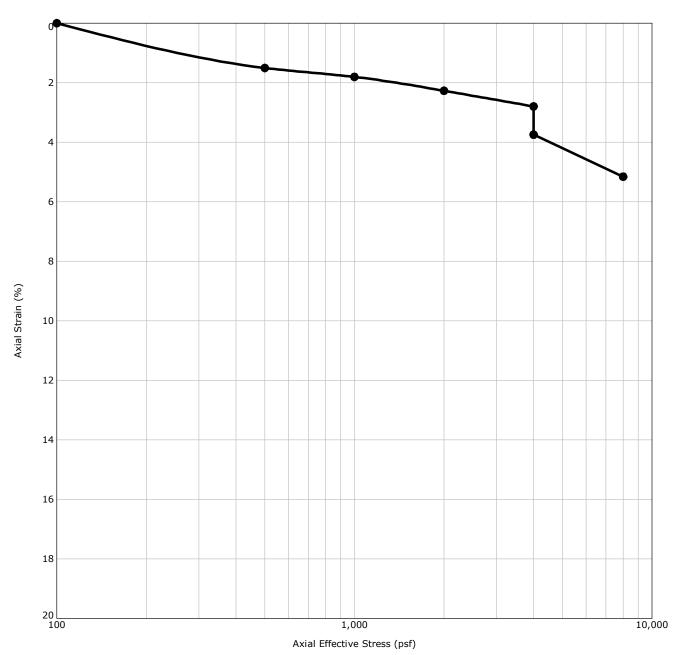
Boring ID	Depth (Ft)	Specimen #			Mate	erial Descr	iption	Material Description						
R&C-52	4 - 5				(	CLAYEY SAI	ND			SC				
	Natura		Initial Dry Density		DT	Specific	Overburden	P <sub>c</sub>	C <sub>c</sub>	C, (% / log	Initial Void			
Saturation	- (0/ )		Dry Density LL PI Specific Overburden Pc (% /						( /0 / 109	( /0 / 109	Ratio			
outurutio.	1 (%)	Moisture (%)	(pcf)			Gravity	(psi)	(psi)	stress)	stress)	Ratio			
Saturation	1 (%)	9.1	(pcf) 103.3	26	10	Gravity	(μσι)	(psi)	stress)	stress)	Ratio			





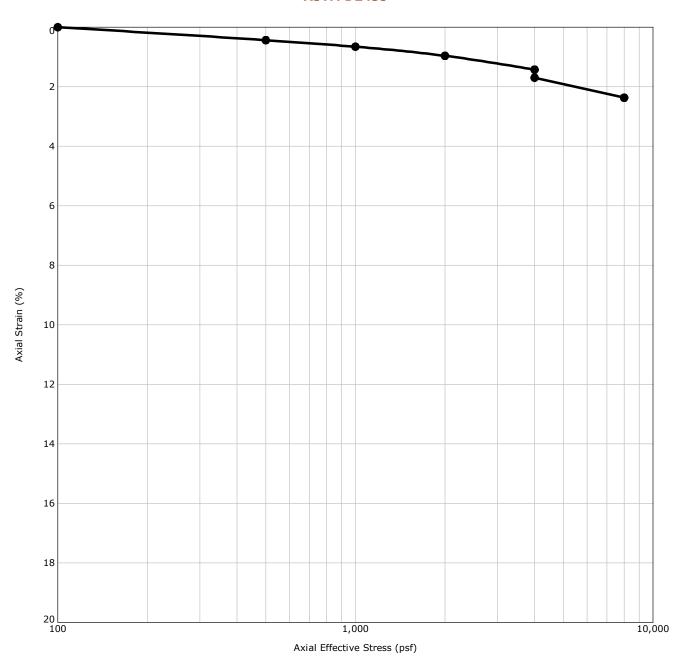
AASHTO uscs Boring ID Depth (Ft) Specimen # **Material Description** B-20 7 - 8 **CLAYEY SAND** SC **Initial** Natural C。 (% / log stress) C<sub>r</sub> (% / log stress) Initial Void Ratio Specific Gravity Overburden P<sub>c</sub> (psf) Dry Density (pcf) LL ΡI (psf) Saturation (%) Moisture (%) 16.2 95.7 Notes: Water added at 4,000 psf





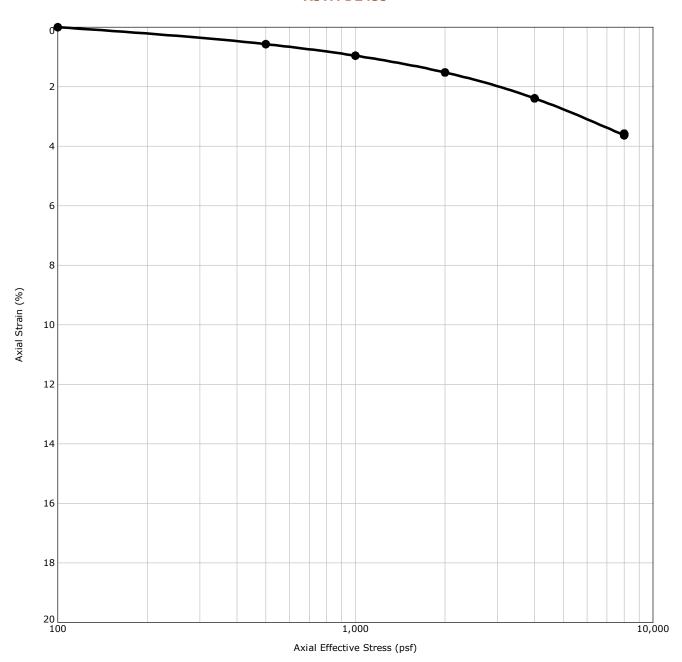
Boring ID	Depth (Ft)	Specimen #	Material Description							USCS	AASHTO
B-21	4 - 5				SILT	ΓΥ, CLAYEY	SAND			SC-SM	
	Natural		Initial Dry Donaity		DT	Specific	Overburden	P.	C <sub>c</sub>	C,	Initial Void
			Dry Density LL PI Specific Overburden Pc (% / lo								
Saturation	n (%)	Moisture (%)	(pcf)			Gravity	(psf)	(psf)	stress)	stress)	Ratio
Saturation	n (%)	<b>Moisture (%)</b> 7.0			-	Gravity	(psf)	(psf)	stress)	stress)	Ratio





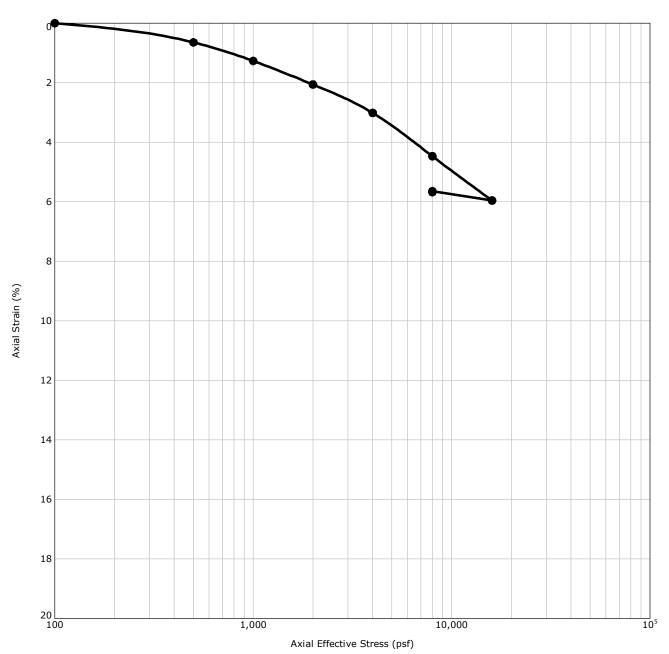
Boring ID	Depth (Ft)	Specimen #			Mate	erial Descr	iption			USCS	AASHTO
B-22	4 - 5		SILTY, CLAYEY SAND SC-SM							SC-SM	
	Natura	I	Initial Dry Density	LL	ΡI	Specific	Overburden	P <sub>c</sub>	C <sub>c</sub>	C, (% / log	Initial Void
Saturation	1 (%)	Moisture (%)	(pcf)			Gravity	(psf)	(psf)	stress)	stress)	Ratio
		8.5	114.3								
Notes: Wate	er added at 4	,000 psf	114.3								





