FINAL DRAINAGE REPORT

RED MOUNTAIN FREEWAY
(PHASE II)

RED MOUNTAIN TRAFFIC INTERCHANGE
TO McKELLIPS ROAD

Prepared for:

ARIZONA DEPARTMENT OF TRANSPORTATION

January 1996

Prepared by:

STANLEY CONSULTANTS, INC.

in association with

WOOD/PATEL ASSOCIATES

MESSAGE DISPLAY FOR WARREN ROSEBRAUGH

To: wfr
ka
fbf
Cc: mal
pac
djr
rgp

From: Don Rerick:TALOS
Postmark: 01/25/96 01:33PM
Status: Previously read

Host: TALOS
Delivered: 01/25/96 01:33PM

Subject: Salt River Channel - East of Price (Pima)

Message:
We have received the 95% P&S, hydrology, and hydraulics for review and comment. We reviewed P&Sback in spring 1995.

ADOT would like our review comments by Feb. 9, which isn't much time.

I am sending you the following for review -

FBF - a set of the levee plan sheets

WFR/KA - set of levee plans, hydrology and hydraulics, and the specs.

I am also sending you a copy of the previous review memos, which really don't contain much information, but will refresh your memorys as to what we have done in past reviews.

C&M should review the construction and O&M access aspects.

Engineering should review the CSA section of the specs, the hydrualic calcs versus toedowns, the plans to confirm the required toedowns, and any other related engineering concern.

Please get me your written comments by Feb. 7.

Thanks!!

Table X
100-Year and 10-Year Design Salt River Water Surface Elevations
(Q_{100}=220,000 cfs, Q_{10}=93,000 cfs)

SR202L Cst. Centerline Station	HEC-2 Cross Section Number	CSA Control Line Station	100-Year WSE (ft)	10-Year WSE (ft)
400+00	224.90	0+52.9	1182.6	1172.9
403+00	225.00	3+57.7	1183.3	1173.2
408+00	225.10	8+58.0	1183.6	1173.5
414+00	225.19	14+66.9	1183.2	1174.1
418+00	225.28	19+00.0	1184.3	1174.8
432+00	225.38	31+24.4	1185.4	1176.0
436+00	225.48	35+26.2	1185.7	1176.0
441+00	225.57	40+27.6	1187.3	1178.6
446+00	225.66	45+36.4	1187.8	1179.3
451+00	225.76	50+00.0	1188.4	1180.1
456+00	225.85	55+92.7	1189.8	1181.4
460+00	225.95	60+99.4	1190.8	1181.7
465+00	226.04	66+00.0	1191.5	1182.4
469+00	226.13	69+54.0	1191.7	1182.6
471+00	226.23	No CSA	1191.1	1183.1
472+00	226.35	No CSA	1194.7	1185.5
473+00	226.50	No CSA	1197.7	1194.3
474+00	226.53	No CSA	1201.4	1195.8
478+00	226.58	No CSA	1202.0	1196.3
488+00	226.61	108+96.5	1204.4	1198.0
495+00	226.70	115+09.0	1206.0	1199.2

Correct toe down depth of cut-off wall for
Levee at x-sec. 113+00 and 114+00

113+00 toe down elev of 1169.9 expected
bottom 1180.0 shown on plan
114+00 elev 1170.4 expected bottom 1180 shown.

MESSAGE DISPLAY FOR KOFI AWUMAH

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Please get me your written comments by Feb. 7.

Thanks!!

X-Sec. 416+00 – 417+00

420+00 – 421+00 → two down of Soil Cement?

422+00 – 425+00 → two down of SC?

X-Sec 446+00 → down two shallow?

447+00 – 450+00 → two shallow

454+00 – 457+00 " "

468 – 469 → two down limits?

480+00 → line

484+00 → different shape (hump)

486, 494+00 " "

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Registered Professional Engineer (Civil) CERTIFICATE NO. 23170 JEFFREY J. HOLZMEISTER Date Signed 1/23/96 ARIZONA, U.S.A.

Registered Professional Engineer CERTIFICATE NO. 24999 JEFFREY R. MINCH DATE SIGNED 1-23-96 ARIZONA, U.S.A.

I. INTRODUCTION

A. Introduction and Purpose

The Red Mountain Freeway, between the Red Mountain Traffic Interchange and McKellips Road, will be designed and constructed in two phases. The Phase I Dobson Road Connection project is constructed and includes a portion of the eastbound mainline traffic lanes, Ramp B of the Dobson Road Traffic Interchange, and the southern portion of Dobson Road. Concurrently, the City of Mesa (COM) constructed an extension of Dobson Road between the Dobson Road Traffic Interchange and Eighth Street. The Phase II Red Mountain Freeway project will construct the remaining freeway improvements adjacent to Phase I, and extend the full freeway improvements beyond Alma School Road. A temporary connection will be built to terminate the freeway at McKellips Road. New traffic interchanges will be designed at Dobson Road and Alma School Road as part of the Phase II.

In support of the Final Design Submittal, this report summarizes the hydrologic and hydraulic analyses performed for the on-site and off-site drainage systems. In addition, a summary of the hydraulic design for the Alma School Drain and a summary of the hydraulic analysis for the bank protection improvements are presented.

The drainage design for the Red Mountain Freeway was prepared in accordance with current ADOT and FHWA design criteria. The drainage design also conforms to the requirements of the Red Mountain Freeway Final Environmental Impact Statement (EIS). The drainage system is designed to be compatible with existing adjacent ADOT and City of Mesa local drainage improvements. The ultimate freeway design will reduce the flood potential along the south bank of the Salt River and provide outfalls for runoff generated from the contributing watershed.

B. Project Location

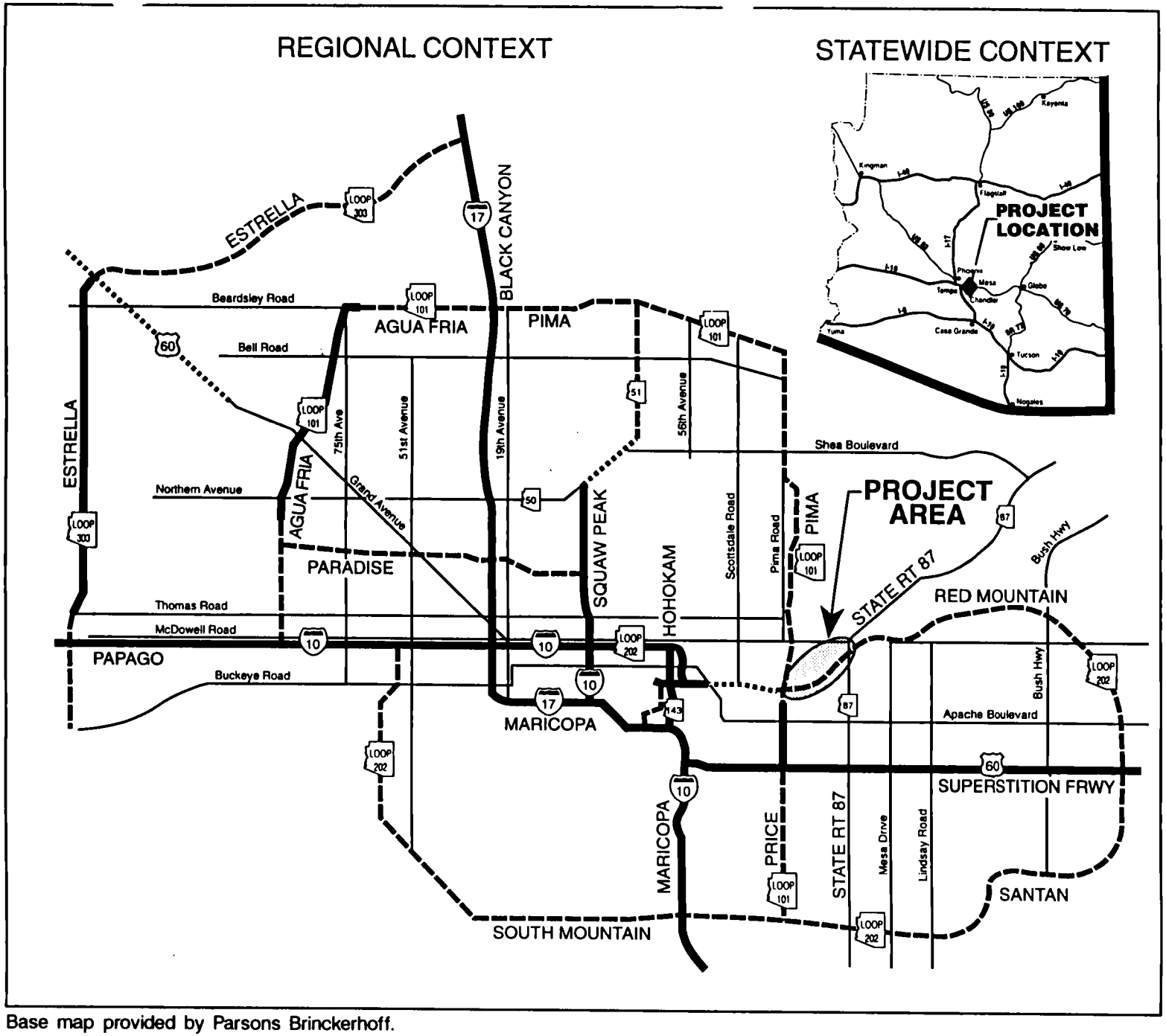
The Red Mountain Freeway (Phases I and II) is located in Maricopa County, Arizona, within Sections 4, 8, 9, 17, and 18 of Township 1 North, Range 5 East of the Gila and Salt River Baseline & Meridian. A vicinity map for the project is illustrated in Figure 1. A recent aerial photograph which defines the limits of Phase I and II construction is provided in Figure 2.

C. Description of Improvements

1. Existing Conditions

Phase II of the proposed Red Mountain Freeway is bounded on the west by the Price Freeway; on the east by McKellips Road; on the north by the Salt River; on the south by agricultural fields, Riverview Park, the Mesa Northwest Water Reclamation Plant, sand and gravel mining operations, and a mobile home park. The City of Mesa percolation ponds were reconfigured as part of the Red Mountain Traffic Interchange (T.I.) construction projects to compensate for the Red Mountain Freeway encroachments.

RED MOUNTAIN FREEWAY



0 2 4 6 8 Mile
approx.

NORTH

GRAPHIC LEGEND

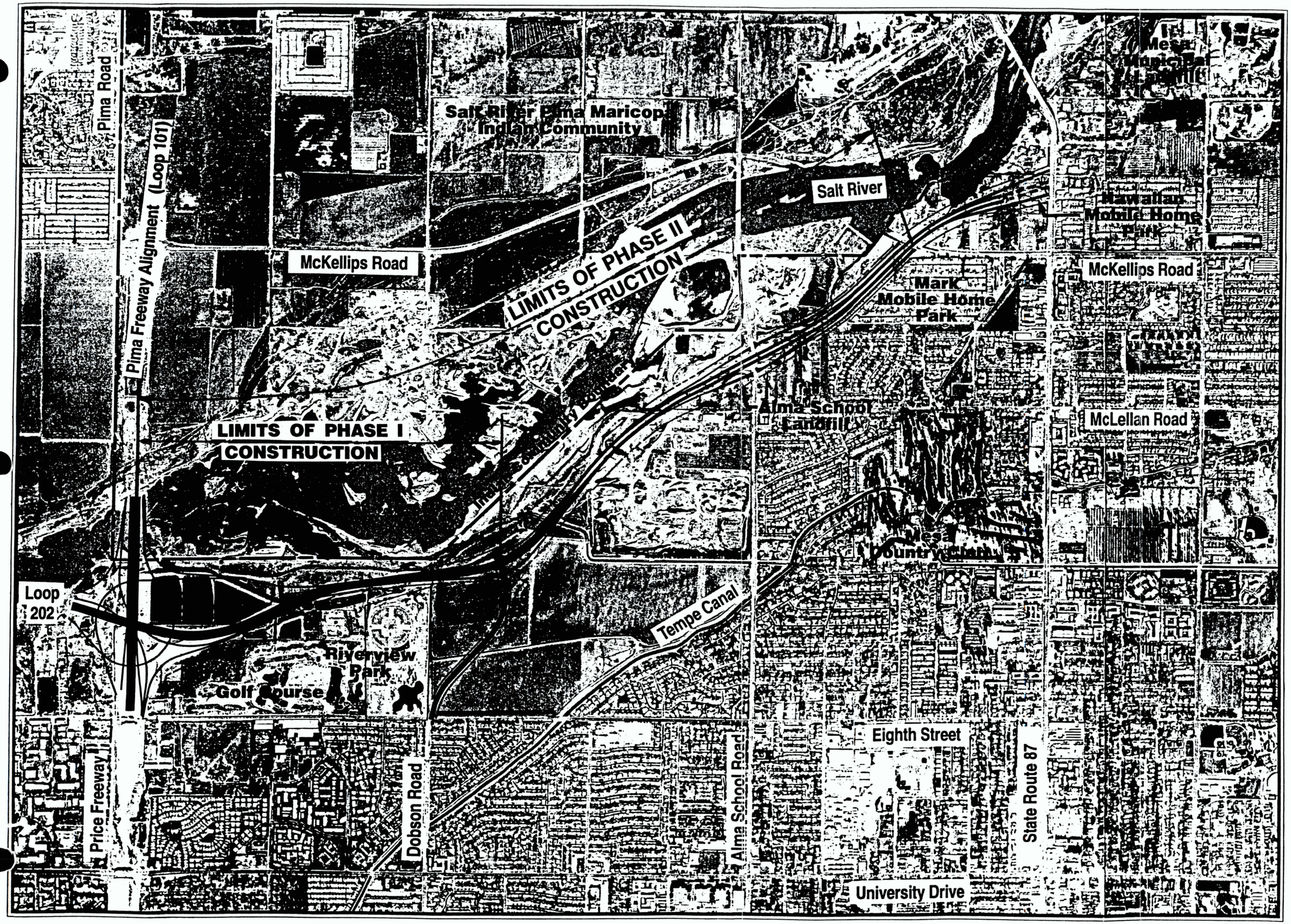
- *Existing*
- *Proposed*
- *Under Construction*

Base map provided by Parsons Brinckerhoff.

