

## Appendix E

- Technical Memorandum #5 - Detailed Preferred Alignment, October 2011

Hidden Waters Parkway North  
Feasibility Study:  
Interstate 10 to State Route 74

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Final -Tech Memo 5  
Detailed Preferred Alignment

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Prepared For:



Prepared By:



November 2011





## Table of Contents

1.0	Introduction .....	1
1.1	Background .....	1
2.0	Selection of Preferred Alignment .....	3
2.1	Candidate Alignments .....	3
2.2	Evaluation of the Candidate Alignments.....	3
2.3	Description of the Preferred Alternative.....	6
3.0	Design Considerations.....	8
3.1	Functional Classification.....	8
3.2	Design Vehicle .....	8
3.3	Design Speeds .....	8
3.4	Cross-Section.....	9
3.5	Vertical Geometry.....	9
3.6	Horizontal Geometry .....	9
3.7	Access Management Guidelines.....	10
3.8	Roadway Intersections .....	10
3.9	Drainage Considerations.....	11
4.0	Preferred Alignment.....	14
4.1	Special Interest Areas .....	14
4.2	Implementation Plan.....	15
4.3	Planning Level Cost Estimate .....	16

## List of Figures

Figure 1-1	Hidden Waters Parkway Study Area .....	2
Figure 2-1	Candidate Alignments .....	4
Figure 2-2	Preferred Alignment .....	7
Figure 3-1	AZ Parkway: Indirect Left-turn Movements .....	8
Figure 3-2	AZ Parkway: 6-lane Urban Typical Section .....	9
Figure 3-3	Estimated Cross-Drainage Features .....	11
Figure 4-1	Special Interest Areas .....	15

## List of Tables

Table 2-1 Summary of Qualitative Evaluation.....	5
Table 3-1 AZ Parkway: Urban Design Speeds .....	8
Table 3-2 Estimated Roadway Drainage Crossing Types and Discharges.....	12
Table 4-1 Summary of Planning Level Cost Estimate .....	16

## Appendix

Appendix A: Select details from Design Guideline Recommendations for the Arizona Parkway (MCDOT, 2008)

Appendix B: Preferred Alignment Drawings

Appendix C: Conceptual Plan and Profile Drawing of CAP Crossing

Appendix D: Planning Level Cost Estimate

## Abbreviations

Arizona Game and Fish Department	AGFD
Arizona Public Service	APS
Arizona State Land Department	ASLD
Bureau of Land Management	BLM
Bureau of Reclamation	BOR
Central Arizona Project	CAP
Development Master Plan	DMP
Maricopa Association of Governments	MAG
Maricopa County Department of Transportation	MCDOT
Master Planned Community	MPC
Planned Area Development	PAD
Salt River Project	SRP
State Route	SR
Technical Advisory Committee	TAC
Traffic Interchange	TI
Western Area Power Authority	WAPA

# 1.0 Introduction

## 1.1 Background

The Interstate-10/Hassayampa Valley Roadway Framework Study (Hassayampa Framework Study) is a transportation planning document completed by the Maricopa Association of Governments (MAG) in 2008 that identified a comprehensive roadway network to meet future traffic demands in northwest Maricopa County. The roadway network recommended by the Hassayampa Framework Study is comprised of freeways, parkways and major arterial roads. The Hidden Waters Parkway was identified as a major link in this recommended transportation framework.

The Hidden Waters Parkway North (Hidden Waters Parkway) Feasibility Study Area is located west of the Phoenix metropolitan area in Maricopa County, Arizona (Figure 1-1). The area west of the White Tank Mountains within the Hassayampa River Valley has been identified as an area where intense growth is anticipated to occur in the future. Maricopa County Department of Transportation (MCDOT) commissioned the Hidden Waters Parkway North Parkway Feasibility Study in response to this anticipated growth and the future need for a high-capacity roadway within this corridor.

The study area includes the northern section of the Hidden Waters Parkway, as shown on the Hassayampa Framework Study, from Interstate 10 (I-10) north to the future alignment of State Route 74 (SR74). The study area is approximately 28 miles long and two miles wide, primarily centered about the Hassayampa Framework Study proposed alignment (baseline alignment) for the Hidden Waters Parkway, except in the area from Northern Avenue to Bell Road where the study area expands to two miles west of the baseline alignment and from the south end of Douglas Ranch to Patton Road where the study area expands to two miles east of the baseline alignment. This results in the study corridor being a total of three miles wide in these two areas (refer to Figure 1-1 for a graphic depiction of the study area).

The proposed Hidden Waters Parkway corridor passes adjacent to, or through, several entitled Master Plan Communities (MPC) including: Millennium Ranch, Hassayampa Ranch, Belmont, and Douglas Ranch. At build-out, it is estimated that these communities may contain over 187,000 dwelling units. The need for a parkway within the Hidden Waters corridor is based upon projected development and is linked directly to the development of the previously mentioned MPC's. It is important to identify a recommended alignment for the Hidden Waters Parkway during the planning stages of the proposed MPC's to ensure that adequate right-of-way will be preserved.

The purpose of the Hidden Waters Parkway study is to document conditions along the parkway corridor, identify potential fatal flaws and develop an alignment alternative that meets the future traffic needs identified in the Hassayampa Framework Study. The recommended alternative will establish a roadway footprint that may be used as a guide for local agencies and development within the corridor.

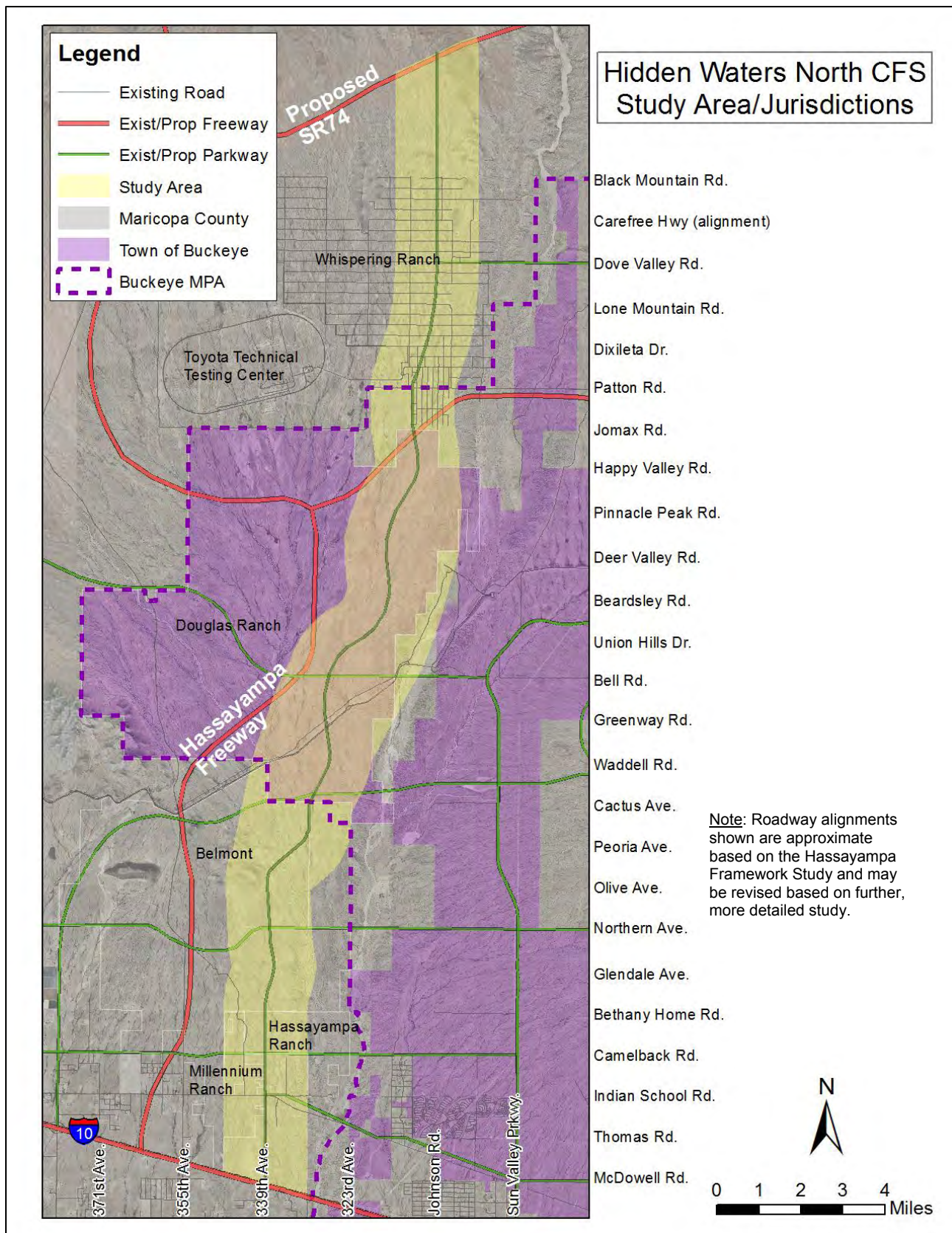


Figure 1-1 Hidden Waters Parkway Study Area



## 2.0 Selection of Preferred Alignment

The purpose of this technical memorandum is to document the preferred alignment in detail and to present the additional design features that were considered during the development and refinement of the alignment.

### 2.1 Candidate Alignments

Conceptual alignments for the Hidden Waters Parkway were initially developed in response to the opportunities and constraints identified in Technical Memos 1, 2 and 3 which include:

- Existing/proposed residential communities
- Existing commercial and/or employment centers
- Current land ownership
- Environmental resources
- Existing/proposed utilities
- Existing drainage patterns

The design team and members of the Technical Advisory Committee (TAC) further refined the conceptual alignments. These refinements resulted in three candidate alternatives that were carried forward for further analysis (see Figure 2-1).

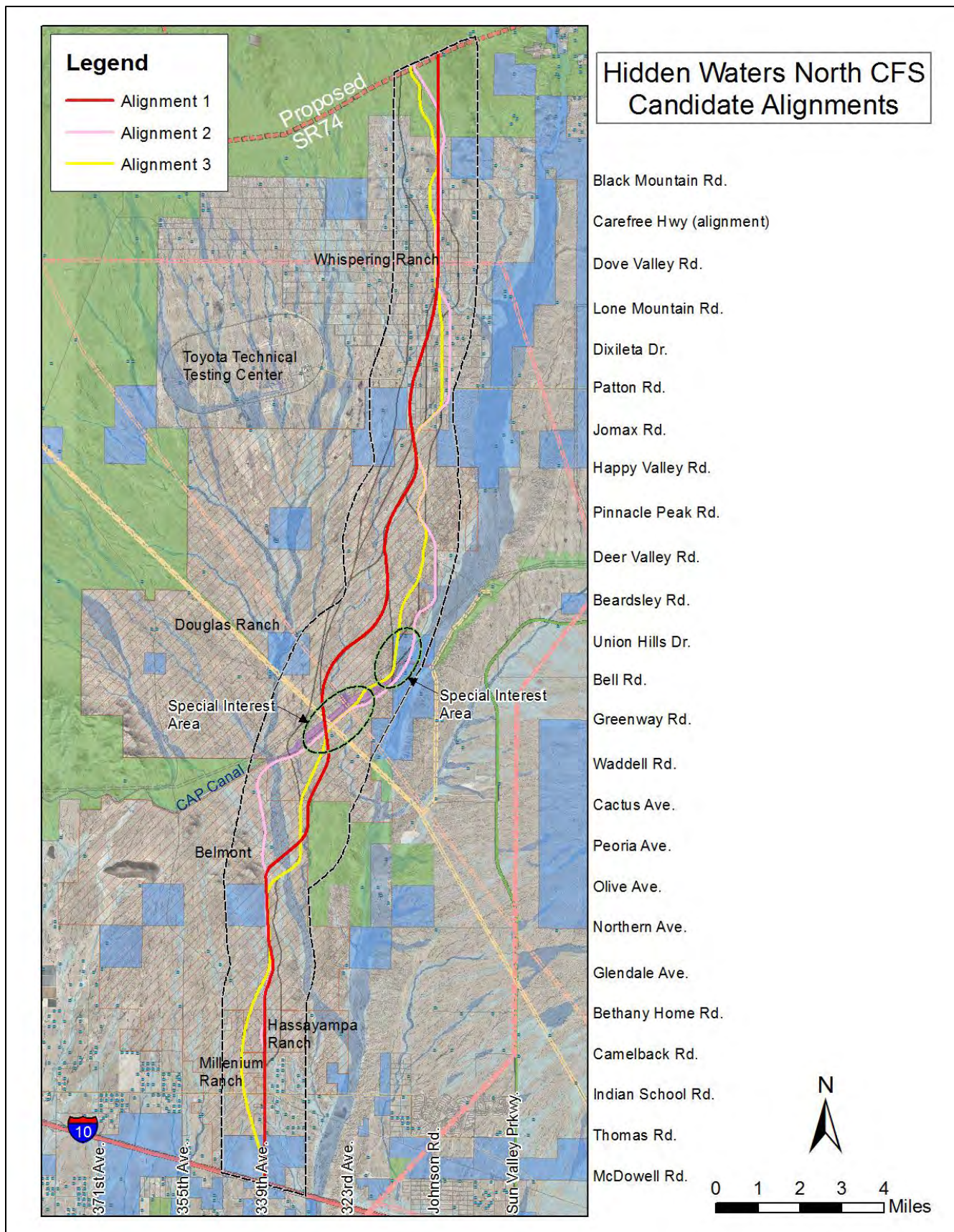
Alignment 1 is based on the alignment developed during the Hassayampa Framework Study, and serves as the approximate center of the Hidden Waters Parkway study area. Alignment 2 was selected in response to existing/approved land plans and the stakeholder feedback received during the planning phase of this study. It incorporates the proposed circulation elements of the Hassayampa Ranch, Belmont, and Douglas Ranch MPCs. Alignment 3 was selected in response to the geomorphology, drainage patterns, utilities, etc. of the study area.

A no-build alternative was also considered to evaluate how the existing roadway network would function if this project were not constructed. This alternative provides a valuable baseline for comparison when evaluating other alignments.

### 2.2 Evaluation of the Candidate Alignments

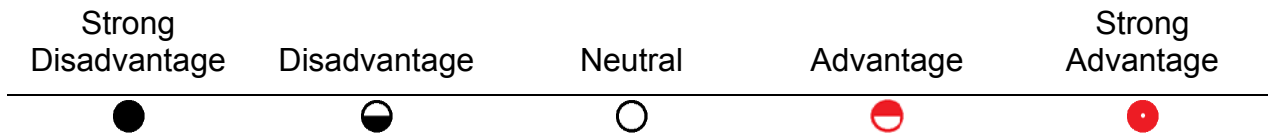
The three candidate alignments were evaluated using a tiered format as described in Technical Memoranda 4 (TM4). The first tier of analysis evaluated the candidate alternatives for any fatal flaws, of which none were identified. The second tier of analysis qualitatively evaluated the candidate and no-build alternatives based upon a set of criteria identified through the agency and public scoping process. These criteria included the following:

- Consistency with proposed development
- Environmental impacts
- Utility impacts
- Drainage impacts
- Engineering complexity
- System functionality
- Right of way requirements
- Buildings/property impacts
- Planning level cost estimate
- Stakeholder and community feedback



**Figure 2-1 Candidate Alignments**

Corridor alternatives were evaluated using one of five rankings based upon the perceived response to each evaluation criteria question.



All three candidate alternatives were qualitatively evaluated based upon the criteria described on the previous page. The results of this initial screening of the candidate alternatives are summarized in Table 2-1.

**Table 2-1 Summary of Qualitative Evaluation**

<b>Evaluation Criteria</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>No Build</b>
<i>Proposed Development</i>	●	●	●	◐
<i>Environmental Impacts</i>	◐	◐	◐	○
<i>Utility Impacts</i>	◐	○	○	○
<i>Drainage Impacts</i>	●	◐	◐	◐
<i>Engineering Complexity</i>	◐	◐	◐	○
<i>System Functionality</i>	●	○	●	●
<i>Buildings/Property Impacts</i>	◐	○	○	◐
<i>Stakeholder/Community Feedback</i>	●	●	●	◐
<i>Right of Way Requirements</i>	686 ac	717 ac	695 ac	N/A
<i>Cost (in millions)</i>	\$266.3	\$248.8	\$232.30	N/A
<i>Recommended for Further Evaluation</i>	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>No</b>

Note: The costs reported in Table 2-1 have been revised from what was reported in Technical Memo 4 to include estimates of roadway prism excavation, median retention, and sidewalks.

Alternative 1 was not recommended for further consideration because it presented the greater impacts to proposed developments, existing utilities, drainage features, and existing buildings/properties. In addition this alternative is the most costly of the candidate alignments and was opposed by several key landowners/stakeholders.

Alternative 3 was rated favorably in several qualitative categories including drainage impacts, engineering complexity and system functionality and also has the lowest estimated cost to construct. However, this candidate alternative was not recommended because it was the least compatible with the approved development master plans within the study area and was opposed by several key landowners/stakeholders.

The No-build alternative was not recommended for further consideration because does not address future traffic demands or the regional connectivity needs of the study area.



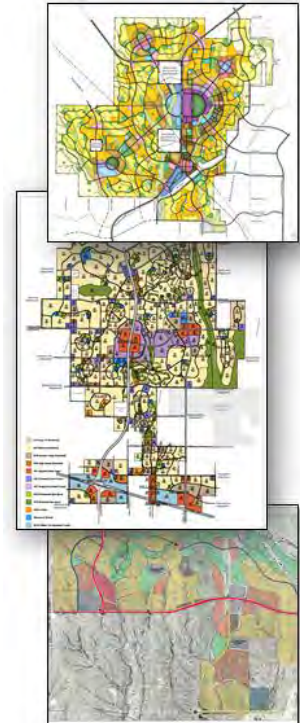
Alternative 2 was recommended as the preferred alternative because it received the greatest support from key landowners/stakeholders and the public. In addition it is coincident with the approved development master plans and no special engineering challenges were identified with this alignment.

### 2.3 Description of the Preferred Alternative

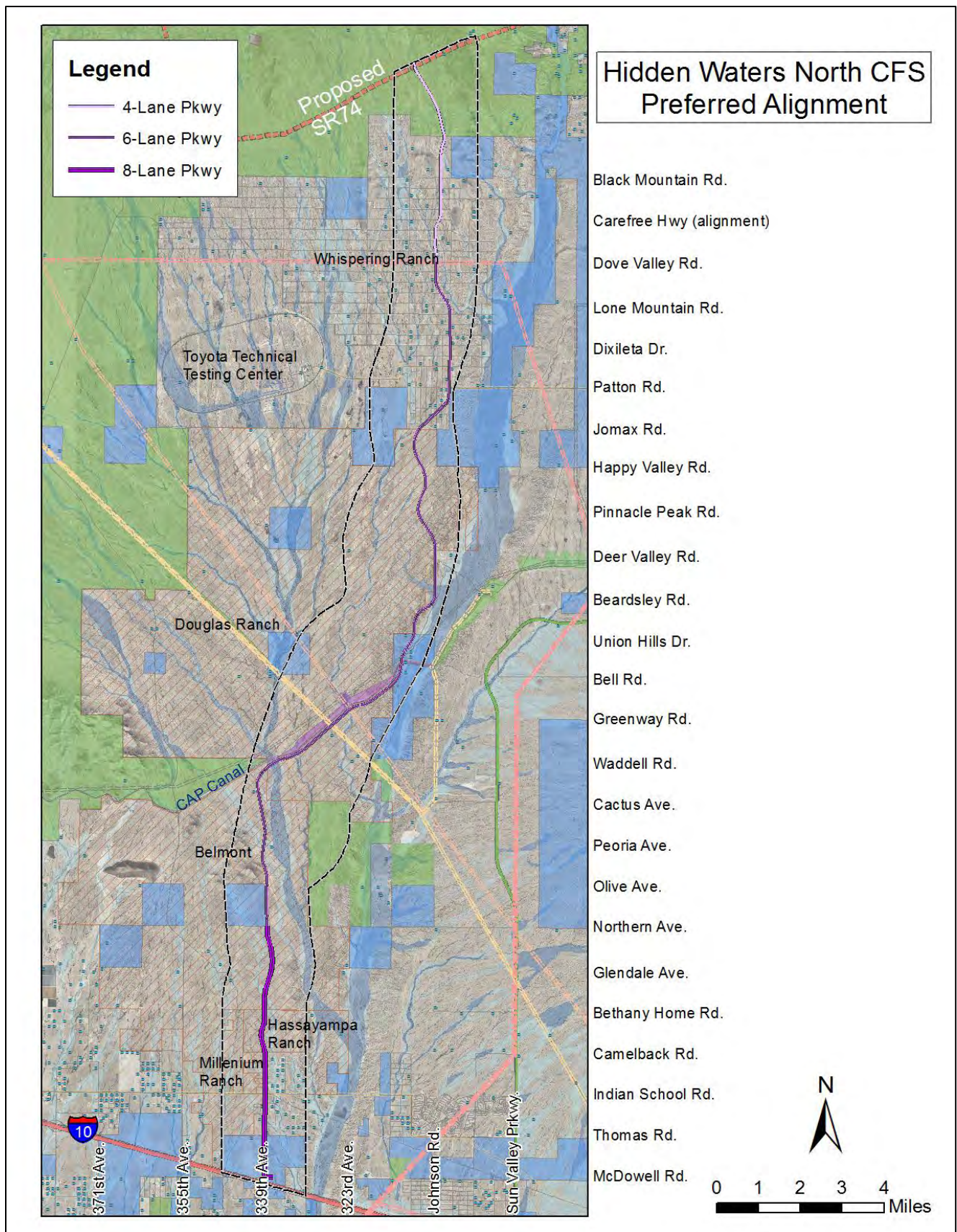
The preferred alternative is centered along the section line coincident with 339th Avenue between the I-10 traffic interchange and Camelback Road. From there, it generally follows the proposed parkway alignments of the approved circulation elements for the planned communities of Hassayampa Ranch, Belmont, and Douglas Ranch.

It parallels the west side of Jackrabbit Wash, through the proposed Belmont MPC, and then turns to the east along the south side of the Central Arizona Project (CAP) Canal. The preferred alternative crosses the CAP canal approximately 500 feet west of the Hassayampa River siphon, then runs along the east side of the proposed Douglas Ranch development to Jomax Road.

Between Jomax Road and Patton Road, the preferred alternative follows a northeasterly alignment. Then generally follows the 299<sup>th</sup> Avenue alignment between Patton Road and Lone Mountain Road. Between Lone Mountain Road and the future Carefree Highway, the alignment shifts west to 302nd Avenue. North of the future Carefree Highway, the preferred alternative alignment runs along the east side of an unnamed wash to the northern limit of the study area (i.e. potential location for the future SR 74 freeway).







**Figure 2-2 Preferred Alignment**

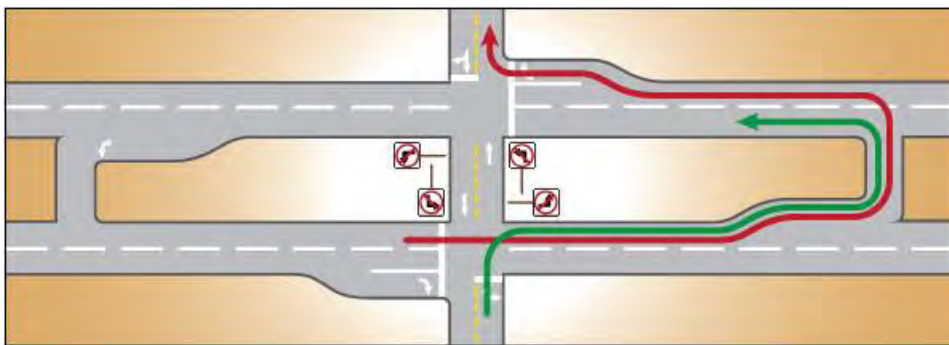
### 3.0 Design Considerations

The *Design Guideline Recommendations for the Arizona Parkway* (MCDOT, August 2008) and the *MCDOT Roadway Design Manual* (2004) were used to further define the preferred alignment of the Hidden Waters Parkway. The following sub-sections detail the design criteria.

#### 3.1 Functional Classification

The functional classification for Hidden Waters Parkway is “Arizona Parkway” (AZ Parkway). The AZ parkway is a new roadway functional classification with a capacity approaching 90,000 vehicles per day (for a full 8-lane parkway section). The design guidelines for this study follow the Urban Arizona Parkway details.

The unique design feature of the AZ parkway is the indirect-left turn concept (see Figure 3-1). Traditional direct left-turn movements are not permitted at AZ parkway intersections. This



allows intersections to utilize two-phase signal cycles, which increase the capacity and safety of the roadway.

Figure 3-1 AZ Parkway: Indirect Left-turn Movements

#### 3.2 Design Vehicle

Design vehicle refers to the largest vehicle anticipated to frequently use a roadway. The choice of design vehicles influences the radii of intersection returns and curving roadways. The MCDOT Design Guideline Recommendations for the Arizona Parkway (p. 7) recommend a WB-50 design vehicle as defined by the AASHTO - Policy on Geometric Design of Highways.

#### 3.3 Design Speeds

Many roadway geometric features (i.e. curve radii and superelevation rates) are dependent on the assumed velocity of traffic. The design speed is the maximum recommended speed that will ensure reasonable and safe vehicle operation. Table 3-1 summarizes the recommended design speeds for an AZ parkway in an urban setting for different terrain.

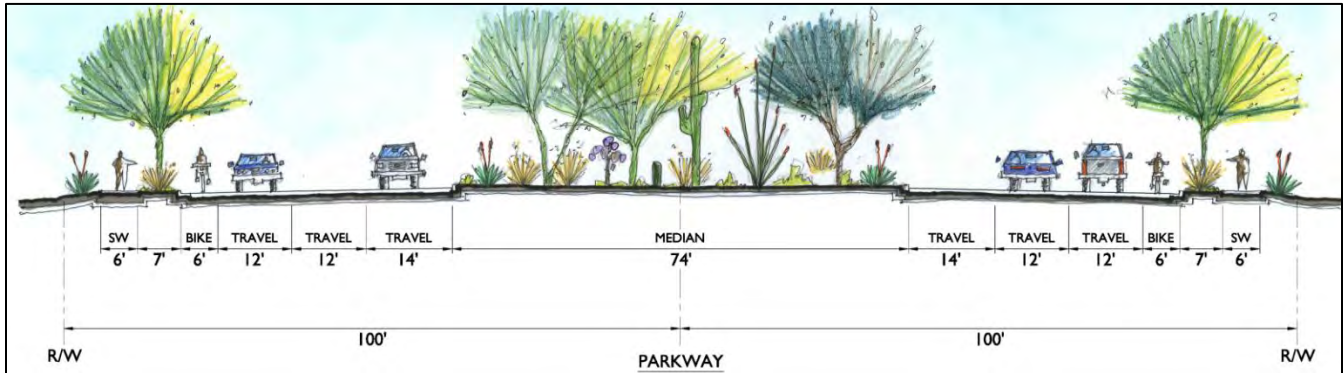
Table 3-1 AZ Parkway: Urban Design Speeds

Terrain	Design Speed
Level	55 mph
Rolling	50 mph
Mountainous	45 mph



### 3.4 Cross-Section

The AZ parkway has phased options for 4-lane, 6-lane, and 8-lane roadway facilities (refer to Appendix A, Figure 14). Figure 3-2 presents a typical section for 6-lane urban parkway. The standard minimum right-of-way width is 200 feet. The urban street section has raised curb and gutter per MAG Detail 220-1, Type A; single curb allowable along median. A 2% cross-slope is recommended for roadway drainage.



**Figure 3-2 AZ Parkway: 6-lane Urban Typical Section**

The Arizona Parkway Intersection/Interchange - Operational Analysis and Design Concepts Study (MCDOT, 2009) provides recommendations for the size/number of lanes for the proposed parkways based upon the traffic projections from the Hassayampa Framework Study. The following recommendations were made for the Hidden Waters Parkway through the study area:

- 8-lane Parkway: between I-10 and Northern Parkway
- 6-lane Parkway: between Northern Parkway and Dove Valley Parkway
- 4-lane Parkway: between Dove Valley Parkway and the future SR 74 Freeway

### 3.5 Vertical Geometry

The maximum vertical gradient for the Hidden Waters parkway per the MCDOT Roadway Design Manual and AASHTO is 5% for an urban roadway on level terrain (see MCDOT RDM Section 5.11). The “minimum” preferred longitudinal slope is +/- 0.25% (per MCDOT RDM Section 5.11).

Vertical curves are designed to ensure that adequate sight distance is provided and to increase the safety and comfort of driving. They should be provided on the Hidden Waters Parkway when the algebraic difference of longitudinal slopes is greater than 0.3% (per MCDOT RDM Section 5.11).

### 3.6 Horizontal Geometry

Flat horizontal curves are recommended wherever possible per the MCDOT Roadway Design Manual. Superelevation rates and curve radii should be designed together as a function of the maximum side friction factor and the assumed maximum superelevation rate per AASHTO design guidelines (2004 AASHTO Green Book, Pages 146-147). The minimum radius for a horizontal curve at a design speed of 55 mph without superelevation is 1833 feet. The maximum superelevation rate recommended for urban roadways is 4%. The minimum horizontal curve radius for the Hidden Waters Parkway with superelevation is 1190 feet.

The parkway design guideline recommendations state that the roadway width should be tapered through the use of reverse curves. The transition taper lengths will vary depending upon the design speed, curve radius and lane offset.

### **3.7 Access Management Guidelines**

The access management guidelines for the Hidden Waters Parkway were taken directly from Section 4 of the Design Guideline Recommendations for the Arizona Parkway. The following general recommendations were made:

- U-turn directional crossovers restricted to a maximum of eight per mile.
- Left-turns in any direction are prohibited at all intersections (full median break).
- Left-turns from a side-street or driveway onto the Parkway are prohibited.
- Left-turns from the Parkway to a side-street or driveway are discouraged due to conflicts between U-turns and right-turns. However, this can be accommodated by aligning the U-turn crossover with the side-street or driveway in order to facilitate left turns and U-turns.
- Intersections (full median breaks) preferably restricted to one-mile spacing and a minimum spacing of half-mile.
- No on-street parking
- Full median openings are only recommended at intersections with arterial or major collector streets.
- For a low-volume driveway, a 165' minimum spacing (from centerline to centerline) is recommended. For a high-volume driveway, a 330' minimum spacing (from centerline to centerline) is recommended.

For additional detail, refer to the typical urban parkway access plan detail from the Design Guideline Recommendations for the Arizona Parkway (Figure 3, Appendix A).

### **3.8 Roadway Intersections**

The Hassayampa Framework Study recommends a network of freeways, parkways, and arterial roadways to accommodate the future traffic needs of the region. As a part of this integrated roadway network, the Hidden Waters Parkway will have three parkway-to-freeway interchanges, six at-grade parkway-to-parkway intersections, and numerous parkway to arterial intersections.

The parkway-to-freeway interchanges located at I-10, the future Hassayampa Freeway, and the future SR 74 will be based upon ADOT's recently completed Freeway-to-Parkway Interchange Templates (October 2010). Additional traffic analysis will be required to select an appropriate interchange template at each of these locations prior to future design efforts.

The at-grade parkway-to-parkway interchanges will be based upon the Arizona Parkway indirect left-turn intersection design established in Design Guideline Recommendations for the Arizona Parkway (Figure 18, Appendix A). These intersections will be located along the Hidden Waters Parkway at intersections with the following parkways: (McDowell Parkway, Camelback Parkway, Northern Parkway, Wintersburg Parkway, Bell/Greenway Parkway, Deer Valley/Beardsley Parkway and Dove Valley Parkway).

Parkway to arterial intersections will be based upon the parkway/arterial intersection detail from the Design Guideline Recommendations for the Arizona Parkway (Figure 6, Appendix A).