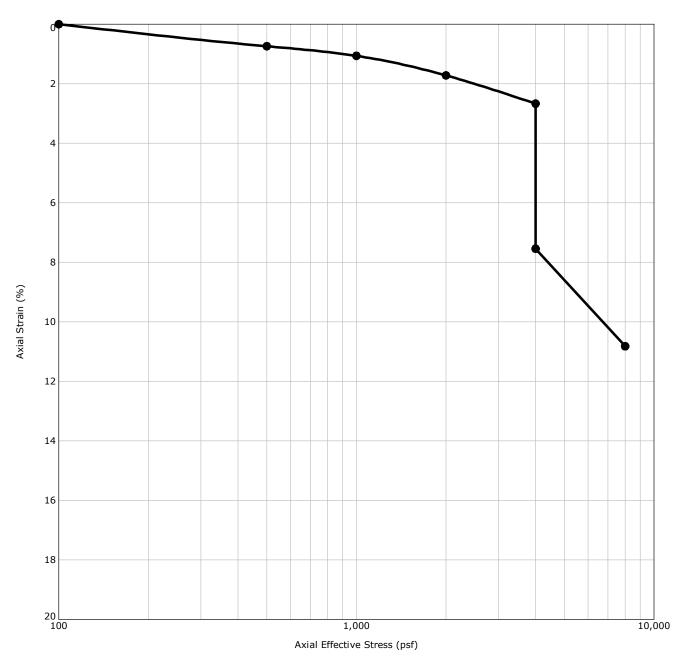
Boring ID	Depth (Ft)	Specimen #			Mate	erial Descr	Material Description						
B-22	34 - 35		FAT CLAY							СН			
	Natura	I	Initial Dry Density	Drug Density II pr Specific Overburden Pc (0)							Initial Void		
Saturation	n (%)	Moisture (%)	(pcf)		• -	Gravity	(psf)	(psf)	stress)	stress)	Ratio		
		21.1	104.3	52	35								
	er added at 8,												





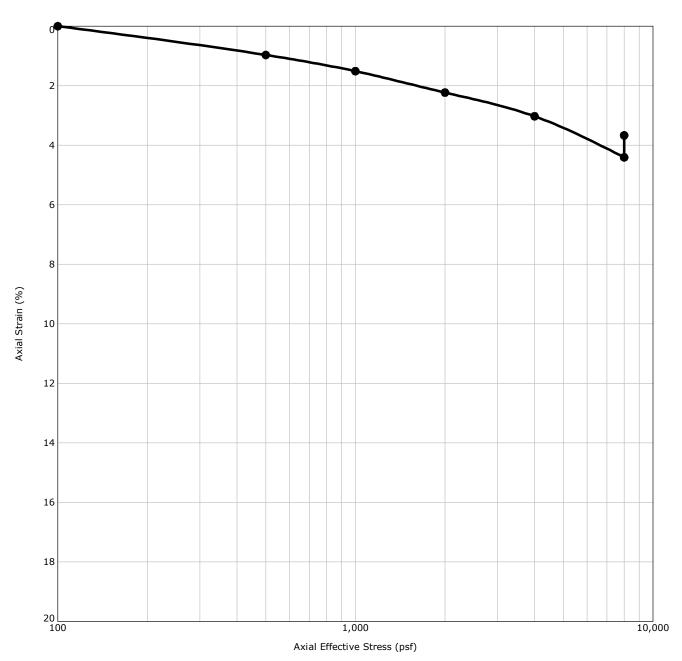
Boring ID	Depth (Ft)	Specimen #	Material Description					USCS	AASHTO		
B-22	49 - 50		SANDY LEAN CLAY					CL			
	Natural		Initial Dry Density	LL	ΡI	Specific	Overburden	P <sub>c</sub>	C.	C, (% / log	Initial Void
Saturation	າ (%)	Moisture (%)	(pcf)			Gravity	(psf)	(psf)	stress)	stress)	Ratio
									sti ess)	sti ess)	
		22.4	103.7	31	17				stress)	stress)	





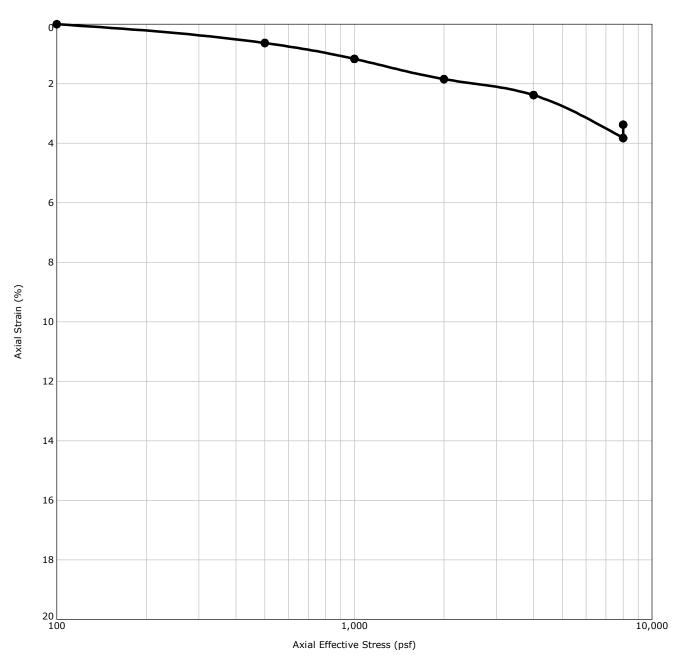
Boring ID	Depth (Ft)	Specimen #	Material Description						USCS	AASHTO	
B-23	4 - 5		SILTY, CLAYEY SAND						SC-SM		
	Natura	l	Initial			Specific	Overburden	P <sub>c</sub>	C <sub>c</sub>	C, (% / log	Initial Void
					DI	- p	• • • • • • • • • • • • • • • • • • • •	• c	(% / log	(% / log	Illicial Vola
Saturation	า (%)	Moisture (%)	Dry Density (pcf)	LL	PI	Gravity	(psf)	(psf)	(% / log stress)	(% / log stress)	Ratio
Saturation	າ (%)	Moisture (%) 11.0		Ш	PI	Gravity	(psf)	(psf)	(% / log stress)	(% / log stress)	Ratio





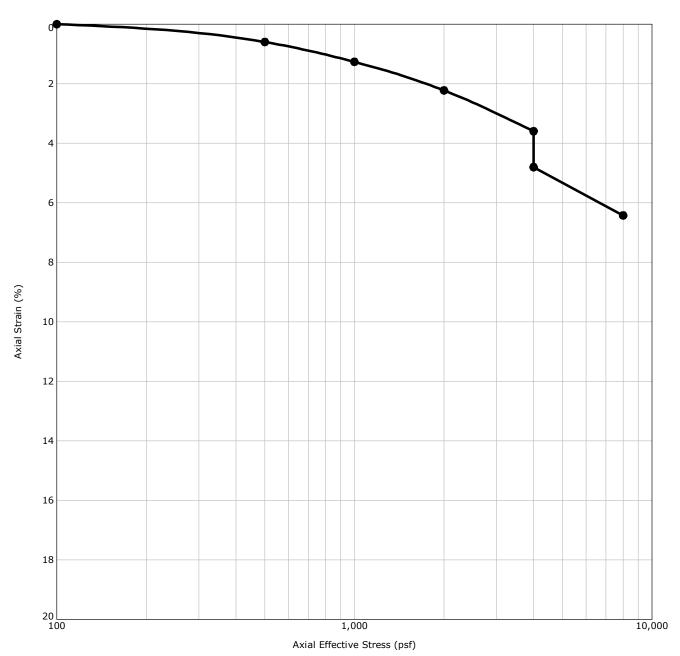
Boring ID	Depth (Ft)	Specimen #	Material Description						USCS	AASHTO	
B-23	24 - 25		FAT CLAY						СН		
	Natura	ni	Initial Dry Density	LL	ΡI	Specific	Overburden	P <sub>c</sub>	C <sub>c</sub>	C, (% / log	Initial Void
Saturation	n (%)	Moisture (%)	(pcf)			Gravity	(psf)	(psf)	stress)	stress)	Ratio
		33.9	89.2	74	53						
Notes: Wate	er added at 8	,000 psf									