Vicinity Map

FIGURE 1

STANLEY CONSULTANTS, INC.



RED MOUNTAIN FREEWAY

0 feet 800' 1600' 2400'
approx.

NORTH

Project Site Aerial Photograph

FIGURE 2

STANLEY CONSULTANTS, INC.
1303 EAST CAMELBACK ROAD, SUITE 330
PHOENIX, ARIZONA 85014 • (602) 955-2600

Several existing City of Mesa storm drains exist within the subject watershed. Generally, they were designed to collect roadway drainage generated by a 10-year (or less) storm event and route it to the Salt River. Engineering documentation (as-built drawings) was available for only a portion of the facilities. The following paragraphs identify the major storm drains located within the watershed.

McLellan Road - a storm drain (ranging in diameter from 36" to 54") routes local street runoff to a concrete channel located west of Alma School Road. Flows are then routed via the channel to the Salt River.

Alma School Road - a 30" RGRCP carries flow from residential streets south of McLellan Road to the Alma School Drain.

Alma School Road - a 24" pipeline drains Alma School Road between Heather Drive and McLellan Road and discharges into the McLellan storm drain.

Country Club Drive - a 54" and 72" storm drain collects street flows and discharges them into a concrete ditch just south of Lehi Road. An additional storm drain in Country Club Drive routes flows south to the McLellan Road storm drain.

The Alma School Drain (Tempe Drain) is an existing open channel which crosses the Red Mountain Freeway alignment between Dobson Road and Alma School Road. The Alma School Drain serves as a wasteway for the Tempe Canal as well as an outlet for local storm drains to the Salt River.

2. Proposed Roadway Improvements

Phase II of the Red Mountain Freeway project lies within the incorporated limits of the City of Mesa. Phase II will construct the eastbound and westbound mainline lanes beginning at the Price Freeway (Sta 355+00) and ending west of McKellips Road (Sta 498+00). The mainline will provide three through lanes in each direction of travel. Traffic interchanges will be constructed at Dobson Road and Alma School Roads. Major bridge and culvert structures will be constructed at Dobson Road, the Alma School Drain, Sunward Materials Equipment underpass, and Alma School Road.

Significant changes were incorporated into the design concept since the initial submittal. To reduce project construction costs, the HOV lane was eliminated east of the Red Mountain Traffic Interchange and the mainline will be constructed with an open median. A auxiliary lane was added to the westbound mainline between Dobson Road and the Future RMTI Ramps W-S and W-N. Auxiliary lanes were added between Dobson Road and McKellips Road. Dobson Road was changed to a non-curbed section under the interchange. The Sunward Materials underpass was eliminated and subsequently added, resulting in significant profile changes between Dobson Road and McKellips Road. The McKellips Road Traffic Interchange was reconcepted to provide a half diamond interchange, thus eliminating the C-D roads and replacing them with auxiliary lanes between the McKellips Road Ramps and the Alma School Road Ramps. In addition, the new interchange concept at McKellips resulted in significant profile changes to the mainline and Alma School Ramps C and D.

In conjunction with ADOT's Phase II improvements, the City of Mesa is currently constructing street improvements to widen Alma School Road south of the Red Mountain Freeway.

D. Drainage Plans

The final on-site drainage plans for Phase II of the Red Mountain Freeway are provided in Exhibit I. Although the complete Salt River bank protection plans are presented in a separate report, the bank protection is illustrated graphically on the drainage plan and profiles provided in Exhibit I.

II. OFF-SITE HYDROLOGIC ANALYSES

A. General Discussion

The hydrologic analysis of the Red Mountain Freeway was performed for the on-site and off-site contributing drainage areas. The on-site hydrologic analysis was performed by Stanley Consultants, Inc. (SCI) and is discussed in detail in Section III. Wood/Patel Associates, Inc. (WPA) performed the off-site hydrologic analysis for the Red Mountain Freeway. Presented below is a summary of the hydrologic analyses utilized to design the off-site drainage system and cross-drainage structures.

Due to the limited right-of-way at McKellips Road and Country Club Drive it was assumed that stormwater runoff collected along the south side of the Red Mountain Freeway will be routed to the Salt River east of Country Club Drive (near Center Street). This is a key design assumption for the drainage design for the Country Club Drive to Gilbert Road section of the Red Mountain Freeway.

B. Watershed Characteristics

1. General Discussion

Off-site hydrologic analyses were performed in accordance with procedures and methodologies outlined in the ADOT drainage design manual. The hydrologic analyses were performed for the existing and design condition scenarios. The existing hydrologic analyses were performed to generate the largest peak discharge and volume of runoff from the contributing watershed. The existing condition considers the City of Mesa's detention/retention requirements for new development which will occur in the vicinity of the Red Mountain Freeway.

2. Watershed Description

The area of the watershed contributing to Phase II of the Red Mountain Freeway is approximately 6.7 square miles. It consists of a variety of land uses (single-family residential development, apartment complexes, commercial properties, industrial areas, irrigated fields, and untilled land). The drainage characteristics of the watershed may be divided into two distinct categories. The rural environment of the Salt River Pima Maricopa Indian Community/Lehi area and the urban environment of the City of Mesa.

Runoff from the agricultural land on the Salt River Pima Maricopa Indian Community is characterized by sheet flow toward the southwest. The flat slopes (0.2%) and tilled fields in this area result in long times of concentration and significant attenuation of the flow. It is anticipated that this flow will be collected and conveyed in a channel along the north side of the proposed freeway. The channel outfall may be located along the McDowell Road alignment. The final alignment will be determined during design of the Country Club Drive to Gilbert Road Section of the Red Mountain Freeway.

South of the proposed freeway and north of McKellips Road, the watershed consists of large residential lots (one acre or more) in the Lehi area. This area is generally characterized by flat slopes, little local relief and flow from east to west. Some flow will

follow local east-west residential streets, but most runoff will occur as shallow sheet flow. For this reason, long times of concentration will occur (relative to more urban areas to the south). The westward direction of flow in this area is intercepted by the proposed freeway. Along portions of the freeway where this occurs; flow may be routed along the south right-of-way parallel to the freeway in an channel or storm drain, or flow may be directed across the freeway via cross drainage structures.

Adjacent to McKellips Road, commercial and residential properties drain to McKellips Road, where concentrated flow continues to the westerly toward the Salt River. Many of the mobile home parks and commercial areas along McKellips Road have a high percentage of impervious areas and do not include any retention facilities. Therefore, a significant volume of runoff will originate from these sub-basins. Slopes range from 0.14 percent to 0.21 percent along McKellips Road.

The southernmost portion of the watershed (roughly between McKellips Road and the Tempe Canal) consists of single-family residential areas, apartment complexes, and commercial property. The majority of this area was developed prior to the development of strict drainage guidelines. Therefore, the volume of runoff created from this area is relatively high in comparison to other portions of the watershed. The City of Mesa currently requires new developments to retain the 100-year 2-hour storm event.

Stormwater runoff follows a natural swale in the topography from east to west with the low point located between McKellips Road and McLellan Road. Although the runoff originates as sheet flow on residential and commercial lots, flow quickly becomes concentrated along local collector and arterial streets.

This part of the watershed also includes the historic south bank of the Salt River. Side slopes along this bank are very steep (as much as 20% in many areas) but the overbank areas are fairly flat (slopes less than 1 percent). The Utah Canal, owned and operated by Salt River Project, is located midway down the historic Salt River south bank. The canal is an earth-lined ditch used for urban irrigation deliveries, and has a capacity of approximately 300 to 400 miner's inches, or 7.5 to 10 cfs. The canal is tiled in areas where flow would otherwise be likely to enter the canal, thereby allowing flow to pass over the canal unobstructed. In areas where residential development is located adjacent to the canal, block walls and local residential drainage patterns direct flow away from the canal and on to streets that pass over the canal. The canal outfall is an 18" RGRCP connected to the Country Club 54" storm drain.

The Tempe Cross Cut Canal forms the southern boundary of the watershed and the Consolidated Canal forms the eastern boundary of the watershed. Because Salt River Project's operating procedure to evacuate the canals in advance of and during major storm events to reduce the possibility of overtopping; it was assumed that these canals do not contribute flow to the watershed. This is accomplished by discharging water through wasteways that convey canal water to the Salt River. The Hennessy Wasteway is located on the Southern Canal upstream of the watershed, and the Tempe Drain (Alma School Drain) is located along the Tempe Cross Cut Canal just east of Alma School Road.

C. Previous Hydrologic Studies

The majority of existing hydrologic studies were performed to identify off-site and on-site runoff within individual developments. In addition, hydrologic studies were performed for the City of Mesa to design the storm drain systems within the watershed. A master drainage study has not been developed for the watershed. City of Mesa topographic mapping, aerial photographs, as-built plans, subdivision drainage plans, etc. were reviewed as part of the development of the off-site hydrologic analyses.

D. Watershed Computer Modeling

1. General Discussion

In order to evaluate the hydrologic performance of a watershed, a database of physical properties was established for the watershed. The primary factors which affect the hydrologic response of a watershed are drainage area size, topography, soil/vegetation type and distribution, and rainfall characteristics. The off-site hydrologic analysis for the Red Mountain Freeway was performed according to procedures outlined in ADOT's drainage design manual.

A computerized rainfall/runoff model was developed for the off-site contributing watershed using the U.S. Army Corps of Engineers Flood Hydrograph Package (HEC-1). The amount and temporal distribution of the rainfall, the runoff characteristics of the watershed, and the hydraulic properties of the channels that collect and convey the direct runoff are entered as numerical parameters in the HEC-1 program. The output then provides a hydrograph at user-selected locations which can be used for the design of drainage channels and cross-drainage structures.

The 1991 extended array version of HEC-1 was used for this study. The models presented with this report should only be run with the 1991 program. The use of the 1990 (or earlier) version of HEC-1 to execute the input files developed for this project may result in different peak discharge values. The following sections present a general overview of the primary factors described above as they relate to the contributing watershed for the Red Mountain Freeway.

2. Drainage Pattern & Sub-Basin Delineation

The off-site watershed was divided into fifty (50) sub-basins in order to maximize the homogeneity in the HEC-1 modeling parameters. Each sub-basin was considered to have relatively uniform hydrologic parameters. Sub-basin delineations and drainage flow paths are illustrated in Exhibit II. The delineations were made on the basis of topographic mapping and local residential area flow patterns. Field investigations were used to verify the sub-basin delineations.

The majority of the contributing watershed consists of residential and agricultural areas which both have mostly overland flow (sheet flow) and shallow channel flow along streets. In general, an attempt was made to confine a single major channel element, or prominent flow path, to each sub-basin. Sub-basins were terminated at the confluence with other major channel elements. The drainage area sizes, slopes, and other physical basin parameters are presented in Table I.