### 3.9 Drainage Considerations

In Technical Memorandum 3, conceptual drainage facilities were estimated for the Hidden Waters Parkway baseline alignment. This analysis was revisited for the preferred alignment and refinements were made to number and size of proposed cross-drainage structures. The revised cross-drainage structure estimates are illustrated graphically in Figure 3-3. The estimated roadway drainage crossing types and discharges for the 100-year and 50-year storm events are summarized in Table 3-2.

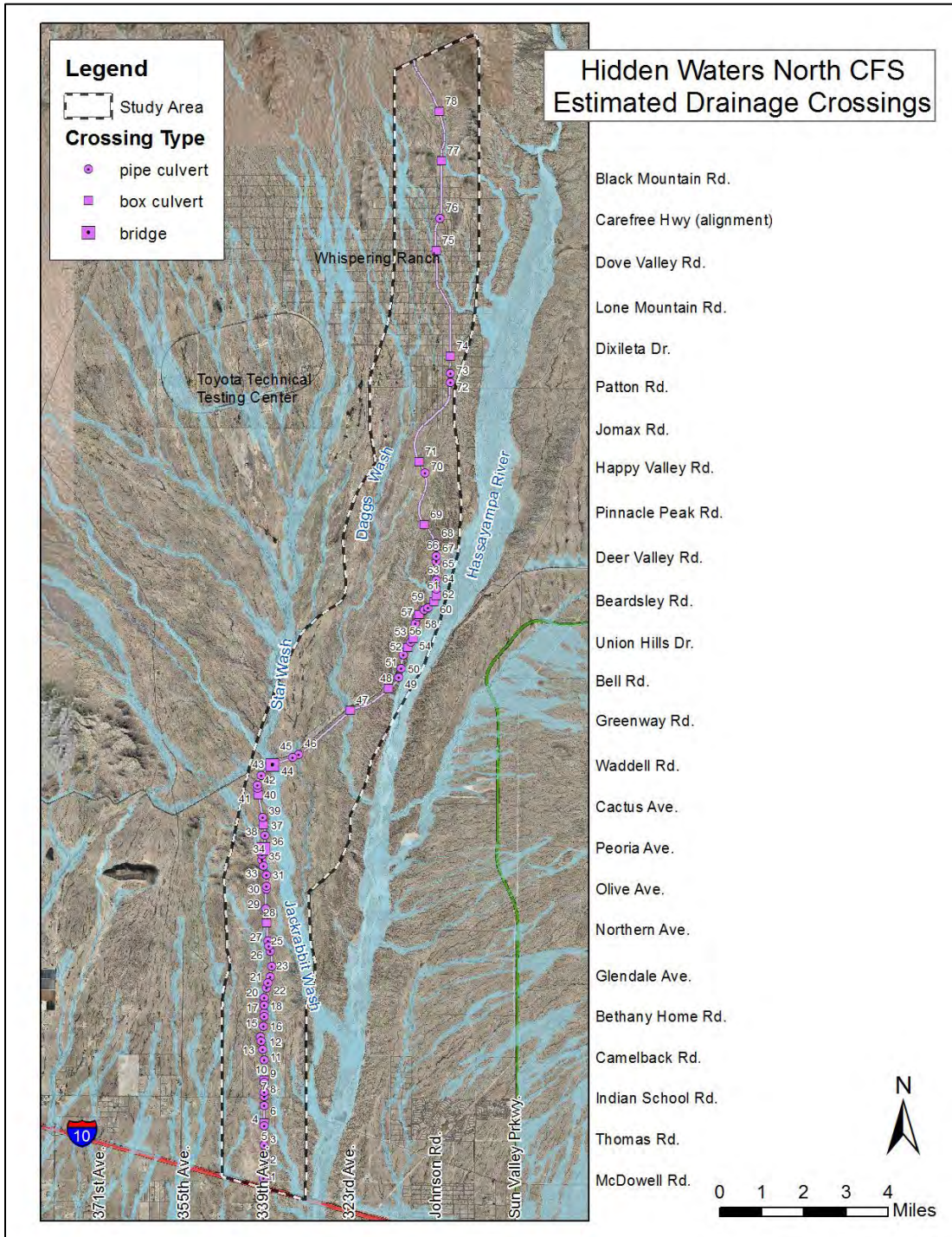


Figure 3-3 Estimated Cross-Drainage Features

**Table 3-2 Estimated Roadway Drainage Crossing Types and Discharges**

Id	Station	Crossing Type	Area		Peak Discharge (cfs)		Source
			(sq.mi.)	(acres)	100-yr	50-yr	
1	14+00	Pipe	0.053	33.7	64	43	Luke Wash Watershed Zone AE FDS (FCD 2007C020)
2	33+83	Pipe	0.035	22.3	43	29	
3	55+45	Pipe	0.133	85.4	150	100	
4	80+02	Pipe	0.065	41.4	73	49	
5	84+24	Box	0.228	146.2	344	230	
6	105+72	Pipe	0.020	12.9	27	18	
7	115+68	Pipe	0.051	32.6	72	48	
8	122+10	Pipe	0.041	26.3	57	38	
9	134+32	Pipe	0.024	15.1	19	13	
10	137+37	Box	0.402	257.2	382	256	
11	162+76	Pipe	0.043	27.3	32	21	
12	174+95	Pipe	0.030	19.2	23	15	
13	186+16	Pipe	0.024	15.5	23	15	
14	192+07	Pipe	0.164	105.1	150	100	
15	205+17	Pipe	0.118	75.7	97	65	
16	218+06	Pipe	0.020	13.0	12	8	
17	222+84	Pipe	0.024	15.5	17	11	
18	232+22	Pipe	0.020	13.1	14	9	
19	236+56	Box	2.737	1751.8	1700	1139	Watershed 'PP' Luke Wash
20	241+94	Pipe	0.241	154.5	118	79	Luke Wash Watershed Zone AE FDS (FCD 2007C020)
21	254+44	Pipe	0.020	12.8	18	12	
22	261+55	Pipe	0.026	16.6	23	15	
23	269+37	Pipe	0.028	18.2	14	9	
24	282+59	Pipe	0.072	46.3	70	47	
25	301+59	Pipe	0.037	23.4	53	36	
26	308+36	Pipe	0.017	10.7	25	17	
27	314+51	Pipe	0.049	31.5	64	43	
28	337+56	Box	0.131	83.9	175	117	
29	360+80	Pipe	0.038	24.3	52	35	
30	379+85	Pipe	0.035	22.4	31	21	Watershed 'PP' Luke Wash FDS (FCD 99-03)
31	383+89	Pipe	0.041	26.1	36	24	
32	398+26	Pipe	0.052	33.4	60	40	
33	411+05	Pipe	0.037	23.8	43	29	
34	417+43	Pipe	0.110	70.5	128	85	
35	422+57	Pipe	0.036	23.3	42	28	
36	431+05	Bridge	41.404	26498.6	5500	3685	
37	447+81	Pipe	0.069	44.3	87	58	
38	461+32	Box	0.177	113.5	268	179	
39	470+74	Pipe	0.055	34.9	93	62	
40	499+72	Box	0.140	89.5	239	160	
41	509+15	Pipe	0.043	27.3	73	49	
42	517+46	Pipe	0.053	33.6	90	60	
43	529+45	Pipe	0.029	18.9	84	56	
44	548+00	Bridge	313.535	200662.	33600	22512	Jackrabbit Wash FDS

Id	Station	Crossing Type	Area		Peak Discharge (cfs)		Source
			(sq.mi.)	(acres)	100-yr	50-yr	
45	575+95	Pipe	2.458	1573.0	115	77	Watershed 'OO' Approx. FDS (FCD 2000C019)
46	584+90	Pipe	2.458	1573.0	130	87	
47	669+07	Box	25.224	16143.4	3277	2196	Daggs Wash FDS HEC-2
48	726+55	Box	0.906	580.0	210	141	Jackrabbit Wash FDS (FCD 90-05)
49	746+56	Pipe	0.092	59.2	65	44	
50	757+03	Pipe	0.057	36.4	32	21	
51	774+01	Pipe	0.035	22.2	20	13	
52	784+58	Box	0.372	238.3	472	316	
53	792+57	Pipe	0.043	27.7	55	37	Watershed 'OO' Approx. FDS (FCD 2000C019)
54	797+95	Box	0.182	116.5	231	155	
55	816+50	Pipe	0.045	28.5	57	38	
56	826+57	Pipe	0.034	21.9	43	29	
57	829+80	Box	0.554	354.5	703	471	
58	838+82	Pipe	0.021	13.6	27	18	
59	844+19	Pipe	0.103	65.7	131	88	
60	854+03	Box	1.180	754.9	1152	772	
61	863+38	Box	0.301	192.9	382	256	
62	871+84	Pipe	0.017	10.9	22	15	
63	881+98	Pipe	0.056	36.0	71	48	
64	895+72	Pipe	0.027	17.1	34	23	
65	905+77	Pipe	0.062	39.6	79	53	
66	915+50	Pipe	0.069	44.1	88	59	
67	924+20	Pipe	0.034	21.5	43	29	
68	928+82	Pipe	0.052	33.6	66	44	
69	956+65	Box	0.237	151.8	300	200	
70	1025+70	Pipe	0.089	57.1	114	76	
71	1040+74	Box	0.511	326.8	655	439	Upper Daggs/Star Wash Zone AE FDS (FCD 2006C006)
72	1156+07	Pipe	0.028	17.8	52	35	
73	1166+70	Pipe	0.071	45.6	131	88	
74	1188+12	Box	0.128	81.6	237	159	
75	1325+79	Box	3.042	1946.6	3900	2613	
76	1367+14	Pipe	0.024	15.4	42	28	
77	1439+29	Box	1.139	729.2	697	467	
78	1502+98	Box	2.368	1515.6	2300	1541	Watershed 'OO' Approx. FDS



## 4.0 Preferred Alignment

The design considerations discussed in the preceding section were used to generate detailed preferred alignment drawings. These drawings, presented in Appendix B, illustrate the alignment centerline, right-of-way lines, and proposed drainage features on aerial base-maps. The detailed preferred alignment is based upon the findings of this corridor feasibility study and may be subject to further refinements during design.

### 4.1 Special Interest Areas

Two special analysis areas were identified during the candidate selection process (refer to Figure 4-1). The first of these two areas is located adjacent to the CAP Canal between the Waddell Road and Greenway Road alignments. This special interest area was identified because the preferred alignment passes in close proximity to existing and proposed overhead transmission lines, major drainage crossings of the CAP canal, a potential cultural resource site and a proposed wildlife linkage corridor. The second special interest area addresses the Hidden Waters Parkway CAP Canal crossing.

Special Interest Area No. 1: The following observations were made about the preferred alignment within special interest area No. 1:

- The preferred alignment provides a minimum 50ft buffer between the proposed curb and gutter and existing Western Area Power Authority (Western) transmission towers per Western's design criteria.
- The alignment will require a multiple cell box culvert immediately downstream of the Daggs Wash flume across the CAP canal (Structure 47 at Sta. 668+75). The proposed box culvert should allow the preferred alignment to pass beneath Western's 345kV transmission line with adequate clearance.
- Technical Memorandum No. 2 of this study recommended that an additional Class III cultural resource survey be completed prior to design to better assess the presence of cultural resources that may be affected by the preferred alignment through this special interest area.
- The preferred alignment passes through special interest area number 1 roughly adjacent to the CAP canal right-of-way. Arizona Game & Fish (AGFD) has expressed the concern that the proximity of the preferred alignment to the CAP canal will negatively impact east-west wildlife movement through the study area. In order to mitigate the potential impacts to this wildlife linkage zone, AGFD has recommended that the preferred alignment be shifted to the southeast along the CAP canal to create a buffer for wildlife movement in the future. This southeasterly shift was not incorporated into the detailed drawings of the preferred alignment. Although feasible, additional coordination between AGFD and the affected land owners/stakeholders will be required to revise the alignment.
- AGFD has requested that the future design of the Hidden Waters Parkway include elements to help promote/facilitate wildlife movement through the study area.

Special Interest Area No. 2 was identified to investigate how the preferred alignment crosses the CAP Canal. The preferred alignment was shifted west of the Hassayampa siphon based upon feedback received from CAP representatives during the evaluation of candidate alignments. A conceptual plan and profile drawing was generated to investigate the CAP crossing in greater detail (see Appendix C).



A vertical alignment was selected to provide a minimum of 14.5 feet of clearance above the CAP Canal access roads, per CAP requirements. A 6.5 foot structure depth was assumed for the proposed bridge across the CAP Canal.

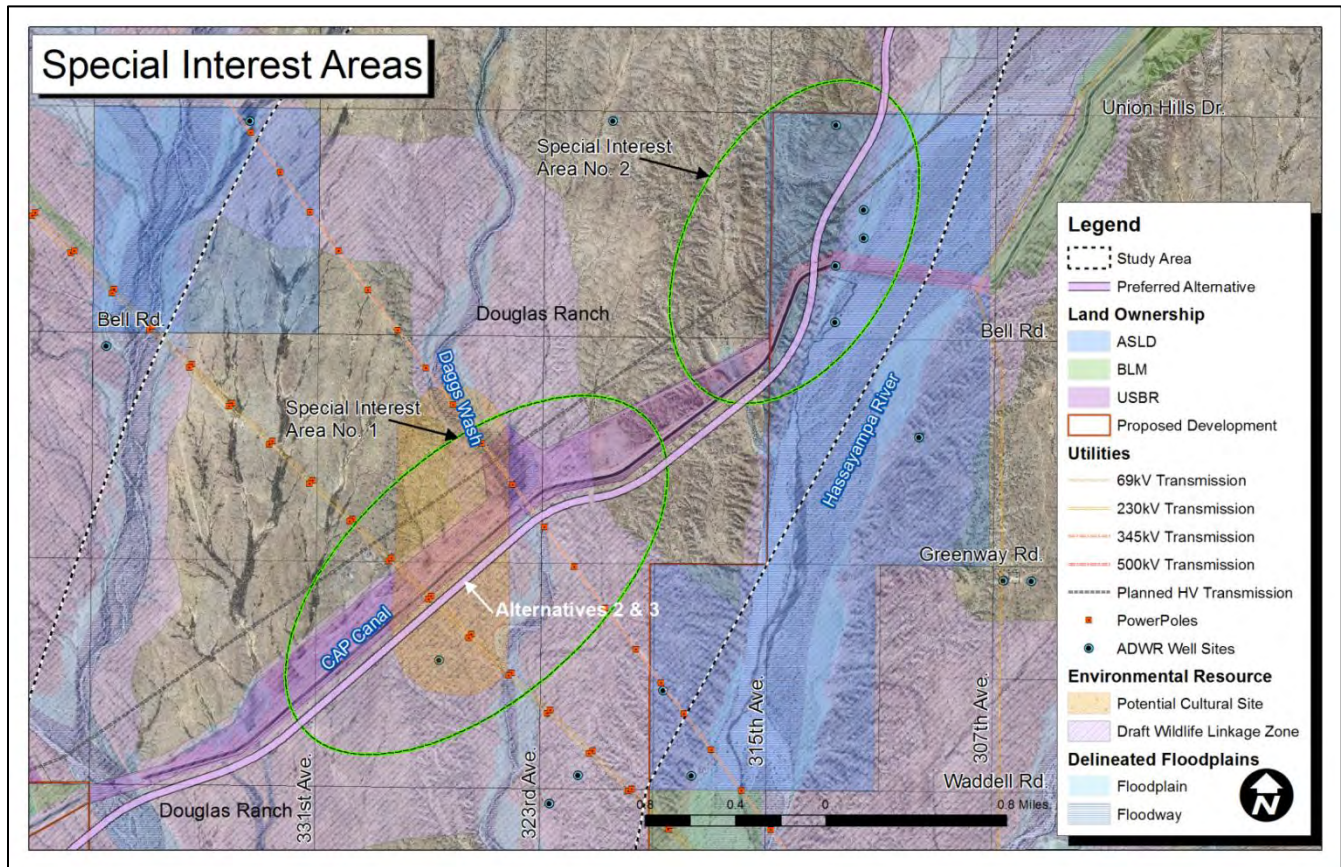


Figure 4-1 Special Interest Areas

## 4.2 Implementation Plan

The recent downturn in the economy has made the timing of the traffic volumes forecast in the MAG Hassayampa Framework Study less certain. It is understood that the need for the Hidden Waters Parkway will be driven by the proposed master planned communities within the study area and that right-of-way dedication and initial parkway construction efforts will likely coincide with the development of these communities.

The existing and future freeways will likely serve as a catalyst to development within the study area. For this reason, it is thought that the southern portions of the Hidden Waters Parkway (adjacent to I-10) may be constructed first. As development progresses to the north, so will construction of the corresponding parkway segments. The northernmost portion of the parkway (north of Jomax Rd) will likely not be needed until the future SR 74 freeway is built.

Ideally, the full-width parkway section would be built with the initial construction. However, the initial traffic volumes generated by these communities may not warrant the construction of the full six-lane facility. The Design Guideline Recommendations for the Arizona Parkway (MCDOT, 2008) provides phasing options to construct portions of the roadway as traffic volumes materialize.

The first option involves a full width phased implementation of the parkway. Under this

scenario, the outside curb line would be constructed in its ultimate location in each direction with an extra-wide center median. Additional lanes, in each direction, can be added to the median as traffic volumes increase. Details illustrating the full-width phased implementation of the parkway have been provided in Appendix A (refer to Figures 14 and 15 of Appendix A).

A second, half-street phasing implementation option could be considered for initial construction efforts. In this case, a half street of the proposed parkway could be constructed first and operated as a traditional arterial roadway allowing left-turns at intersections. The following general descriptions for a half street phased implementation were given in the parkway design guidelines:

- Build outside curb and gutter in its ultimate location and construct three travel lanes and appropriate shoulders;
- Operate with one lane in each direction of travel and with a striped median lane (continuous two-way left-turn lane);
- Allow left-turns at intersections similar to a traditional street;
- Do not build crossovers until the development patterns (and accompanying access locations) on both sides of the roadway have been established in order to optimize the crossover locations.
- The minimum half-street width is approximately 44' which corresponds to one-half of the six-lane urban section and will accommodate three travel lanes in the interim condition.

### 4.3 Planning Level Cost Estimate

The planning level cost estimate for the preferred alternative was revisited based upon the refined layout, recommended numbers of lanes (see section 3.4) and drainage analysis. Table 4-1 summarizes the revised planning level cost estimate. The cost estimate is based upon MCDOT's 2010 construction cost worksheet. Roadway construction costs and utility relocations both include a 20% contingency cost. The revised detailed cost estimate is referenced in Appendix D.

**Table 4-1 Summary of Planning Level Cost Estimate**

Cost Category	Factor	Preferred Alternative	Phased Option No. 1	Phased Option No. 2
Construction		\$88,700,000	\$77,900,000	\$56,700,000
Design (10% TO 15%)	12%	\$10,600,000	\$9,300,000	\$6,800,000
Construction Management	15%	\$13,300,000	\$11,700,000	\$8,500,000
Right-of-Way		\$104,000,000	\$104,000,000	\$104,000,000
Structures		\$21,500,000	\$21,500,000	\$10,800,000
Utility Relocation		\$100,000	\$100,000	\$100,000
Administration (8% TO 13%)	10%	\$8,900,000	\$7,800,000	\$5,700,000
<b>Total</b>		<b>\$247,100,000</b>	<b>\$232,300,000</b>	<b>\$192,600,000</b>

The preferred alignment requires right-of-way from 113 parcels within the Whispering Ranch community. However, the impact to these properties will not affect the usable/buildable area of

the lots. It is anticipated that only one parcel will have impacts significant enough to require full property purchase. At the time of this study there are two existing structures that will be impacted by the proposed alignment. These impacts will need to be reevaluated prior to final design.

Table 4-1 also provides estimates of how the initial construction costs could be modified if either of the two phased implementation strategies discussed in the previous section were implemented (assuming that the full right-of-way would be purchased with both phased implementation options). The full-width phased implementation option provides marginal cost savings at best (approximately 5%). The half-street phased option reduces the initial overall cost by approximately 23%. If desirable, an interim roadway could be constructed for the entire route using a reduced right-of-way width potentially saving up to an additional 20% of the ultimate project cost.

## Appendix A

- Select details from Design Guideline Recommendations for the Arizona Parkway (MCDOT, 2008)



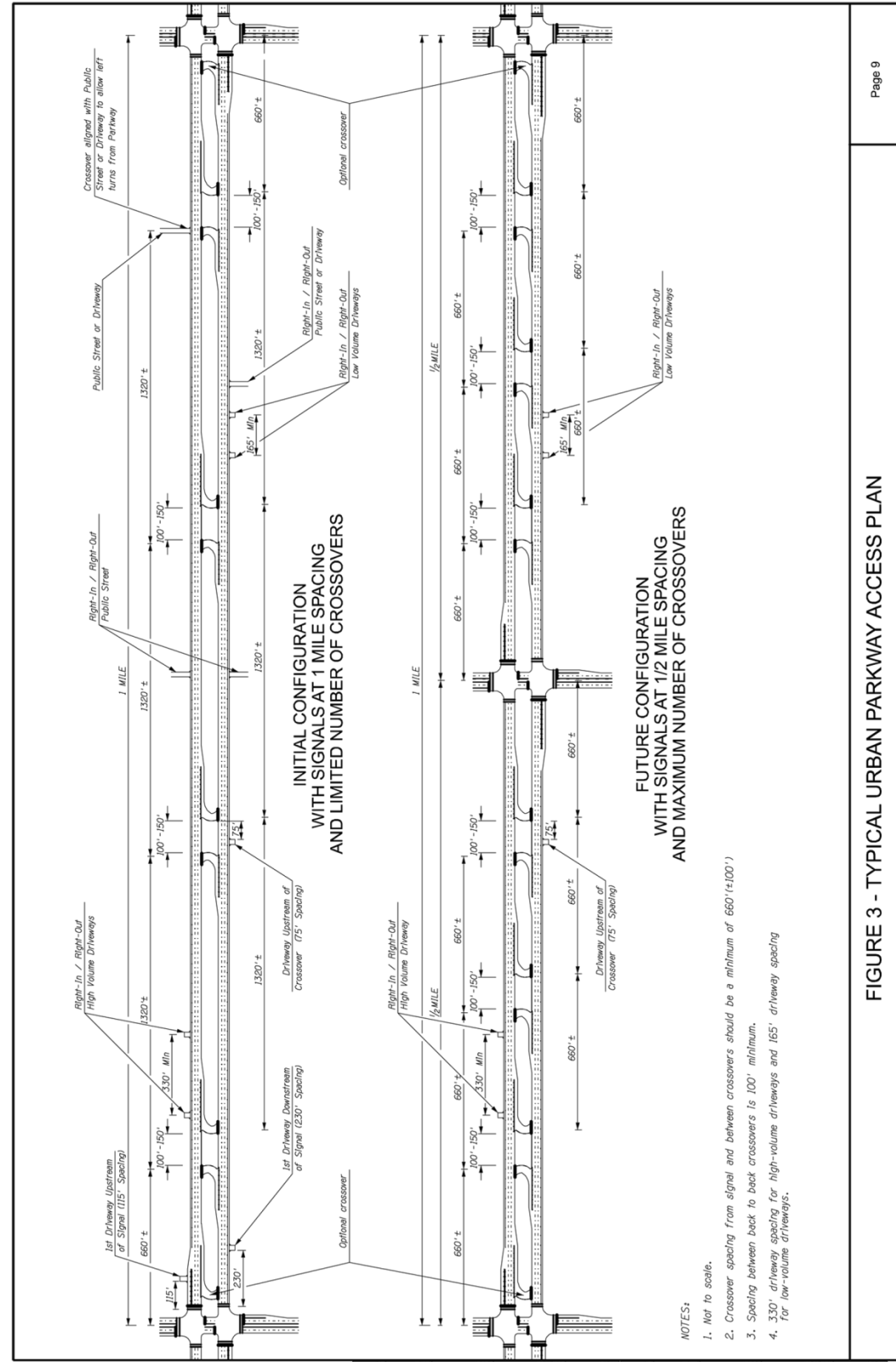


FIGURE 3 - TYPICAL URBAN PARKWAY ACCESS PLAN

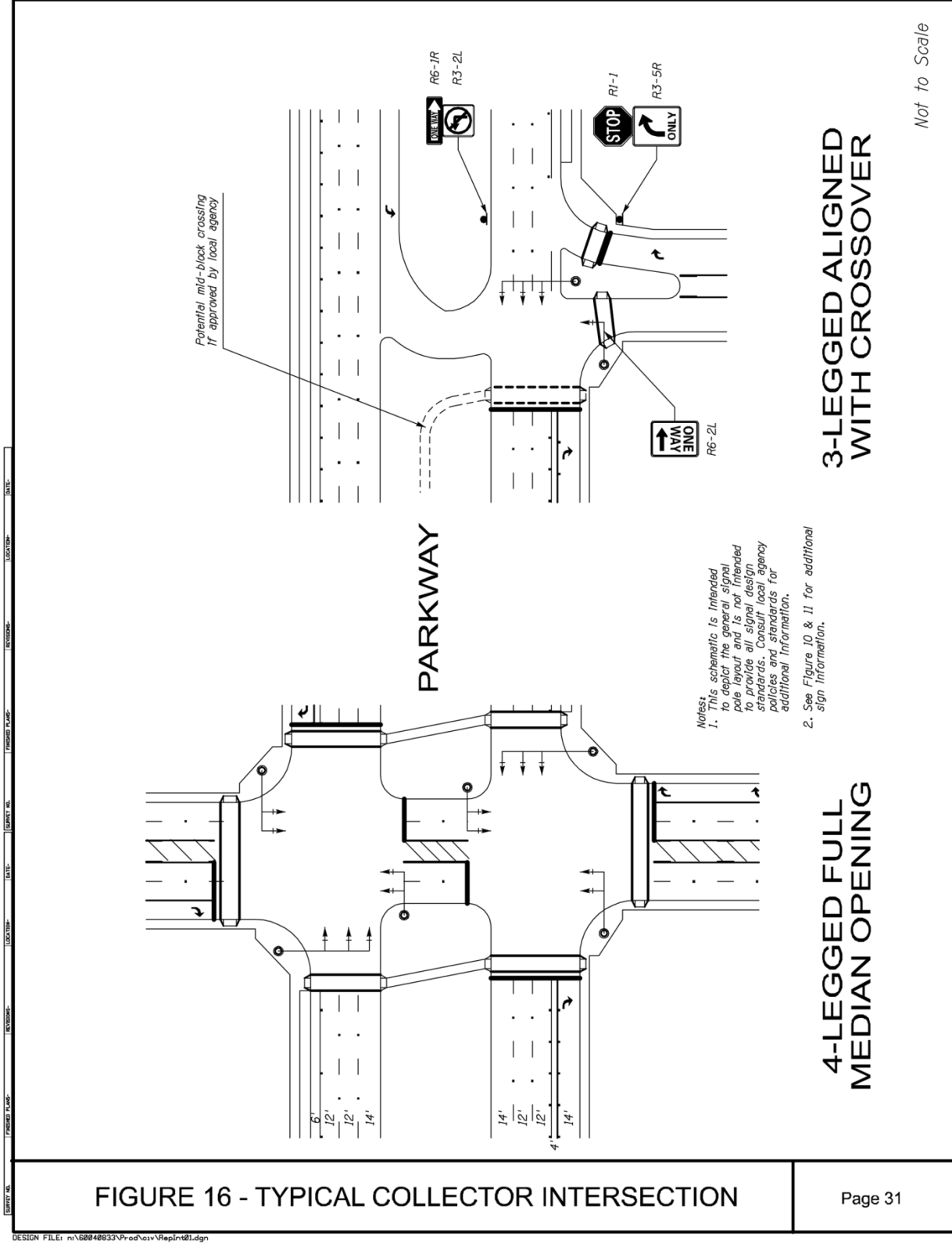
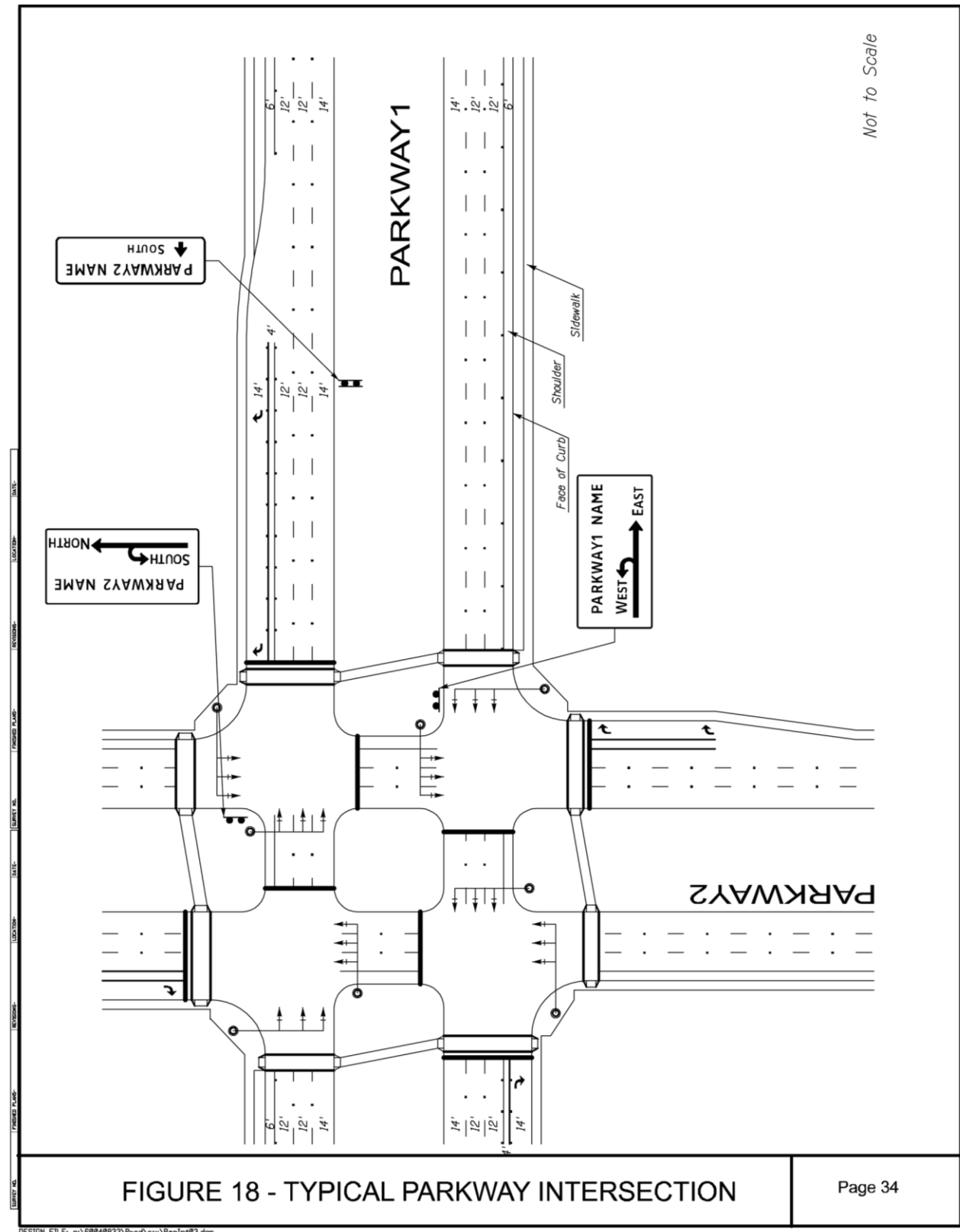
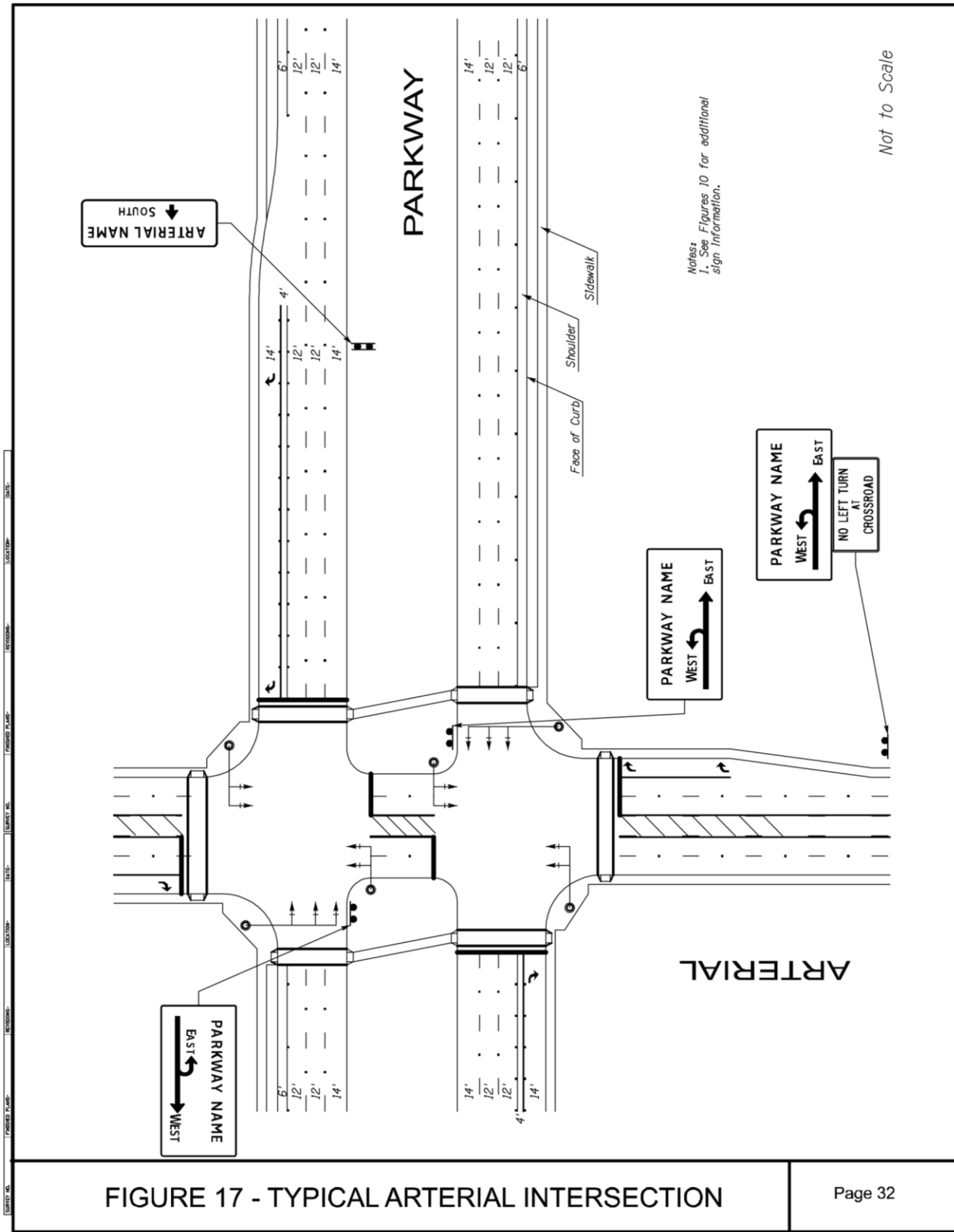