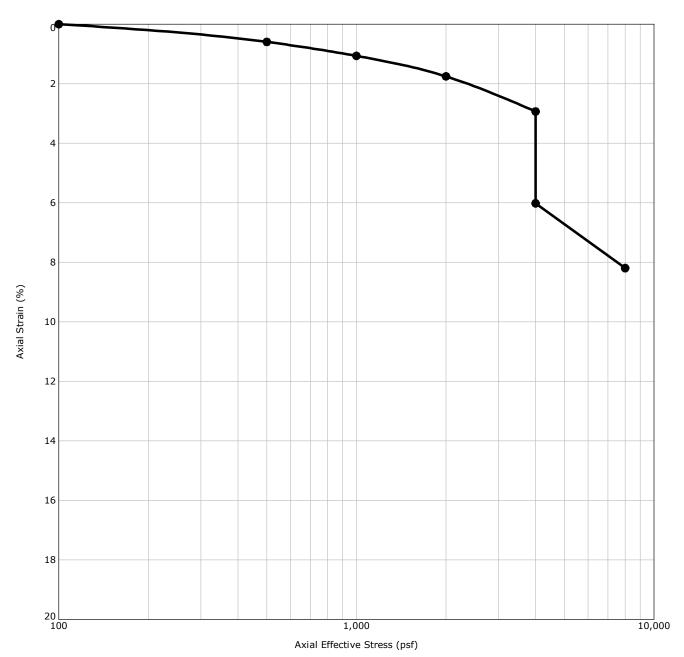
Boring ID	Depth (Ft)	Specimen #	Material Description					USCS	AASHTO		
B-24	19 - 20		LEAN CLAY with SAND					CL			
	Natural		Initial Dry Density	LL	ΡI	Specific	Overburden	P <sub>c</sub>	C <sub>c</sub>	C <sub>r</sub> (% / log stress)	Initial Void
Saturation	(%)					Gravity		/el		( /0 / 109	Ratio
	1 ( 70)	Moisture (%)	(pcf)			Gravity	(psf)	(psf)	stress)	stress)	Katio
	1 ( 70 )	21.5	(pcf) 104.2	42	25	Gravity	(psi)	(psr)	stress)	stress)	Katio





Boring ID	Depth (Ft)	Specimen #	Material Description						USCS	AASHTO	
B-25	4 - 5		SILTY SAND						SM		
	Natura		Initial Dry Density	LL	ΡI	Specific	Overburden	P <sub>c</sub>	C.	C, (% / log	Initial Void
Saturation	า (%)	Moisture (%)	(pcf)			Gravity	(psf)	(psf)	stress)	stress)	Ratio
		4.6	108.7	NP	NP						
			108.7 NP NP								





Boring ID	Depth (Ft)	Specimen #	Material Description						USCS	AASHTO	
B-25	7 - 8		SILTY, CLAYEY SAND						SC-SM		
	Natura	l	Initial			Specific	Overburden	P <sub>c</sub>	C <sub>c</sub>	C, (% / log	Initial Void
					DT	Specific	Overburden	F C	(% / log	(% / log	Initial Vola
Saturation	າ (%)	Moisture (%)	Dry Density (pcf)	LL	PI	Gravity	(psf)	(psf)	(% / log stress)	(% / log stress)	Ratio
Saturation	า (%)	Moisture (%) 9.2		LL	PI	Gravity	(psf)	(psf)	(% / log stress)	(% / log stress)	Ratio



I-10 GRIC Design-Build Project 65225282 **PROJECT:** JOB NO: LOCATION: 2 Koli Road TI **WORK ORDER NO:** Silty, Clayey Sand (SC-SM) R&C-39 @7'-8' **MATERIAL:** LAB NO: **SAMPLE SOURCE:** R&C-39 @7'-8' **DATE SAMPLED:** 03/24/25

Sample Preparation: In-situ density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens not inundated.

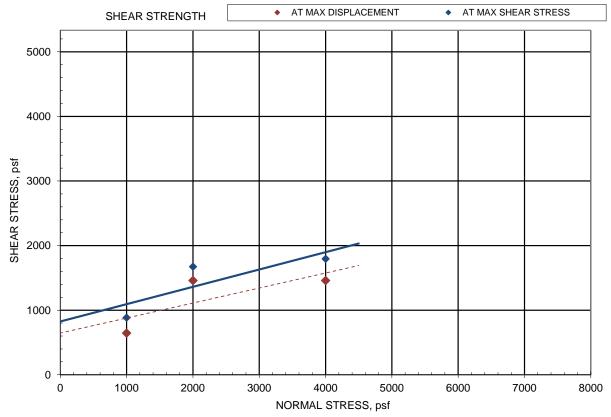
Initial Param	Initial Parameters of specimen:						
	Point 1	Point 2	Point 3				
Normal Stress (psf):	1000	2000	4000				
Dry mass (g):	123.03	125.75	129.42				
Height (in):	1.0000	1.0000	1.0000				
Diameter (in):	2.42	2.42	2.42				
Moisture, %:	7.5	7.7	5.9				
Dry Density (pcf):	101.9	104.2	107.2				
Saturation, %:	32	35	29				
Void Ratio:	0.62	0.59	0.54				
-							

Pre- Shear	Parameters of	of specimen:	
	Point 1	Point 2	Point 3
Normal Stress (psf):	1000	2000	4000
Dry mass (g):	123.03	125.75	129.42
Height (in):	0.9895	0.9771	0.957
Diameter (in):	2.42	2.42	2.42
Moisture, %:	7.2	7.1	5.2
Dry Density (pcf):	103.0	106.6	112.0
Saturation, %:	32	34	29
Void Ratio:	0.61	0.55	0.48

Normal Stress (psf):	1000	2000	4000
Maximum Shear Stress, (psf):	885	1674	1794
Displacement at Maximum Shear, (in):	0.139	0.115	0.175
Shear Stress at Max Displacement, (psf)	646	1459	1459
Maximum Displacement, (in):	0.448	0.450	0.452
Rate of Deformation, in/min	0.007	0.007	0.007

SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

SPECIFIC GRAVITY: Specific gravity assumed: 2.651



**Note:** The friction angle presented is applicable only to the load ranges and sample conditions tested



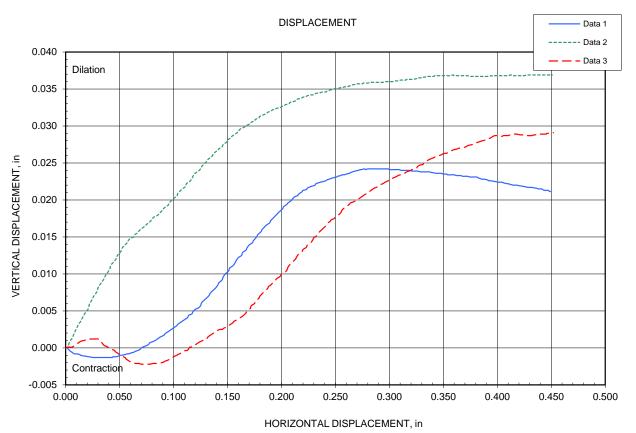
**PROJECT:** I-10 GRIC Design-Build Project **JOB NO:** 65225282

LOCATION: Koli Road TI WORK ORDER NO: 2

MATERIAL: Silty, Clayey Sand (SC-SM) LAB NO: R&C-39 @7'-8'

**SAMPLE SOURCE**: R&C-39 @7'-8' **DATE SAMPLED**: 3/24/25







03/24/25

 PROJECT:
 I-10 GRIC Design-Build Project
 JOB NO:
 65225282

 LOCATION:
 Koli Road TI
 WORK ORDER NO:
 2

MATERIAL: Silty, Clayey Sand (SC-SM) LAB NO: R&C-46 @ 4'-5'

Sample Preparation: In-situ density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior

to shear. Specimens not inundated.

Initial Param	Initial Parameters of specimen:						
	Point 1	Point 2	Point 3				
Normal Stress (psf):	1000	2000	4000				
Dry mass (g):	124.71	119.30	122.95				
Height (in):	1.0000	1.0000	1.0000				
Diameter (in):	2.42	2.42	2.42				
Moisture, %:	5.6	5.3	5.5				
Dry Density (pcf):	103.3	98.8	101.8				
Saturation, %:	25	21	23				
Void Ratio:	0.60	0.67	0.63				
_							

R&C-46 @ 4'-5'

**SAMPLE SOURCE:** 

Pre- Shear Parameters of specimen:							
	Point 1	Point 2	Point 3				
Normal Stress (psf):	1000	2000	4000				
Dry mass (g):	124.71	119.30	122.95				
Height (in):	0.9824	0.9528	0.9446				
Diameter (in):	2.42	2.42	2.42				
Moisture, %:	5.1	4.7	4.9				
Dry Density (pcf):	105.1	103.7	107.8				
Saturation, %:	24	21	24				
Void Ratio:	0.57	0.60	0.54				

**DATE SAMPLED:** 

Normal Stress (psf): 1000 2000 4000 Maximum Shear Stress, (psf): 1100 1531 2655 Displacement at Maximum Shear, (in): 0.036 0.354 0.238 Shear Stress at Max Displacement, (psf) 670 1268 2392 Maximum Displacement, (in): 0.450 0.450 0.450 Rate of Deformation, in/min 0.003 0.003 0.003

FRICTION
ANGLE COHESION
AT MAX SHEAR STRESS 28 538
Specs:

SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

SPECIFIC GRAVITY: Specific gravity assumed: 2.651

AT MAX DISPLACEMENT	30	108
Specs:		