TABLE I
RED MOUNTAIN FREEWAY, PHASE II
Off-Site Watershed Sub-Basin Parameters

Subarea Number	Area (sq mi)	Length (ft)	Length (mi)	Lca (ft)	Lca (mi)	Top Elevation	Bottom Elevation	Slope (ft/mi)	Percent Imperv. Area	Watershed Type	Time of Conc. (hr)	Storage Coefficient (hr)
10	0.868	12985	2.459	6800	1.288	1300	1259	16.67	1	AGRI	5.395	5.350
20	0.108	6000	1.136	2900	0.549	1258	1241	14.96	14	URBAN	0.603	0.830
30	1.411	12800	2.424	5400	1.023	1270	1241	11.96	1	AGRI	5.693	4.256
40	0.279	7090	1.343	3450	0.653	1244	1229	11.17	0	AGRI	3.785	4.248
50	0.489	8500	1.610	4000	0.758	1249	1227	13.67	14	URBAN	0.840	0.670
60	0.115	3000	0.568	1900	0.360	1227	1217	17.60	29	URBAN	0.344	0.247
70	0.164	6700	1.269	3300	0.625	1242	1227	11.82	14	URBAN	0.690	0.831
80	0.202	5800	1.098	2850	0.540	1241	1227	12.74	15	URBAN	0.630	0.595
90	0.098	3400	0.644	1640	0.311	1227	1222	7.76	12	URBAN	0.524	0.478
100	0.073	3700	0.701	2100	0.398	1224	1216	11.42	8	AGRI	2.474	3.387
110	0.130	4000	0.758	2450	0.464	1240	1232	10.56	7	AGRI	2.822	2.997
120	0.030	350	0.066	200	0.038	1251.5	1251	7.54	34	URBAN	0.107	0.026
130	0.028	1740	0.330	670	0.127	1235	1232	9.10	32	URBAN	0.214	0.209
140	0.015	1500	0.284	700	0.133	1233	1228.3	16.54	85	URBAN	0.126	0.151
150	0.084	3000	0.568	1600	0.303	1233	1227.9	8.98	43	URBAN	0.305	0.259
160	0.014	1200	0.227	500	0.095	1228	1226.5	6.60	54	URBAN	0.146	0.154
170	0.007	900	0.170	450	0.085	1228.3	1227.2	6.45	85	URBAN	0.105	0.125
180	0.028	1600	0.303	800	0.152	1228	1227	3.30	35	URBAN	0.244	0.228
185	0.056	1550	0.294	600	0.114	1228	1227	3.41	35	URBAN	0.240	0.147
190	0.012	1500	0.284	800	0.152	1227	1226	3.52	47	URBAN	0.197	0.280
200	0.048	2200	0.417	900	0.170	1227	1224.5	6.00	54	URBAN	0.226	0.198
210	0.046	3100	0.587	1600	0.303	1226.8	1221	9.88	75	URBAN	0.234	0.281
220	0.019	1600	0.303	900	0.170	1224	1223	3.30	54	URBAN	0.206	0.238
230	0.029	1750	0.331	850	0.161	1222	1221	3.02	54	URBAN	0.220	0.214
240	0.012	1200	0.227	500	0.095	1223	1221	8.80	85	URBAN	0.117	0.131

TABLE I
RED MOUNTAIN FREEWAY, PHASE II
Off-Site Watershed Sub-Basin Parameters

Subarea Number	Area (sq mi)	Length (ft)	Length (mi)	Lca (ft)	Lca (mi)	Top Elevation	Bottom Elevation	Slope (ft/mi)	Percent Imperv. Area	Watershed Type	Time of Conc. (hr)	Storage Coefficient (hr)
250	0.018	1000	0.189	300	0.057	1221	1219.8	6.34	85	URBAN	0.107	0.082
260	0.114	3700	0.701	1450	0.275	1222	1216	8.56	56	URBAN	0.297	0.250
270	0.068	2400	0.455	1600	0.303	1216	1200	35.20	64	URBAN	0.203	0.155
280	0.058	800	0.152	350	0.066	1260	1250	66.00	5	URBAN	0.237	0.084
290	0.069	2300	0.436	1200	0.227	1233	1225.9	16.30	30	URBAN	0.274	0.207
300	0.026	1750	0.331	875	0.166	1228.3	1225.1	9.65	54	URBAN	0.187	0.188
* 310	0.210	5870	1.112	2340	0.443	1256	1224.6	10.94	36	URBAN	0.451	0.405
320	0.027	1900	0.360	1050	0.199	1226.6	1224.6	5.56	54	URBAN	0.216	0.234
330	0.013	750	0.142	300	0.057	1255	1254	7.04	54	URBAN	0.113	0.081
340	0.082	2440	0.462	700	0.133	1254	1250	8.66	35	URBAN	0.255	0.182
350	0.018	600	0.114	300	0.057	1230	1225	44.00	22	URBAN	0.118	0.059
360	0.090	2400	0.455	600	0.114	1227.5	1222.8	10.34	35	URBAN	0.240	0.160
370	0.107	3500	0.663	2000	0.379	1224	1219.8	6.34	35	URBAN	0.390	0.335
380	0.070	1940	0.367	650	0.123	1254.8	1251	10.34	10	URBAN	0.356	0.240
* 390	0.063	2600	0.492	1300	0.246	1251	1220.5	22.63	45	URBAN	0.235	0.204
400	0.125	1200	0.227	500	0.095	1253.6	1250	15.84	5	URBAN	0.371	0.123
410	0.035	1840	0.348	650	0.123	1240	1220	57.39	47	URBAN	0.148	0.130
420	0.065	2000	0.379	700	0.133	1220	1214.1	15.58	40	URBAN	0.208	0.141
430	0.092	1692	0.320	700	0.133	1218	1216.5	4.68	36	URBAN	0.254	0.127
440	0.116	2500	0.473	1750	0.331	1221.4	1216	11.40	39	URBAN	0.310	0.190
450	0.026	1300	0.246	900	0.170	1216.4	1215.1	5.28	10	URBAN	0.347	0.300
460	0.026	2200	0.417	1000	0.189	1218	1215.6	5.76	85	URBAN	0.186	0.229
470	0.056	2400	0.455	900	0.170	1216	1212.3	8.14	54	URBAN	0.225	0.193
480	0.128	3200	0.606	600	0.114	1216	1210	9.90	57	URBAN	0.226	0.154
* 490	0.611	7192	1.362	2840	0.538	1253	1206.4	19.24	31	URBAN	0.540	0.317
500	0.011	870	0.165	400	0.076	1210	1205	30.34	54	URBAN	0.100	0.090

* SLOPE NOT BASED ON TOTAL CHANGE IN ELEVATION

3. Rainfall Data

The hydrologic response of a watershed is dependent upon rainfall characteristics such as depth, duration, spatial and temporal distribution of the rainfall event. The rainfall depth is a function of the probability of occurrence and the duration of the event. This probability is expressed as a recurrence interval (50-year, 100-year, etc.) which is often defined as the average interval of time within which the magnitude of an event will be equaled or exceeded at least one time. The 100-year 24-hour storm event in conjunction with the Corps hypothetical distribution were utilized for this study.

Rainfall depths for the project drainage area were developed using isopluvial maps and regression equations developed by the National Oceanic and Atmospheric Administration. Point rainfall estimates were computed using the Bureau of Reclamation's PREFRE computer program. Table II summarizes point precipitation values for the project watershed.

TABLE II
Point Rainfall Depths

Duration	2-yr (in.)	5-yr (in.)	10-yr (in.)	25-yr (in.)	50-yr (in.)	100-yr (in.)	500-yr (in.)
5-min	0.29	0.40	0.47	0.56	0.64	0.71	0.89
10-min	0.44	0.60	0.71	0.86	0.98	1.10	1.36
15-min	0.54	0.75	0.90	1.10	1.25	1.41	1.76
30-min	0.71	1.01	1.21	1.48	1.69	1.91	2.39
1-hr	0.87	1.25	1.50	1.85	2.12	2.38	3.00
2-hr	0.95	1.36	1.63	2.01	2.30	2.59	3.26
3-hr	1.00	1.43	1.72	2.12	2.43	2.73	3.44
6-hr	1.10	1.58	1.89	2.33	2.67	3.00	3.77
12-hr	1.20	1.73	2.08	2.56	2.93	3.30	4.15
24-hr	1.30	1.88	2.26	2.79	3.20	3.60	4.53

4. Soil Properties & Surface Cover

Soil data from the Soil Conservation Service (SCS) was used in conjunction with procedures and methodologies outlined in the ADOT drainage design manual to determine the infiltration parameters for the watershed. The vegetative cover ranges from 0% for the agricultural fields between growing seasons, to 60% in the residential areas. The soil types occurring in the study watershed are presented in Table III.

5. Interception and Infiltration Losses

The Green-Ampt infiltration equation was used to simulate rainfall losses due to infiltration into the soil matrix. The surface retention loss and the rate of rainfall infiltration must be estimated. The parameters for this equation are estimated as a function of soil texture. The soil is placed in one of twelve texture classes based on the percentage sand, silt, and clay and the size gradation.

The three Green-Ampt infiltration parameters used in the 1991 version of HEC-1 are: 1) hydraulic conductivity at natural section (XKSAT); 2) wetting front capillary suction (PSIF); and 3) volumetric soil moisture deficit at the start of rainfall (DTHETA). One of these parameters (hydraulic conductivity) can be adjusted for the effects of vegetation ground cover. These parameters are functions of soil characteristics, ground surface characteristics, and land management practices.

Soil horizon data from the SCS soil survey was combined with Green-Ampt parameter values published by ADOT to develop Green-Ampt infiltration parameters for the soil associations listed in Table III of this report. Table V lists the calculated Green-Ampt parameters used in the HEC-1 model.

Most drainage areas will be composed of more than one soil type and may require the determination of composite values for the Green-Ampt parameters. The procedure used to determine these values is to average the area-weighted logarithms of the individual subarea XKSAT values and to select the PSIF and DTHETA values from a graph. Table IV shows the area-weighted logarithm procedure for determining the sub-basin composite XKSAT values. After the composite XKSAT value is determined, the values of PSIF and DTHETA are selected from Figure 3-3 in the ADOT drainage design manual.

6. Unit Hydrographs

Unit hydrograph methodology is used to route the time increments of excess rainfall from the watershed (or sub-basin) to the watershed outlet (or modeling concentration point). The hydrograph of one-inch of excess runoff from a storm of specified duration for a specific watershed is called a unit hydrograph. In order to properly develop a unit hydrograph for a particular watershed, an adequate database (rainfall and runoff records) is required.

TABLE III

01/02/96

RED MOUNTAIN FREEWAY, PHASE II

Offsite Watershed Soil Types

SOIL UNIT AREAS IN SQUARE MILES

Subarea ID	Total Area	SOIL UNIT										
		Am	Av	Gf	Gm	LsA	Pm	PnC	PvA	RIA	RIB	Ru
	Soil Type	Alluvial Land	Clay Loam	Fine Sandy Loam	Loam	Loam	Clay Loam	Gravelly Loam	V. Grav. Loam	Gravelly Loam	Gravelly Loam	Rough Broken Land
10	0.8681				0.2394	0.4142			0.0941	0.0432		0.0772
20	0.1084		0.0868						0.0185			0.0031
30	1.4111		0.7038		0.5189		0.1158		0.0726			
40	0.2791		0.2714		0.0062				0.0015			
50	0.4893		0.3951		0.0108				0.0710			0.0124
60	0.1151	0.0216	0.0441		0.0216		0.0278					
70	0.1640		0.1161						0.0479			
80	0.2016		0.1491		0.0216				0.0309			
90	0.0979		0.0654		0.0124		0.0124		0.0077			
100	0.0728	0.0185	0.0234		0.0139		0.0170					
110	0.1301		0.0653		0.0293				0.0031			0.0124
120	0.0295							0.0095		0.0015		0.0185
130	0.0284		0.0114		0.0170							
140	0.0145		0.0145									
150	0.0839		0.0607						0.0232			
160	0.0137		0.0069		0.0034				0.0034			
170	0.0070		0.0039						0.0031			
180	0.0280		0.014		0.0112				0.0028			
185	0.0562		0.0084		0.0422				0.0056			
190	0.0117		0.0006		0.0111							
200	0.0484		0.029		0.0194							
210	0.0455		0.0455									
220	0.0187		0.0178				0.0009					
230	0.0291		0.0262				0.0029					
240	0.0119		0.0119									
250	0.0175		0.0175									
260	0.1140	0.0031	0.0846				0.0263					
270	0.0678	0.0124	0.0124		0.0124		0.0306					
280	0.0578					0.0062		0.017		0.03		0.0046
290	0.0689		0.031		0.0379							
300	0.0264		0.0264									
310	0.2102		0.0077		0.0386	0.1268		0.0077		0.0232		0.0062
320	0.0268		0.0268									
330	0.0133					0.0133						
340	0.0823					0.0544				0.0062	0.0093	0.0124
350	0.0183				0.0183							
360	0.0896		0.0762		0.0134							
370	0.1073		0.0965		0.0015		0.0093					
380	0.0701					0.0655				0.0046		
390	0.0630		0.0124		0.0243					0.0077	0.0062	0.0124
400	0.1245					0.089				0.0355		
410	0.0345				0.0172		0.0052					0.0121
420	0.0654		0.0216				0.0438					
430	0.0923		0.0552				0.0371					
440	0.1156		0.0523		0.0247		0.0293					0.0093
450	0.0257		0.0139				0.0118					
460	0.0256		0.0102				0.0154					
470	0.0564		0.0045		0.0119		0.0401					
480	0.1276				0.1021		0.0255					
490	0.6112	0.0163	0.0133	0.0103	0.3392	0.0385	0.1493			0.0252		0.0192
500	0.0108				0.0108							