FIGURE 16 - TYPICAL COLLECTOR INTERSECTION





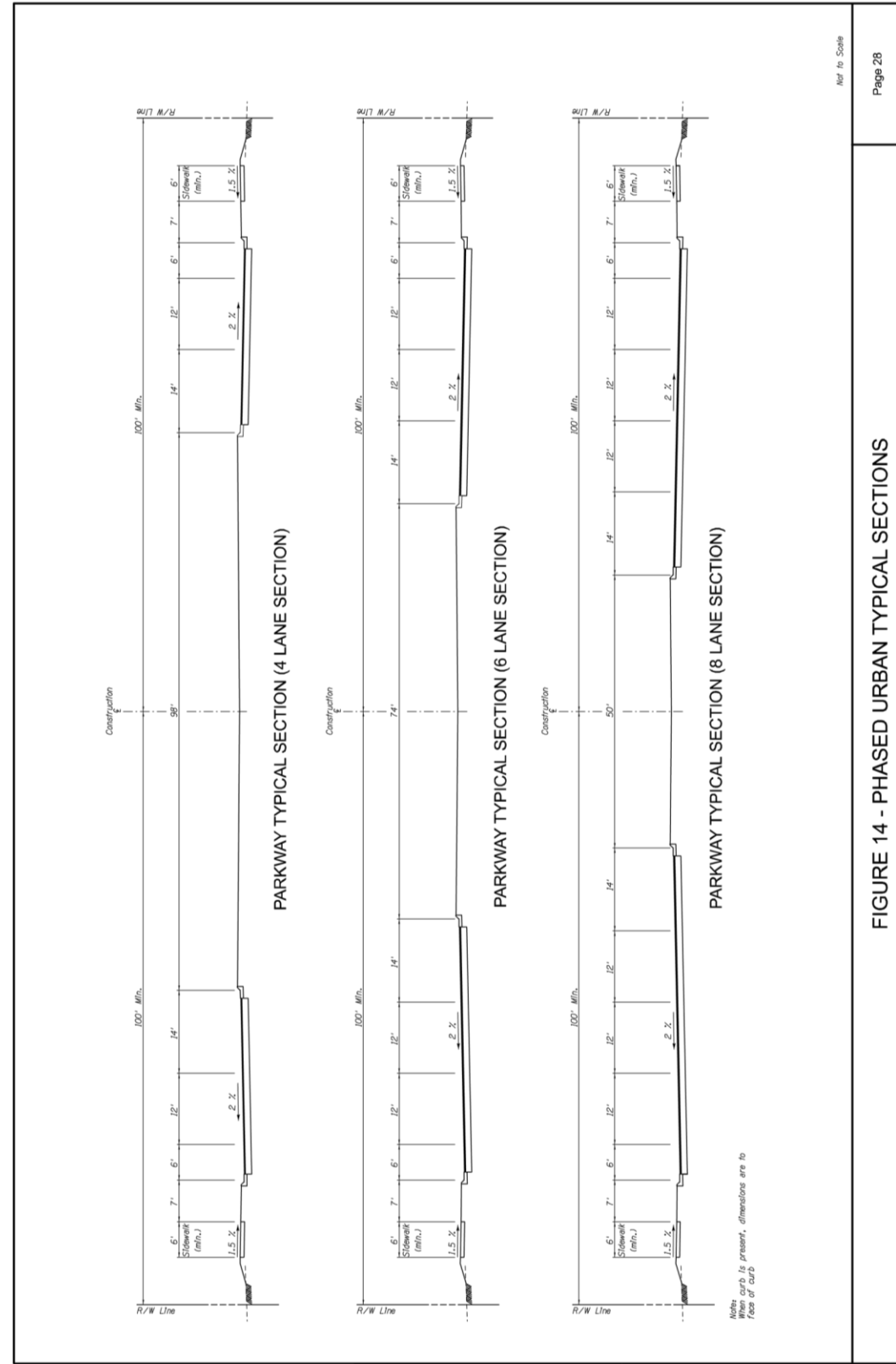


FIGURE 14 - PHASED URBAN TYPICAL SECTIONS

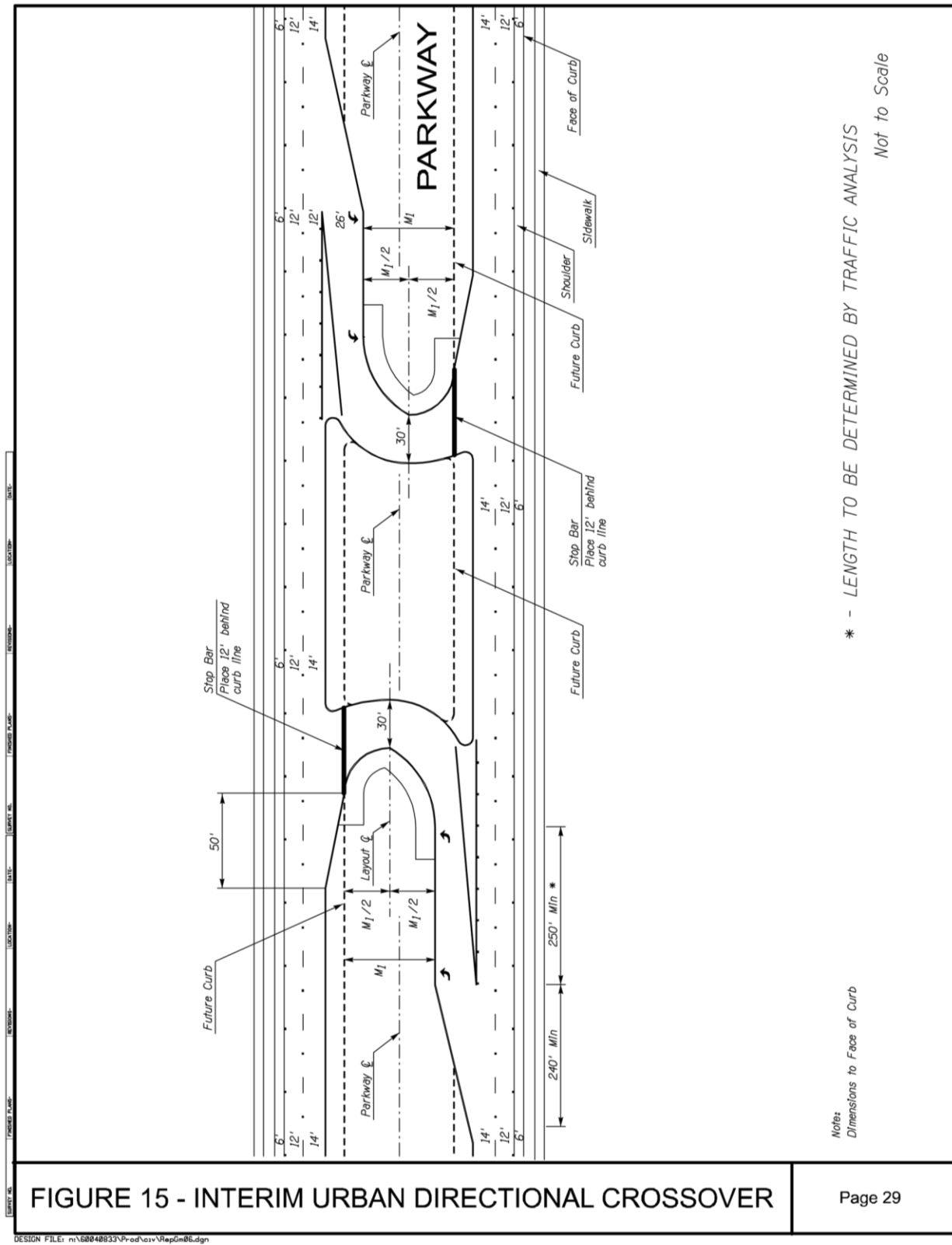


FIGURE 15 - INTERIM URBAN DIRECTIONAL CROSSOVER

Note:  
Dimensions to Face of Curb

\* - LENGTH TO BE DETERMINED BY TRAFFIC ANALYSIS  
Not to Scale



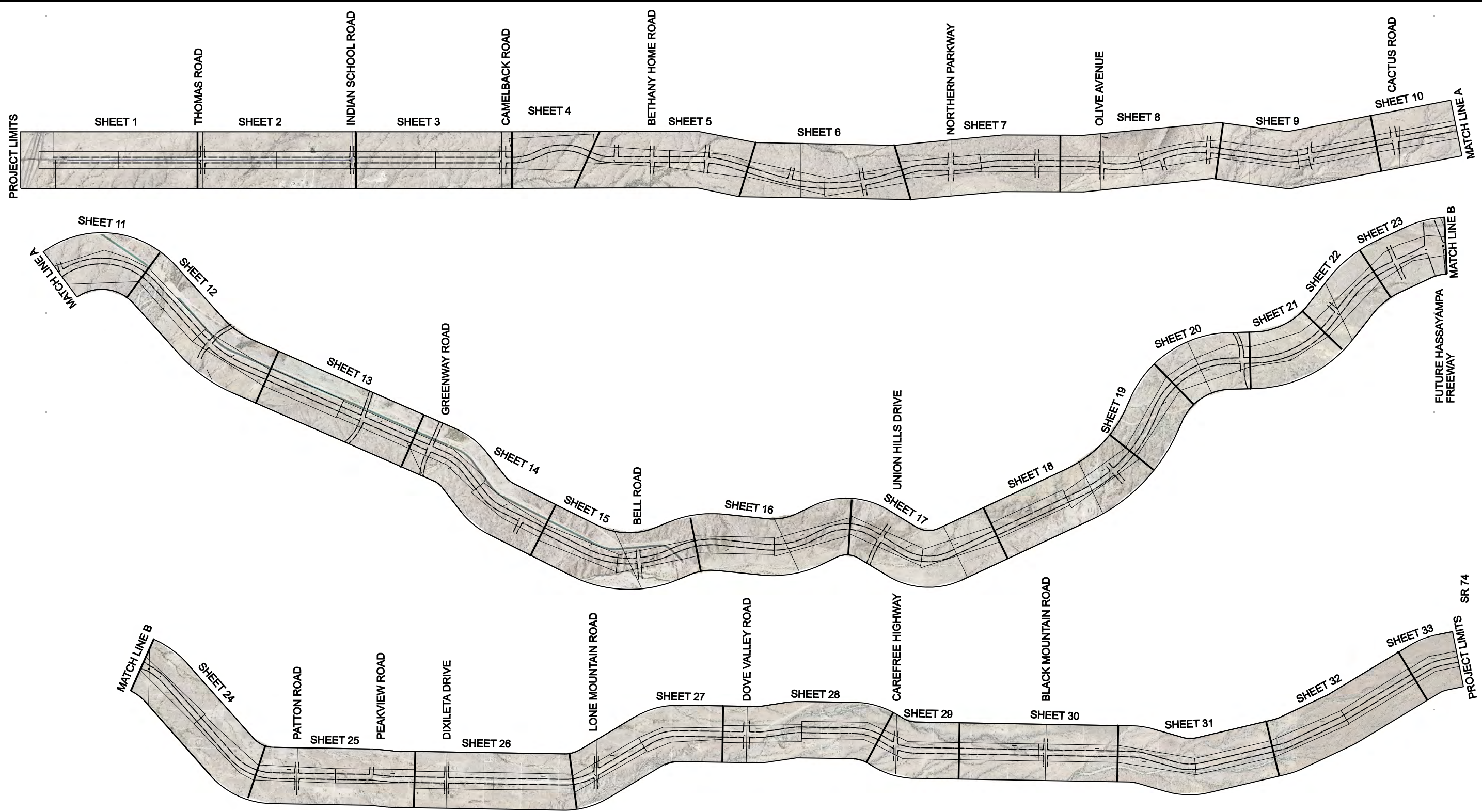
## Appendix B

- Preferred Alignment Drawings

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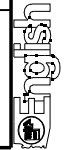