SHEAR ST	RENGTH [	•	AT MAX DISPLA	CEMENT	◆ AT MA	X SHEAR STRE	SS
1000	2000	3000	4000	5000	6000	7000	8000
		SHEAR STRENGTH	1000 2000 3000	1000 2000 3000 4000	SHEAR STRENGTH	1000 2000 3000 4000 5000 6000	1000 2000 3000 4000 5000 6000 7000

**Note:** The friction angle presented is applicable only to the load ranges and sample conditions tested



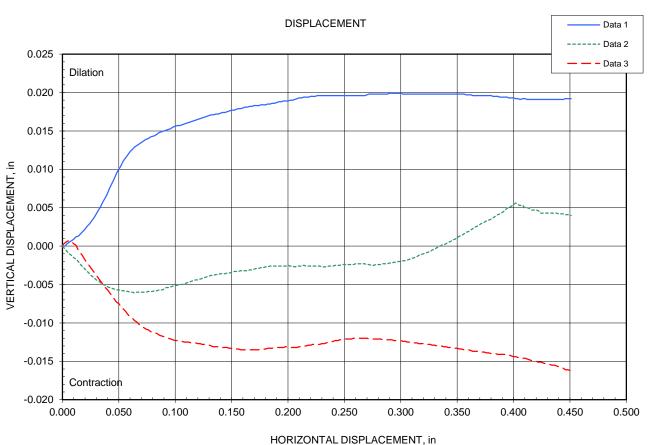
PROJECT: I-10 GRIC Design-Build Project JOB NO: 65225282

LOCATION: Koli Road TI WORK ORDER NO: 2

MATERIAL: Silty, Clayey Sand (SC-SM) LAB NO: R&C-46 @ 4'-5'

 SAMPLE SOURCE:
 R&C-46 @ 4'-5'
 DATE SAMPLED:
 3/24/25







 PROJECT:
 I-10 GRIC Koli Road TI Design
 JOB NO:
 65225282

 LOCATION:
 Koli Road TI
 WORK ORDER NO:
 1

 MATERIAL:
 Silty, Clayey Sand (SC-SM)
 LAB NO:
 B-20 @4'-5'

 SAMPLE SOURCE:
 B-20 @4'-5'
 DATE SAMPLED:
 03/24/25

Sample Preparation: In-situ density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens not inundated.

eters of spe	cimen:	
Point 1	Point 2	Point 3
2000	4000	8000
125.56	125.17	123.13
1.0000	1.0000	1.0000
2.42	2.42	2.42
6.5	6.4	6.9
104.0	103.7	102.0
29	29	29
0.59	0.60	0.62
	Point 1 2000 125.56 1.0000 2.42 6.5 104.0 29	2000         4000           125.56         125.17           1.0000         1.0000           2.42         2.42           6.5         6.4           104.0         103.7           29         29

Pre- Shea	r Parameters (	of specimen:	
	Point 1	Point 2	Point 3
Normal Stress (psf):	2000	4000	8000
Dry mass (g):	125.56	125.17	123.13
Height (in):	0.9788	0.9472	0.9443
Diameter (in):	2.42	2.42	2.42
Moisture, %:	5.8	6.0	6.2
Dry Density (pcf):	106.3	109.5	108.0
Saturation, %:	28	31	31
Void Ratio:	0.56	0.51	0.53

_			
Normal Stress (psf):	2000	4000	8000
Maximum Shear Stress, (psf):	1555	2751	5119
Displacement at Maximum Shear, (in):	0.144	0.146	0.204
Shear Stress at Max Displacement, (psf)	1220	2272	4616
Maximum Displacement, (in):	0.450	0.450	0.451
Rate of Deformation, in/min	0.007	0.007	0.007

## FRICTION ANGLE COHESION

AT MAX SHEAR STRESS 31 371

Specs: 30 48

Specs:

SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

SPECIFIC GRAVITY: Specific gravity assumed: 2.651

	SH	EAR STRENG	ЭТН	◆ AT MA)	( DISPLACEME	NT •	AT MAX SHEA	AR STRESS
10000 -	-							
8000 -	-							
6000 - 60	-							
7 Y Y Y 4000 -	-							
2000 -	-							
0 -		000 40	000 60	00 80		000 120	000 140	000 1600

NORMAL STRESS, psf

**Note:** The friction angle presented is applicable only to the load ranges and sample conditions tested

Exhibit: B-39

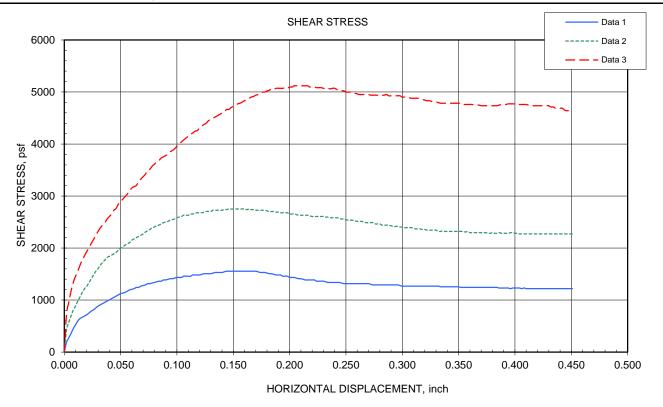


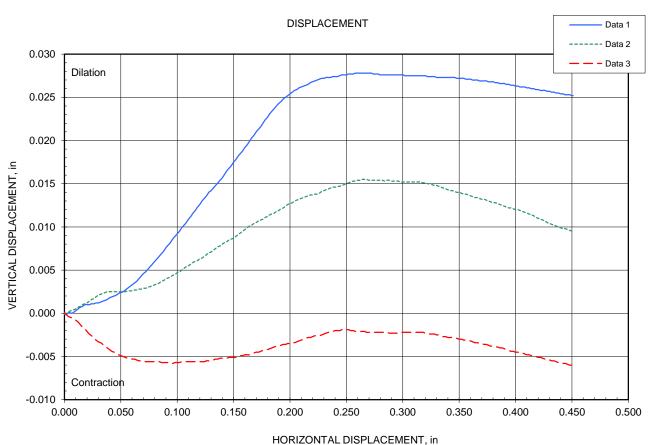
PROJECT: I-10 GRIC Koli Road TI Design JOB NO: 65225282

LOCATION: Koli Road TI WORK ORDER NO: 1

 MATERIAL:
 Silty, Clayey Sand (SC-SM)
 LAB NO:
 B-20 @4'-5'

 SAMPLE SOURCE:
 B-20 @4'-5'
 DATE SAMPLED:
 3/24/25







 PROJECT:
 I-10 GRIC Design-Build Project
 JOB NO:
 65225282

 LOCATION:
 Koli Road TI
 WORK ORDER NO:
 1

 MATERIAL:
 Gravelly Fat Clay (CH)
 LAB NO:
 B-21 @49'-50'

 SAMPLE SOURCE:
 B-21 @49'-50'
 DATE SAMPLED:
 03/24/25

Sample Preparation: In-situ density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens not inundated.

Initial Parameters of specimen: Point 1 Point 3 Point 2 Normal Stress (psf): 3000 5000 10000 Dry mass (g): 102.33 105.45 96.87 Height (in): 1.0000 1.0000 1.0000 Diameter (in): 2.42 2.42 2.42 Moisture, %: 36.4 32.3 29.5 Dry Density (pcf): 84.8 87.3 80.2 Saturation, %: 101 96 74 Void Ratio: 0.95 0.89 1.06

Pre- Shear	Parameters of	of specimen:	
	Point 1	Point 2	Point 3
Normal Stress (psf):	3000	5000	10000
Dry mass (g):	102.33	105.45	96.87
Height (in):	0.9544	0.9026	0.896
Diameter (in):	2.42	2.42	2.42
Moisture, %:	34.8	32.0	28.6
Dry Density (pcf):	88.8	96.8	89.6
Saturation, %:	107	120	90
Void Ratio:	0.86	0.71	0.85

3000	5000	10000
1519	1603	1746
0.112	0.246	0.098
1292	1531	1387
0.448	0.450	0.450
0.003	0.003	0.003
	1519 0.112 1292 0.448	1519 1603 0.112 0.246 1292 1531 0.448 0.450

FRICTION
ANGLE COHESION
AT MAX SHEAR STRESS 2 1433
Specs:

Specs:

0

1371

AT MAX DISPLACEMENT

SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

8000		
8000		
\frac{1}{8} \text{ 6000}		
0 6000 0 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		