FILE = RIOSOILS.WQ3

TABLE IV
RED MOUNTAIN FREEWAY, PHASE II
Calculation of Subbasin Composite XKSAT

01/02/96

Composite XKSAT = antilog {sum[A(i) * log(XKSAT(i))] / A}

where A(i) = Area of Soil Unit within Subbasin (from Table III-A)
A = Total Subbasin Area (from Table III-A)
XKSAT(i) = XKSAT Value for Soil Unit (below)

Subarea ID	Composite XKSAT, in/hr	A(i) * log(XKSAT(i)) Am	Av	Gf	Gm	LaA	Pm	PnC	PvA	RIA	RIB	Ru
10	0.28				-0.14	-0.25			-0.04	-0.02		-0.03
20	0.06		-0.12						-0.01			-0.00
30	0.09		-0.98		-0.31		-0.16		-0.03			
40	0.04		-0.38		-0.00				-0.00			
50	0.06		-0.55		-0.01				-0.03			-0.00
60	0.11	0.00	-0.06		-0.01		-0.04					
70	0.08		-0.16						-0.02			
80	0.07		-0.21		-0.01				-0.01			
90	0.06		-0.09		-0.01		-0.02		-0.00			
100	0.13	0.00	-0.03		-0.01		-0.02					
110	0.08		-0.12		-0.02				-0.00			-0.00
120	0.40							-0.00		-0.00		-0.01
130	0.12		-0.02		-0.01							
140	0.04		-0.02									
150	0.08		-0.08						-0.01			
160	0.11		-0.01		-0.00				-0.00			
170	0.11		-0.01						-0.00			
180	0.10		-0.02		-0.01				-0.00			
185	0.20		-0.01		-0.03				-0.00			
190	0.23		-0.00		-0.01							
200	0.08		-0.04		-0.01							
210	0.04		-0.06									
220	0.04		-0.02				-0.00					
230	0.04		-0.04				-0.00					
240	0.04		-0.02									
250	0.04		-0.02									
260	0.04	0.00	-0.12				-0.04					
270	0.10	0.00	-0.02		-0.01		-0.04					
280	0.38					-0.00		-0.01		-0.01		-0.00
290	0.11		-0.04		-0.02							
300	0.04		-0.04									
310	0.25		-0.01		-0.02	-0.08		-0.00		-0.01		-0.00
320	0.04		-0.04									
330	0.25					-0.01						
340	0.29					-0.03				-0.00	-0.00	-0.00
350	0.25				-0.01							
360	0.05		-0.11		-0.01							
370	0.04		-0.13		-0.00		-0.01					
380	0.26					-0.04				-0.00		
390	0.21		-0.02		-0.01					-0.00	-0.00	-0.00
400	0.29					-0.05				-0.01		
410	0.22				-0.01		-0.01					-0.00
420	0.04		-0.03				-0.06					
430	0.04		-0.08				-0.05					
440	0.07		-0.07		-0.01		-0.04					-0.00
450	0.04		-0.02				-0.02					
460	0.04		-0.01				-0.02					
470	0.06		-0.01		-0.01		-0.06					
480	0.17				-0.06		-0.04					
490	0.17	0.00	-0.02	-0.01	-0.20	-0.02	-0.21			-0.01		-0.01
500	0.25				-0.01							
XKSAT for Soil Unit		1.2	0.04	0.25	0.25	0.25	0.04	0.4	0.4	0.4	0.4	0.4
log XKSAT		0.0792	-1.3979	-0.6021	-0.6021	-0.6021	-1.3979	-0.3979	-0.3979	-0.3979	-0.3979	-0.3979

FILE = RIOSOILS WQ2

TABLE V

03/15/95

RED MOUNTAIN FREEWAY, PHASE II

Green-Ampt Infiltration Parameters

Subarea ID	Composite XKSAT, in/hr	Vegetative Cover, %	Ck	IA, in	DTHETA (normal)	PSIF, in	Adjusted XKSAT	RTIMP, %
10	0.28	90	1.88	0.47	0.25	4.9	0.53	1
20	0.06	43	1.36	0.14	0.15	8.5	0.09	14
30	0.09	2	1.00	0.48	0.15	7.5	0.09	1
40	0.04	0	1.00	0.50	0.15	9.6	0.04	0
50	0.06	43	1.36	0.14	0.15	8.5	0.08	14
60	0.11	28	1.20	0.20	0.16	7.0	0.13	29
70	0.08	43	1.36	0.14	0.15	7.8	0.11	14
80	0.07	42	1.36	0.13	0.15	8.1	0.09	15
90	0.06	30	1.22	0.26	0.15	8.5	0.07	12
100	0.13	6	1.00	0.45	0.21	6.5	0.13	8
110	0.08	18	1.09	0.36	0.15	7.8	0.09	7
120	0.40	33	1.25	0.12	0.25	4.2	0.50	34
130	0.12	34	1.26	0.12	0.19	6.7	0.15	32
140	0.04	8	1.00	0.07	0.15	9.6	0.04	85
150	0.08	28	1.20	0.11	0.15	7.8	0.09	43
160	0.11	23	1.14	0.10	0.16	7.0	0.13	54
170	0.11	8	1.00	0.07	0.16	7.0	0.11	85
180	0.10	33	1.25	0.12	0.15	7.1	0.13	35
185	0.20	33	1.25	0.12	0.25	5.5	0.25	35
190	0.23	27	1.18	0.10	0.25	5.2	0.27	47
200	0.08	23	1.14	0.10	0.15	7.8	0.10	54
210	0.04	13	1.03	0.08	0.15	9.6	0.04	75
220	0.04	23	1.14	0.10	0.15	9.6	0.05	54
230	0.04	23	1.14	0.10	0.15	9.6	0.05	54
240	0.04	8	1.00	0.07	0.15	9.6	0.04	85
250	0.04	8	1.00	0.07	0.15	9.6	0.04	85
260	0.04	22	1.13	0.09	0.15	9.6	0.05	56
270	0.10	18	1.09	0.09	0.15	7.1	0.11	64
280	0.38	48	1.41	0.15	0.25	4.2	0.54	5
290	0.11	35	1.28	0.12	0.16	7.0	0.14	30
300	0.04	23	1.14	0.10	0.15	9.6	0.05	54
310	0.25	32	1.24	0.11	0.25	5.0	0.32	36
320	0.04	23	1.14	0.10	0.15	9.6	0.05	54
330	0.25	23	1.14	0.10	0.25	5.0	0.29	54
340	0.29	33	1.25	0.12	0.25	4.8	0.37	35
350	0.25	39	1.32	0.13	0.25	5.0	0.33	22
360	0.05	33	1.25	0.12	0.15	9.0	0.07	35
370	0.04	33	1.25	0.12	0.15	9.6	0.05	35
380	0.26	50	1.44	0.50	0.25	5.0	0.37	10
390	0.21	28	1.19	0.11	0.25	5.4	0.25	45
400	0.29	47	1.41	0.47	0.25	4.8	0.40	5
410	0.22	27	1.18	0.10	0.25	5.3	0.26	47
420	0.04	30	1.22	0.11	0.15	9.6	0.05	40
430	0.04	32	1.24	0.11	0.15	9.6	0.05	36
440	0.07	31	1.23	0.11	0.15	8.1	0.09	39
450	0.04	80	1.77	0.50	0.15	9.6	0.07	10
460	0.04	8	1.00	0.07	0.15	9.6	0.04	85
470	0.06	23	1.14	0.10	0.15	8.5	0.07	54
480	0.17	22	1.13	0.09	0.25	5.8	0.20	57
490	0.17	25	1.16	0.23	0.25	5.8	0.19	31
500	0.25	23	1.14	0.10	0.25	5.0	0.29	54

Since very few watersheds in Arizona have adequate data, an indirect method is usually used to develop a synthetic unit hydrograph. This synthetic hydrograph is representative of all of the composite effects of the storm and watershed characteristics that result in excess runoff from the watershed. The synthetic hydrograph procedure recommended by ADOT is the Clark unit hydrograph. The Clark unit hydrograph requires the estimation of three parameters; the time of concentration (T_c), the storage coefficient (R), and a time-area relation.

Time of concentration is the travel time, during the corresponding period of most intense rainfall excess, for a flood wave to travel from the hydraulically most distant point in the watershed to the point of interest. The agricultural/urban T_c equations used for the project site are presented below.

Agricultural: $$T_c = 7.2 A^{0.1} L^{0.25} L_{ca}^{0.25} S^{-0.2}$$

Urban: $$T_c = 3.2 A^{0.1} L^{0.25} L_{ca}^{0.25} S^{-0.14} RTIMP^{-0.36}$$

where:

T_c	=	Time of concentration, (hours);
A	=	Area, (square miles);
L	=	Length of watercourse to hydraulically most distant point, (miles);
L_{ca}	=	Length measured from the concentration point along L to a point on L that is perpendicular to the watershed centroid, (miles);
S	=	Watercourse slope, (ft/mile)
RTIMP	=	Effective impervious area, in percent.

The storage coefficient is a Clark unit hydrograph parameter that relates the effects of direct runoff storage in the watershed to unit hydrograph shape. The equation for estimating the storage coefficient (R) is:

$$R = 0.37 T_c^{1.11} L^{0.80} A^{-0.57}$$

where:

R	=	Storage coefficient (hours);
T_c	=	Time of concentration (hours);
L	=	Length of watercourse to the hydraulically most distant point (miles);
A	=	Area (square miles).

The time-area relation is a graphical parameter that specifies the accumulated area of the watershed that is contributing runoff to a concentration point at any given time. Sufficient data was not available to analyze the watershed by producing areas that have equal incremental travel times to the outflow location. Therefore, synthetic time-area relationships "A" and "C" from ADOT Table 4-1 were utilized for this analyses. These relationships are presented in Table VI.

Table VI
Values of the Dimensionless Synthetic Time-Area Relations for the Clark Unit Hydrograph

TRAVEL TIME, AS A PERCENT OF T_c	Contributing Area, as a Percent of Total Area URBAN WATERSHED "A"	Contributing Area, as a Percent of Total Area AGRICULTURAL WATERSHED "C"
0	0	0
10	5	3
20	16	5
30	30	8
40	65	12
50	77	20
60	84	43
70	90	75
80	94	90
90	97	96
100	100	100

7. Channel Routing Parameters

Runoff from overland flow areas (yards, fields, etc.) will ultimately reach some type of defined channel (streets, etc.) where it joins with other runoff and continues downstream as open channel flow. The modified puls channel routing operations were used to route hydrographs from one sub-basin to the next. The "normal depth, storage outflow" option in HEC-1 was used for sub-basin routing operations.

Field observation, review of USGS quadrangle maps, and engineering judgement were used to develop channel routing geometries for the storage routing operations. The routing procedure utilizes input that describes the channel length, slope, roughness, and geometry. An 8-point cross-section with variable overbank and channel roughness values is utilized.

In residential areas, routed flows do not follow a specific street, but instead may spread out among several streets. Where this is likely to occur, the width and length of channels in the HEC-1 model were adjusted to accurately model the basin. On any street routing procedure, building or block wall offsets from the curb were included as part of the channel cross-section and were based on field observations and engineering judgement. In residential areas, a Manning's "n" value of 0.016 was used for street flow and 0.030 was used for flow outside of the street. A summary of HEC-1 routing parameters is provided in Table VII.

8. Flow Diversions

The City of Mesa storm drain system is designed to handle the 10-year storm event. Flows up to and including the 10-year event were diverted from the surface flow at the McKellips Road/Country Club Drive intersection and at the Alma School Road/McLellan Road intersection. The capacities of the storm drains were estimated assuming normal depth flow.

In addition to storm drain diversions, two other diversion points were included in the HEC-1 model. Field investigations determined that significant flow splits occur at the McKellips Road/Mesa Drive intersection and at the McKellips Road/Country Club Drive intersection. Flow distributions were estimated based on normal depth capacities of each roadway section. Diversion sub-routines were included in the HEC-1 model for these areas.

9. On-site Retention/Detention Facilities

Many of the residential areas within the study watershed include at least some retention. From 1973 to 1987, the City of Mesa drainage design ordinances required retention of the 50-year, 24-hour storm volume for new development; in 1987 the drainage ordinance was modified to require retention of the 100-year, 2-hour storm volume. However, many areas within the urbanized watershed were constructed prior to 1973 and do not have stormwater retention.

In order to determine the quantity of retention provided within individual developments, City of Mesa subdivision design records were reviewed and, where data was not available, estimates of retention basin sizes were made based on field observation.

Subareas for which the retention requirement was known were modeled accordingly. If the design event was not known, but significant retention facilities were evident, the smaller of the 100-year 2-hour event or the 50-year 24-hour event was used to determine the retention volume. Subareas with little or no apparent retention facilities were modeled with no retention.