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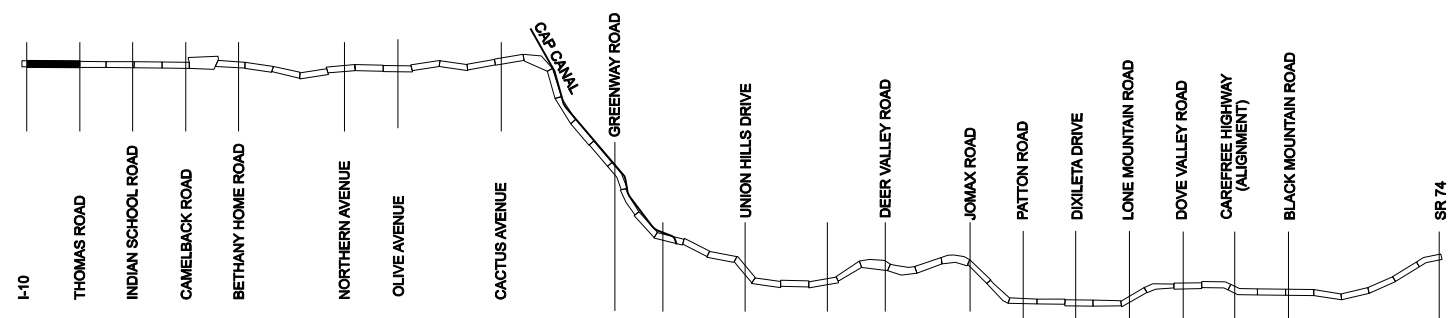
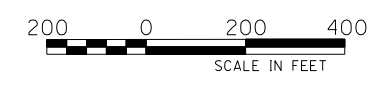
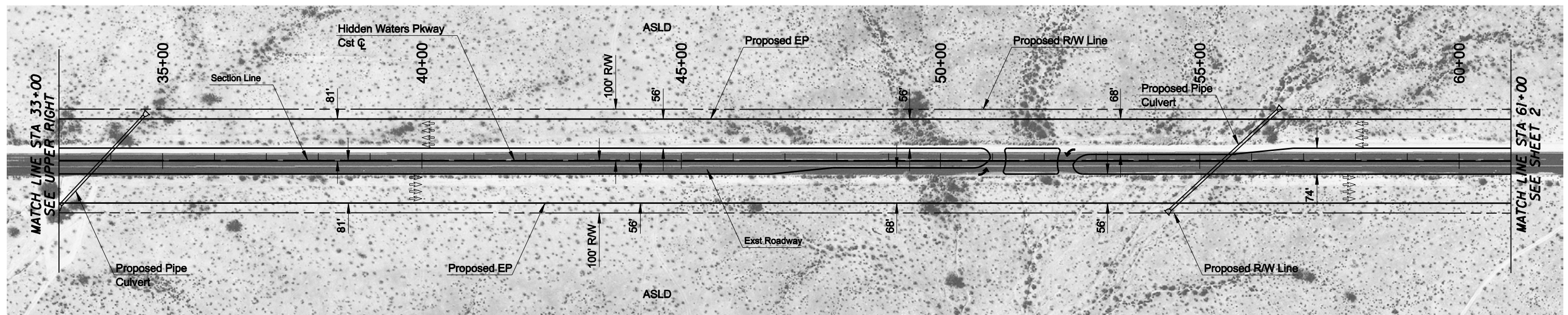
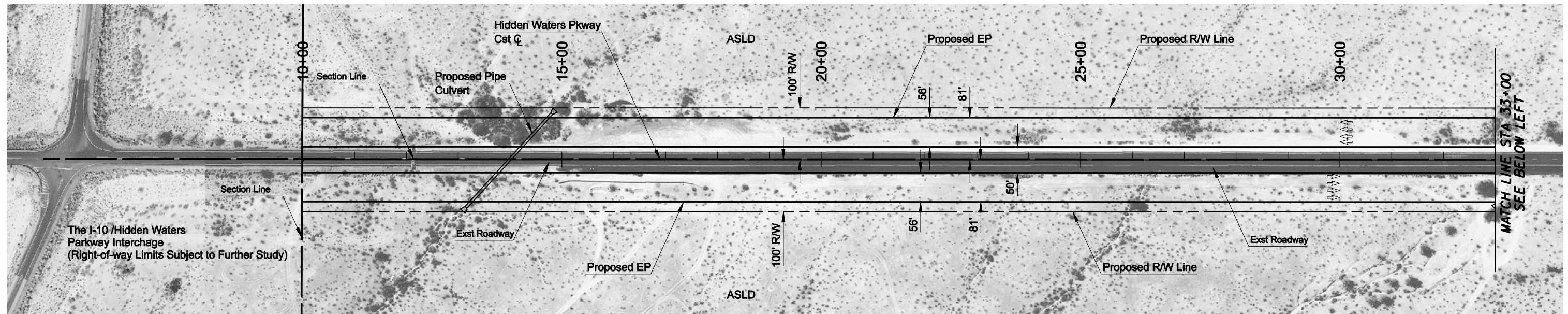
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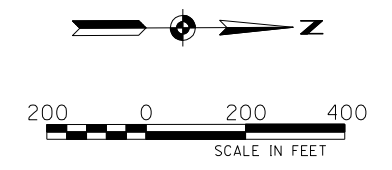
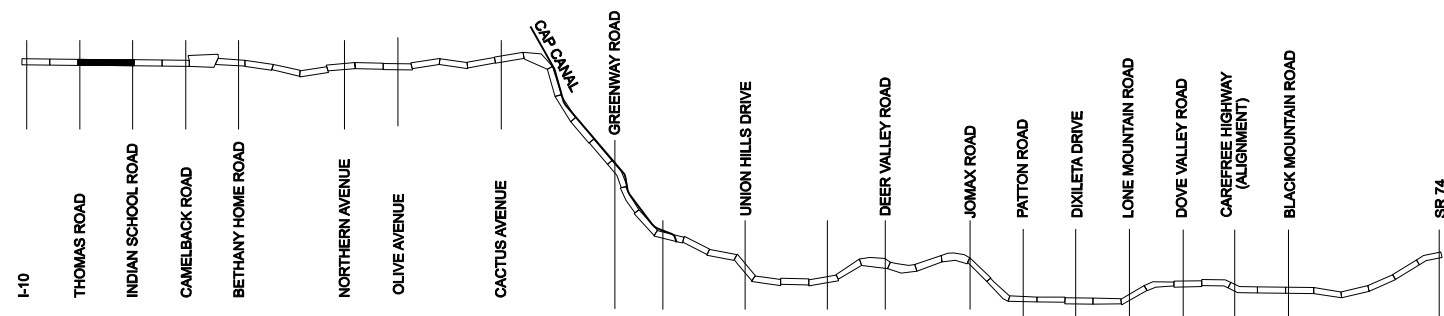
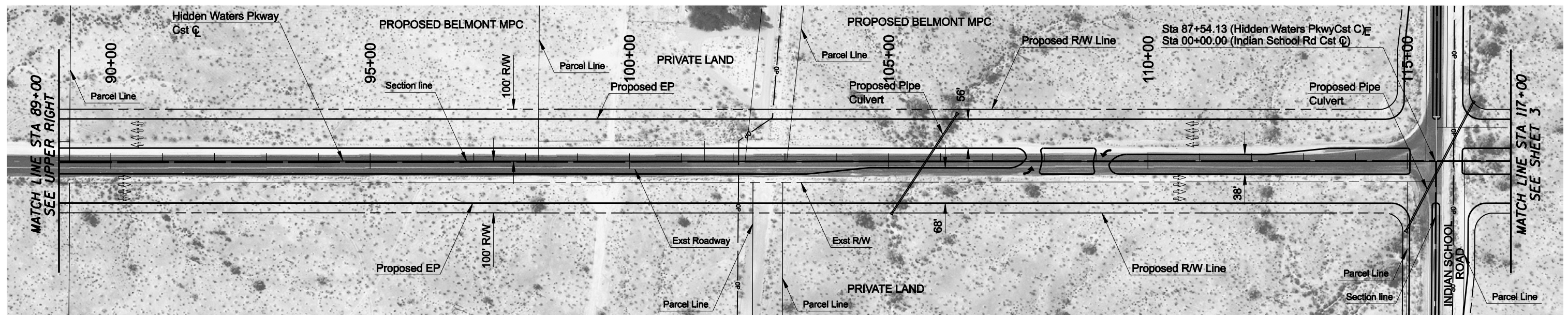
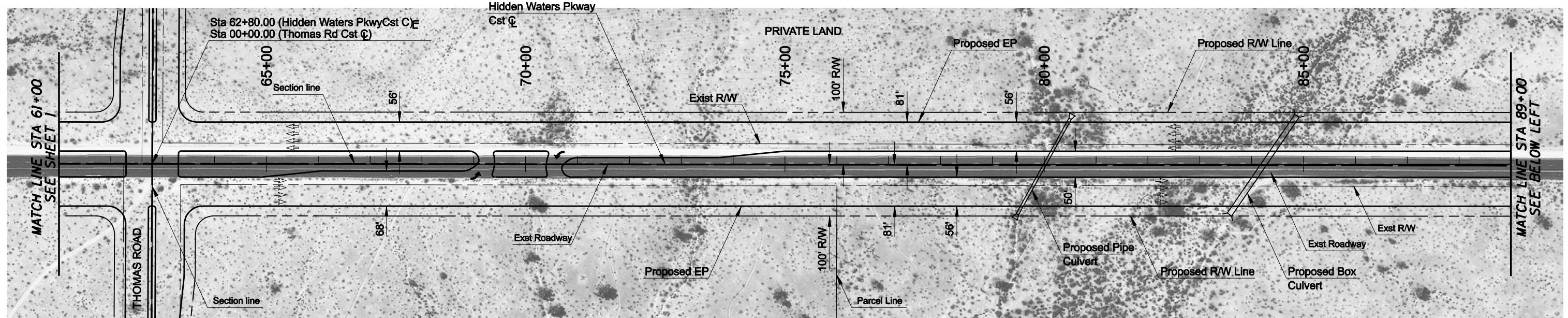
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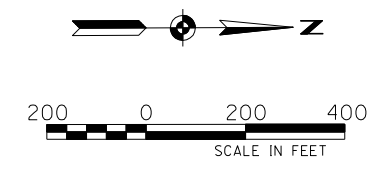
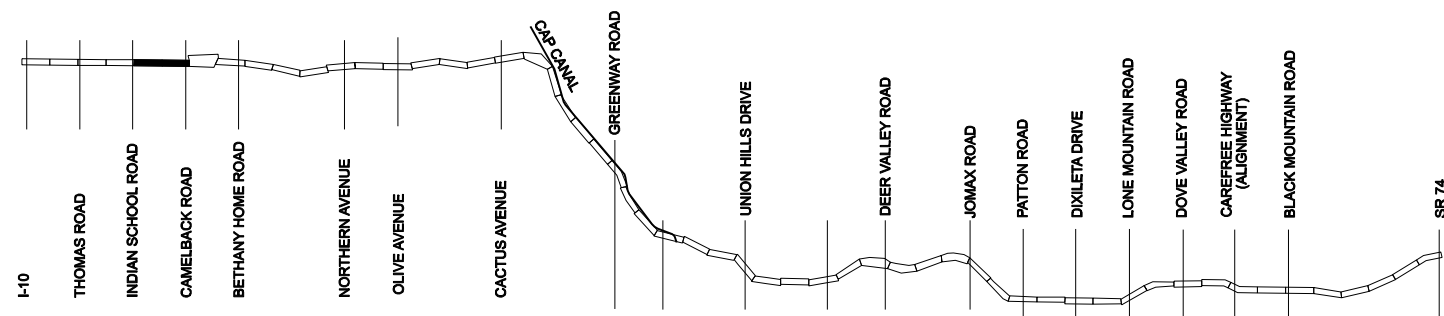
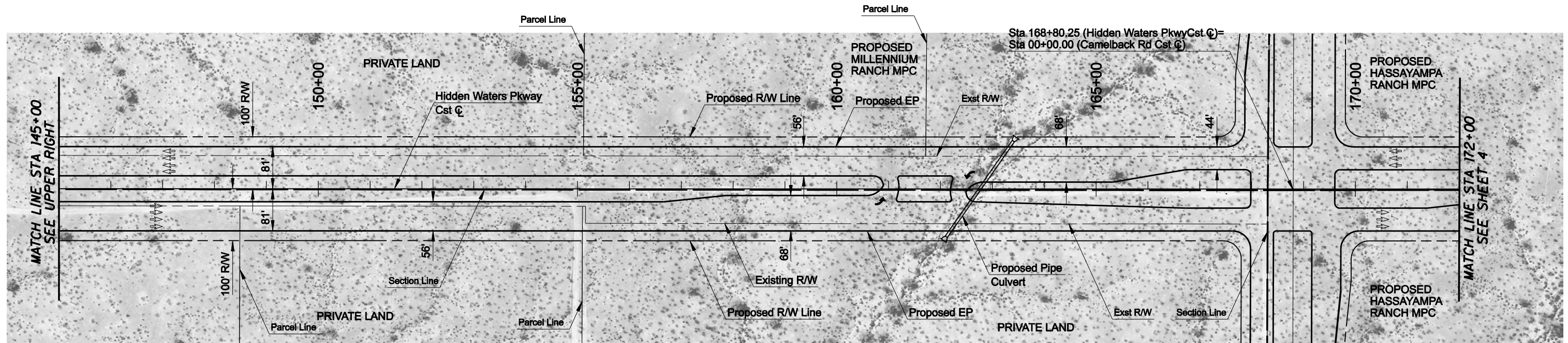
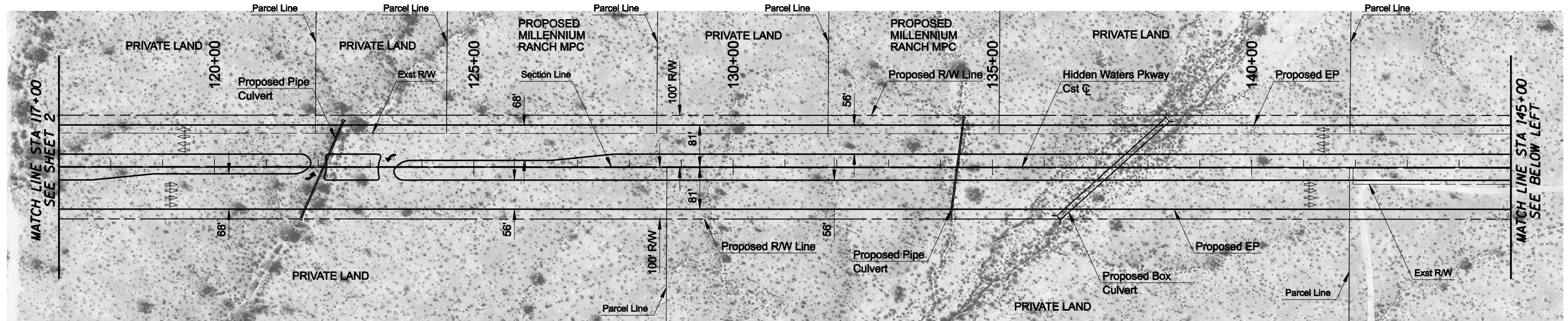
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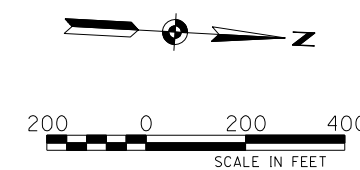
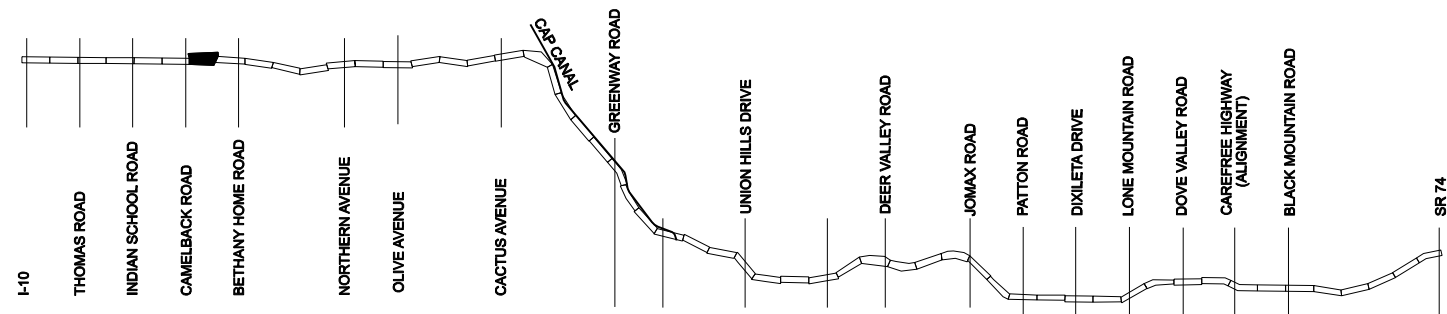
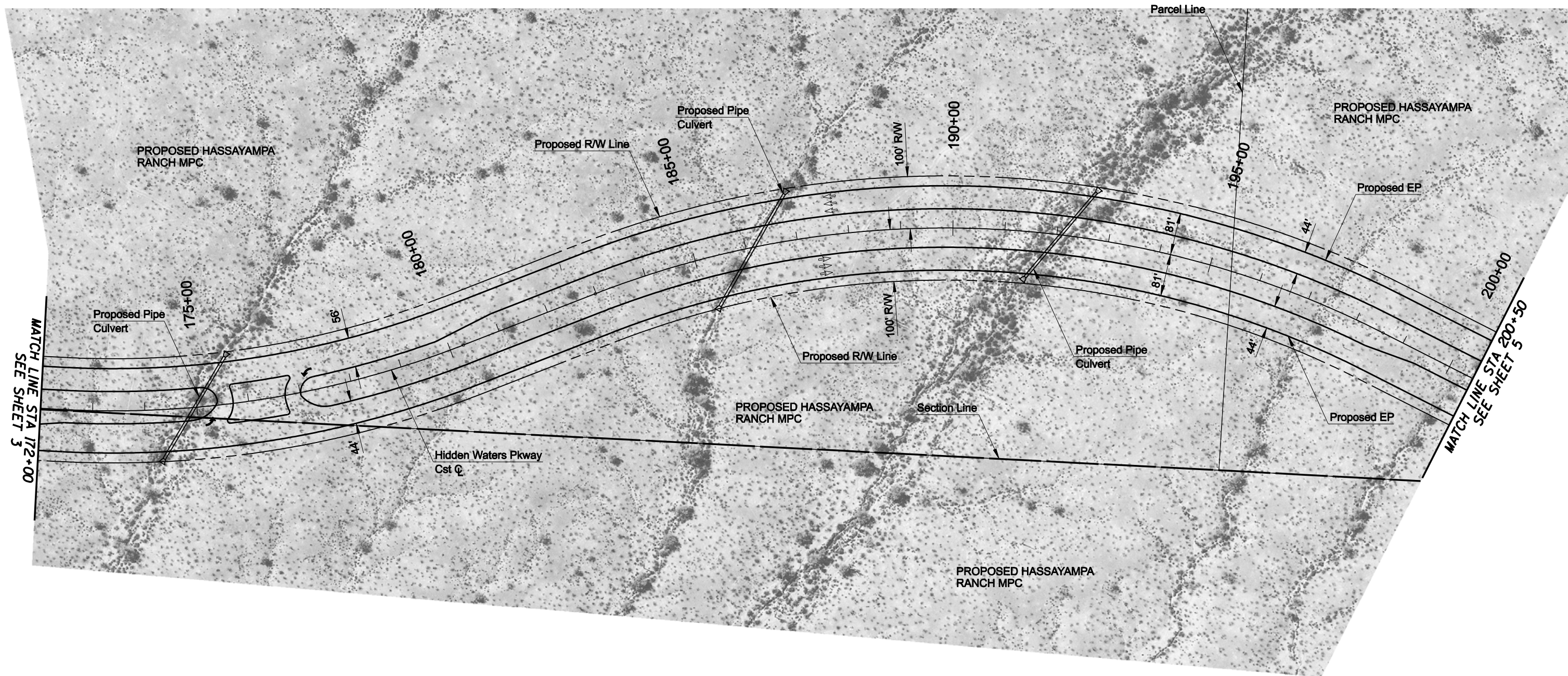
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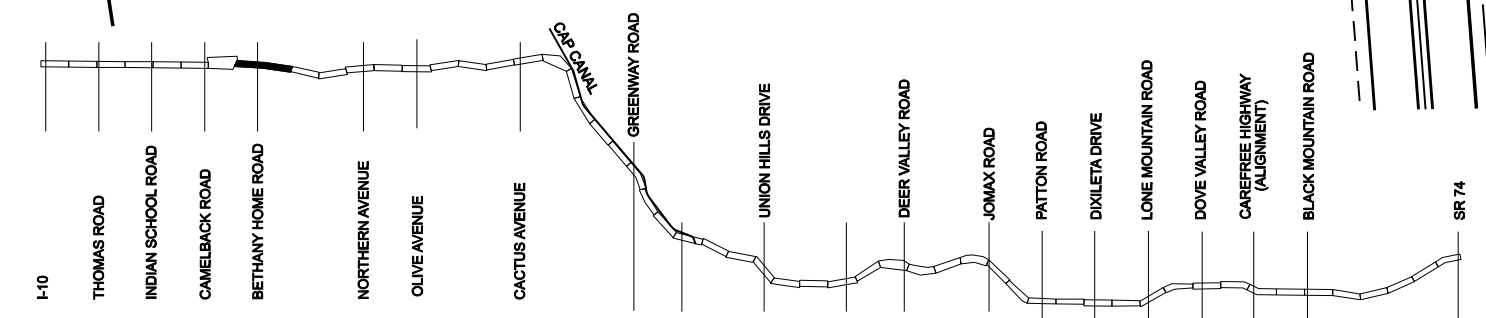
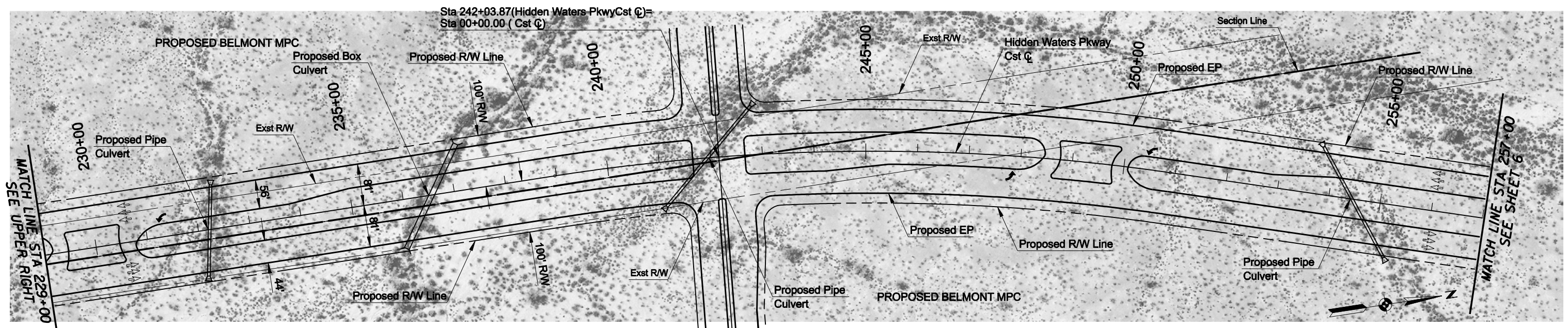
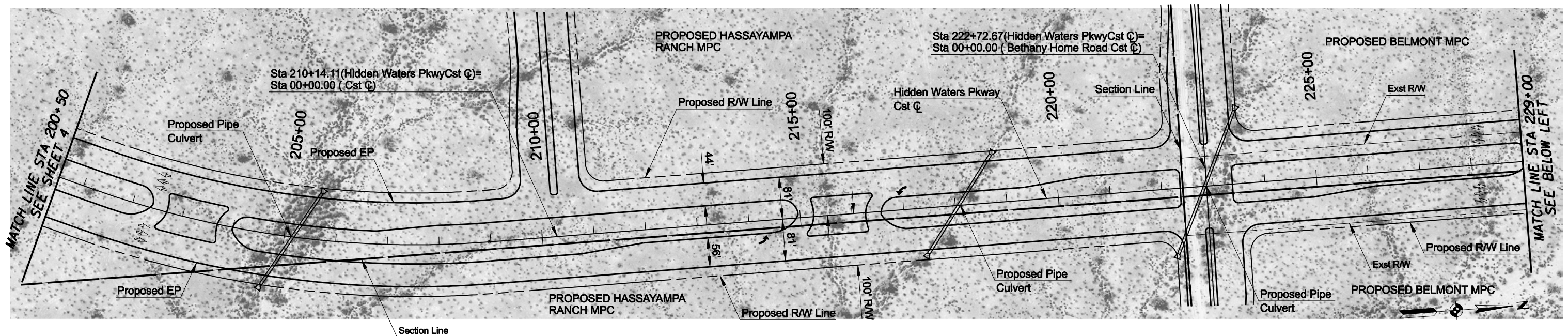
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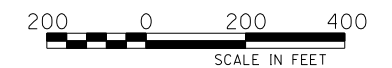
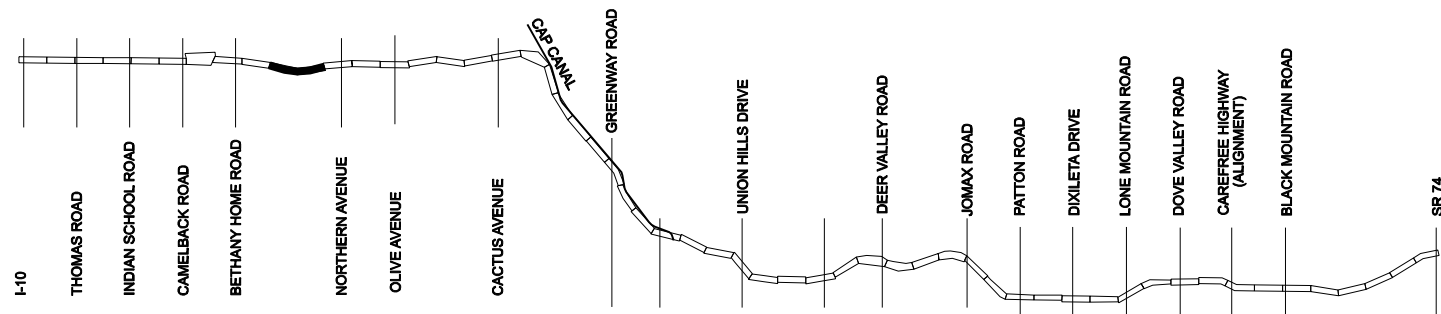
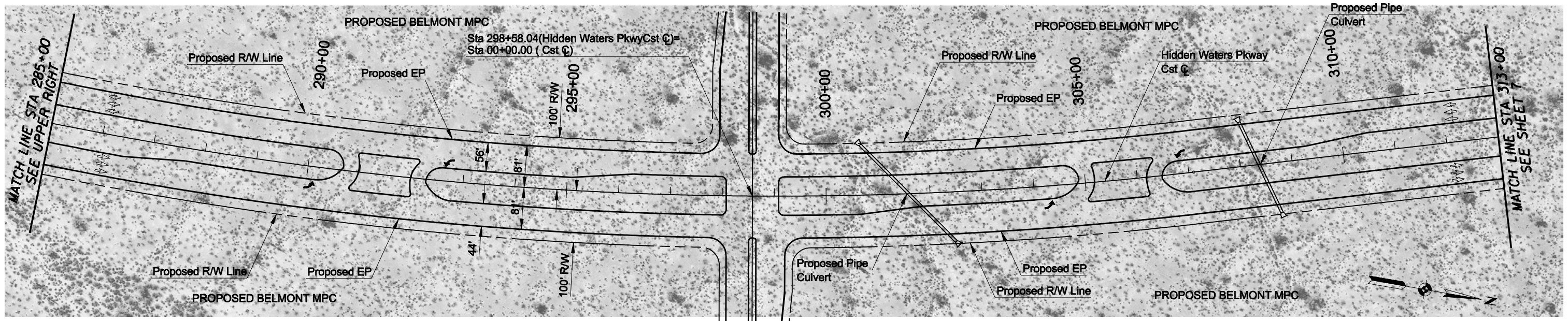
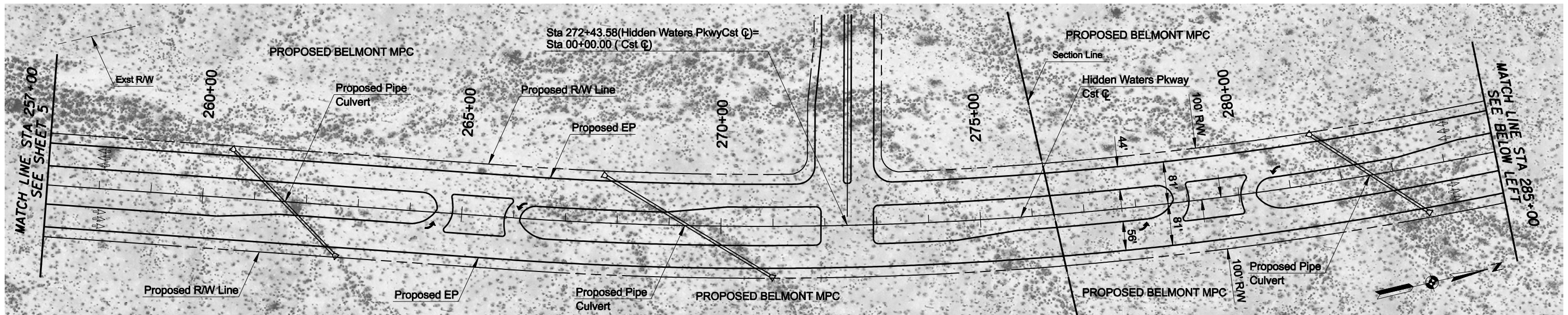
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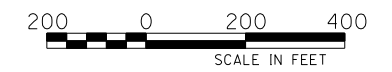
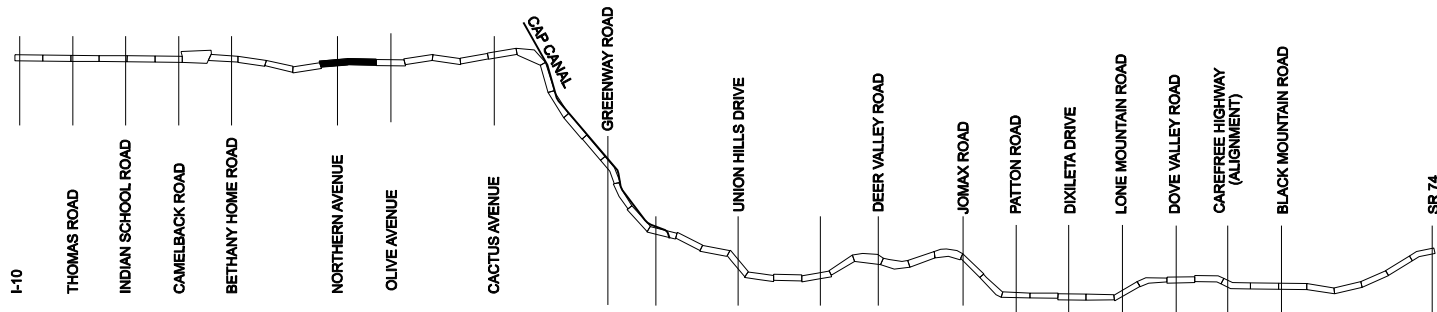
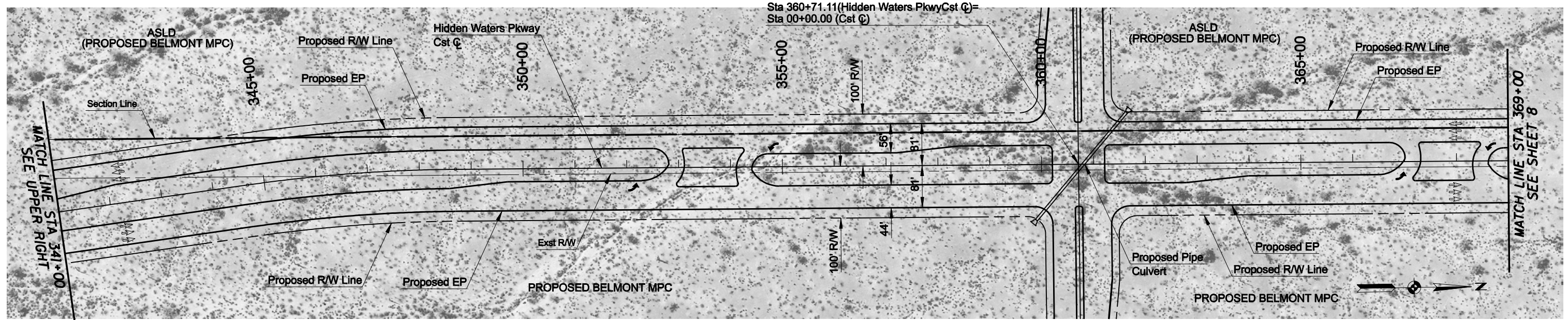
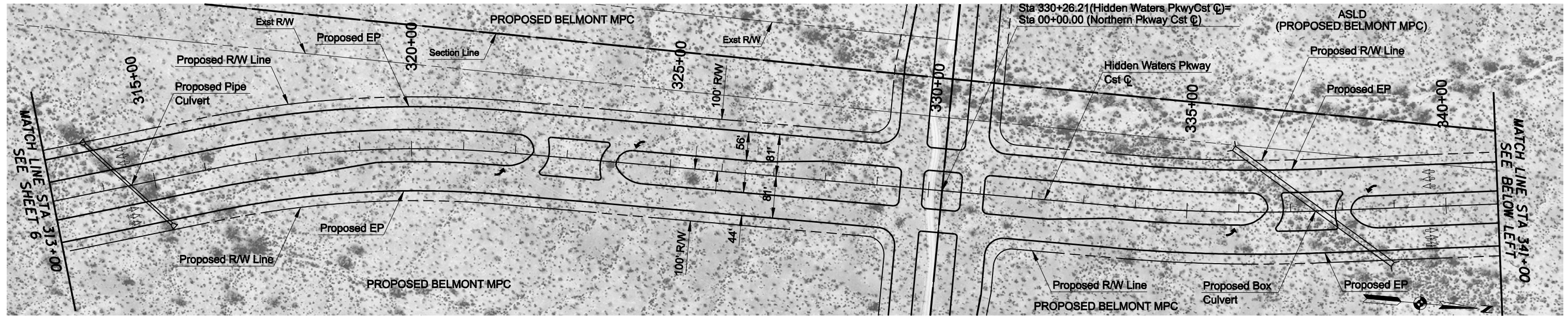
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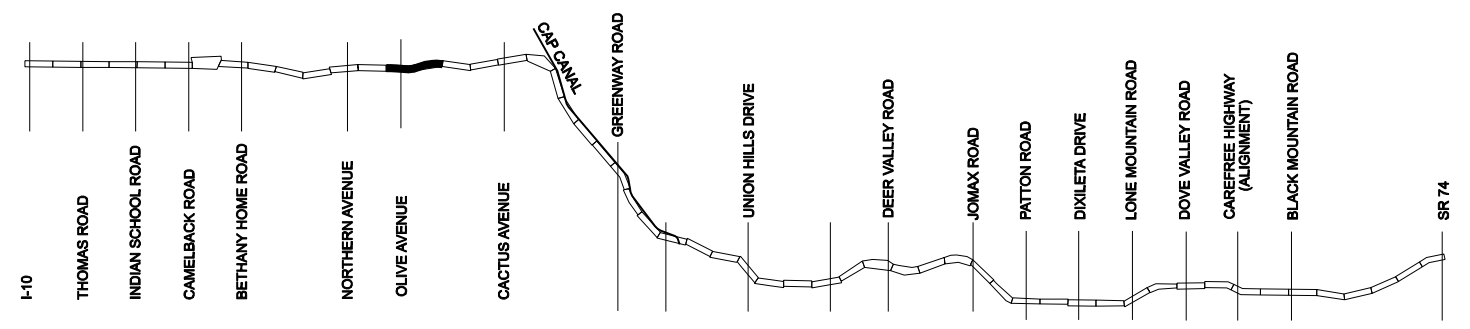
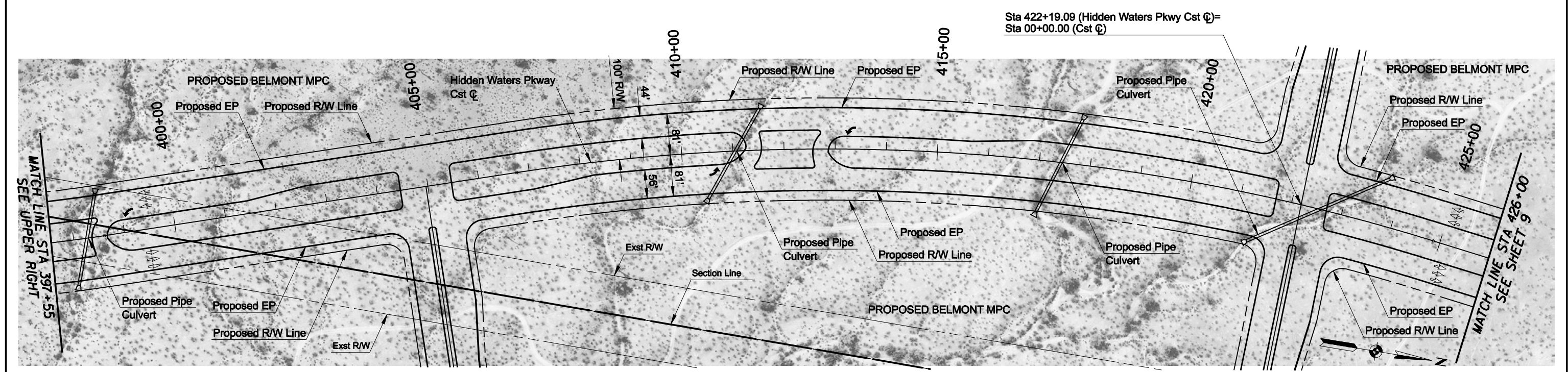
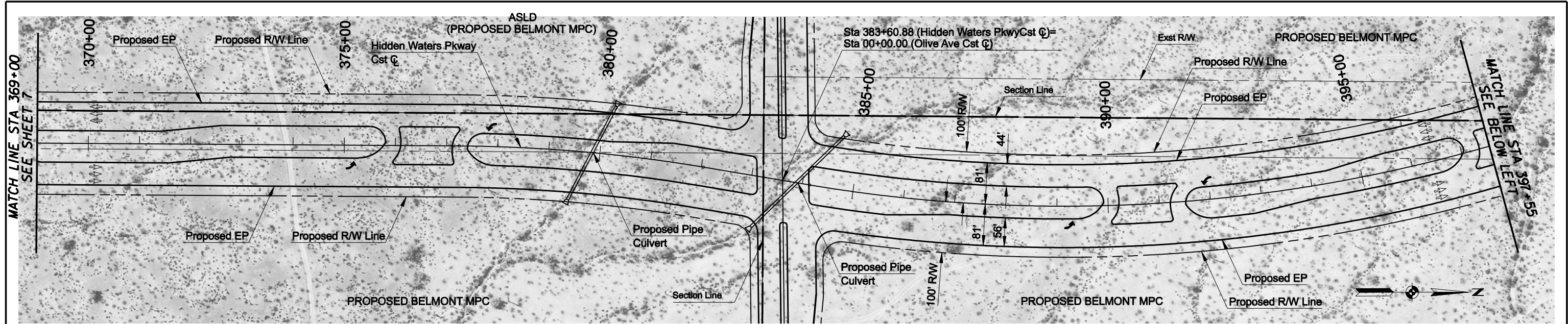
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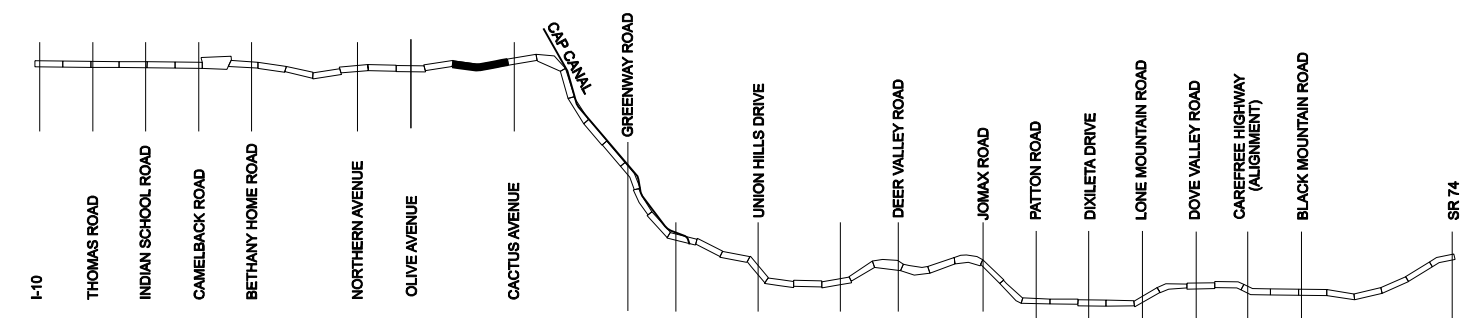
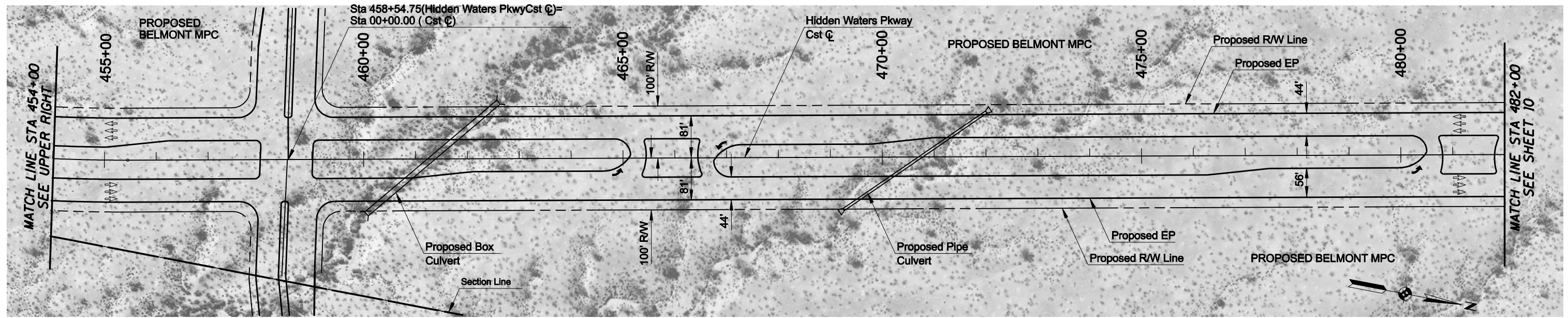
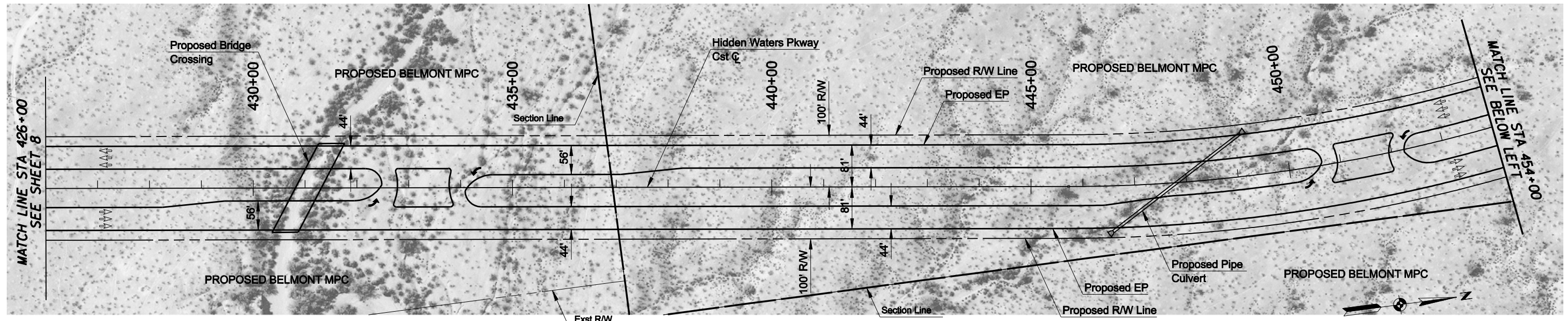
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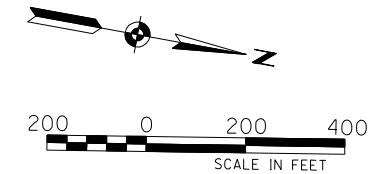
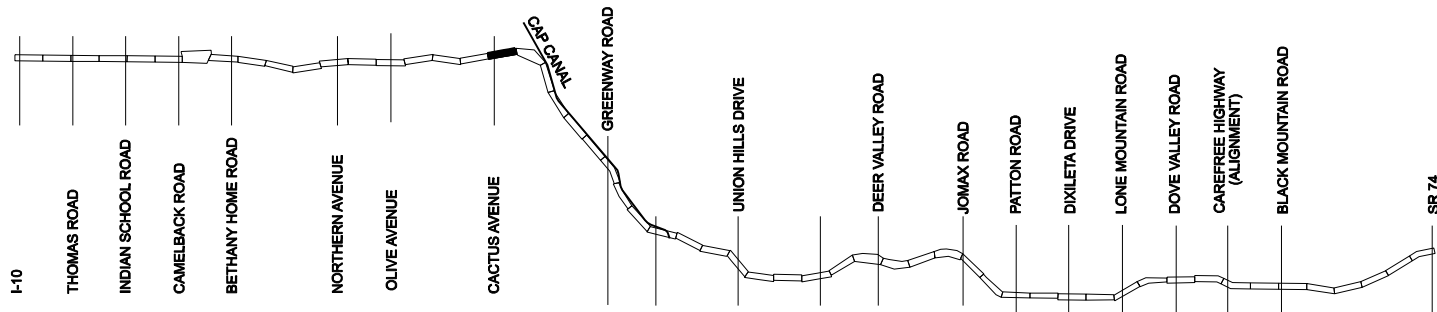
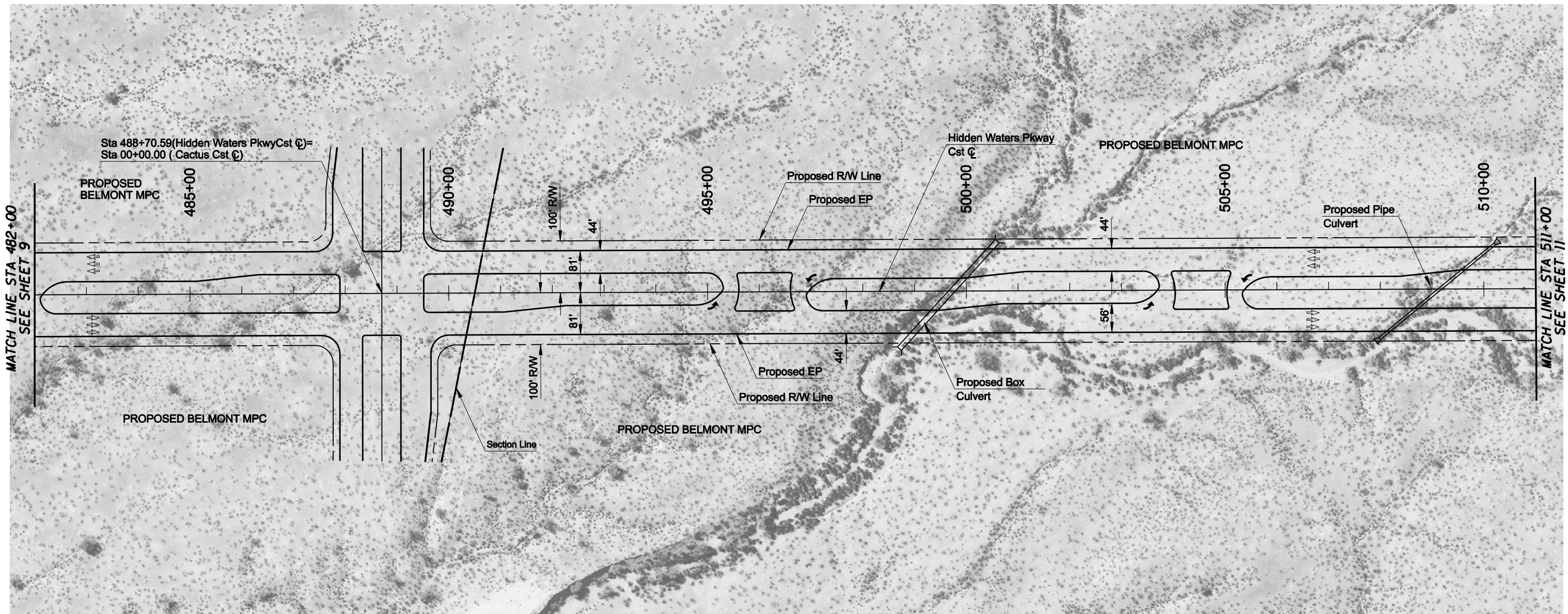
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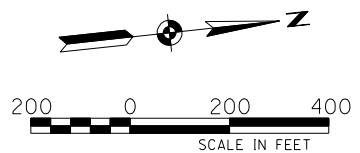
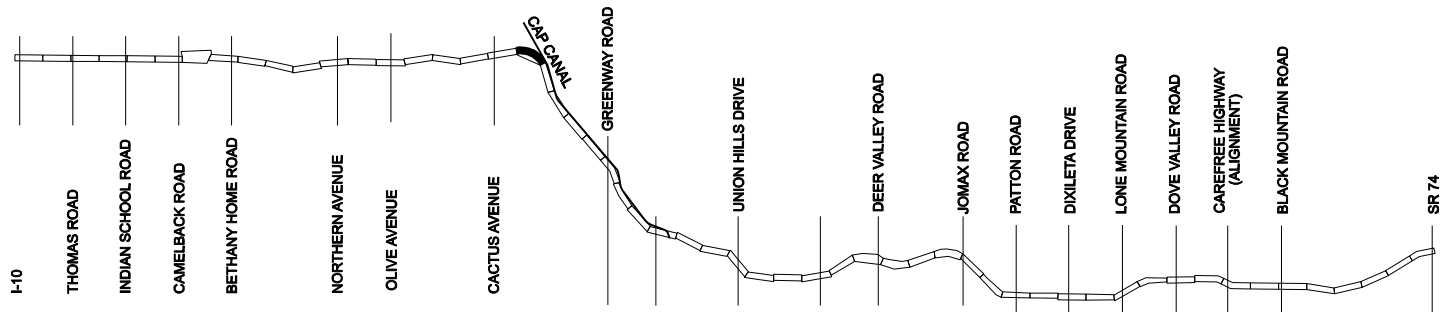
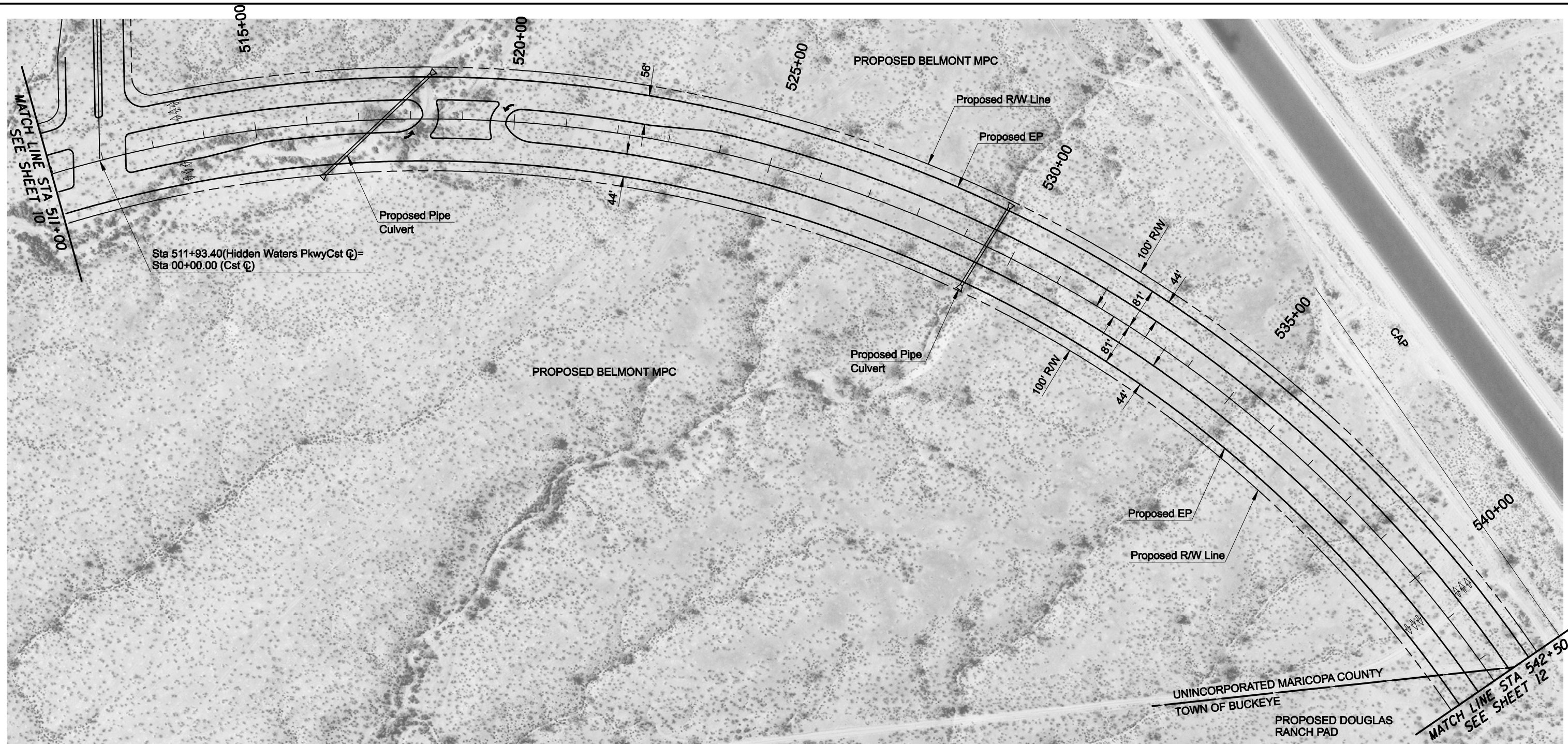
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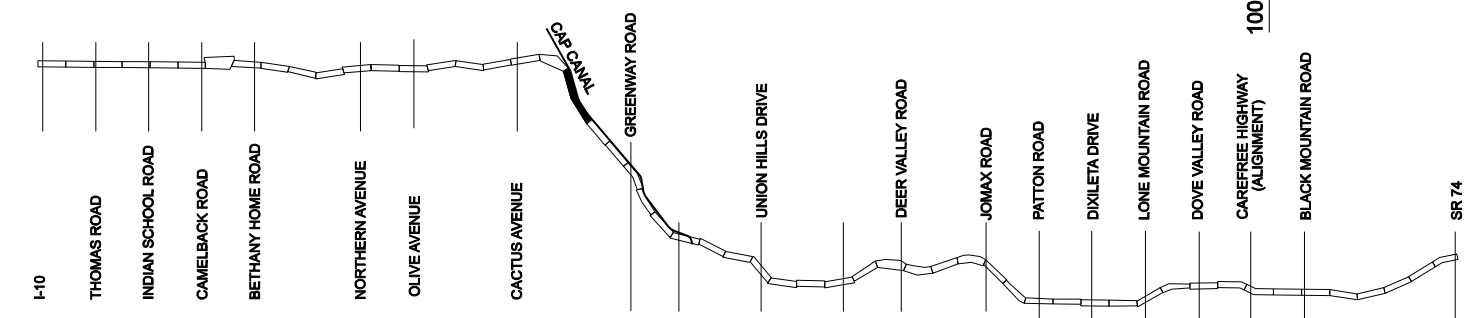
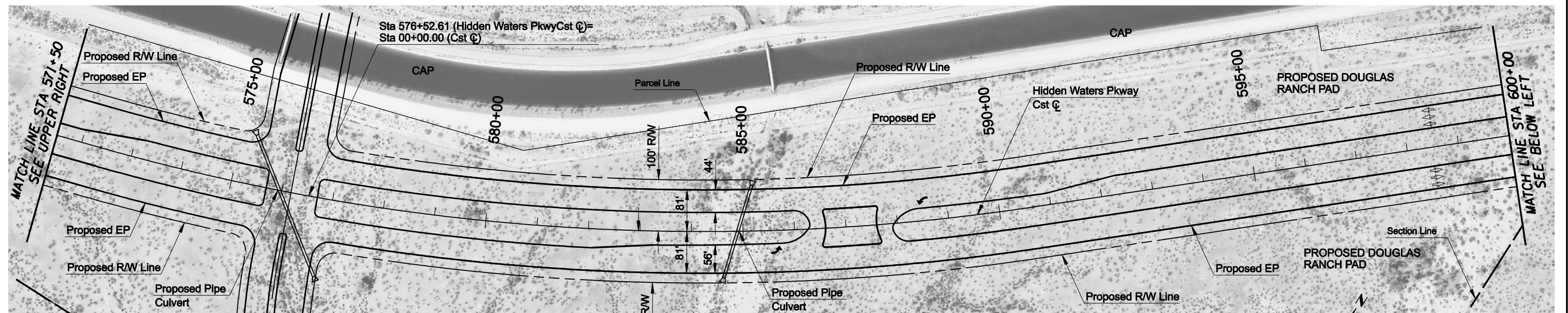
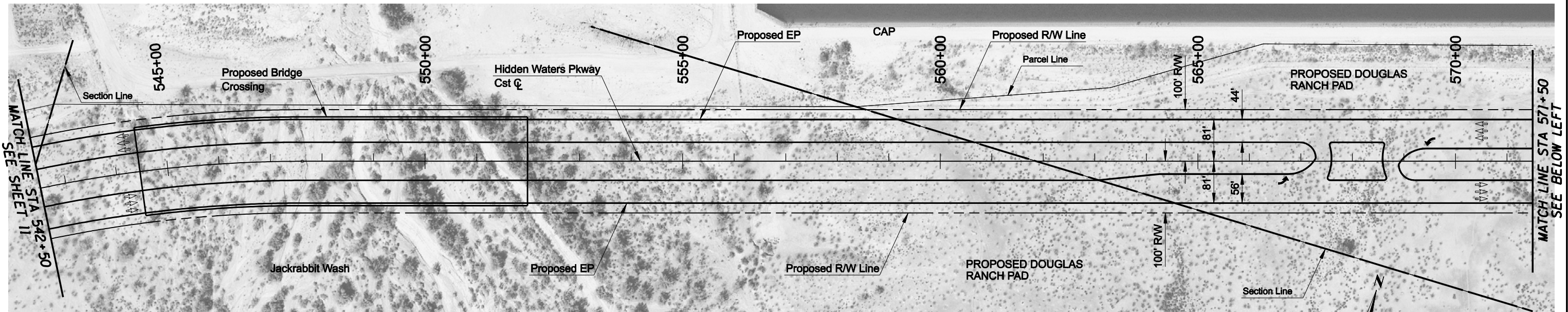
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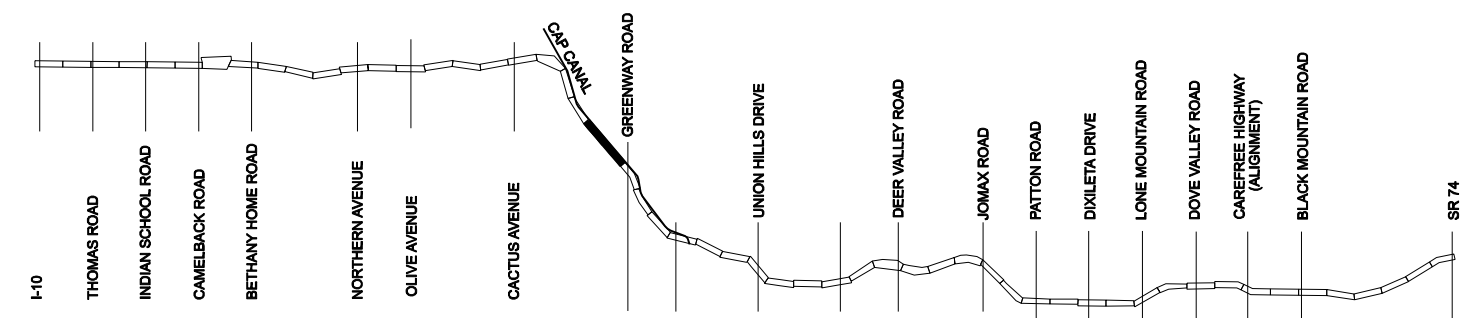
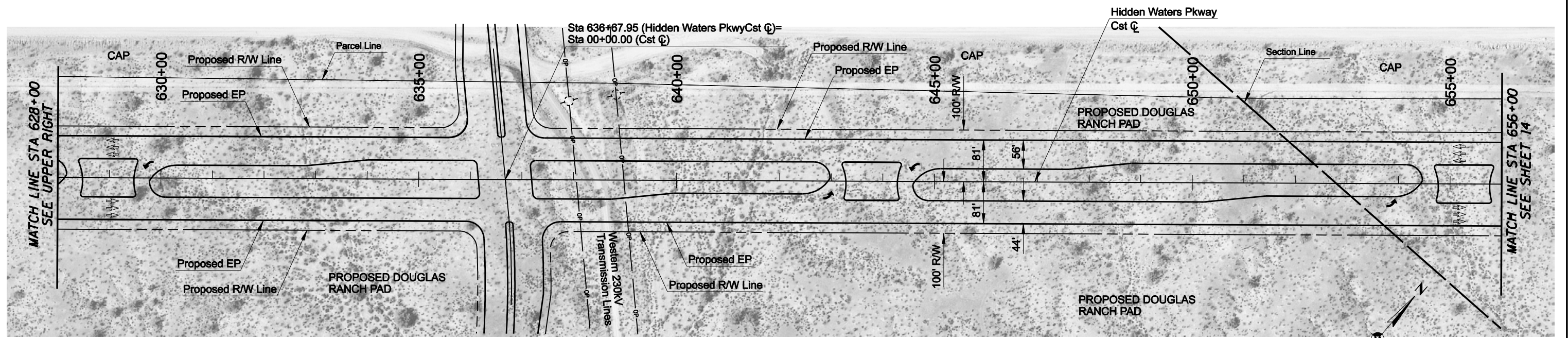
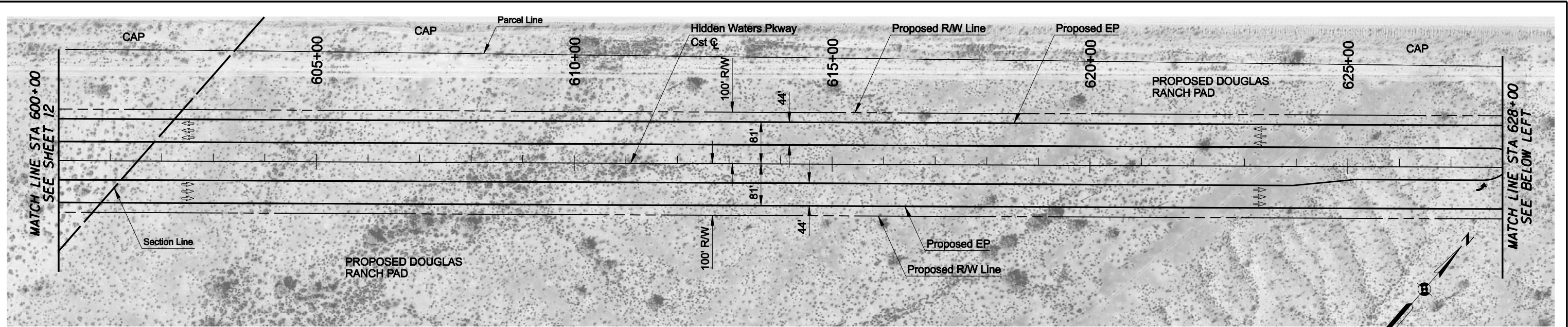
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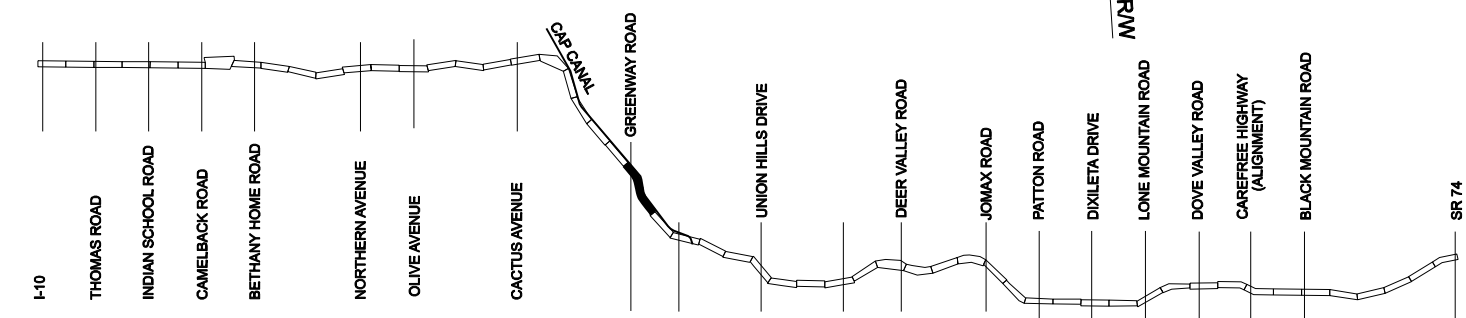
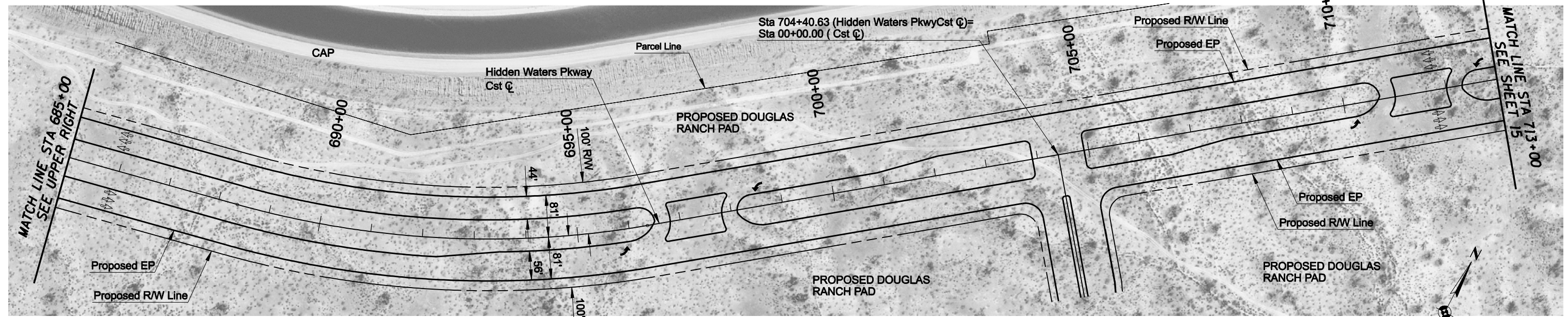
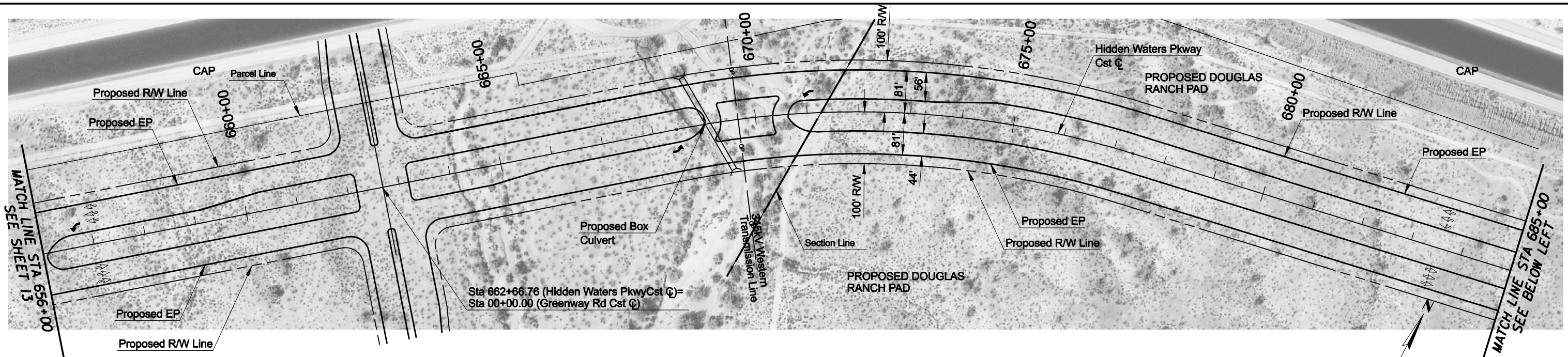
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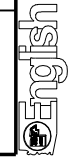