**Note:** The friction angle presented is applicable only to the load ranges and sample conditions tested

4000

6000

8000

NORMAL STRESS, psf

10000

12000

14000

16000

2000

2000

0

0

Exhibit: B-41

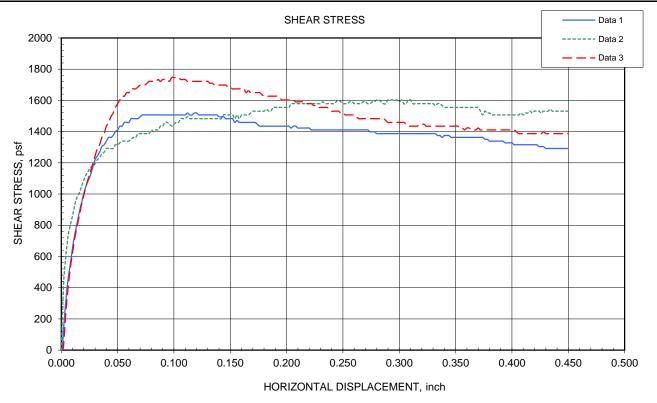


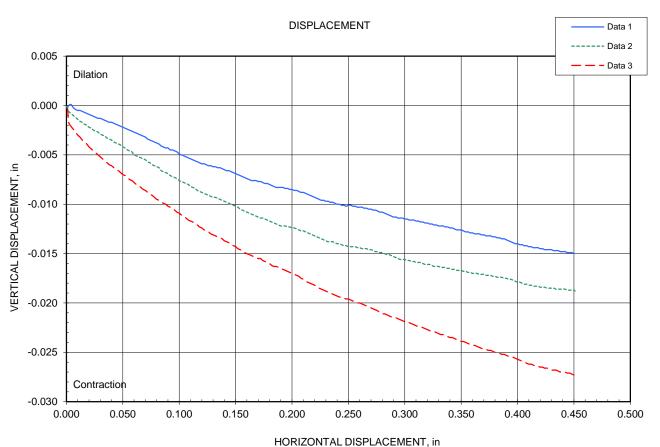
PROJECT: I-10 GRIC Design-Build Project JOB NO: 65225282

LOCATION: Koli Road TI WORK ORDER NO: 1

MATERIAL: Gravelly Fat Clay (CH) LAB NO: B-21 @49'-50'

**SAMPLE SOURCE**: B-21 @49'-50' **DATE SAMPLED**: 3/24/25





# DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080



PROJECT: I-10 GRIC Design-Build Project JOB NO: 65225282

LOCATION: Koli Road TI WORK ORDER NO: 1

MATERIAL: Poorly Graded Sand with Silt and Gravel (SP-SM) LAB NO: B-22 @7'-8' SAMPLE SOURCE: B-22 @7'-8' DATE SAMPLED: 03/24/25

Sample Preparation: In-situ density, material and moisture. Specimens consolidated at normal load for 30 mins. Prior to shear. Specimens not inundated.

Initial Parameters of specimen:						
Point 1 Point 2 Point 3						
Normal Stress (psf):	2000	4000	8000			
Dry mass (g):	132.81	129.38	130.02			
Height (in):	1.0000	1.0000	1.0000			
Diameter (in):	2.42	2.42	2.42			
Moisture, %:	8.8	6.4	6.0			
Dry Density (pcf):	110.0	107.2	107.7			
Saturation, %:	46	31	30			
Void Ratio:	0.50	0.54	0.54			
_						

Pre- Shear Parameters of specimen:				
Point 1 Poir			Point 3	
Normal Stress (psf):	2000	4000	8000	
Dry mass (g):	132.81	129.38	130.02	
Height (in):	0.972	0.9653	0.96	
Diameter (in):	2.42	2.42	2.42	
Moisture, %:	3.6	5.8	5.3	
Dry Density (pcf):	113.2	111.0	112.2	
Saturation, %:	21	31	30	
Void Ratio:	0.46	0.49	0.48	

Normal Stress (psf): 4000 2000 8000 Maximum Shear Stress, (psf): 1674 3313 5956 Displacement at Maximum Shear, (in): 0.126 0.159 0.199 Shear Stress at Max Displacement, (psf) 1363 2763 5358 Maximum Displacement, (in): 0.451 0.451 0.452 Rate of Deformation, in/min 0.007 0.007 0.007

FRICTION
ANGLE COHESION
AT MAX SHEAR STRESS 35 352
Specs:

SHEAR DEVICE: Geomatic model 8914, Dead Weight load force

SPECIFIC GRAVITY: Specific gravity assumed: 2.651

AT MAX DISPLACEMENT	34	65
Specs:		

	SHEAR STRENGTH	◆ AT MAX DISPLACEMEN	NT • AT MAX SHEAR STRESS
10000			
-			
8000			
-			
ý 6000			
SHEAR STRESS, psf			
₩ 4000 —			
<u> </u>			
2000			
-			
0			
0	2000 4000	6000 8000 100 NORMAL STRESS, psf	000 12000 14000 16000 f

**Note:** The friction angle presented is applicable only to the load ranges and sample conditions tested

Exhibit: B-43

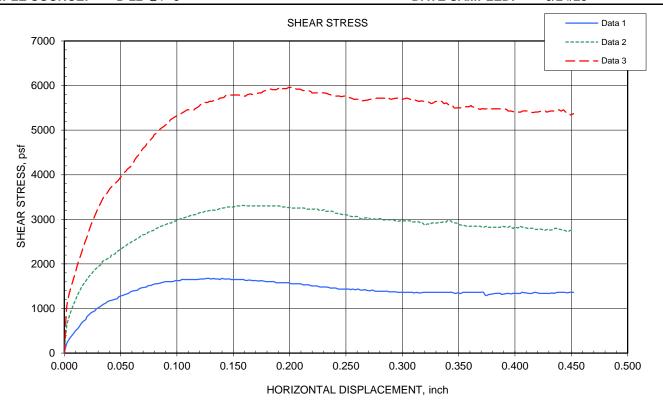
# DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS ASTM D3080

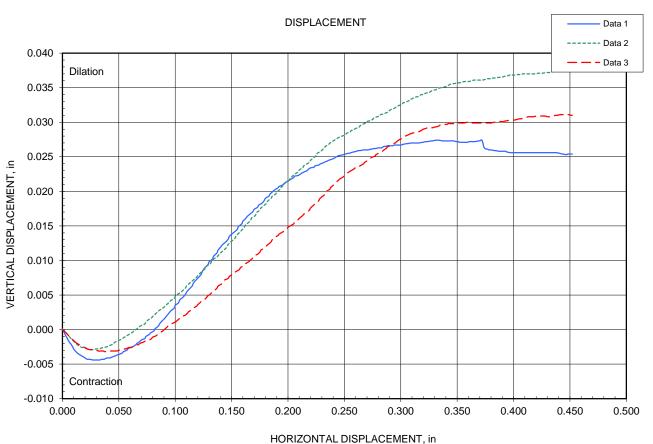


PROJECT: I-10 GRIC Design-Build Project JOB NO: 65225282

LOCATION: Koli Road TI WORK ORDER NO: 1

MATERIAL:Poorly Graded Sand with Silt and Gravel (SP-SM)LAB NO:B-22 @7'-8'SAMPLE SOURCE:B-22 @7'-8'DATE SAMPLED:3/24/25







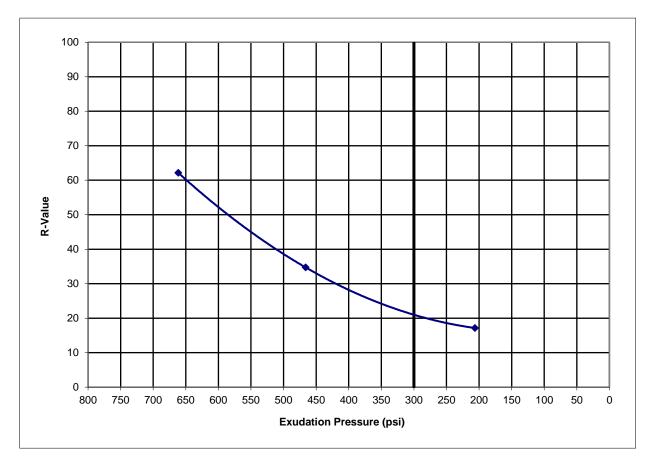
PROJECT: I-10 GRIC Design-Build Project

JOB NO: 65225282
LOCATION: Koli Road TI
MATERIAL: Clayey Sand (SC)

R&C-50 @ 2'-7'

#### RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	Α	В	С
Moisture Content	22.4%	18.8%	15.2%
Compaction Pressure (psi)	75	125	225
Specimen Height (inches)	2.50	2.49	2.46
Dry Density (pcf)	116.0	120.3	125.5
Horiz. Pres. @ 1000lbs (psi)	50.0	36.0	21.0
Horiz. Pres. @ 2000lbs (psi)	119.0	89.0	47.0
Displacement	4.16	3.75	3.66
Expansion Pressure (psi)	0.0	0.0	0.0
Exudation Pressure (psi)	206	466	661
R Value	17	35	62