In order to account for on-site retention within particular sub-basins, "dummy reservoirs" were added to the HEC-1 model. Reservoir volumes were sized to model the 100-year 2-hour or 50-year 24-hour City of Mesa retention requirements. Runoff created by the 100-year 24-hour storm event was routed through the reservoir to simulate the attenuation and/or translation of the hydrographs. Runoff in excess of the reservoir capacity was allowed to flow out of the reservoir to the next downstream sub-basin.

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TABLE VII
RED MOUNTAIN FREEWAY, PHASE II
Summary of HEC-1 Routing Parameters

HEC-1 Operation	Manning's "n" Left Overbank	Manning's "n" Main Channel	Manning's "n" Right Overbank	Length (ft)	Slope (ft/ft)	Channel Bottom Width (ft)	Estimate Avg Velo (fps)	Approx. Travel Time (min)	NSTPS
11	0.035	0.030	0.035	6000	0.0030	10	3.2	31.3	16
21	0.040	0.040	0.040	5800	0.0022	250	0.8	120.8	60
36	0.035	0.030	0.035	4800	0.0025	60	3.4	23.5	12
56	0.040	0.040	0.040	3000	0.0037	250	2.1	23.8	12
66	0.035	0.030	0.035	3000	0.0003	60	1.8	27.8	14
86	0.040	0.040	0.040	2900	0.0017	250	0.9	53.7	27
96	0.030	0.016	0.030	2650	0.0023	25	4.7	9.4	5
106	0.035	0.030	0.035	2700	0.0059	60	6.3	7.1	4
121	0.030	0.016	0.030	1250	0.0152	44	4.9	4.3	2
137	0.030	0.016	0.030	1400	0.0026	68	2.3	10.1	5
146	0.030	0.016	0.030	500	0.0008	68	1.7	4.9	2
176	0.030	0.016	0.030	650	0.0011	68	2.6	4.2	2
187	0.030	0.016	0.030	1350	0.0004	64	2.1	10.7	5
196	0.030	0.016	0.030	1000	0.0015	68	2.9	5.7	3
226	0.030	0.016	0.030	950	0.0021	68	3.2	4.9	2
246	0.030	0.016	0.030	600	0.0035	68	4.3	2.3	1
256	0.030	0.016	0.030	2000	0.0019	68	3.7	9.0	5
266	0.030	0.016	0.030	2450	0.0065	68	2.1	19.4	10
281	0.030	0.016	0.030	800	0.0176	800	1.6	8.3	4
296	0.030	0.016	0.030	700	0.0011	25	2.9	4.0	2
306	0.030	0.016	0.030	600	0.0008	25	3.2	3.1	2
324	0.030	0.016	0.030	1350	0.0014	64	2.6	8.7	4
326	0.030	0.016	0.030	1250	0.0014	50	3.8	5.5	3
346	0.030	0.016	0.030	550	0.0091	300	3.8	2.4	1
356	0.030	0.016	0.030	500	0.0080	25	4.3	1.9	1
366	0.030	0.016	0.030	800	0.0023	25	5.1	2.6	1
368	0.030	0.016	0.030	1250	0.0010	75	2.8	7.4	4
386	0.030	0.030	0.030	1900	0.0043	300	3.8	8.3	4
398	0.030	0.016	0.030	1800	0.0021	75	4.2	7.1	4
401	0.030	0.016	0.030	1900	0.0105	64	5.2	6.1	3
416	0.030	0.016	0.030	650	0.0091	64	4.1	2.6	1
431	0.030	0.016	0.030	1350	0.0004	25	1.7	13.2	7
447	0.030	0.016	0.030	1350	0.0014	64	4.3	5.2	3
459	0.030	0.016	0.030	1700	0.0006	64	2.1	13.5	7
467	0.030	0.016	0.030	700	0.0014	64	3.1	3.8	2
469	0.030	0.016	0.030	1250	0.0017	64	4.9	4.3	2
476	0.030	0.016	0.030	1650	0.0015	64	5.0	5.5	3
481	0.030	0.016	0.030	1300	0.0010	25	2.5	8.7	4
486	0.030	0.016	0.030	2150	0.0015	64	5.1	7.0	4

filename: routparm.wq2

E. Ponding at Alma School Road

A large earthen berm around the gravel mining operation (located north of the Alma School Drain) and a slight sag in the Alma School Road profile cause a significant volume of ponding to occur on and adjacent to Alma School Road during major storm events. During the 100-year, 24-hour storm event, approximately 1400 cfs concentrates near the intersection of McLellan and Alma School Roads; ponds east of Alma School Road, and then flows in two directions.

First, a portion of the flow continues west in a 48" storm drain along McLellan Road. A part of the flow in excess of the storm drain capacity will continue into the existing gravel mining operation west of Alma School Road. Flow not entering the gravel pit, combined with the McLellan Road storm drain flow, totals 250 cfs (concentration point 499C) in the 100-year 24-hour storm. This 250 cfs is the flow arriving at the Red Mountain Freeway. The flow was estimated based on a flow distribution along a cross-section on the gravel mining operation property. A 54" outlet pipe located in a detention basin west of Alma School Road on the south side of the Red Mountain Freeway is proposed to route flows to the Salt River. This detention basin receives pavement runoff from 18 acres of Freeway storm drains as well as the 250 cfs flow arriving from the east. With storage routing in the approximately 2-acre detention basin, the basin peak inflow of 270 cfs is attenuated to a peak of 190 cfs.

If blockage of the outlet pipe should occur, or if more than 250 cfs should arrive at the culvert from the east, the excess flow will enter the gravel pit to the south. If the gravel pit fills, flow will continue through the Sunward Materials equipment underpass and into the Salt River. The equipment pass has a flow capacity nearly equal to the 1400 cfs arriving at the McLellan Road and Alma School Road intersection, and is located approximately 5 feet below the surrounding natural grade. It therefore serves as a very effective emergency overflow structure.

It must be noted that any future construction within the gravel mining operation must preserve a path for emergency overflows with no decrease in capacity compared to the existing condition.

Second, flows are diverted south along Alma School Road. Stormwater runoff on Alma School Road ponds to a depth of approximately 1 foot before outfalling into the Alma School Drain.

F. Summary of Results

The summary output from the HEC-1 computer program for Phase II of the Red Mountain Freeway is presented in Appendix A. The off-site peak discharges are summarized in Table VIII.

Note that it is assumed that the flow at concentration point 65C will be routed to the Salt River east of Country Club Drive, near Center Street. This is a key design assumption for the drainage design for the Country Club Drive to Gilbert Road section of the Red Mountain Freeway.

Flow arriving at concentration point 105C (Country Club Drive) totals 20 cfs in the 100-year event and remains on the south side of the freeway until it reaches McKellips Road. It then combines with flow arriving from the east along McKellips, and crosses the freeway at McKellips Road. The combined flow is about 220 cfs at concentration point 275C.

Table VIII
Peak Discharge Values for the Red Mountain Freeway
Phase II Off-Site Drainage Areas

Concentration Point	Description of Concentration Point	Q_{100} (cfs)
35C	North Channel McDowell and Stapley Roads	370
45C	North Channel McDowell Road and Mesa Drive	420
65C	South Channel Lehi Road and Center Street	590
105C	South Channel Freeway at Country Club Drive	20
275C	Cross Drainage Freeway at McKellips Road	220
499C	Cross Drainage at McLellan Road Alignment	250
Basin	Detention Basin Outflow	190

III. ON-SITE DRAINAGE

A. General Discussion

The on-site drainage system is designed to optimize the number and location of storm drain catch basins, minimize maintenance requirements, provide safe and efficient access for maintenance operations; and allow for staged construction of the Red Mountain Freeway projects into an integrated drainage system. Generally, on-site runoff is intercepted by catch basins and conveyed through storm drain laterals to cross-culverts or roadside ditches which outfall to the Salt River.

1. Previous Studies

A previous on-site drainage study was performed in November 1992 for the global design of the Red Mountain Traffic Interchange. In October 1993, the Red Mountain Freeway alignment, Red Mountain Traffic Interchange ramps, and the Dobson Road T.I. were modified as a result of the Draft Environmental Impact Statement. The final Drainage Report for the Phase I Dobson Road Connection Portion of the Red Mountain Freeway was completed in September 1994.

This report documents the on-site drainage system for Phase II of the Red Mountain Freeway, between the Red Mountain Traffic Interchange and the temporary connection at McKellips Road.

2. Design Criteria

The drainage design criteria for this project is based on ADOT's Design Procedures Manual. To reduce construction costs, the HOV lane was removed and an open median will be constructed east of the Red Mountain T.I. However, the cross-road bridges will be constructed to the ultimate freeway width at Dobson Road and Alma School Road.

Mainline pavement superelevated away from the median is designed for the ultimate closed median condition. It is assumed that all the area from the construction centerline would be paved in the future and contribute runoff to the catch basins located along the outside shoulder.

Mainline pavement superelevated towards the median is designed for an open median condition. The contributing drainage area includes the interim pavement and the open median. Therefore, the drainage area and runoff contributing to the median catch basins is greatest for the interim condition. The storm drain laterals in the median are located to permit paving the median and relocating the basins adjacent to future barrier. Median storm drain connector pipes are located within the future shoulder to prevent sign foundation conflicts.

Since the open median section is considered a long-term interim condition, the design pavement spread was increased to 9 feet along the open median curb and gutter. Nine feet of spread encroaches into the 12 foot travel lane approximately 1 foot for the interim design. The design spread along the outside shoulder is designed based on no more than one-half travel lane encroachment for the 10-year frequency storm.

Normal crowned mainline pavement sections are designed for closed median conditions. All catch basins along the outside shoulder are sited assuming a future closed median condition which generates larger contributing drainage areas. In addition, catch basins are sited at convenient cross culvert locations and low points in the median to intercept and convey the interim open median runoff.

ADOT District Maintenance requested that all outfalls to roadside ditches utilize ADOT standard flared end sections (C-13.20) with riprap pads to reduce outlet erosion. ADOT District Maintenance indicated that these facilities require less maintenance than alternative designs.

At Alma School Road, cross-road ramps superelevated towards the infield are designed to convey runoff to infield channels using scuppers. It was considered cost prohibitive to construct a storm drain lateral and catch basin to intercept the ramp runoff at these locations. Detail J presents the scupper design as part of the 100% drainage plans.

Runoff on the north side of the Red Mountain Freeway sheet flows down the bank protection into the Salt River.

Double catch basin systems were designed for all off-ramp gore locations. The first basin was placed approximately 105 feet behind the back-of-gore to intercept the contributing runoff. This basin is located on the upstream side of the barrier GET system where runoff depths can exceed the 3 inch height of the Type D curb and gutter section. A second basin was placed 13 feet behind the back-of-gore at the beginning of the gore curb and gutter transition. This basin intercepts all the contributing stormwater and reduces runoff from crossing the gore onto the ramp.

Runoff: The on-site runoff was quantified using the rational method as outlined in ADOT's hydrology manual.

Runoff Coefficients:

Paved Surfaces	0.95
Highway Slopes (Decomposed granite with 3:1 slopes or less)	0.70
Highway Slopes (Decomposed granite with less than 5:1 slopes)	0.60

Time of Concentration: The time of concentration for the on-site runoff was determined using ADOT's hydrology procedures. The minimum time of concentration is 10 minutes (overland flow plus routing time). All the roadway inlet catch basins default to the minimum 10 minute time of concentration. The computed time of concentration for two of the infield basin areas was in excess of 10 minutes.

Rainfall Intensity: ADOT's hydrology manual was used to determine rainfall intensities. This method is based upon the 6-hour and 24-hour precipitation depths at the project site. The rainfall intensity is iteratively determined at the point of interest using the actual time of concentration and the site specific intensity-duration-frequency curves developed for this project.

3. Study Methods

a. Hydrology

The rational method was used to estimate the peak discharge for the on-site drainage areas. These discharges were then used to determine the design gutter flow, pavement spread, catch basin size and spacing, temporary ditch design flow, and storm drain sizing. The catch basins were generally designed for 100 percent interception with little or no flow-by. Therefore, the contributing area for catch basins in series is assumed to extend only to the next upstream catch basin.

b. Hydraulics

The FHWA's Hydraulic Engineering Circular No. 12 (HEC-12) was used as the basis for gutter and catch basin interception hydraulics. HEC-12 uses a modified Manning's equation for gutter flow and a combination of weir, orifice and empirical relationships for catch basin hydraulics.

ADOT's roadway inlet design computer program, which is based on HEC-12, was used extensively for gutter and catch basin hydraulic design. The efficiency of the catch basins utilize criteria outlined in ADOT's Design Procedures Manual. Output presented with this submittal from the ADOT inlet computer program was spot checked for accuracy with HEC-12 procedures.