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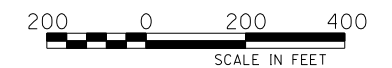
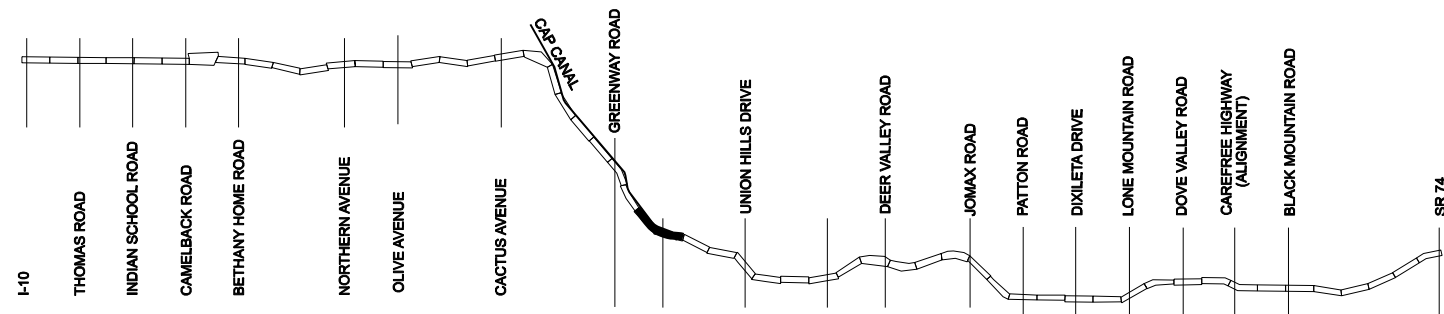
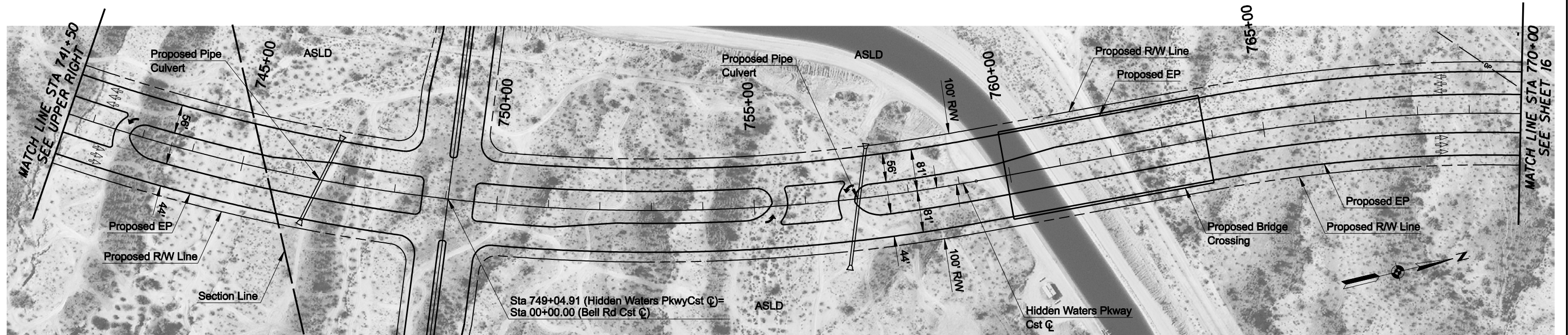
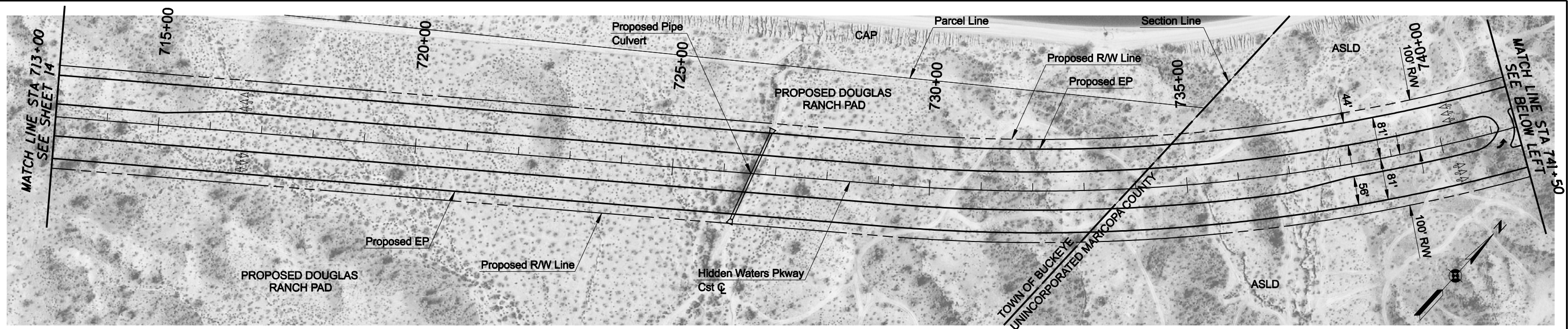
HIDDEN WATERS PARKWAY  
CORRIDOR FEASIBILITY STUDY

ALTERNATIVE 2  
Sheet 14 of 33

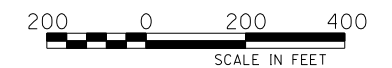
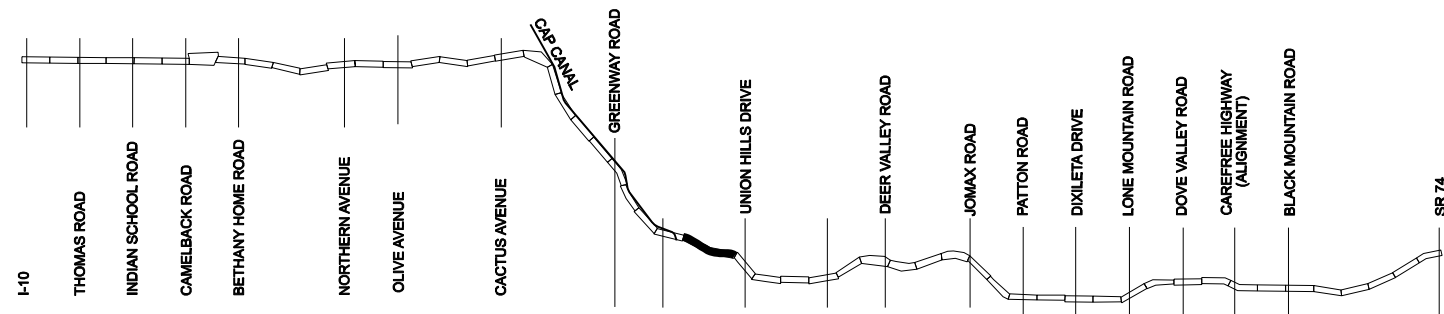
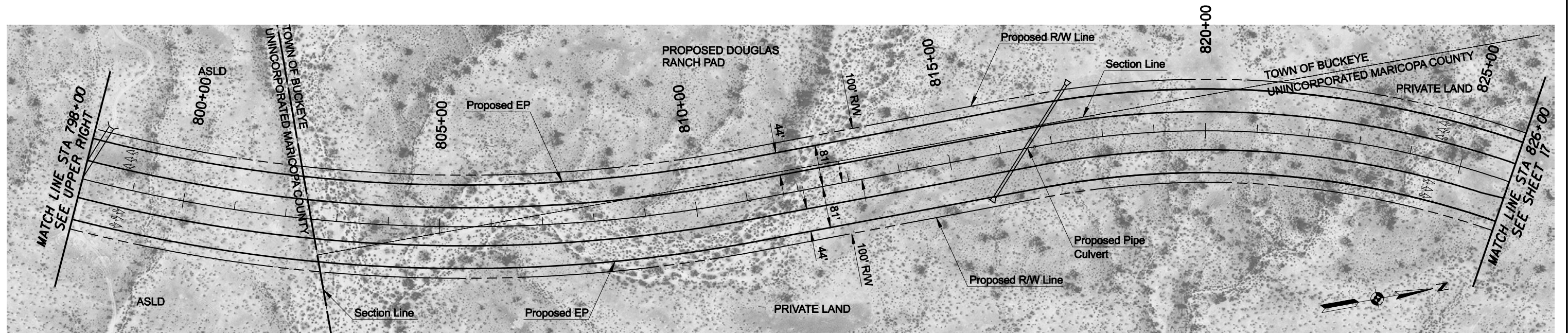
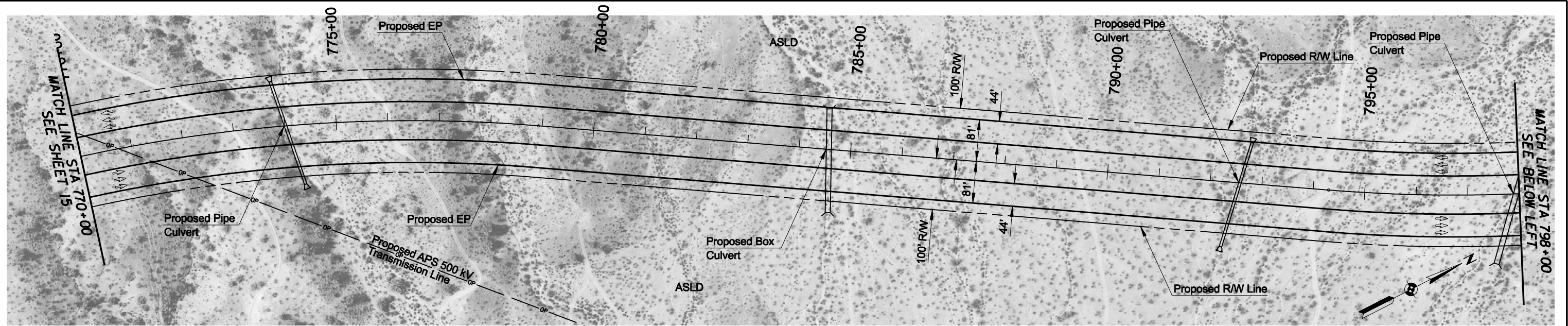
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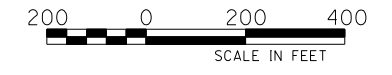
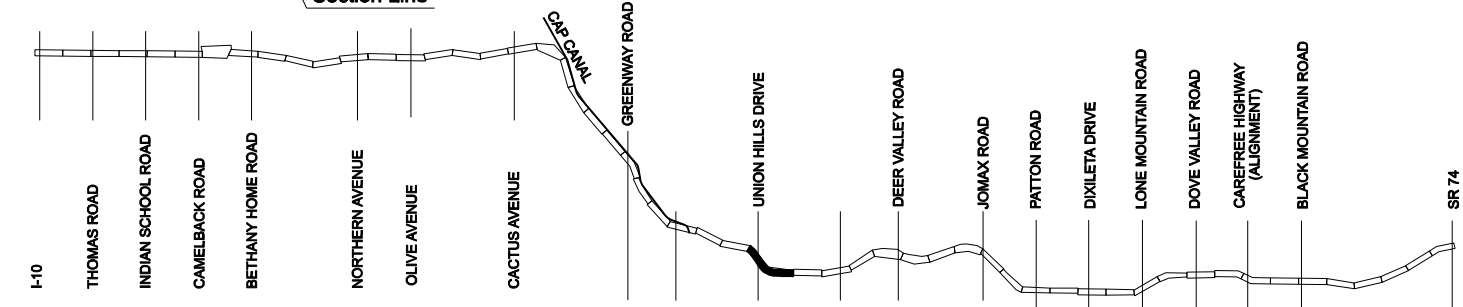
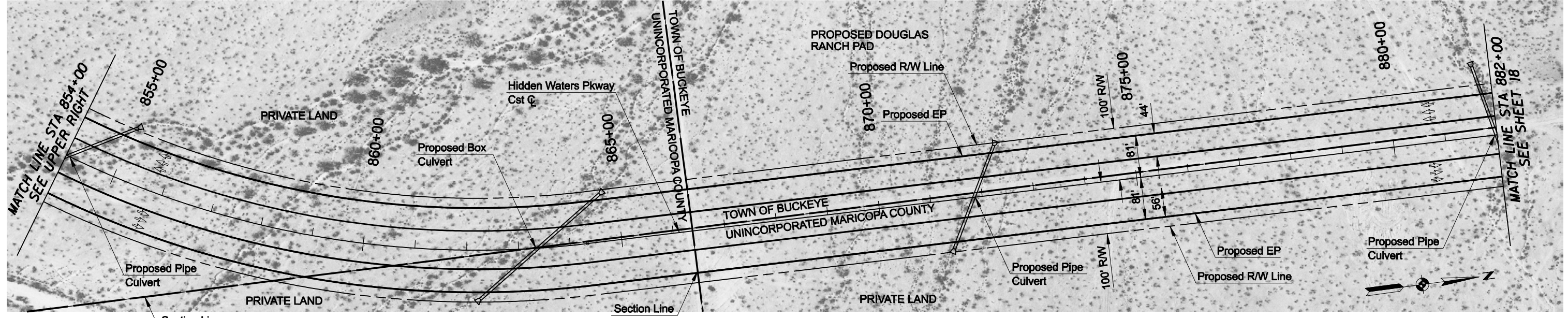
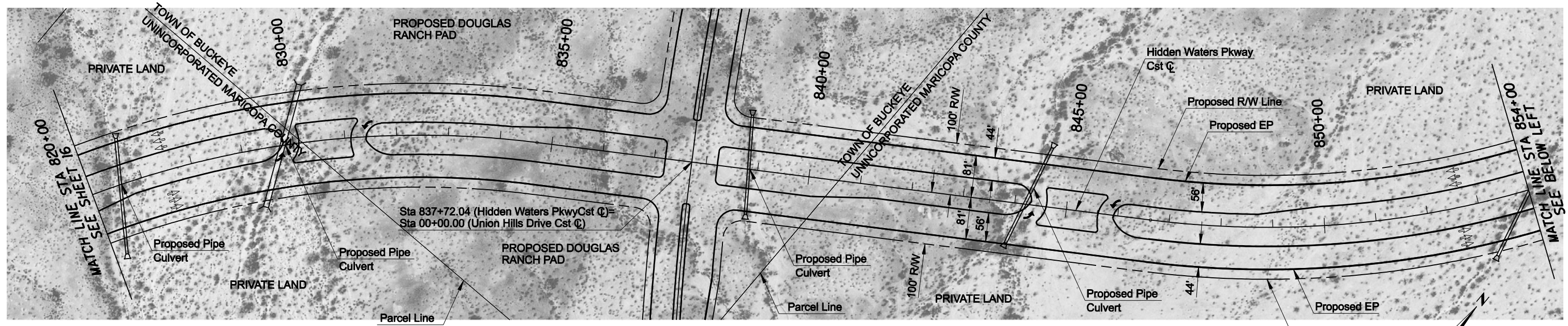
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**ALTERNATIVE 2**  
Sheet 16 of 33