**R Value at 300 PSI =** 21.0



**PROJECT:** I-10 GRIC Design-Build Project

 JOB NO:
 65225282

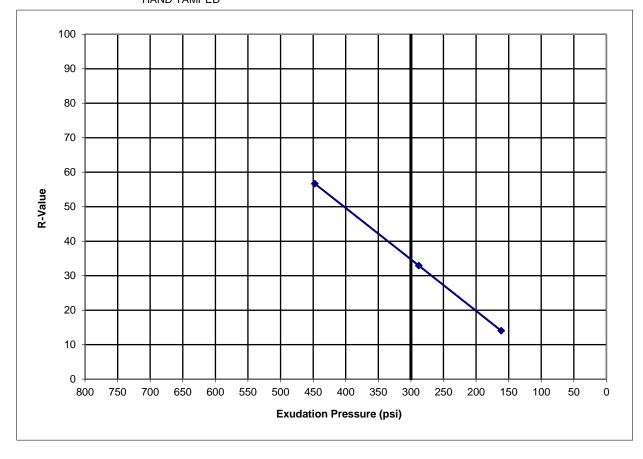
 LOCATION:
 Koli Road TI

 MATERIAL:
 Clayey Sand (SC)

 R&C-52 @ 0.5'-6'

#### RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	Α	В	С
Moisture Content	24.4%	20.9%	17.3%
Compaction Pressure (psi)	*	125	175
Specimen Height (inches)	2.43	2.49	2.47
Dry Density (pcf)	113.6	117.7	122.4
Horiz. Pres. @ 1000lbs (psi)	53.0	36.0	29.0
Horiz. Pres. @ 2000lbs (psi)	123.0	91.0	62.0
Displacement	4.29	3.86	3.02
Expansion Pressure (psi)	0.0	0.0	0.0
Exudation Pressure (psi)	161	288	447
R Value	14	33	57
* HAND TAMPED			



**R Value at 300 PSI =** 34.7



ING 122 ENDORMOND,

Report: 954857 Reported: 4/3/2025 Received: 3/27/2025 PO: 65225282

## **Laboratory Analysis Report**

Terracon Ramon Padilla 4685 S. Ash Ave Suite H4 Tempe, AZ 85282

Project: 65225282

Lab Number	Sample ID
954857-1	R&C-39 (0.5-6')

## **Test Parameter**

Test	Method	Result	Units	
pH (ARIZ 236e)	ARIZ 236e	9.3	SU	_
Minimum Resistivity	ARIZ 236e	2349	ohm-cm	
Sulfate	ASTM C1580	268	mg/kg	
Chloride	ASTM D512c	43	mg/kg	

Lab Number	Sample ID
954857-2	R&C-46 (2.1-8')

## **Test Parameter**

Test Method Result Units	
pH (ARIZ 236e) ARIZ 236e 8.3 SU	
Minimum Resistivity ARIZ 236e 268 ohm-c	m
Sulfate ASTM C1580 562 mg/k	5
Chloride ASTM D512c 1264 mg/k	

Lab Number	Sample ID
954857-3	R&C-50 (2-7')

## **Test Parameter**

Test	Method	Result	Units	
pH (ARIZ 236e)	ARIZ 236e	8.6	SU	
Minimum Resistivity	ARIZ 236e	483	ohm-cm	
Sulfate	ASTM C1580	666	mg/kg	
Chloride	ASTM D512c	555	mg/kg	

Lab Number	Sample ID
954857-4	R&C-52 (0.5-6')

## **Test Parameter**

Test	Method	Result	Units
pH (ARIZ 236e)	ARIZ 236e	8.6	SU
Minimum Resistivity	ARIZ 236e	2013	ohm-cm
Sulfate	ASTM C1580	1251	mg/kg
Chloride	ASTM D512c	397	mg/kg



Report: 954691 Reported: 3/19/2025 Received: 3/13/2025

## PO: 65225282

## **Laboratory Analysis Report**

Terracon Joaquin Perez Solis 4685 S. Ash Ave Suite H4 Tempe, AZ 85282

Project: 65225282

Lab Number	Sample ID
954691-1	B-20 (0-4')

## **Test Parameter**

Test	Method	Result.	Units	
pH (ARIZ 236e)	ARIZ 236e	8.2	SU	
Minimum Resistivity	ARIZ 236e	315	ohm-cm	
Sulfate	ASTM C1580	1392	mg/kg	
Chloride	ASTM D512c	2719	mg/kg	

## **Test Parameter**

Test	Method	Result.	Units	
pH (ARIZ 236e)	ARIZ 236e	8.5	SU	
Minimum Resistivity	ARIZ 236e	872	ohm-cm	
Sulfate	ASTM C1580	253	mg/kg	
Chloride	ASTM D512c	156	mg/kg	

Lab Number	Sample ID
954691-3	B-25 (0-5')

## **Test Parameter**

Test	Method	Result.	Units	
pH (ARIZ 236e)	ARIZ 236e	9.6	SU	
Minimum Resistivity	ARIZ 236e	1879	ohm-cm	
Sulfate	ASTM C1580	78	mg/kg	
Chloride	ASTM D512c	400	mg/kg	

Borehole	Depth	USCS	In-Situ P	roperties	CI	assific	ation			Ex	pansion	Testing						
No.	(ft.)	Soil Class.	Dry Density (pcf)	Water Content (%)	Passing #200 Sieve (%)	Atter	berg L	imits PI	Dry Density (pcf)	Water Content (%)	Surcharge (psf)	Expansion (%)	Expansion Index EI50	рН	Resistivity (ohm-cm)	Sulfates (ppm)	Chlorides (ppm)	Remarks
R&C-39	0.5 - 6.0	SM			33	19	16	3	. ,	, ,				9.3	2349	268	43	
R&C-39	1.0 - 2.0	SM	115	7														1, 2
R&C-39	4.0 - 5.0	SM	106	8														1, 2
R&C-39	7.0 - 8.0	SW-SM	105	7	8	NP	NP	NP										1
R&C-39	9.0 - 10.0	ML	102	17	59	NP	NP	NP										1
R&C-39	24.0 - 25.5	CL			92	39	21	18										
R&C-40	1.0 - 2.0	SC	106	6														1, 2
R&C-40	1.1 - 6.0	SC			37	22	14	8										
R&C-40	4.0 - 5.0	SC	108	5														1, 2
R&C-40	9.0 - 9.9	CL	104	13														1, 2
R&C-40	24.0 - 25.5	CL			68	44	17	27										
R&C-40	44.0 - 45.5	SM			16	NP	NP	NP										
R&C-41	1.0 - 2.0	SC	104	3														1, 2
R&C-41	1.1 - 6.0	SC			38	22	12	10										
R&C-41	4.0 - 4.4	SC		7														2
R&C-41	9.0 - 9.4	SC-SM		7														2
R&C-42	0.0 - 3.0	ML			59	NP	NP	NP										
R&C-42	2.0 - 3.0	ML	102	13														1, 2
R&C-42	3.0 - 8.0	CL			52	26	17	9										
R&C-42	4.0 - 5.0	CL	98	11	50	31	17	14										1
R&C-42	7.0 - 8.0	CL	108	10														1, 2
R&C-42	9.0 - 10.0	SM	102	13	35	NP	NP	NP										1
R&C-43	0.0 - 4.0	SC			39	24	15	9										
R&C-43	2.0 - 3.0	CL-ML	108	8	57	22	17	5										1
R&C-43	4.0 - 5.0	CL-ML	106	6														1, 2

PROJECT: I-10 GRIC Design-Build Project	<b>Fierracon</b>	PROJECT NUMBER: 65225282
SITE: Koli Road TI ADOT GEC	4685 S Ash Ave, Ste H-4 Tempe, AZ	CLIENT: HDR Engineering, Inc. Phoenix, AZ
SET CONTRACTOR OF THE CONTRAC	PH. 480-897-8200 FAX. 480-897-1133	EXHIBIT: B-49