Temporary roadside ditch hydraulics are based primarily on FHWA's Hydraulic Design Circular No. 4. Criteria for minimum slope, maximum velocity, and freeboard, comply with ADOT design criteria. The 10-year water surface elevation in traffic interchange infield channels is designed for 1 foot below the adjacent subgrade elevation and under all circumstances, 3 inches below the lowest adjacent travel lane. Manning's equation was used to calculate normal depth for the temporary roadside ditches.

B. Inlet/Catch Basin Design

The rainfall intensity-duration-frequency relationship for the Red Mountain Freeway was determined using procedures outlined in ADOT's Hydrology Manual. The point rainfall depths at the project site are provided in Table III. The concept roadway drainage area maps are presented in Exhibit IV. Catch basin design runoff calculations are presented in Appendix B.

The catch basins are sized and spaced based on several considerations and design criteria. The roadway catch basins are located at all points of vertical sag and sized for 100 percent interception at acceptable ponding depths and pavement flow spread. Roadway catch basins on grade are located to meet acceptable ponding depth and spread, and are generally sized

for 100 percent interception. Roadway catch basins are also located near points with zero percent superelevation, cross-road intersections, interim sump conditions at cross-road bridges, and at gore areas to prevent runoff from accumulating and crossing travel lanes. ADOT pavement drainage analysis computer program output for the design of the Red Mountain Freeway is presented in Appendix B. Inlet and catch basin efficiencies conform to ADOT standards and are indicated on the inlet program output. Grated catch basins on cross-roads and cross-road interchanges will be designed using Type EF or equivalent grates.

C. Storm Drain Design

Hydraulic grade line calculations were performed using THYSYS and STORMCAD computer programs. The Texas HYdraulic SYStem (THYSYS) is an integrated system of computer programs for highway hydraulic design and analysis developed by the Texas Department of Transportation. The SEWER sub-system was used to calculate the hydraulic grade line for a majority of the storm drain systems. The THYSYS program is capable of calculating open channel, full flow, and pressure flow hydraulic grade line solutions. Minor losses were calculated and input manually into the THYSYS computer program using equations presented in the new ASCE manual. The minor junction losses calculated using the ASCE equations were determined to be conservative when compared to other procedures (i.e., Pima County, Maricopa County). STORMCAD was used on longer storm drain systems to account for the impact of system flow time on the cumulative discharge.

The storm drain pipe profiles are presented in Exhibit I on the final drainage plans. The THYSYS and STORMCAD hydraulic grade line calculations for the Red Mountain Freeway drainage system are presented in Appendix D. The storm drain hydraulic grade line was designed to a minimum of one foot below the top of the roadway grate inlets for the 10-year storm event.

Sections of the freeway mainline were constructed using retaining walls at cross-road traffic interchanges. Storm drain laterals were placed in the middle of the median shoulder. Catch basins are connected to the storm drain lateral with Tee's or manholes which are spaced to meet ADOT design criteria. Typically, the first storm drain in a series is connected directly to a manhole. The storm drain lateral location should reduce pipe excavation and backfill depths by keeping the pipe higher in the fill. In addition, the proposed storm drain lateral location will provide maintenance access from the shoulder.

D. Main Storm Drains

The cross-culverts which outfall to the Salt River are the main storm drain outfalls for the roadway and off-site drainage. New major cross-culverts proposed for the Red Mountain Freeway include the Alma School Drain, the cross-culvert outfalling the detention basin in the southwest quadrant of the Alma School Road T.I. (Sta 460+00), and a cross-culvert between Alma School Road and McKellips Road (Sta 489+95).

Cross-culverts were designed in accordance with ADOT and FHWA procedures and methodologies. The hydraulic grade lines were analyzed for two conditions: 1) the 10-year off-site contributing discharge and a tailwater elevation based on the 100-year water surface elevation in the Salt River; 2) the 100-year off-site discharge and a tailwater elevation based on the 10-year water surface elevation in the Salt River. The hydraulic grade line elevations are presented on the pipe profiles in Exhibit I. The water-surface elevation in the Salt River

is based on the hydraulic analyses for the Red Mountain Freeway and not the effective Salt River Flood Insurance Study. The Salt River water-surface elevations determined for the Red Mountain Freeway should be conservative since the 100-year design discharge (220,000 cfs) does not consider the impact of the reconstructed Roosevelt Dam.

E. Outlet Design

The on-site drainage system is generally connected to the off-site system of cross-culverts which outfall to the Salt River. One new major storm drain system will outfall to the Salt River independent of the cross-culverts. The new system outfalls to a drainage channel and eventually the Salt River at the northeast quadrant of the Alma School Road T.I.

F. Proposed Drainage Improvements

A summary of the storm drain systems to be constructed with Phase II of the Red Mountain Freeway is provided below:

1. Sag Vertical Curve (Sta 356+00±)

   The Red Mountain Freeway sag vertical curve at Sta 356+00 is located in the vicinity of the Price Road Outfall. The sag vertical curve is also located at the beginning of a horizontal curve. As a result, the eastbound mainline rotates through a superelevation transition with zero percent cross-slope.

   The drainage design at the sag vertical curve concentrates the roadway drainage into storm drain laterals. The storm drain then drops into the top of the Price Road Outfall box culvert. The Price Road Outfall construction plans indicate a 24-inch pipe stub was placed through the top of the slab with Change Order No. 1 (DWG D-1.2). The temporary connection to the tunnel, constructed with the Dobson Road Connection project, will be removed and replaced with a 60" manhole and a 60" to 30" eccentric for access behind the proposed barrier.

2. Red Mountain T.I. Ramps W-S & W-N (Sta 376+50±)

   The catch basins were sited to intercept all roadway runoff prior to the temporary barrier installation. A basin was sited at Sta 377+00 and timber capped for future use at the beginning of the gore curb and gutter transition to prevent cross-over flow onto the off-ramp. Phase II constructs two westbound catch basins and connects them to a storm drain lateral constructed with the Dobson Road Connection.

3. Sag Vertical Curve (Sta 385+50±)

   The hydrologic analyses for this system assumes that PBQD will design the exit ramp drainage system to intercept all the runoff prior to the back of gore location. The interim drainage will sheetflow under the temporary barrier into the percolation ponds until the ramp drainage system is constructed.

The system developed at this location intercepts all runoff prior to the beginning of the temporary barrier installation. Runoff from the westbound lanes will be collected into a cross-culvert, which outlets into a off-site drainage channel on the south side of the freeway.

4. Embankment Downdrain (Sta 396+30±)

   Phase II will construct a catch basin for the westbound roadway and connect to a storm drain lateral built with Phase I. The freeway runoff will be conveyed through the storm drain lateral to the eastbound catch basin and embankment downdrain. The runoff will then be conveyed through a channeled to a cross-culvert and outfall into the Salt River.

5. Cross-Culvert Outfalls (Sta 400+50 to Sta 408+50)

   The cross-culverts constructed along this segment with the Dobson Road Connection will be extended to outfalls in the bank protection with Phase II. Cross-culverts at stations 400+50 and 407+70 are ADOT roadway drainage outfalls to the Salt River. The culvert at station 407+70 also conveys off-site runoff to the Salt River.

   The City of Mesa 72" storm drain is extended to a headwall in the bank protection as part of this phase of construction. The cross-culvert at Sta 408+50 is an extension of an off-site drainage culvert to the Salt River. No ADOT roadway drainage contributes to this culvert.

6. Red Mountain Freeway at the Dobson Road T.I.

   The Red Mountain Freeway mainline profile crests at Dobson Road and is in a horizontal curve at this location. The on-site drainage system will collect roadway runoff from the eastbound median and westbound lanes into a storm drain lateral which discharges into the off-site cross-culvert at Sta 407+45. Permanent catch basins which were timber capped in Phase I will be constructed to their ultimate configuration.

7. Dobson Road

   Roadway runoff from Dobson Road is collected by ramp infield basins since no curb and gutter will be constructed along Dobson Road at the interchange. Stormwater collected a the ramp low points and infields are conveyed to the storm drain trunkline in Dobson Road which outfalls to the Salt River.

8. Dobson Ramps C & D

   Runoff is collected at the back-of-gore curb and gutter transition for Ramp C. Runoff which collects in the median prior to the mainline superelevation cross-over and Ramp D back-of-gore is collected and conveyed in a single storm drain system to the Salt River. Runoff collecting along the Ramp D right-of-way ditches is collected by area drains and conveyed to the Alma School Drain.

9. Sag Vertical Curve (Sta 441+00±)

Runoff contributing from east and west of the sag low point are conveyed to the Salt River through independent storm drain systems. Eastbound contributing runoff west of the sag low point is collected at the sag low point without violating ADOT design spread criteria. The westbound contributing runoff east of the sag low point will be intercepted by a series of catch basins which connect to a storm drain lateral in the westbound median shoulder.

East of the sag low point, westbound runoff is collected by catch basins located along the median at locations where the design spread approaches nine feet. These catch basins outfall directly to the Salt River per ADOT comments to reduce the storm drain lateral that would be required longitudinally within the median.

10. Alma School Ramp B Gore (Sta 460+00±)

A storm drain system connects two catch basins east of the Alma School Road Ramp B back-of-gore. Roadway drainage collected by these catch basins will be conveyed through a storm drain which outfalls to the detention basin in the southwest quadrant of the Alma School Road T.I. Runoff from these basins is conveyed to the Salt River through a cross-culvert at Sta 460+00.

11. Cross-Culvert Outfall (Sta 460+00±)

The cross-culvert at Sta 460+00± serves as a major outfall for off-site (McLellan Rd. storm drain and surface runoff) and roadway drainage west of approximately Sta 485+00. Roadway and infield drainage from Alma School Ramps B and D, the southern portion of Alma School Road, and the mainline to Sta 485+00 are conveyed to the detention basin in the southwest quadrant of the Alma School Road T.I. In addition, the McLellan Road storm drain will be reconstructed to outfall to this facility. The detention basin attenuates the contributing peak discharge from approximately 250 cfs to 190 cfs for the 100-year, 24-hour design storm event. Stormwater collected in the detention basin is conveyed under the freeway through a 54" circular pipe culverts which outfalls directly to the Salt River.

12. Northwest Alma School T.I. Drainage Channel (Sta 471+00±)

The northwest Alma School T.I. drainage channel conveys stormwater runoff to the Salt River along the riverside of the bank protection. Roadway and infield drainage from Alma School Ramps A and C, runoff from the mainline at the bridges, and the northern two-thirds of Alma School Road is conveyed in this channel.

13. Alma School Ramp B (Sta 17+00±)

Runoff is collected at the sag low point of Alma School Ramp B. A scupper is sited prior to the superelevation cross-over and runoff is conveyed to the ramp infield. The collected stormwater is conveyed to the detention basin.

14. Alma School Ramp D (Sta 1+90±)

Runoff is collected at the sag low point of Alma School Ramp D using grated catch basins and the ramp infield. The collected stormwater is conveyed to the detention basin through a catch basin in the south right-of-way.

15. Alma School Ramps C and D Gore (Sta 482+00±)

Runoff is intercepted prior to the Alma School Ramp C back-of-gore and at the mainline superelevation cross-over at Alma School Ramp D. The stormwater is collected and conveyed to the Ramp D right-of-way ditch. The runoff is conveyed down the ditch and collected by an infield basin. The standard infield basin has the capacity to intercept the 10-year ditch runoff. The current design utilizes an infield basin since there is some question whether the 100-year discharge would actually concentrate at the Ramp D right-of-way inlet.

16. Sag Vertical Curve system (Sta 487+50±)

Westbound mainline runoff is collected through a series of basins along the shoulder and conveyed through a storm drain lateral to the right-of-way ditch along the south side of the freeway. Eastbound mainline stormwater is collected and conveyed to the right-of-way ditch on the south side of the freeway. The right-of-way ditch conveys the runoff to a detention basin and cross-culvert at Sta 489+95 which outfall to the south branch of the Salt River.

17. Cross-Culvert Outfall (Sta 489+95)

A detention basin south of the mainline with a 24" cross-culvert outfall to the Salt River generally collects all roadway and right-of-way drainage between Sta 485+00 and McKellips Road. Hydraulic grade line profiles are illustrated on the pipe profiles provided in Exhibit I. The cross-culvert is sized to provide conveyance of the 10-year on-site concurrent with the 100-year Salt River flood while maintaining one foot of freeboard for the surrounding properties.

18. Median Storm Drain Lateral (Sta 494+00±)

This system is provided for future catch basins required along the median west of the McKellips Road T.I. The median lateral outfalls to the roadside ditch along the south side of the freeway. The runoff eventually outfalls to the Salt River through the detention basin and cross-culvert outfall at Sta 489+95.

19. McKellips Road Ramp B (Sta 509+00±)

Runoff is collected prior to McKellips Road and conveyed to the Salt River through a temporary outfall ditch. The outfall ditch also conveys runoff from the right-of-way south and west of McKellips Road.