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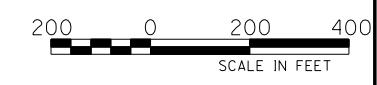
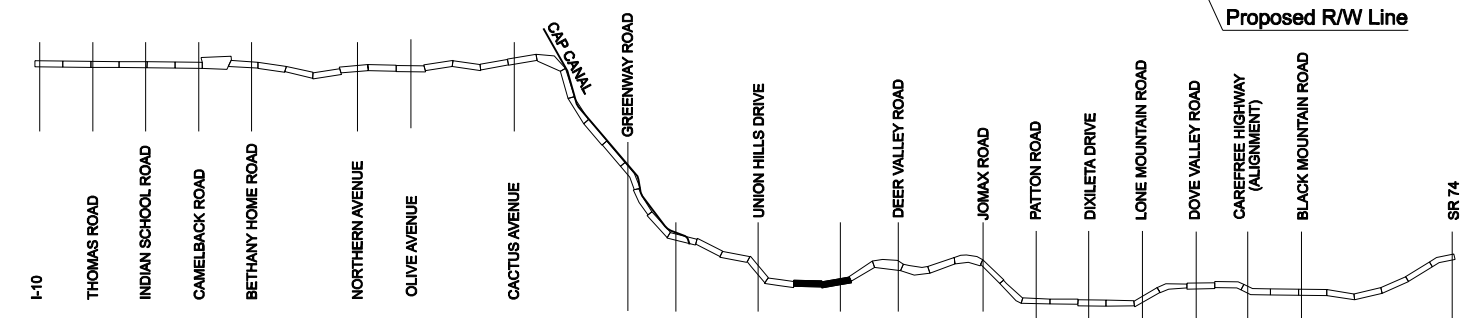
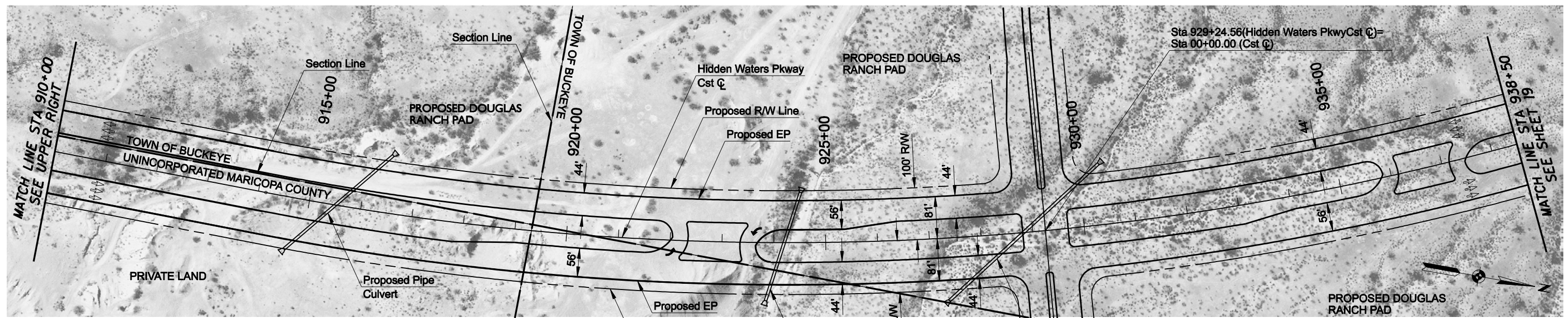
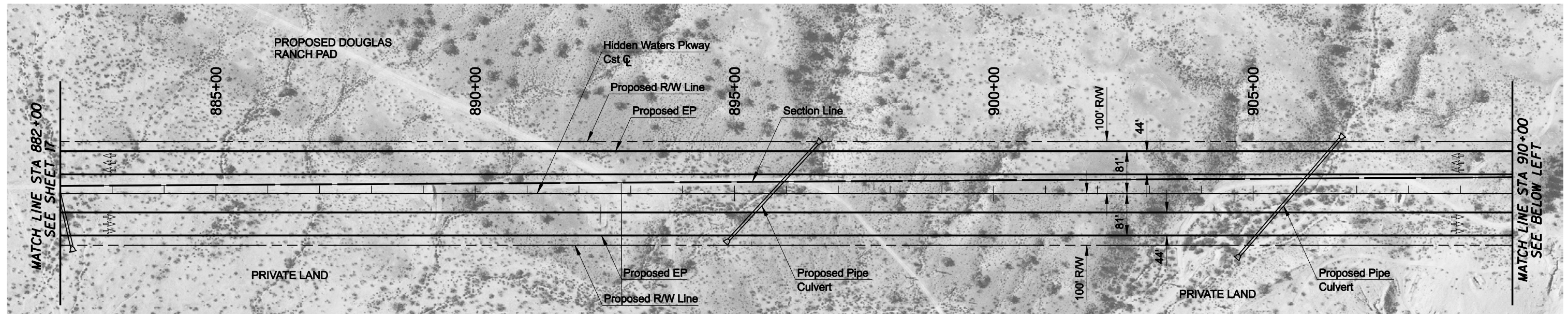
**HIDDEN WATERS PARKWAY  
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Sheet 17 of 33

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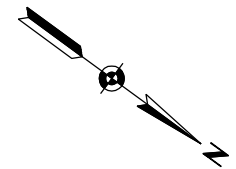
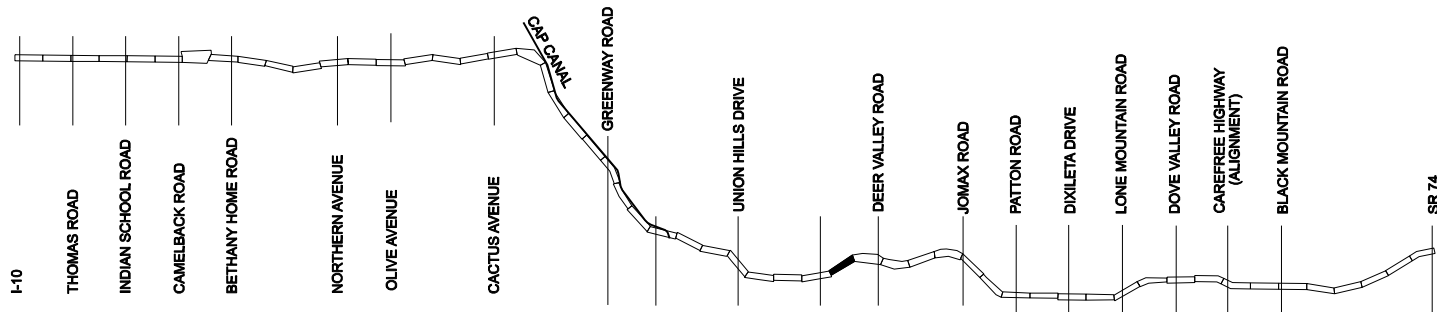
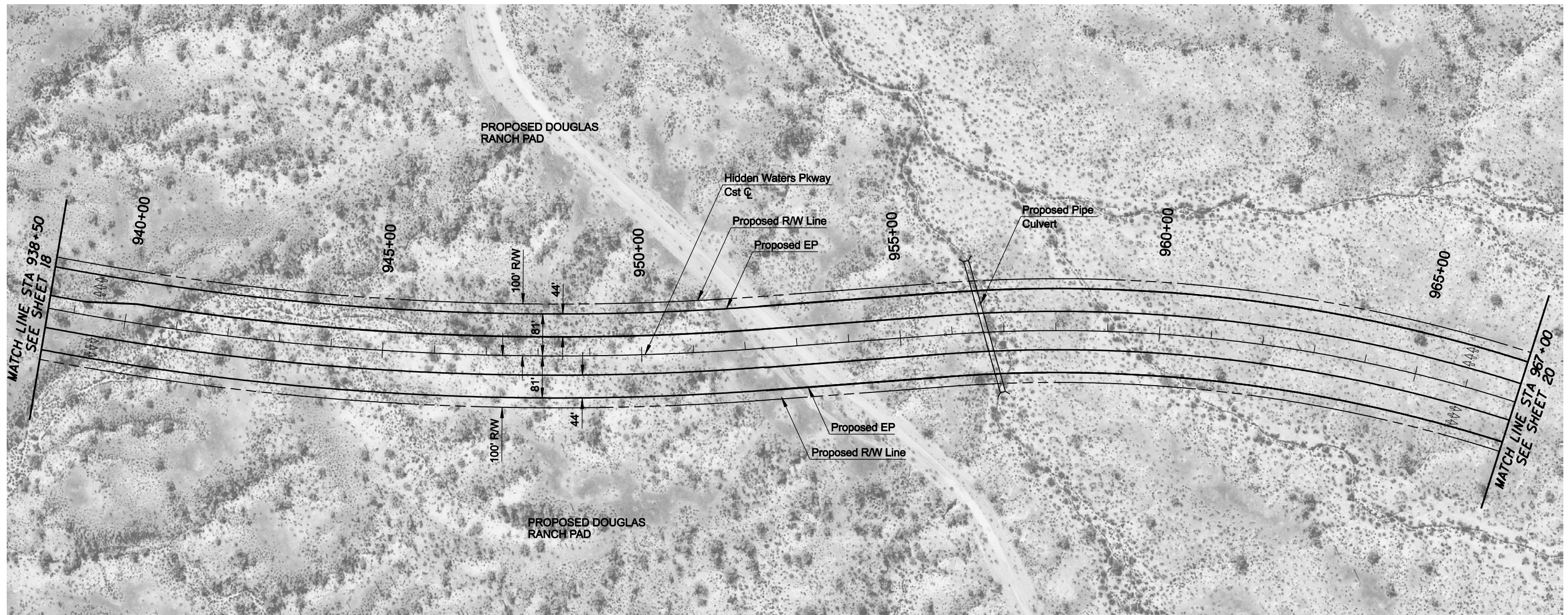
**HIDDEN WATERS PARKWAY  
CORRIDOR FEASIBILITY STUDY**

**ALTERNATIVE 2**  
Sheet 18 of 33

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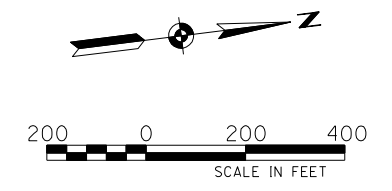
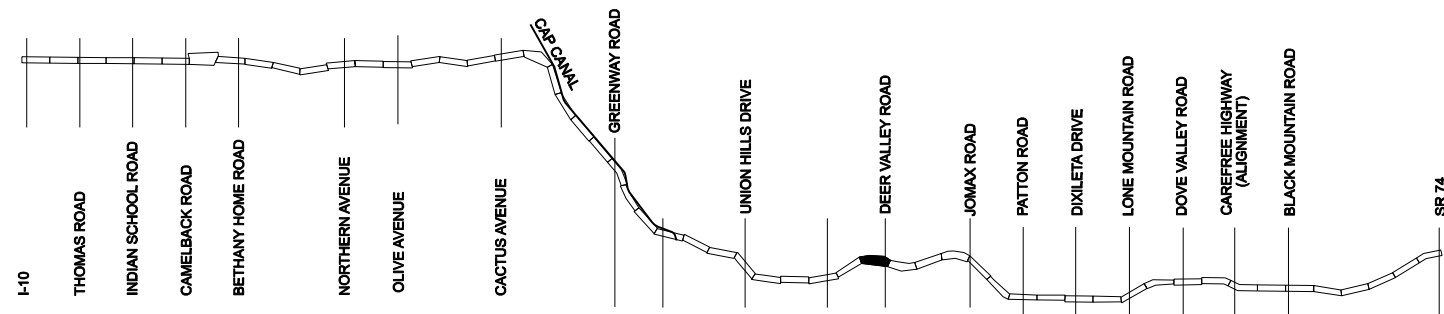
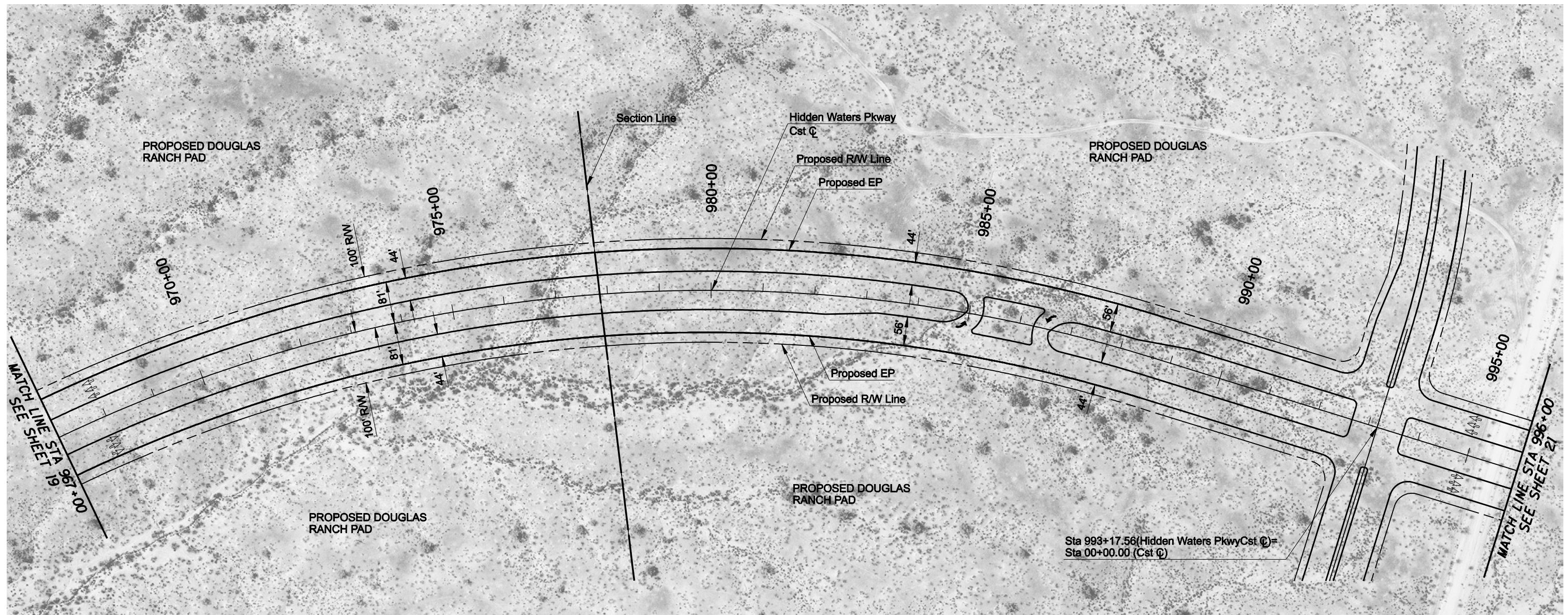
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CORRIDOR FEASIBILITY STUDY

ALTERNATIVE 2  
Sheet 19 of 33

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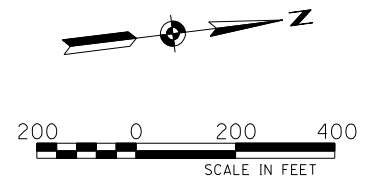
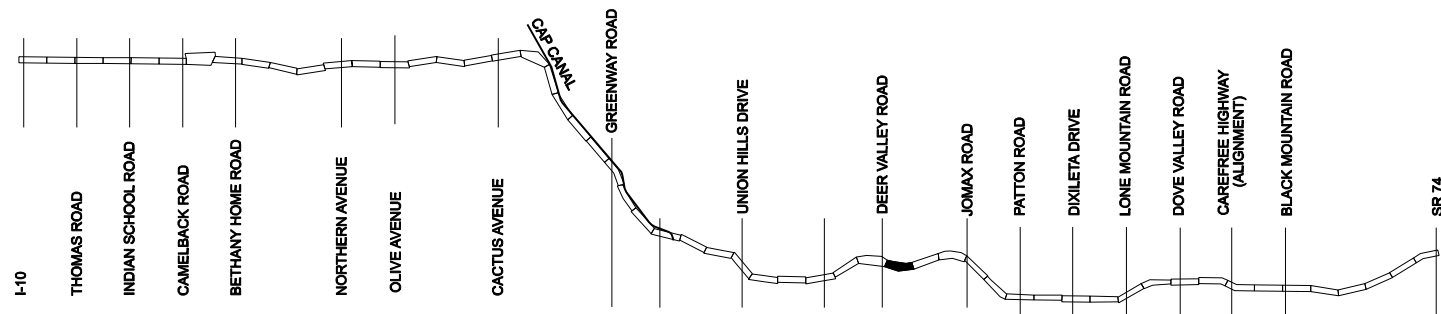
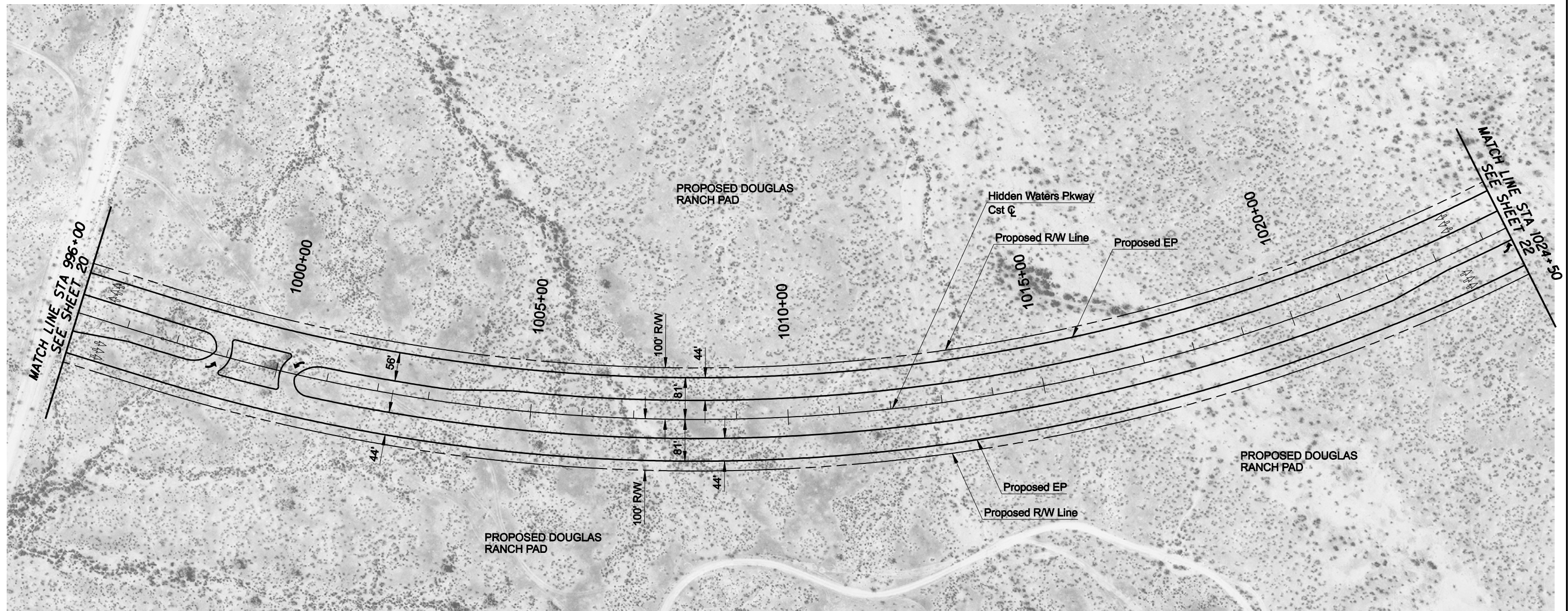
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CORRIDOR FEASIBILITY STUDY**

**ALTERNATIVE 2**  
Sheet 20 of 33

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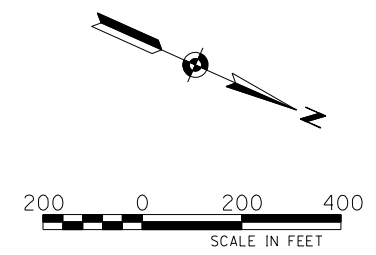
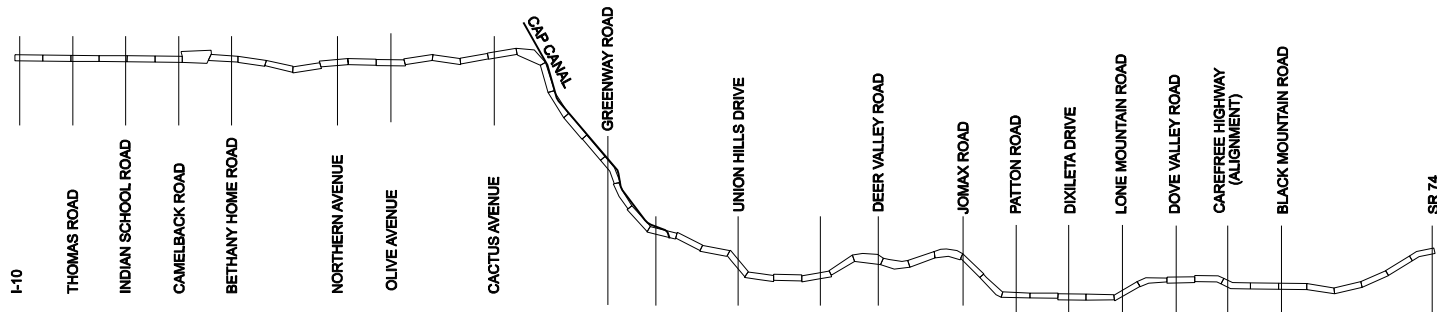
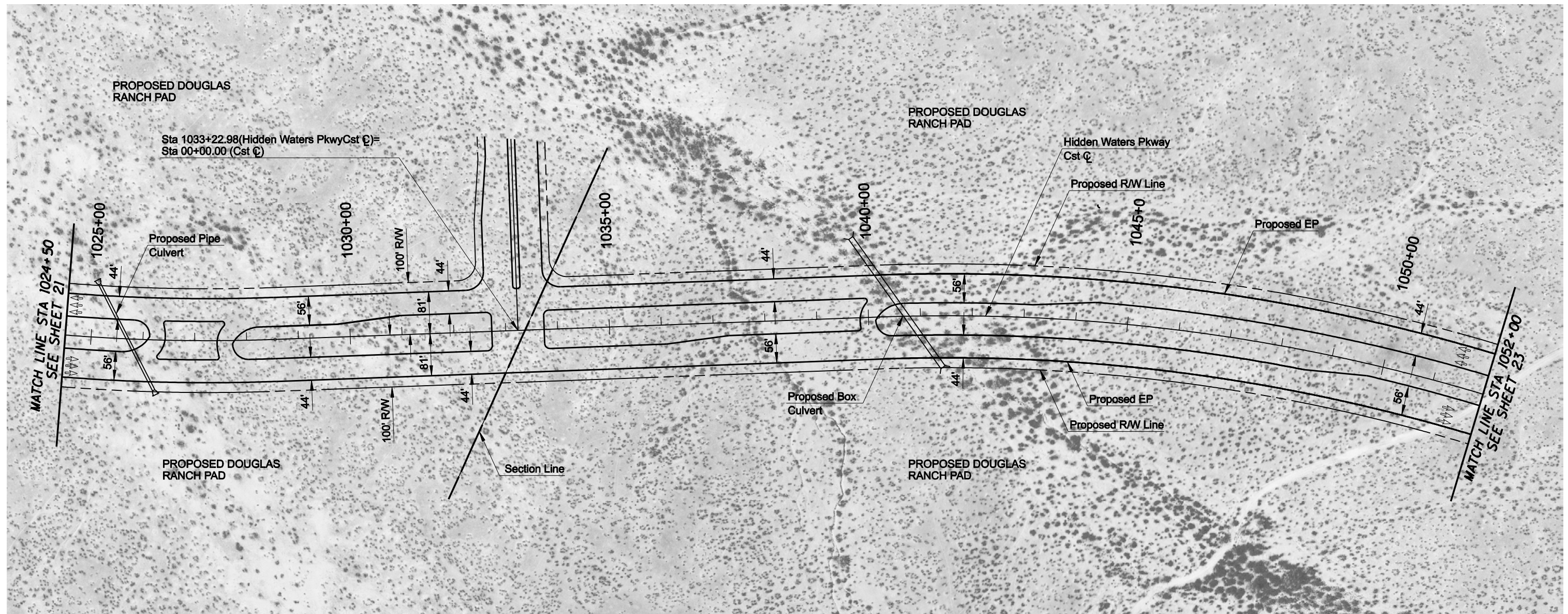
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**HIDDEN WATERS PARKWAY  
CORRIDOR FEASIBILITY STUDY**

**ALTERNATIVE 2**  
Sheet 21 of 33

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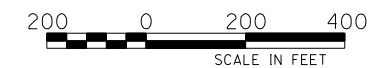
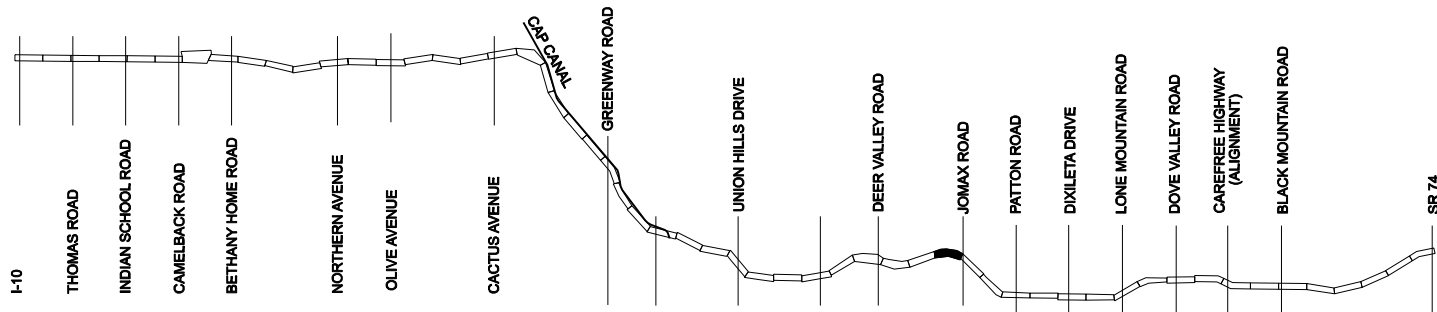
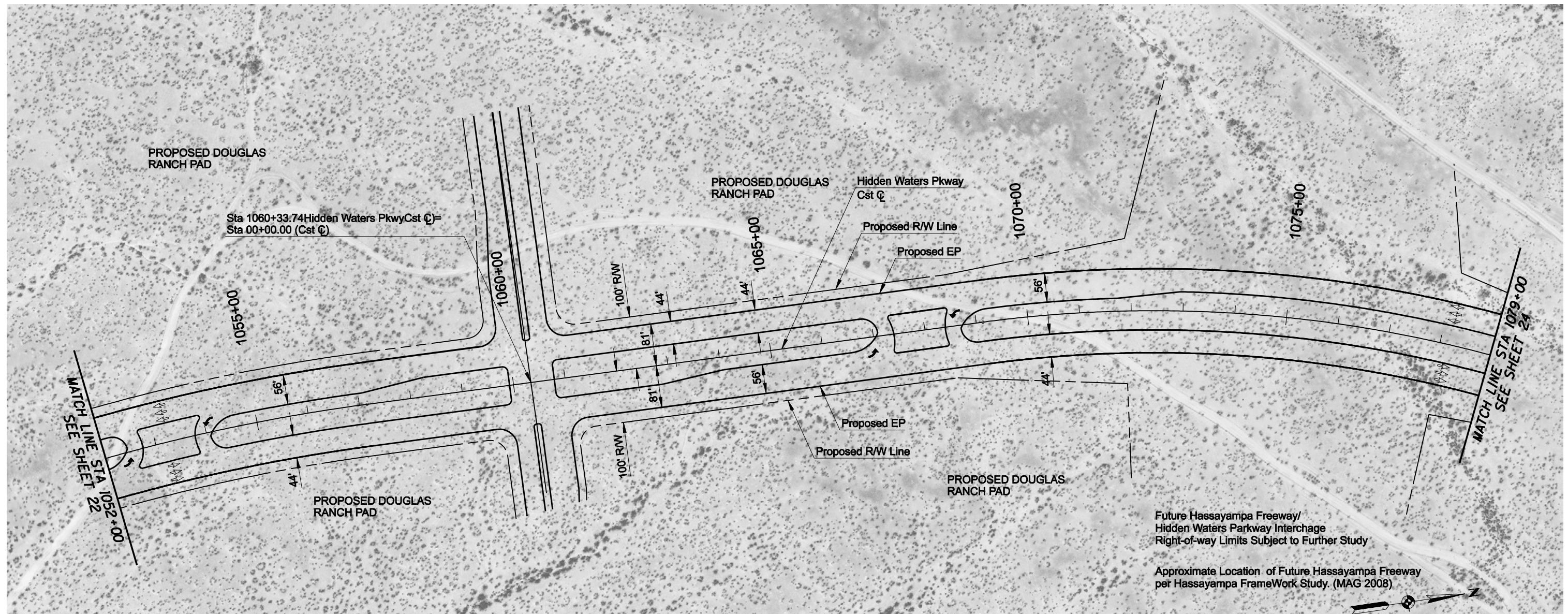
**HIDDEN WATERS PARKWAY  
CORRIDOR FEASIBILITY STUDY**