SM SM SM SM SC SM SC-SM SC-SM SC-SM SC-SM SC-SM SC-SM SC-SM SC-SM SC	Dry Density (pcf)  123 110  107 110  105  104 106 108 114	Water Content (%)  2 3  4 9  4 6 5 11 14	Passing #200 Sieve (%)  27  37  32  33	NP NP 19 21	NP NP 13	NP NP 6	Dry Density (pcf)	Water Content (%)	Surcharge (psf)	(%)	Expansion Index EI50	рН	Resistivity (ohm-cm)	Sulfates (ppm)	Chlorides (ppm)	1, 2 1, 2 1, 2 1, 2
SM SM SC SM SC-SM SC-SM SC-SM SC-SM SC-SM SC-SM SC-SM SC-SM	110 107 110 105 104 106 108	3 4 9 4 6 5	37	NP 19	NP	NP 6	117	7.6								1, 2 1, 2 1, 2
SM SC SM SC-SM SC-SM SC-SM SC-SM SC-SM SC-SM SC-SM SC-SM	107 110 105 104 106 108	4 9 4 6 5	37	NP 19	NP	NP 6	117	7.6	100							1, 2
SM SC SM SC-SM SC-SM SC-SM SM SC-SM SC-SM SC SC SC	110 105 104 106 108	9 4 6 5 11	37	NP 19	NP	NP 6	117	7.6	100							1, 2
SC SM SC-SM SC-SM SC-SM SC-SM SC SC SC	110 105 104 106 108	9 4 6 5 11	32	19	13	6	117	7.6	100							1, 2
SM SC-SM SC-SM SM SC-SM SC-SM SC SC SC	105 104 106 108	4 6 5 11	32	19	13	6	117	7.6	100							·
SC-SM SC-SM SM SC-SM SC SC SC	104 106 108	6 5 11	32	19	13	6	117	7.6	100							4.0
SC-SM SM SC-SM SC SC SC	104 106 108	6 5 11	_		_	_	117	7.6	400							4.0
SM SC-SM SC SC SC	106 108	5 11	_		_	_	117	7.6	400							1, 2
SC-SM SC SC SC	106 108	5 11	33	21	19	_		7.0	100	0.1		8.3	268	562	1264	
SC SC SC	108	11				2										1
SC SC																1, 2
SC	114	14														1, 2
		'-														1, 2
00			29	25	16	9										
SC	110	8														1, 2
SC	106	11														1, 2
SC	109	10														1, 2
CL			90	36	21	15										
SM			28	NP	NP	NP										
SC-SM	97	6														1, 2
SC			36	27	12	15	116	9.5	100	0.9		8.6	483	666	555	
SC	107	11														1, 2
SC-SM	97	10														1, 2
SC-SM	109	8														1, 2
SC-SM			31	24	17	7										
SC-SM	109	14														1, 2
	SM SC-SM SC SC-SM SC-SM SC-SM SC-SM	SM SC-SM 97 SC SC 107 SC-SM 97 SC-SM 109 SC-SM SC-SM 109 e determined from one saturation.	SM 97 6 SC-SM 97 10 SC-SM 97 10 SC-SM 109 8 SC-SM 109 14 e determined from one or more ring	SM         28           SC-SM         97         6           SC         36           SC         107         11           SC-SM         97         10           SC-SM         109         8           SC-SM         31           SC-SM         109         14	SM         28         NP           SC-SM         97         6           SC         36         27           SC 107         11         36           SC-SM         97         10           SC-SM         109         8           SC-SM         31         24           SC-SM         109         14	SM         28         NP         NP           SC-SM         97         6         6           SC         36         27         12           SC-SM         97         10         6           SC-SM         109         8         6           SC-SM         31         24         17           SC-SM         109         14         14           e determined from one or more rings of a multi-ring sample.         saturation.	SM         28         NP         NP         NP           SC-SM         97         6         6         7         12         15           SC         107         11         7         15 <td>SM         28         NP         NP         NP           SC-SM         97         6         6         6         7         12         15         116         11</td> <td>SM         28         NP         NP         NP           SC-SM         97         6         6         97         12         15         116         9.5           SC         107         11         10         1</td> <td>SM         28         NP         NP         NP           SC-SM         97         6         6         97         10         9.5         100           SC         107         11         10         1</td> <td>SM         28         NP         NP         NP           SC-SM         97         6         6         97         10         9.5         100         0.9           SC         107         11         10</td> <td>SM         28         NP         NP         NP           SC-SM         97         6         6         97         10         9.5         100         0.9           SC         107         11         10</td> <td>SM         28         NP         NP         NP           SC-SM         97         6         6           SC         36         27         12         15         116         9.5         100         0.9         8.6           SC-SM         97         10         50         &lt;</td> <td>SM         28         NP         NP         NP           SC-SM         97         6         6           SC         36         27         12         15         116         9.5         100         0.9         8.6         483           SC-SM         97         10         97         10         97         10         97         10         97         10</td> <td>SM         28         NP         NP         NP           SC-SM         97         6         6         8         <td< td=""><td>SM         28         NP         NP         NP           SC-SM         97         6         6         555           SC         36         27         12         15         116         9.5         100         0.9         8.6         483         666         555           SC         107         11         10</td></td<></td>	SM         28         NP         NP         NP           SC-SM         97         6         6         6         7         12         15         116         11	SM         28         NP         NP         NP           SC-SM         97         6         6         97         12         15         116         9.5           SC         107         11         10         1	SM         28         NP         NP         NP           SC-SM         97         6         6         97         10         9.5         100           SC         107         11         10         1	SM         28         NP         NP         NP           SC-SM         97         6         6         97         10         9.5         100         0.9           SC         107         11         10	SM         28         NP         NP         NP           SC-SM         97         6         6         97         10         9.5         100         0.9           SC         107         11         10	SM         28         NP         NP         NP           SC-SM         97         6         6           SC         36         27         12         15         116         9.5         100         0.9         8.6           SC-SM         97         10         50         <	SM         28         NP         NP         NP           SC-SM         97         6         6           SC         36         27         12         15         116         9.5         100         0.9         8.6         483           SC-SM         97         10         97         10         97         10         97         10         97         10	SM         28         NP         NP         NP           SC-SM         97         6         6         8 <td< td=""><td>SM         28         NP         NP         NP           SC-SM         97         6         6         555           SC         36         27         12         15         116         9.5         100         0.9         8.6         483         666         555           SC         107         11         10</td></td<>	SM         28         NP         NP         NP           SC-SM         97         6         6         555           SC         36         27         12         15         116         9.5         100         0.9         8.6         483         666         555           SC         107         11         10

LOGISN	PROJECT: I-10 GRIC Design-Build Project	Ferracon	PROJECT NUMBER: 65225282
BORING	SITE: Koli Road TI ADOT GEC	4685 S Ash Ave, Ste H-4 Tempe, AZ	CLIENT: HDR Engineering, Inc. Phoenix, AZ
THIS		PH. 480-897-8200 FAX. 480-897-1133	EXHIBIT: B-50

I	Borehole	Depth	USCS	In-Situ P	roperties	Classification				Expansion Testing					Corrosivity				
T 4/15/25	No.			Dry Density (pcf)	Water Content (%)	Passing #200 Sieve (%)	Atter	berg L	imits	Dry Density (pcf)	Water Content (%)	Surcharge (psf)	Expansion (%)	Expansion Index EI50	рН	Resistivity (ohm-cm)	Sulfates (ppm)	Chlorides (ppm)	Remarks
E.GD	R&C-51	9.0 - 10.0	SC-SM	113	15														1, 2
PLAT	R&C-51	29.0 - 30.5	ML			63	NP	NP	NP										
TEM	R&C-52	0.5 - 6.0	SC			35	23	14	9	116	8.9	100	0.6		8.6	2013	1251	397	
DATA	R&C-52	1.0 - 2.0	SC	107	11														1, 2
NO.	R&C-52	4.0 - 5.0	SC	106	9	42	26	16	10										1
RAC	R&C-52	7.0 - 8.0	SC	107	7														1, 2
甲	R&C-52	9.0 - 10.0	SP	100	7	1	NP	NP	NP										1
T.GP.	R&C-52	14.0 - 15.5	CL			52	48	24	24										
RD. I	R&C-53	1.0 - 2.0	SC	109	7														1, 2
KOLI	R&C-53	1.1 - 6.0	SC			47	25	16	9										
JOT P	R&C-53	4.0 - 5.0	SC	103	8														1, 2
82 AI	R&C-53	9.0 - 9.9	CL	95	17														1, 2
2252	B-20	0.0 - 4.0	SC-SM			39	19	13	6						8.2	315	1392	2719	
2 65	B-20	2.0 - 3.0	SC-SM	109	4														1, 2
TIES	B-20	4.0 - 5.0	SC-SM	106	6														1, 2
PROPERTIES	B-20	5.0 - 7.0	SC-SM			30	20	15	5										
	B-20	7.0 - 8.0	SC	106	13														1, 2
SOIL	B-20	9.0 - 10.0	SC	108	12														1, 2
ORT.	B-20	19.0 - 20.0	CL	98	20														1, 2
REPORT	B-20	34.0 - 35.0	CL	99	25	85	38	20	18										1
INAL	B-20	49.0 - 50.0	SM	100	15	34	NP	NP	NP										1
ORIG	B-21	1.0 - 6.0	SC-SM			30	20	15	5						8.5	872	253	156	
SOM	B-21	2.0 - 3.0	SC-SM	111	5														1, 2
	B-21	4.0 - 5.0	SC-SM	107	7														1, 2
RATE	B-21	7.0 - 8.0	SC-SM	109	6														1, 2
NOT VALID IF SEPARATED FROM ORIGINAL	2. Visual Classification. 3. Submerged to approximate saturation. 4. Expansion Index in accordance with ASTM D4829-95. 5. Air-Dried Sample																		