The storm drain system at this intersection will be developed in more detail with the McKellips Road to Country Club Drive initial design. Coordination with the Salt River Pima Maricopa County Indian Community may be required for drainage improvements north of freeway alignment.

20. Alma School Road at McLellan

The storm drain system at this intersection is similar to the system developed for the City of Mesa by AGK. However, the basins on Alma School Road outlet directly to the detention basin at the southwest quadrant of the T.I. The McLellan Road storm drain trunkline is also redirected to the detention basin.

21. Open Median Catch Basins

Catch basins are located at all sag low points in the open median and a locations prior to mainline superelevation cross-over points. Additional basins were provided where convenient cross-culvert junctions are required to provide an additional factor of safety.

IV. OFF-SITE DRAINAGE

A. General Discussion

The purpose of the off-site drainage system is to collect and route the 100-year 24-hour stormwater runoff generated by the contributing watershed under the Red Mountain Freeway to the Salt River. Generally, stormwater runoff flows in a southwesterly direction parallel to the freeway alignment. Therefore, the size of the off-site drainage facilities for this reach of the freeway may be smaller in comparison to other sections of the freeway. A detailed description of the assumptions and methodologies utilized in the off-site hydrologic analyses were presented in Section II. Results of these analyses were used in the design the off-site drainage system.

Outfalls for the off-site drainage system were designed to accommodate on-site flows where possible. An attempt was made to reduce the number of outfalls through the bank protection and minimize National Pollutant Discharge Elimination System (NPDES) permit issues.

B. Channel Design

The majority of the off-site drainage channels adjacent to the Red Mountain Freeway will collect and route runoff from the highway embankment and local drainage to an appropriate river outfall. The right-of-way channels are designed as earth ditches. Due to constructibility and maintenance concerns the channels will typically include an 8-foot bottom width and 3 or 4 (horizontal) to 1 (vertical) side slopes. In areas where excessive velocities may occur, or where right-of-way is limited, the channel may require riprap, gunite, or concrete erosion protection.

C. Culvert Selection and Design

1. Alma School Drain

The Alma School Drain (Tempe Drain) is an existing channel that serves as a wasteway for the Tempe Canal as well as an outlet for local drainage. The channel crosses Alma School Road via a 3 barrel 10' X 6' RCBC and outlets at the Salt River just east of the Dobson Road realignment.

The design discharge for the Alma School Drain was determined by an Intergovernmental Agreement (IGA) between the State of Arizona, the City of Mesa, the Salt River Valley Water Users Association (SRVWUA), and the Flood Control District of Maricopa County (FCDMC). The total design flow is 845 cfs and is defined as follows:

Table IX
Alma School Drain Contributing Flows

Governmental Agency	Discharge (cfs)	Percent of Flow
SRVWUA	645	74
City of Mesa	180	21.3
ADOT	40	4.7
Total IGA Discharge	845	100

Initially, the Alma School Drain RCBC was sized to pass the design event (845 cfs) without ponding water outside of ADOT right-of-way during a 100-year flow in the Salt River. In addition, the culvert was designed to outfall above the 10-year water-surface elevation of the Salt River. A 2 barrel 6' X 7' RCBC was initially selected for the cross culvert and is located along the existing Alma School Drain alignment.

The SRVWUA then requested that ADOT adopt their criteria for RCBC design. Their criteria requires 1.5' of open space through the culvert (pressure flow not allowed) and recommends 3' of freeboard within the channel section.

Mr. Robert Hurley, an adjacent property owner, also requested that ADOT increase the capacity of the RCBC to allow stormwater runoff from his property to be routed through the Alma School Drain structure to the Salt River. He requested that the capacity be increased 150 cfs.

Negotiations between ADOT, SRVWUA, and Mr. Hurley resulted in a final box size of 2-8' x 8' RCBC was chosen for the design. Hydraulic computations for this culvert are included in Appendix C.

2. McLellan Road Storm Drain

The existing McLellan Road storm drain is an RCP, varying in size from 36" to 54", that outlets into a concrete lined channel west of Alma School Road. The channel then routes flows through the sand and gravel operations to a pipe which discharges into the Salt River. Engineering documentation for the storm drain was not available from the City of Mesa. It was assumed that the McLellan Road storm drain was designed to route the runoff generated by the 10-year event in the street section to the Salt River.

The off-site hydrologic analyses indicates that during the 100-year, 24-hour event, substantially more runoff flows to the intersection of McLellan Road and Alma School Road than the pipe can convey. The runoff may pond over a large area of Alma School Road and adjacent streets then outlet to the McLellan Road storm drain, the existing gravel pits, or the Alma School Drain.

At the intersection of McLellan Road and Alma School Road, the Red Mountain Freeway drainage system utilizes a detention basin at the southwest quadrant of the interchange which collects both on-site and off-site stormwater runoff. A 54" circular pipe conveys the runoff under the Red Mountain Freeway to the Salt River.

The cross-culvert was sized to convey the 100-year design discharge to the Salt River with a design headwater elevation lower than the McLellan Road storm drain soffit elevation. Therefore, the McLellan Road storm drain will not be impacted by the relocated outfall. A hydraulic grade line was calculated for the McLellan Road storm drain and is presented in Appendix D.

3. Cross-Culverts

On-site and off-site runoff concentrating in the south right-of-way ditch between Sta 485+00 and McKellips Road is conveyed to a detention basin which outfalls to the south branch of the Salt River through a 24" pipe. The pipe was sized to provide 1 foot of freeboard between the design headwater elevation and the surrounding existing ground elevations. Detention basin routing and outfall hydraulics are presented in Appendix C. Outlet protection is not considered necessary because of the bank protection toe elevations are far below the outfall elevation.

The hydraulic and analysis for the detention basin in the southwest quadrant of the Alma School Road interchange is presented in Appendix C. Hydrology for the 54" cross-culvert is incorporated into the off-site HEC-1 model.

V. SALT RIVER HYDRAULICS

A. General Discussion

This section summarizes the hydraulic analyses performed on the Salt River for the Red Mountain Freeway (Phase II). The discharge used for these analyses is the pre-Roosevelt 100-year flow of 220,000 cfs. Detailed documentation of the analyses performed in support of the bank protection design is presented in a separate report titled "Salt River Hydrologic, Hydraulic, & Sediment Transport Analyses."

B. Design Conditions

Two design conditions were considered for the Salt River bank protection adjacent to the Red Mountain Freeway. The first hydraulic design condition only assumed south bank encroachments from the proposed Red Mountain Freeway bank protection. The major difference between existing conditions and the first design condition are encroachments along the south bank of the Salt River. The second design condition assumes full channelization of the Salt River utilizing north bank levee alignments developed by BSI/BRW. The north bank levees were hydraulically modeled with encroachments.

The design condition which produced the highest water surface elevation, plus freeboard, was used to define the levee height for the Red Mountain Freeway bank protection. The worst case design condition generally results from the BSI/BRW north levee in combination with the Red Mountain Freeway bank protection. Table X presents the design 100-year water-surface elevations adjacent to the Red Mountain Freeway. The water surface elevations presented in Table X were used to develop hydraulic grade lines for the cross-culvert outfalls under the Red Mountain Freeway.

C. Selection of Bank Protection Toe Down Elevations

The selection of the toe down elevations for the hardbank was determined by subtracting either the theoretical scour depth or a 10-foot minimum toe down from the invert elevation of the channel. However, due to extremely limited right-of-way, the area adjacent to the settling ponds (sand and gravel operation east of Ama School Road) utilized a slightly different criteria.

A 10' foot vertical mining easement was granted to the sand and gravel operator. This 10-feet is measured from the existing ground elevation shown on the Red Mountain Freeway topographic mapping. The theoretical scour depth was added to the mining easement to determine the total scour depth.

The hardbank typical section in the area adjacent to the settling ponds is composed of a vertical cutoff wall and CSA (1H:1V). Geotechnical and structural analyses indicated that an additional 10 feet of toe down (below the computed scour elevation) was required for stability. This 10-foot dimension was included in the determination of the design toe elevation.

Table X
100-Year and 10-Year Design Salt River Water Surface Elevations
(Q_{100}=220,000 cfs, Q_{10}=93,000 cfs)

SR202L Cst. Centerline Station	HEC-2 Cross Section Number	CSA Control Line Station	100-Year WSE (ft)	10-Year WSE (ft)
400+00	224.90	0+52.9	1182.6	1172.9
403+00	225.00	3+57.7	1183.3	1173.2
408+00	225.10	8+58.0	1183.6	1173.5
414+00	225.19	14+66.9	1183.2	1174.1
418+00	225.28	19+00.0	1184.3	1174.8
432+00	225.38	31+24.4	1185.4	1176.0
436+00	225.48	35+26.2	1185.7	1176.0
441+00	225.57	40+27.6	1187.3	1178.6
446+00	225.66	45+36.4	1187.8	1179.3
451+00	225.76	50+00.0	1188.4	1180.1
456+00	225.85	55+92.7	1189.8	1181.4
460+00	225.95	60+99.4	1190.8	1181.7
465+00	226.04	66+00.0	1191.5	1182.4
469+00	226.13	69+54.0	1191.7	1182.6
471+00	226.23	No CSA	1191.1	1183.1
472+00	226.35	No CSA	1194.7	1185.5
473+00	226.50	No CSA	1197.7	1194.3
474+00	226.53	No CSA	1201.4	1195.8
478+00	226.58	No CSA	1202.0	1196.3
488+00	226.61	108+96.5	1204.4	1198.0
495+00	226.70	115+09.0	1206.0	1199.2

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EXHIBIT I

Final Drainage Plans
(95% Submittal)

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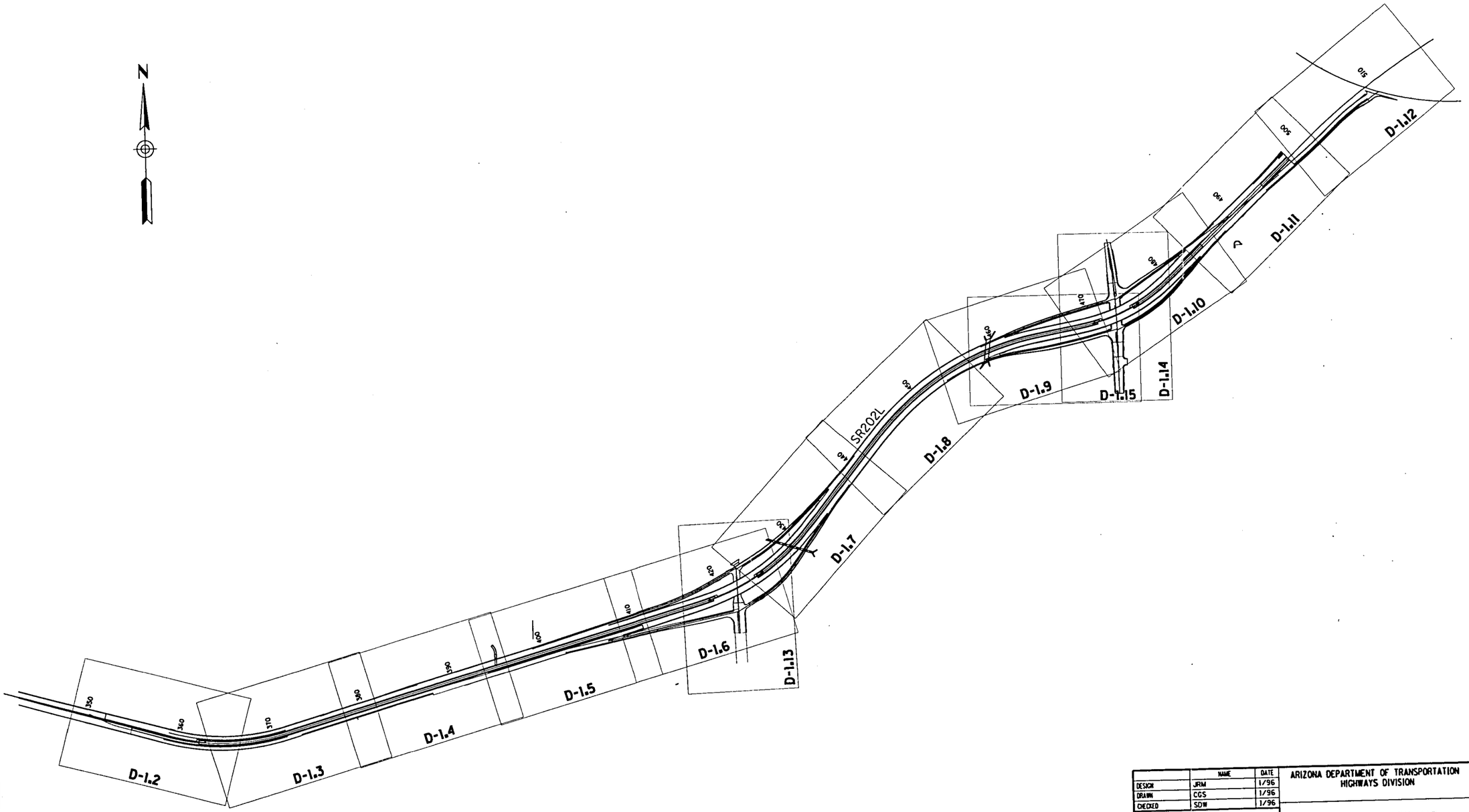