**ALTERNATIVE 2**  
Sheet 22 of 33

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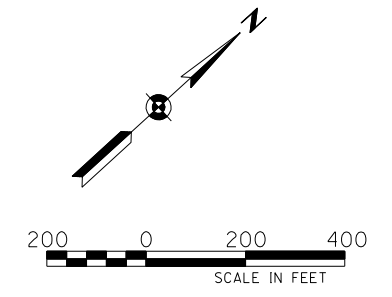
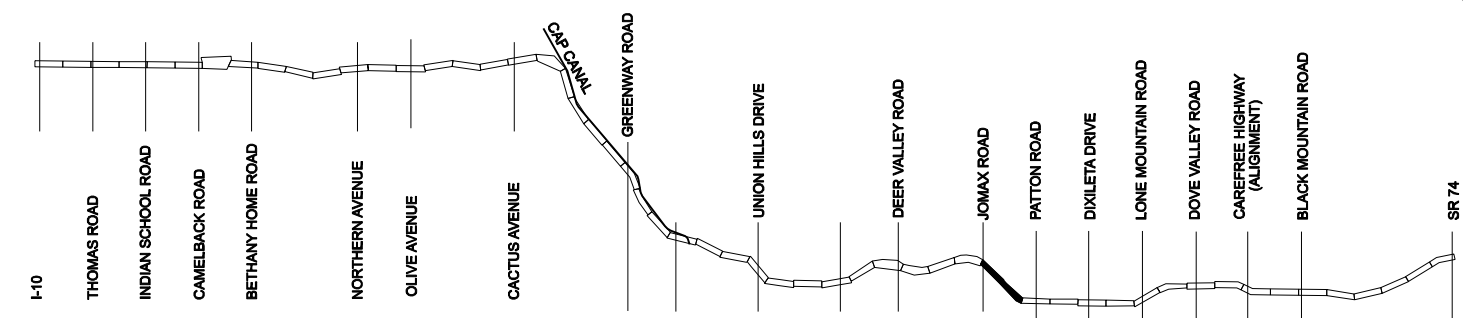
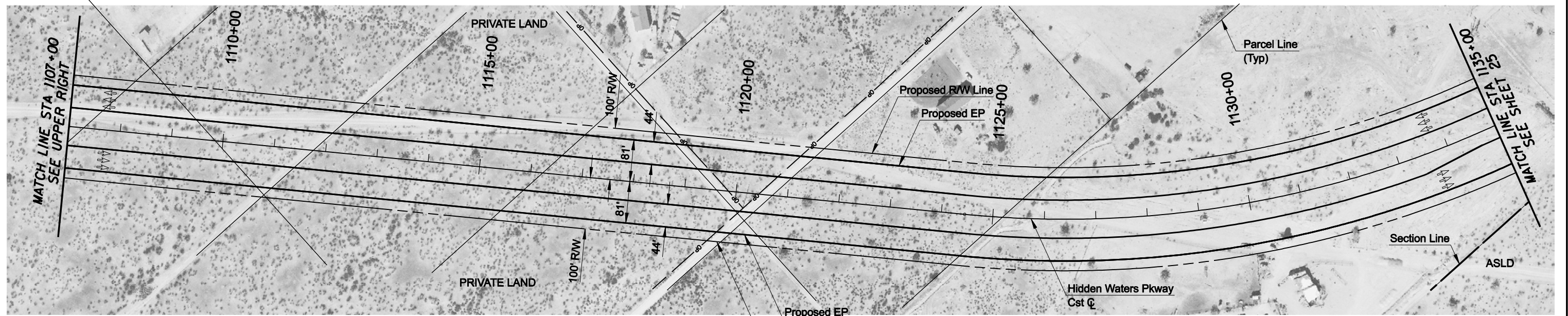
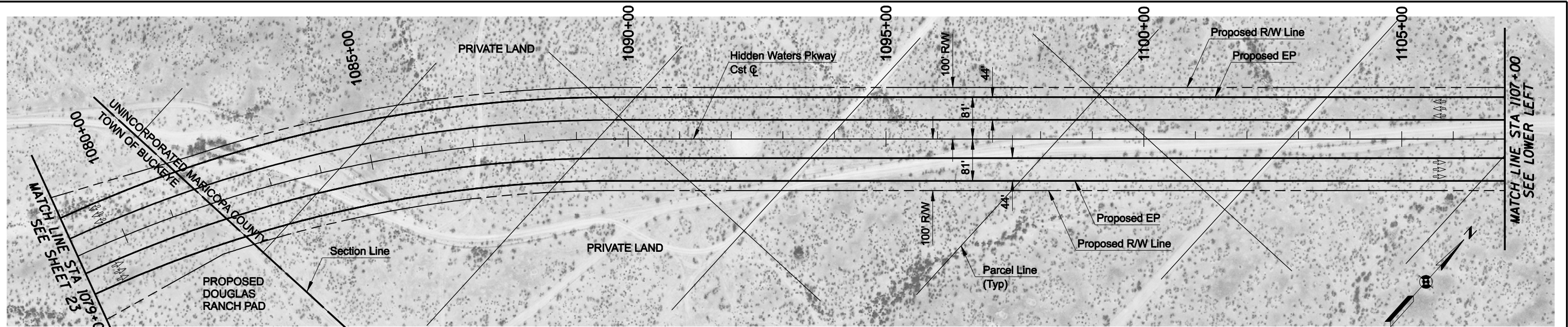
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CORRIDOR FEASIBILITY STUDY**

**ALTERNATIVE 2**  
Sheet 23 of 33

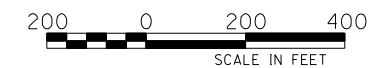
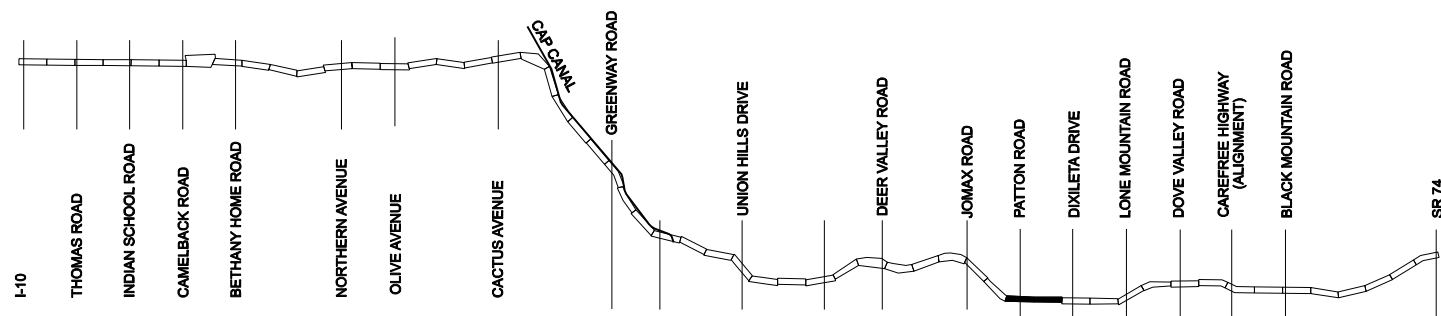
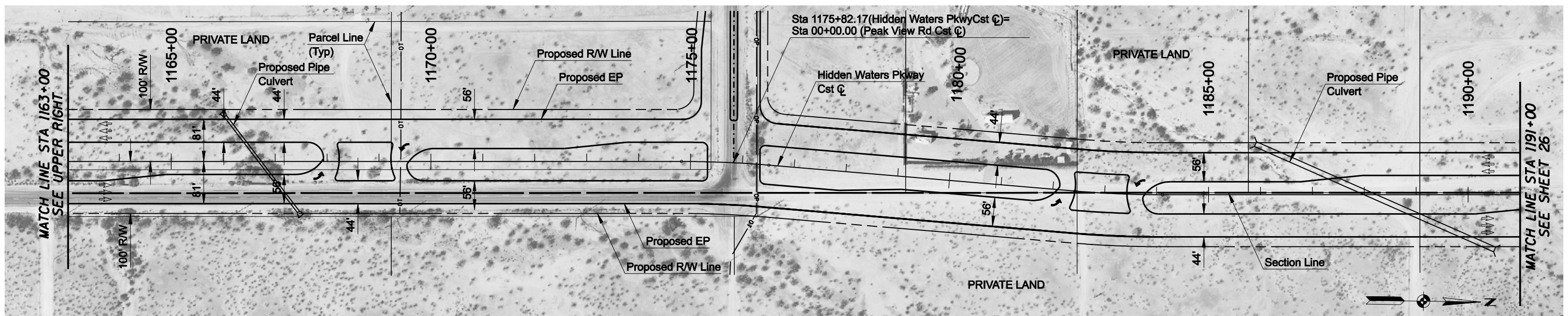
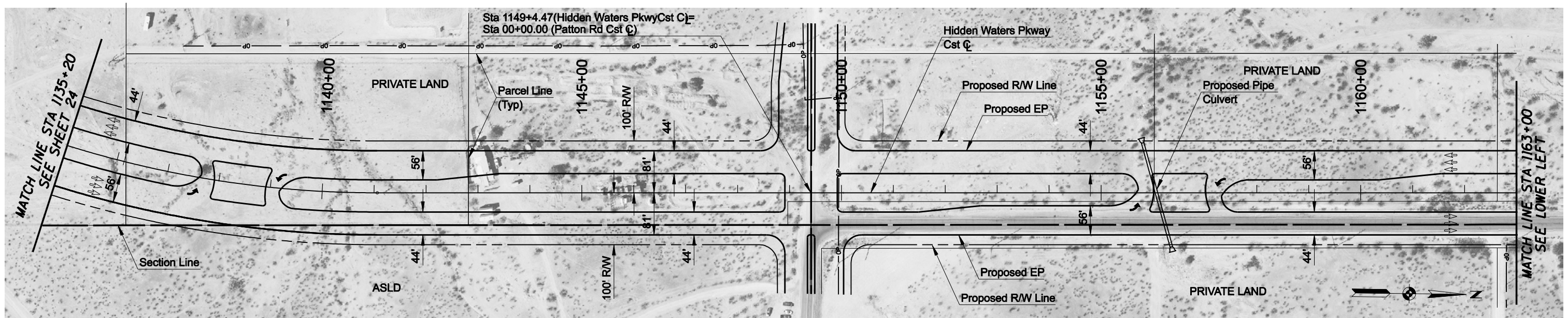
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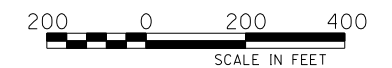
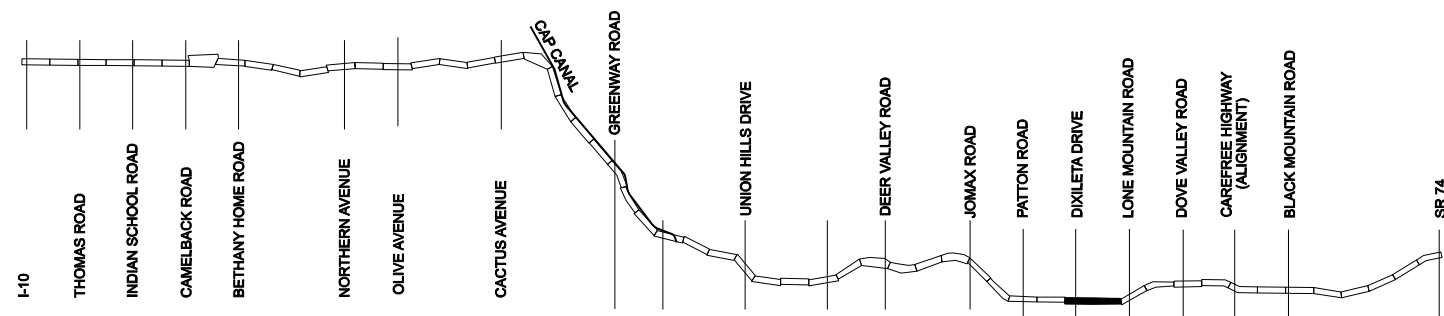
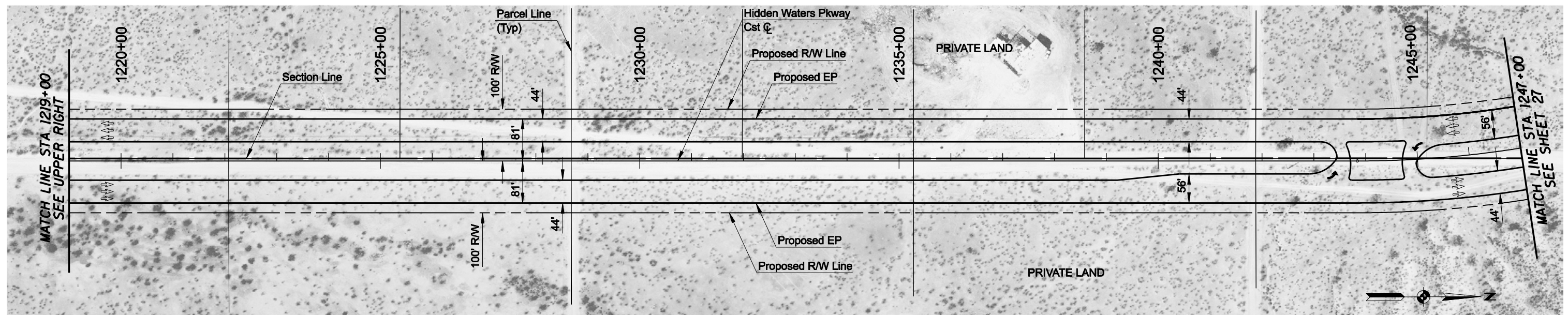
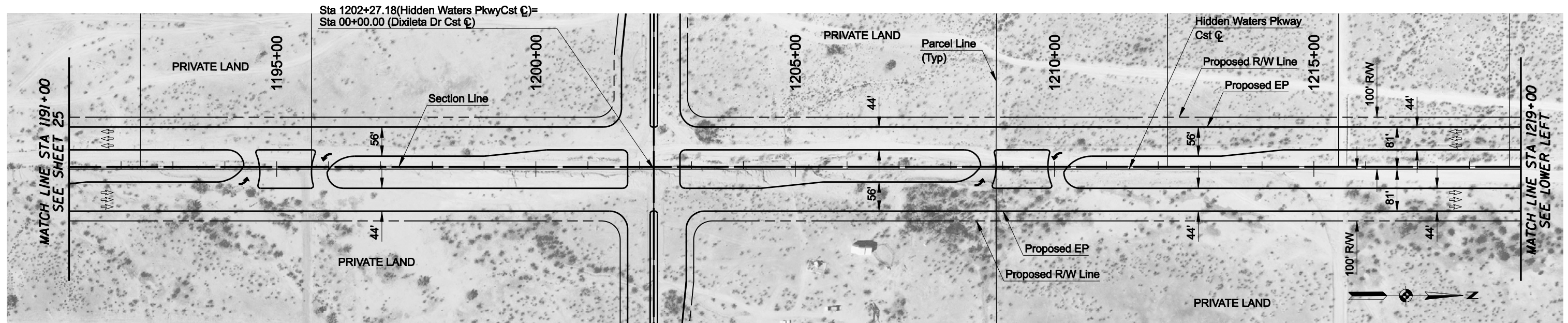
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CORRIDOR FEASIBILITY STUDY

ALTERNATIVE 2  
Sheet 25 of 33

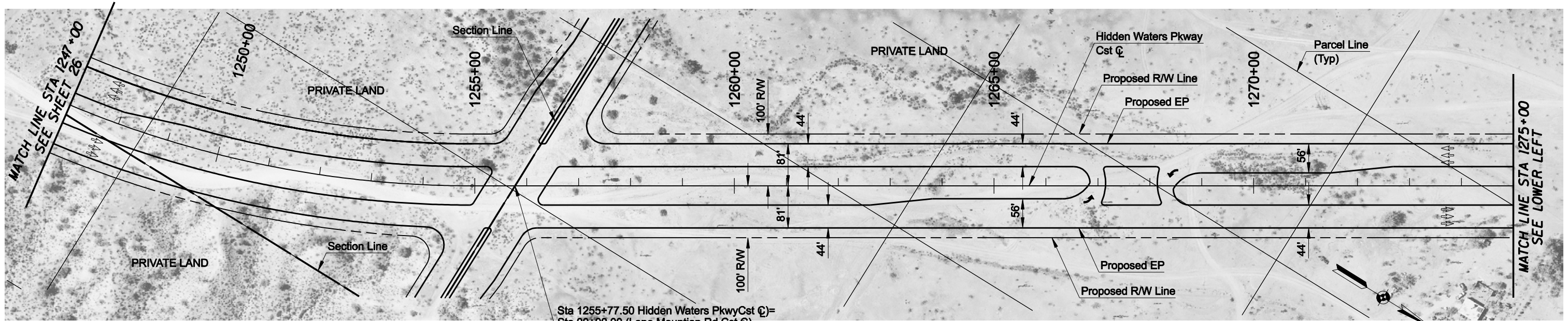
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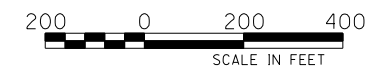
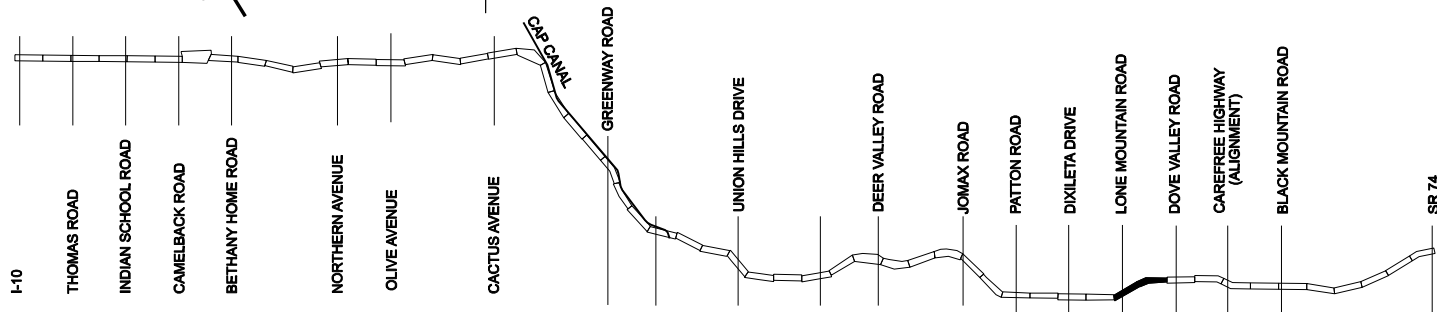
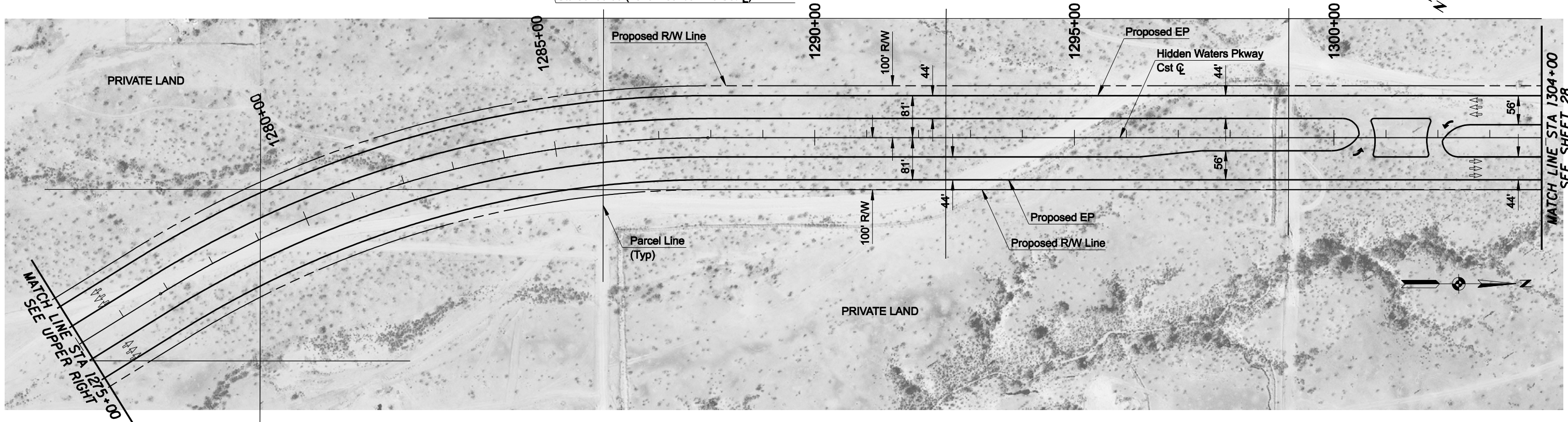








Sta 1255+77.50 Hidden Waters Pkwy Cst Q =  
Sta 00+00.00 (Lone Mountain Rd Cst Q)



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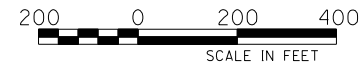
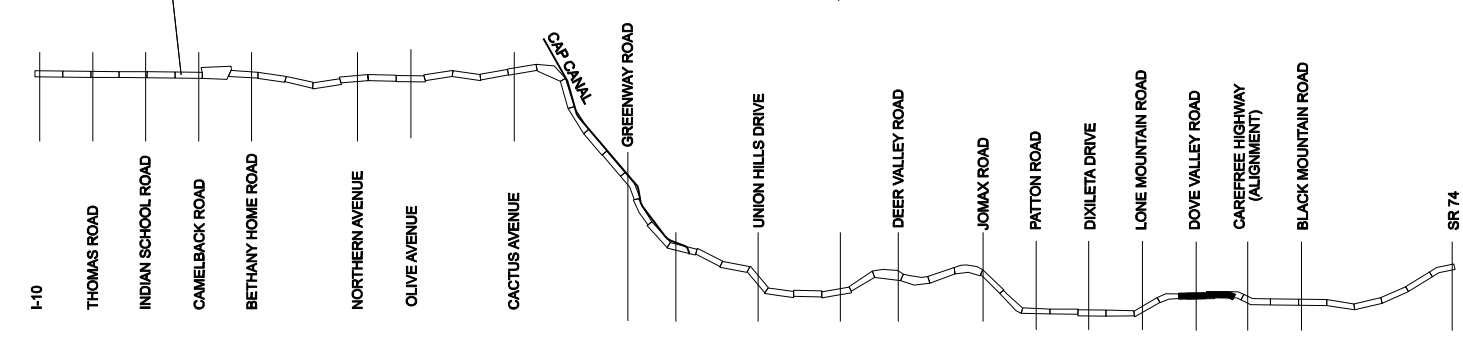
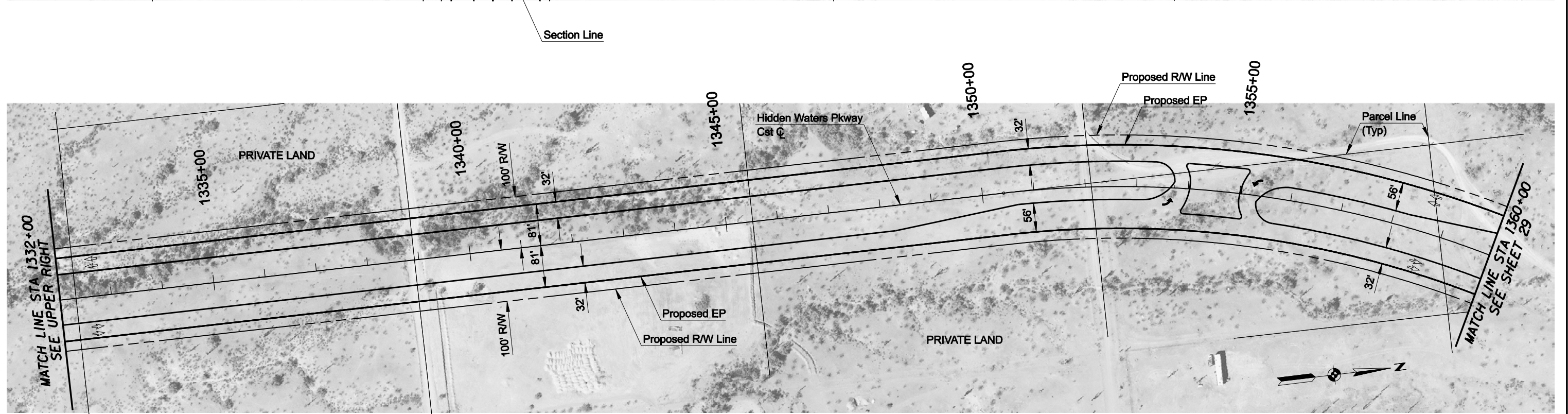
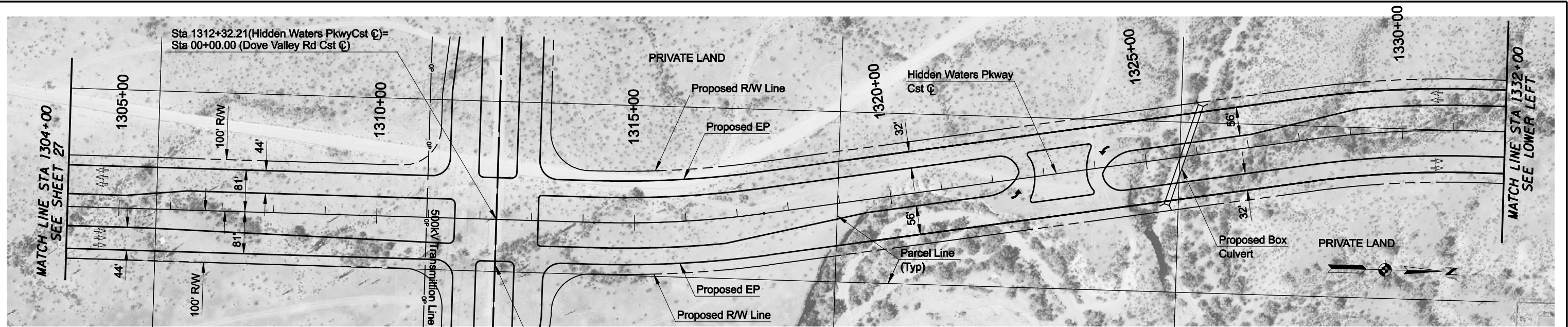
**HIDDEN WATERS PARKWAY  
CORRIDOR FEASIBILITY STUDY**

**ALTERNATIVE 2**  
Sheet 27 of 33

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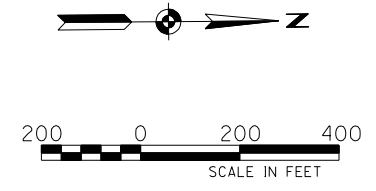
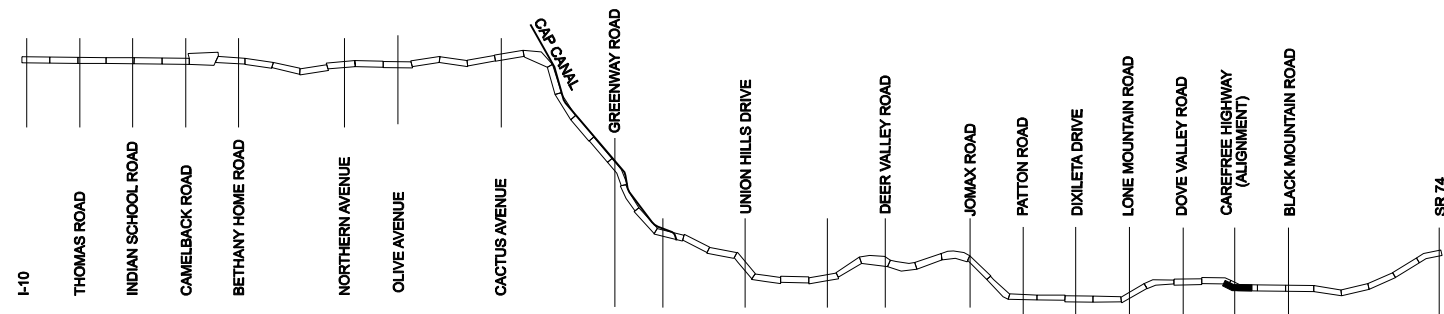
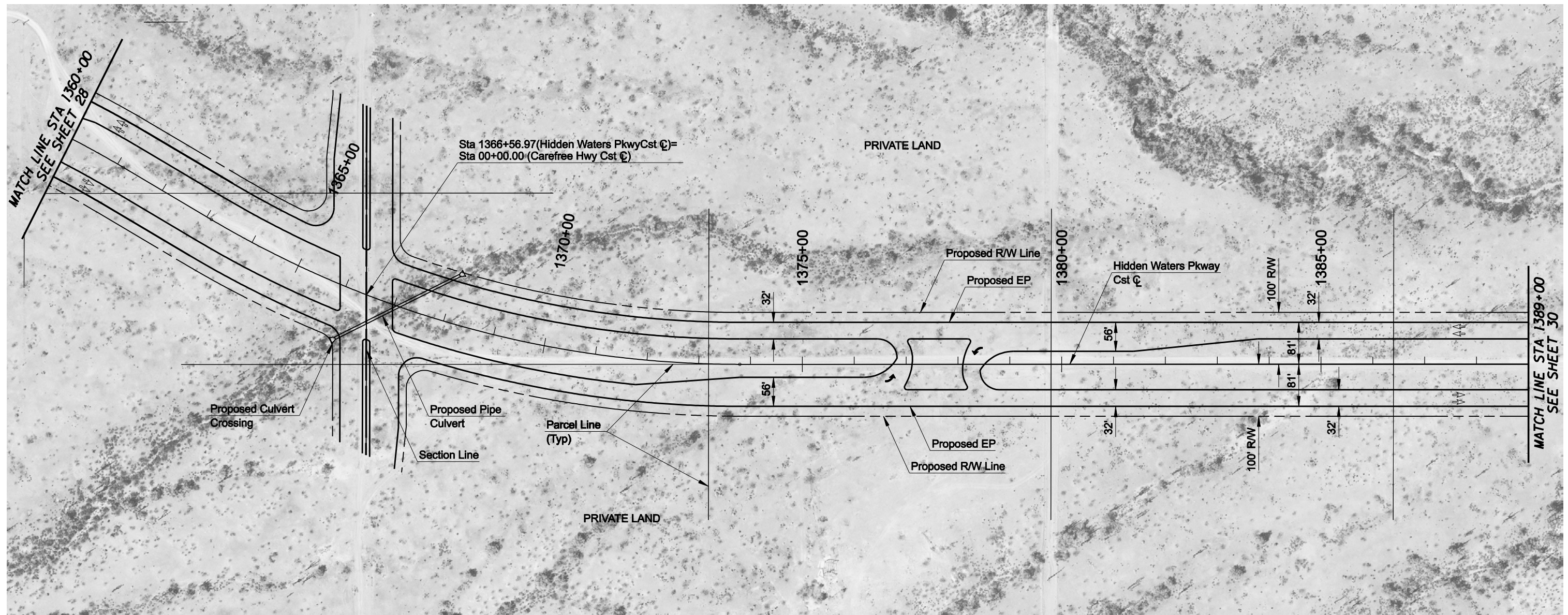
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HIDDEN WATERS PARKWAY  
CORRIDOR FEASIBILITY STUDY