PROJECT: I-10 GRIC Design-Build Project	<b>Fierracon</b>	PROJECT NUMBER: 65225282
SITE: Koli Road TI ADOT GEC	4685 S Ash Ave, Ste H-4 Tempe, AZ	CLIENT: HDR Engineering, Inc. Phoenix, AZ
SET.	PH. 480-897-8200 FAX. 480-897-1133	EXHIBIT: B-51

ம Boreh	nole Dont	Depth	USCS	In-Situ P	roperties	Classification				Expansion Testing					Corrosivity				
No	No. (ft.)		Soil Class.	Dry Density (pcf)	Water Content (%)	Passing #200 Sieve (%)	Atter	berg L	imits Pl	Dry Density (pcf)	Water Content (%)	Surcharge (psf)	Expansion (%)	Expansion Index EI 50	рН	Resistivity (ohm-cm)	Sulfates (ppm)	Chlorides (ppm)	Remarks
B-2 B-2 B-2 B-2 B-2	9.0 - 1	0.0	SC-SM	106	11														1, 2
B-2	24.0 - 2	25.0	CL	100	23	73	44	18	26										1
B-2	1 34.5 - 3	35.5	SC-SM	110	19														1, 2
B-2	1 39.0 - 4	0.0	SC-SM	113	12														1, 2
	1 49.0 - 5	0.0	СН	91	26	64	52	15	37										1
B-2 B-2	2.0 - 3	3.0	SC-SM	87	23														1, 2
D-2	2.0 - 6	6.6	SC-SM			29	19	14	5										
Б-2	2 4.0 - 5	5.0	SC-SM	111	8														1, 2
B-2	2 7.0 - 8	3.0	SP-SM	107	6	8	NP	NP	NP										1
B-2	2 9.0 - 1	0.0	SP-SM	110	9														1, 2
b B-2	2 19.0 - 2	20.0	CL	94	27														1, 2
B-2 B-2 B-2 B-2	29.0 - 3	80.0	CL	111	13														1, 2
B-2	2 34.0 - 3	35.0	СН	95	33	88	52	17	35										1
B-2	2 49.0 - 5	0.0	CL	105	20	57	31	14	17										1
	2 69.0 - 7	0.0	SM	111	17														1, 2
В-2 В-2 В-2	23 0.0 - 5	5.0	SC-SM			48	21	14	7										
B-2	2.0 - 3	3.0	SC-SM	109	7														1, 2
ട്ട B-2	3 4.0 - 5	5.0	SC-SM	98	10														1, 2
E B-2	3 5.0 - 1	0.0	SC			38	22	14	8										
B-2 B-2	3 7.0 - 8	3.0	SC	109	10														1, 2
	3 9.0 - 1	0.0	SC	108	16														1, 2
ଅ B-2	24.0 - 2	25.0	CH	88	40	92	74	21	53										1
ĕ B-2	29.0 - 3	80.0	СН	93	25														1, 2
<sup>€</sup> B-2	3 40.5 - 4	1.5	SP-SM	100	3														1, 2
≝ B-2	23 44.0 - 4	5.0	ML	94	24	88	28	23	5										1
1. Dr. 2. Vis 3. Su 4. Ex	<ol> <li>Visual Classification.</li> <li>Submerged to approximate saturation.</li> <li>Expansion Index in accordance with ASTM D4829-95.</li> <li>Air-Dried Sample</li> </ol>																		

PROJEC	CT: I-10 GRIC Design-Build Project	<b>E</b> lerr	acon	PROJECT NUMBER: 65225282
=	íoli Road TI ADOT GEC	4685 S Ash	Ave, Ste H-4 pe, AZ	CLIENT: HDR Engineering, Inc. Phoenix, AZ
THIS		PH. 480-897-8200	FAX. 480-897-1133	EXHIBIT: B-52

Borehole	Depth	USCS	In-Situ P	roperties	Classification				Expansion Testing					Corrosivity				
No. (ft.)		Soil Class.	Dry Density (pcf)	Water Content (%)	Passing #200 Sieve (%)	Atter	berg L	imits	Dry Density (pcf)	Water Content (%)	Surcharge (psf)	Expansion (%)	Expansion Index EI 50	рН	Resistivity (ohm-cm)	Sulfates (ppm)	Chlorides (ppm)	Remarks
B-24	2.0 - 3.0	SM	101	6	, ,				,	. ,								1, 2
B-24	2.0 - 7.0	SM			27	20	17	3										
B-24	4.0 - 5.0	SM	108	5														1, 2
B-24	7.0 - 8.0	SM	111	7														1, 2
B-24	9.0 - 10.0	CL	114	10														1, 2
B-24	19.0 - 20.0	CL	95	34	75	42	17	25										1
B-24	29.0 - 30.0	CL	108	18														1, 2
B-24	34.0 - 35.0	CL	102	21	84	33	20	13										1
B-24	44.0 - 45.0	CL	104	16		27	19	8										1
B-25	0.0 - 5.0	SC			39	26	14	12						9.6	1879	78	400	
B-25	2.0 - 3.0	SC	107	6														1, 2
B-25	4.0 - 5.0	SM	109	3	30	NP	NP	NP										1
B-25	7.0 - 8.0	SC-SM	105	9														1, 2
B-25	9.0 - 9.9	SC-SM	107	15														1, 2
B-25	24.0 - 25.0	CL	111	11	66	33	19	14										1
B-25	29.0 - 30.0	CL	106	10														1, 2
B-25	39.0 - 39.8	SP-SM	107	4														1, 2
B-25	44.0 - 45.0	SP-SM	109	11														1, 2
TP-1	2.0 - 3.0	SC	98	10														1, 2
TP-1	2.1 - 4.0	SC			29	33	18	15										
TP-1	8.0 - 10.0	SW-SC			9	38	14	24										

PROJECT: I-10 GRIC Design-Build Project	<b>Fierracon</b>	PROJECT NUMBER: 65225282
SITE: Koli Road TI ADOT GEC	4685 S Ash Ave, Ste H-4 Tempe, AZ	CLIENT: HDR Engineering, Inc. Phoenix, AZ
SET CONTRACTOR OF THE CONTRAC	PH. 480-897-8200 FAX. 480-897-1133	EXHIBIT: B-53



# **APPENDIX C**

## **Geotechnical Engineering Data Report**

I-10 Gila River Indian Community Design-Build Project | Koli Road TI Terracon Project No. 65225282







Photos 1 and 2: Typical layout for Bridge Boring



Photo 3: Typical layout for Bridge Boring

## **Geotechnical Engineering Data Report**

I-10 Gila River Indian Community Design-Build Project | Koli Road TI Terracon Project No. 65225282





Photo 4: Typical layout for Ramps & Crossroads Boring



Photo 5: Facing northwest, near location R&C-43



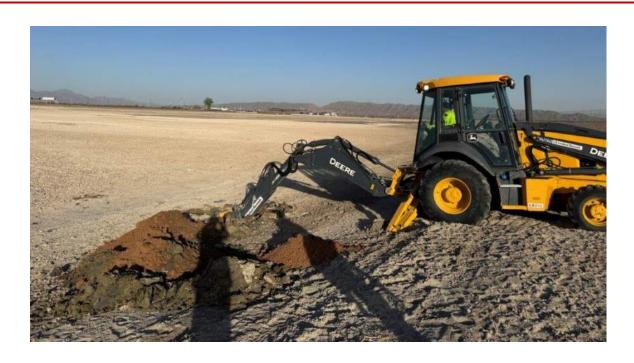


Photo 6: John Deere Backhoe at Test Pit TP-1

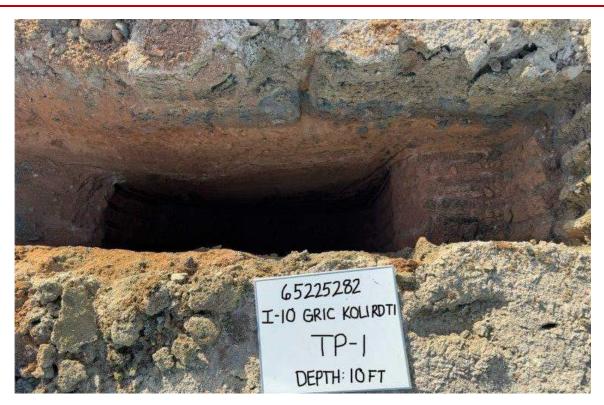


Photo 7: Side Wall of Test Pit TP-1