ALTERNATIVE 2  
Sheet 28 of 33

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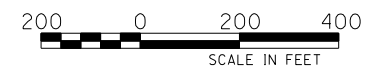
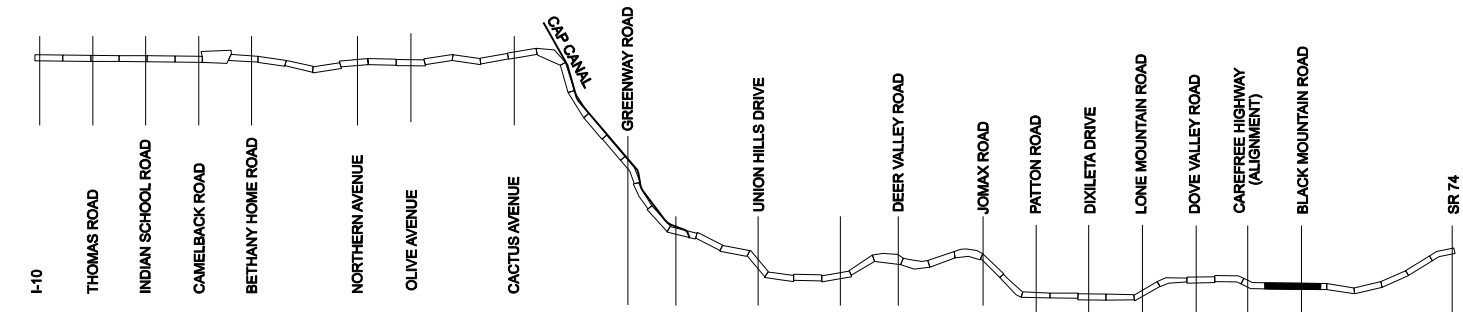
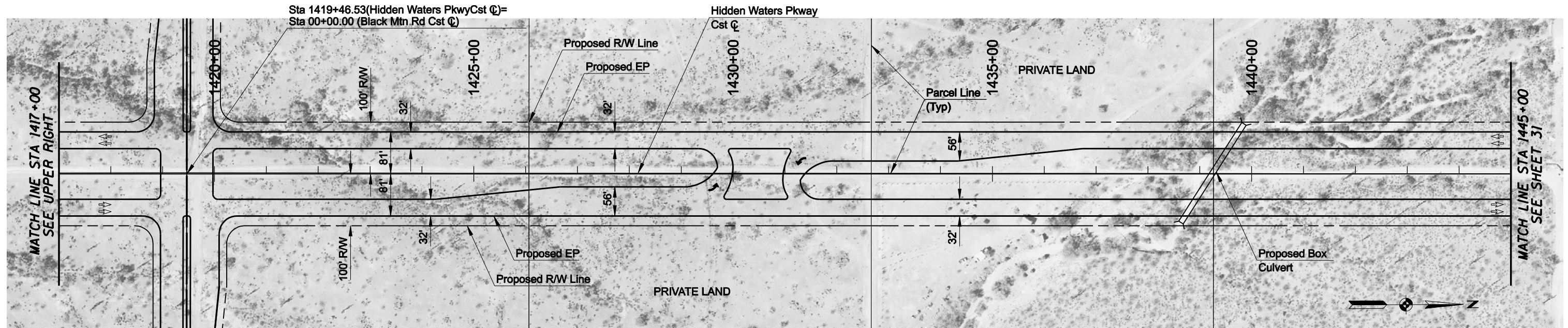
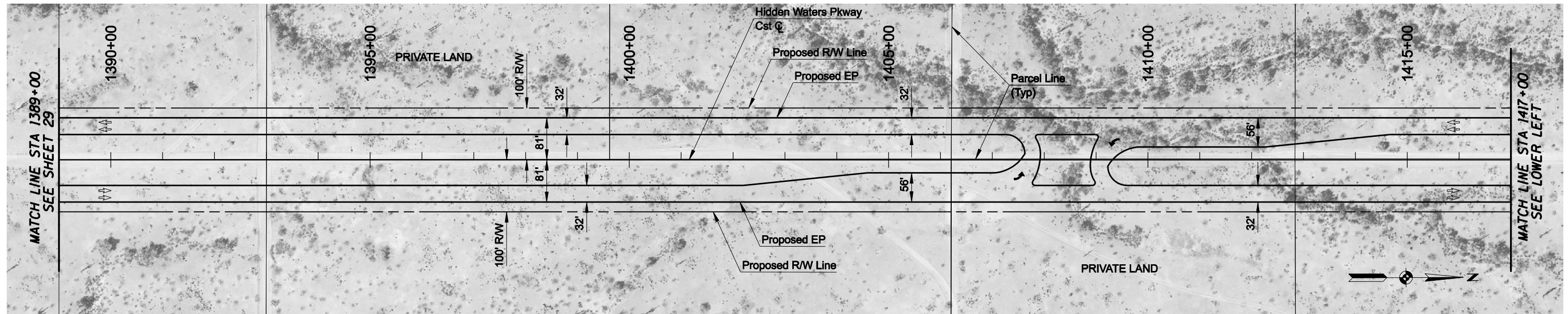
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CORRIDOR FEASIBILITY STUDY**

**ALTERNATIVE 2**  
Sheet 29 of 33

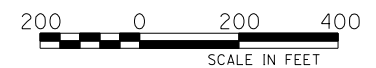
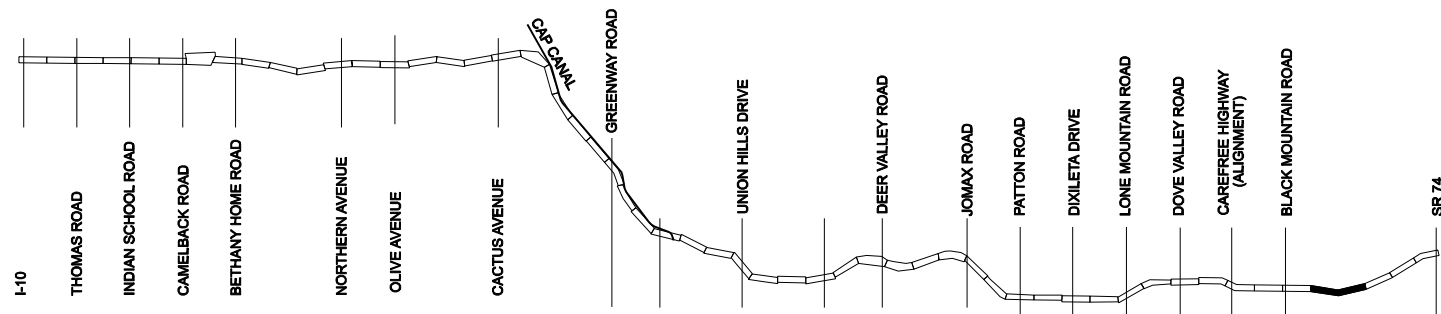
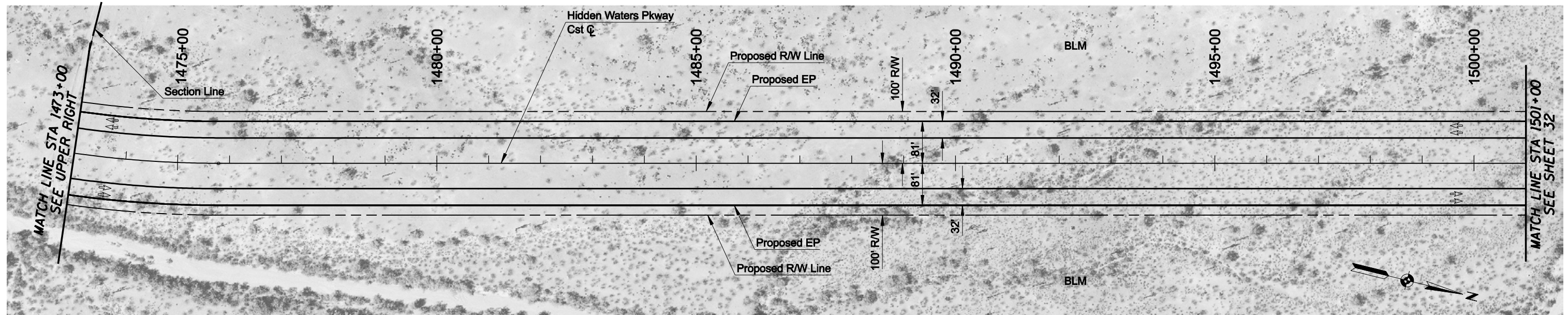
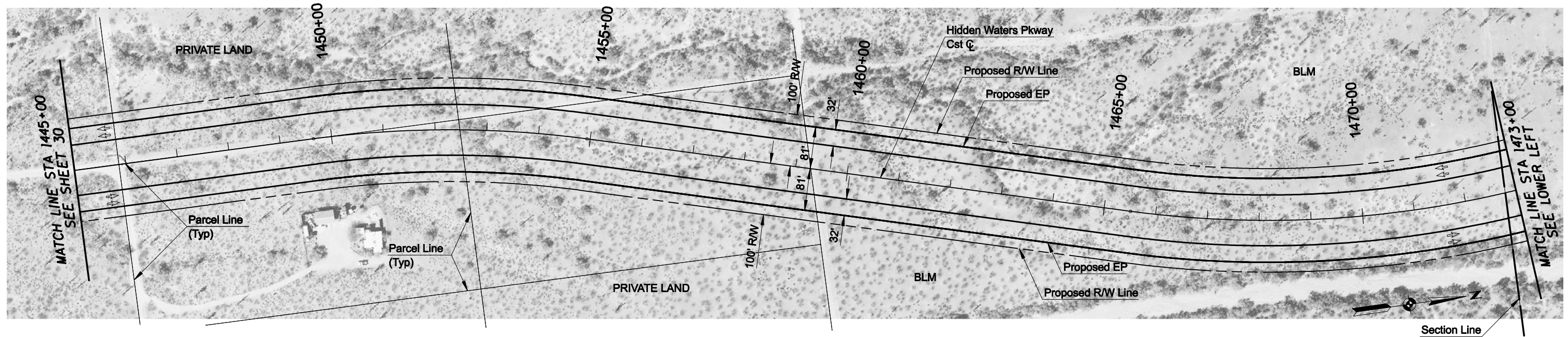
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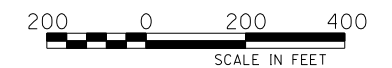
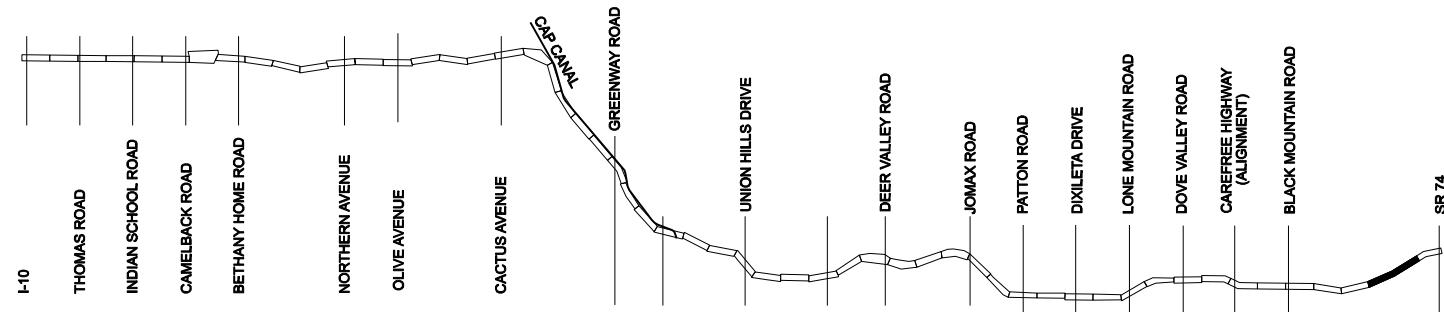
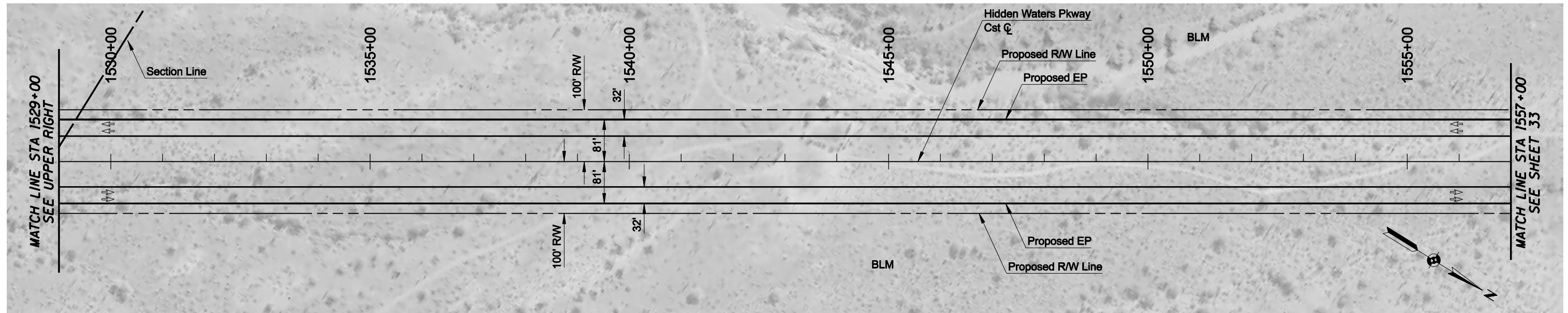
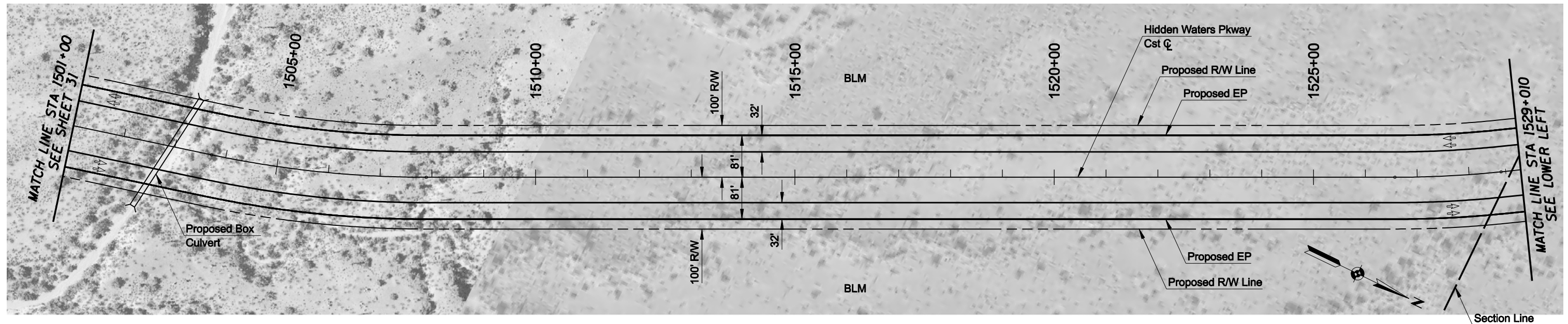
**HIDDEN WATERS PARKWAY  
CORRIDOR FEASIBILITY STUDY**

**ALTERNATIVE 2**  
Sheet 31 of 33

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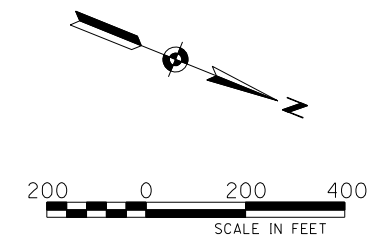
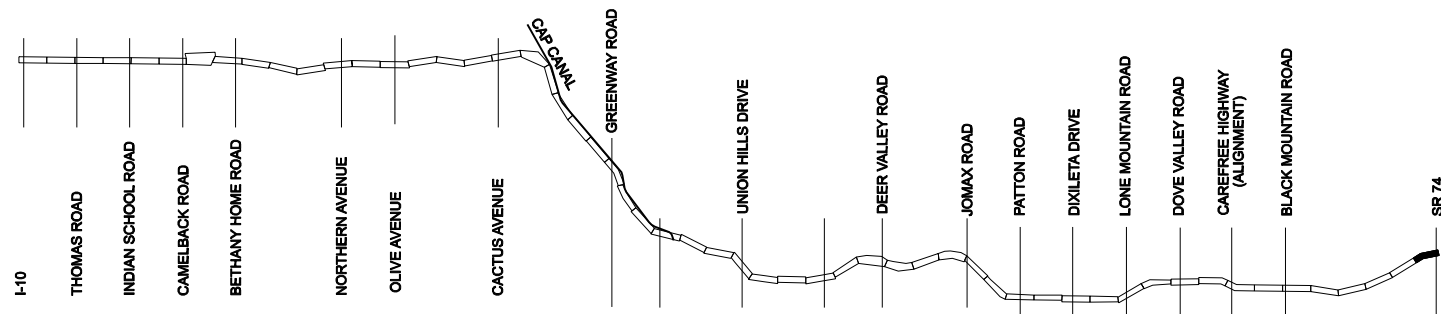
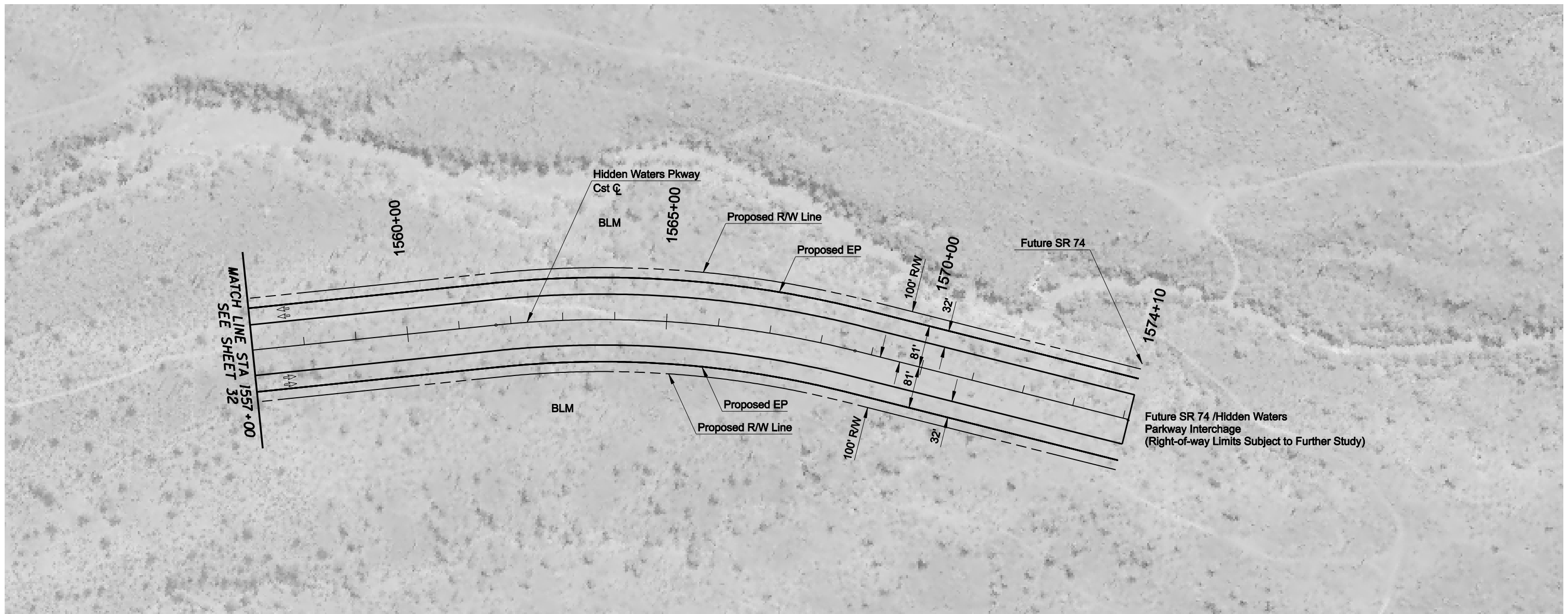


MARICOPA COUNTY  
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CORRIDOR FEASIBILITY STUDY

ALTERNATIVE 2  
Sheet 32 of 33

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CORRIDOR FEASIBILITY STUDY**

**ALTERNATIVE 2**  
Sheet 33 of 33

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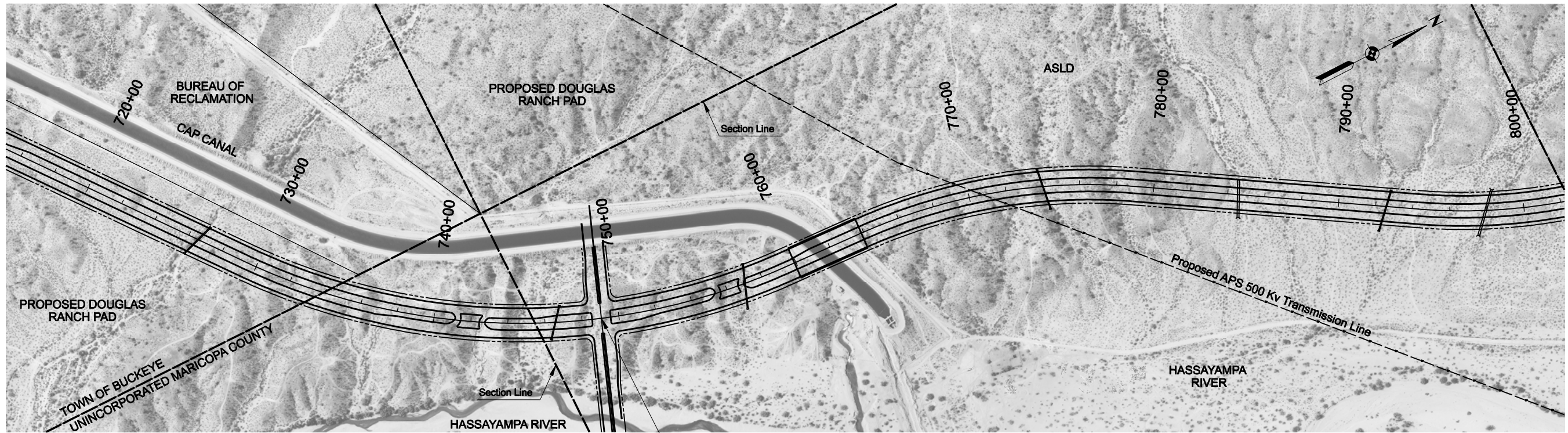


## Appendix C

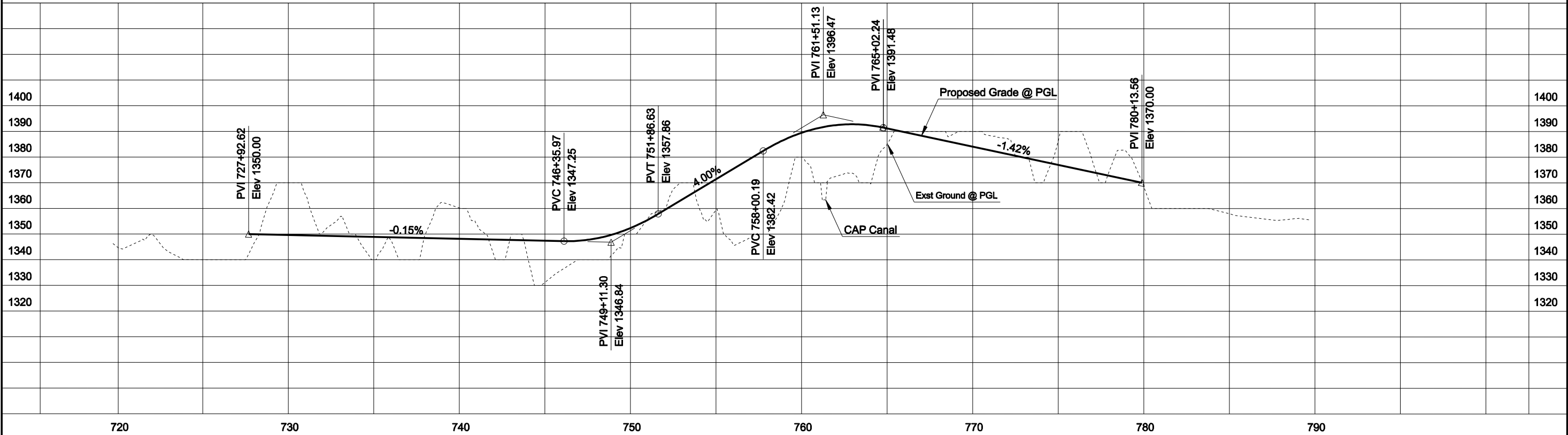
- Conceptual Plan and Profile Drawing of CAP Crossing

11/14/2011

3:43:51 PM



Sta 749+04.91 (Hidden Waters PkwyCst C)=  
 Sta 00+00.00 (Bell Rd Cst C)



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MARICOPA COUNTY  
 DEPARTMENT OF TRANSPORTATION  
 ENGINEERING DIVISION

HIDDEN WATERS PARKWAY  
 CORRIDOR FEASIBILITY STUDY

ALTERNATIVE 2  
 SPECIAL ANALYSIS AREA

**eps group, Inc.**  
 Engineers, Planners & Surveyors  
 2045 S. Vineyard Ave., Ste. 101, Mesa, Arizona 85210  
 Phone (480) 503-2250 Fax (480) 503-2258

English



## Appendix D

- Planning Level Cost Estimate

Alternative: Road Construction - Item Description	Unit	Unit Cost	Preferred Alternative		Phased Option 1		Phased Option 2	
			Quantity	Total	Quantity	Total	Quantity	Total
N.P.D.E.S.	Lump Sum	\$ 31,858.71	1	\$ 31,858.71	1	\$ 31,858.71	1	\$ 31,858.71
Community Relations	Allowance	\$ 12,790.30	1	\$ 12,790.30	1	\$ 12,790.30	1	\$ 12,790.30
Engineer's Field Office	Lump Sum	\$ 139,708.51	1	\$ 139,708.51	1	\$ 139,708.51	1	\$ 139,708.51
Roadway Excavation	C YD	\$ 4.26	590,593	\$ 2,516,495.34	429,522	\$ 1,830,178.43	295,297	\$ 1,258,247.67
Channel & Retention Basin Excavation	C YD	\$ 2.88	347,136	\$ 1,000,096.54	347,136	\$ 1,000,096.54	173,568	\$ 500,048.27
Subgrade Preparation	SQ YD	\$ 1.59	1,527,396	\$ 2,436,051.68	1,110,834	\$ 1,771,673.95	763,698	\$ 1,218,025.84
New Asphalt Concrete Pavement (see Pavement sheet)	SQ YD	\$ 13.85	1,527,396	\$ 21,154,440.76	1,110,834	\$ 15,385,047.82	763,698	\$ 10,577,220.38
Concrete Single Curb	LF	\$ 14.42	312,422	\$ 4,504,999.49	312,422	\$ 4,504,999.49	156,211	\$ 2,252,499.75
Concrete Curb & Gutter	LF	\$ 12.36	312,422	\$ 3,861,136.01	312,422	\$ 3,861,136.01	156,211	\$ 1,930,568.00
Concrete Sidewalk Std Det 230	SQ YD	\$ 50.41	312,422	\$ 15,748,651.58	312,422	\$ 15,748,651.58	156,211	\$ 7,874,325.79
Traffic Signing & Striping - 2 lanes	LF	\$ 2.41		\$ -		\$ -	156,211	\$ 375,895.32
Traffic Signing & Striping - 5 lanes	LF	\$ 4.58		\$ -	156,211	\$ 716,133.85		\$ -
Traffic Signing & Striping - 7 lanes	LF	\$ 4.85	156,211	\$ 757,241.70		\$ -		\$ -
Traffic Signal, Full Intersection	EA	\$ 494,973.19	24	\$ 11,879,356.67	24	\$ 11,879,356.67	24	\$ 11,879,356.67
Interconnect/Traffic Signals	LF	\$ 9.47	156,211	\$ 1,479,860.82	156,211	\$ 1,479,860.82	156,211	\$ 1,479,860.82
Traffic Signal, Future "Box-in"	EA	\$ 6,049.47	24	\$ 145,187.34	24	\$ 145,187.34	24	\$ 145,187.34
42" & 48" RGRCP, Class III	LF	\$ 154.00	10,716	\$ 1,650,264.00	5,358	\$ 825,132.00	5,358	\$ 825,132.00
Headwall (MAG details)	EA	\$ 5,941.91	114	\$ 677,377.56	114	\$ 677,377.56	114	\$ 677,377.56
Box Culvert (see Structure sheet)	LS	\$ 250,000.00	19	\$ 4,750,000.00	19	\$ 4,750,000.00	19	\$ 4,750,000.00
	Subtotal			\$ 72,745,517.01		\$ 64,759,189.59		\$ 45,928,102.94
Removal of Existing Improvements @ 2%	Lump Sum		1	\$ 1,454,910.00	1	\$ 1,295,184.00	1	\$ 918,562.00
Mobilization/Demobilization @ 4%	Lump Sum		1	\$ 2,909,821.00	1	\$ 2,590,368.00	1	\$ 1,837,124.00
Traffic Control @ 3%	Lump Sum		1	\$ 2,182,366.00	1	\$ 1,942,776.00	1	\$ 1,377,843.00
	SUBTOTAL Construction			\$ 79,292,614.01		\$ 70,587,517.59		\$ 50,061,631.94
	Contingency	20%		\$ 15,858,522.80		\$ 14,117,503.52		\$ 10,012,326.39
	<b>TOTAL</b>			<b>\$ 95,151,136.82</b>		<b>\$ 84,705,021.11</b>		<b>\$ 60,073,958.33</b>
Right-of-Way - Item Description	Unit	Unit Cost	Quantity	Total	Quantity	Total	Quantity	Total
Right-of-Way	Acres	\$145,000.00	718	\$ 104,110,000.00	718	\$ 104,110,000.00	718	\$ 104,110,000.00
Residential Structure	EA	\$400,000.00	2	\$ 800,000.00	2	\$ 800,000.00	2	\$ 800,000.00
	<b>TOTAL</b>			<b>\$ 104,910,000.00</b>		<b>\$ 104,910,000.00</b>		<b>\$ 104,910,000.00</b>
Structures - Item Description	Unit	Unit Cost	Quantity	Total	Quantity	Total	Quantity	Total
Wash Bridge (Station 430+90)	Sq Ft	\$190.00	50'x108'	\$ 1,026,000.00	50'x108'	\$ 1,026,000.00	50'x54'	\$ 513,000.00
Jackrabbit Wash Bridge (Station 548+40)	Sq Ft	\$190.00	800'x108'	\$ 16,416,000.00	800'x108'	\$ 16,416,000.00	800'x54'	\$ 8,208,000.00
CAP Canal Bridge (Station 756+50)	Sq Ft	\$190.00	200'x108'	\$ 4,104,000.00	200'x108'	\$ 4,104,000.00	200'x54'	\$ 2,052,000.00
	<b>TOTAL</b>			<b>\$ 21,546,000.00</b>		<b>\$ 21,546,000.00</b>		<b>\$ 10,773,000.00</b>
Utility - Item Description	Unit	Unit Cost	Quantity	Total	Quantity	Total	Quantity	Total
Relocate 12 kv Wood Pole (Tangent)	EA	\$5,000.00	8	\$40,000.00	8	\$40,000.00	8	\$40,000.00
Relocate 69 kv Steel Pole (Tangent)	EA	\$20,000.00	1	\$20,000.00	1	\$20,000.00	1	\$20,000.00
	Subtotal Construction			\$60,000.00		\$60,000.00		\$60,000.00
	Contingency	20%		\$ 12,000.00		\$ 2,400.00		\$ 480.00
	<b>TOTAL</b>			<b>\$72,000.00</b>		<b>\$ 62,400.00</b>		<b>\$ 60,480.00</b>