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STORM DRAIN KEY MAP

ROUTE: 202L
LOCATION: RED MTN - SR 101L - McKELLIPS ROAD
DWG NO. D-1.1

TRACS NO. H087502C

600-8-(006)

___ OF ___

SURVEY NO.	F.A.	WYS	REVISIONS	LOCATION	DATE

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

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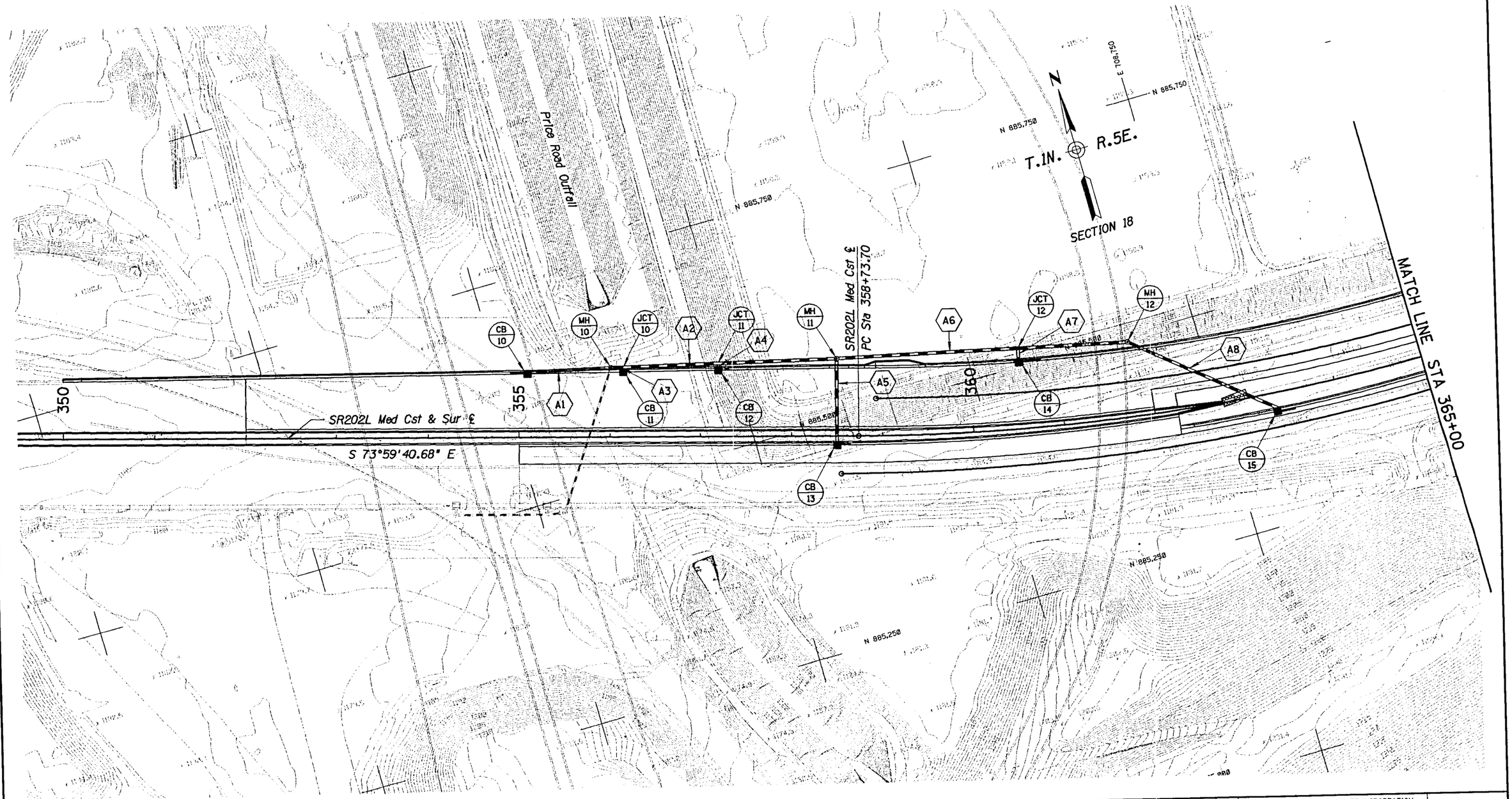

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DRAINAGE PLAN
SR202L
STA 350+00 TO STA 365+00

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.2

SURVEY NO.	FN#	NG	REVISIONS	LOCATION	DATE

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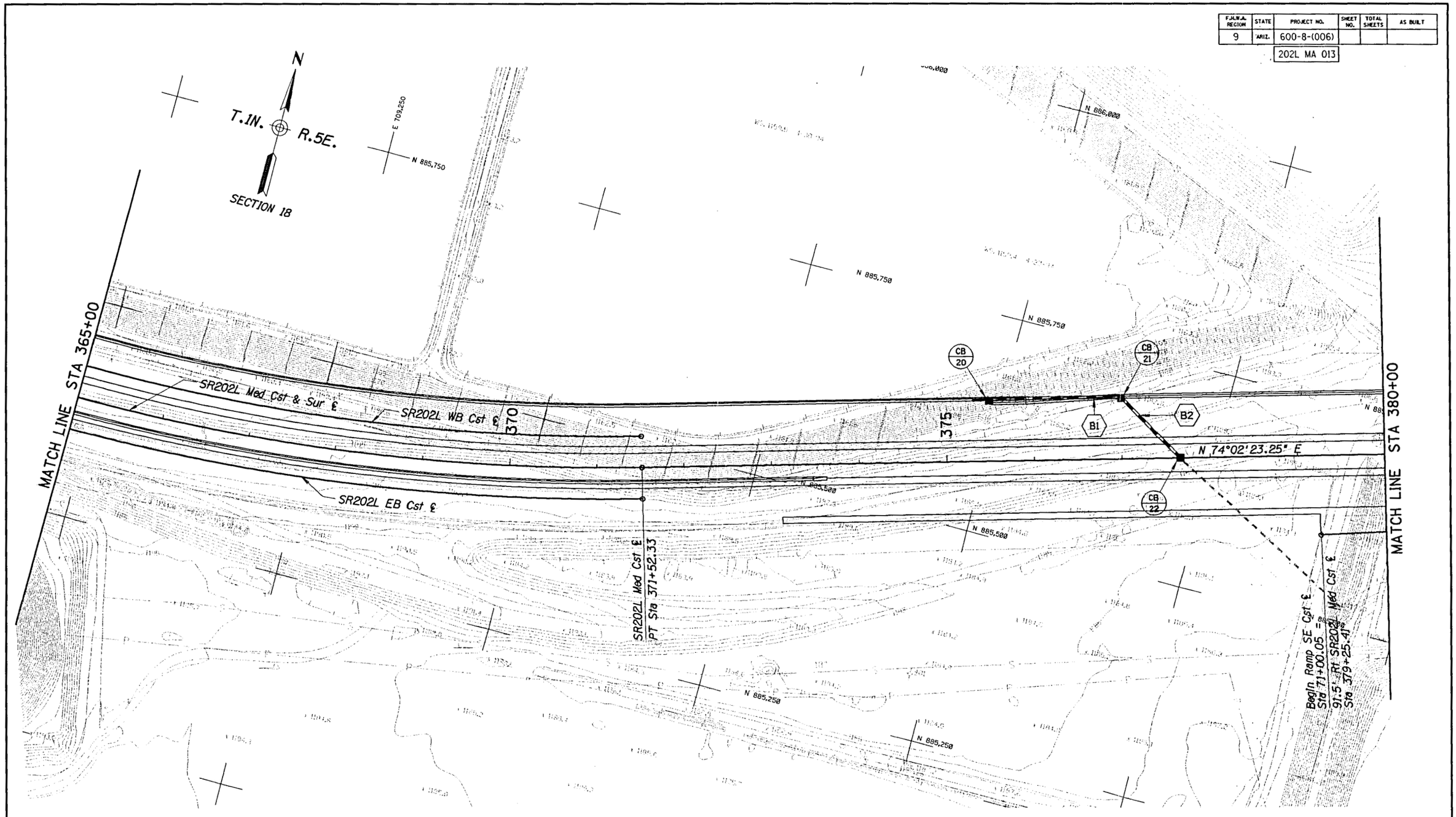

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DRAINAGE PLAN
SR202L
STA 365+00 TO STA 380+00

ROUTE: 202L
LOCATION: RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.3

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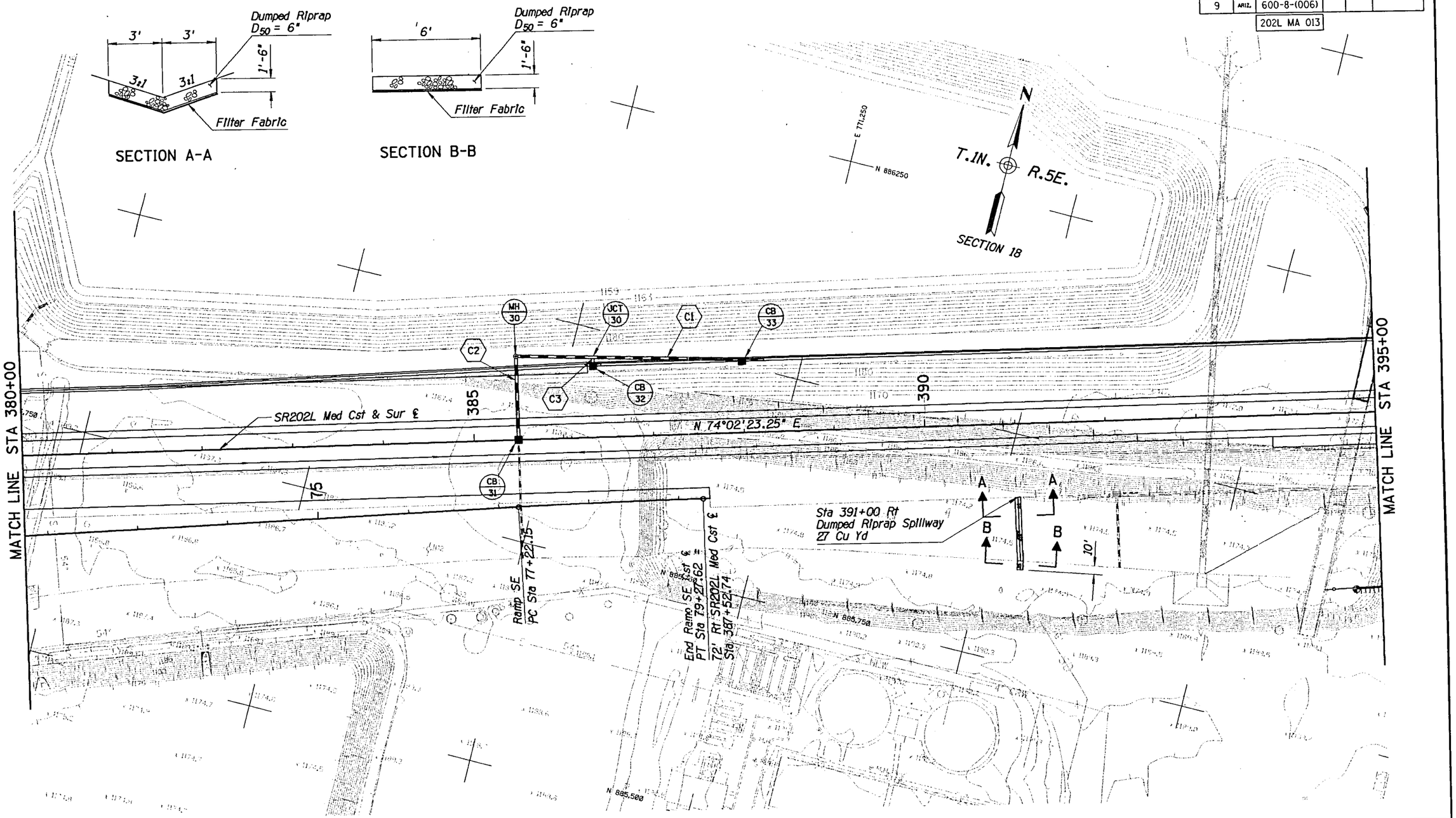

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DRAINAGE PLAN
SR202L
STA 380+00 TO STA 395+00

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.4

SURVEY NO.	FIELD BOOK	NO.	REVISIONS	LOCATION	DATE

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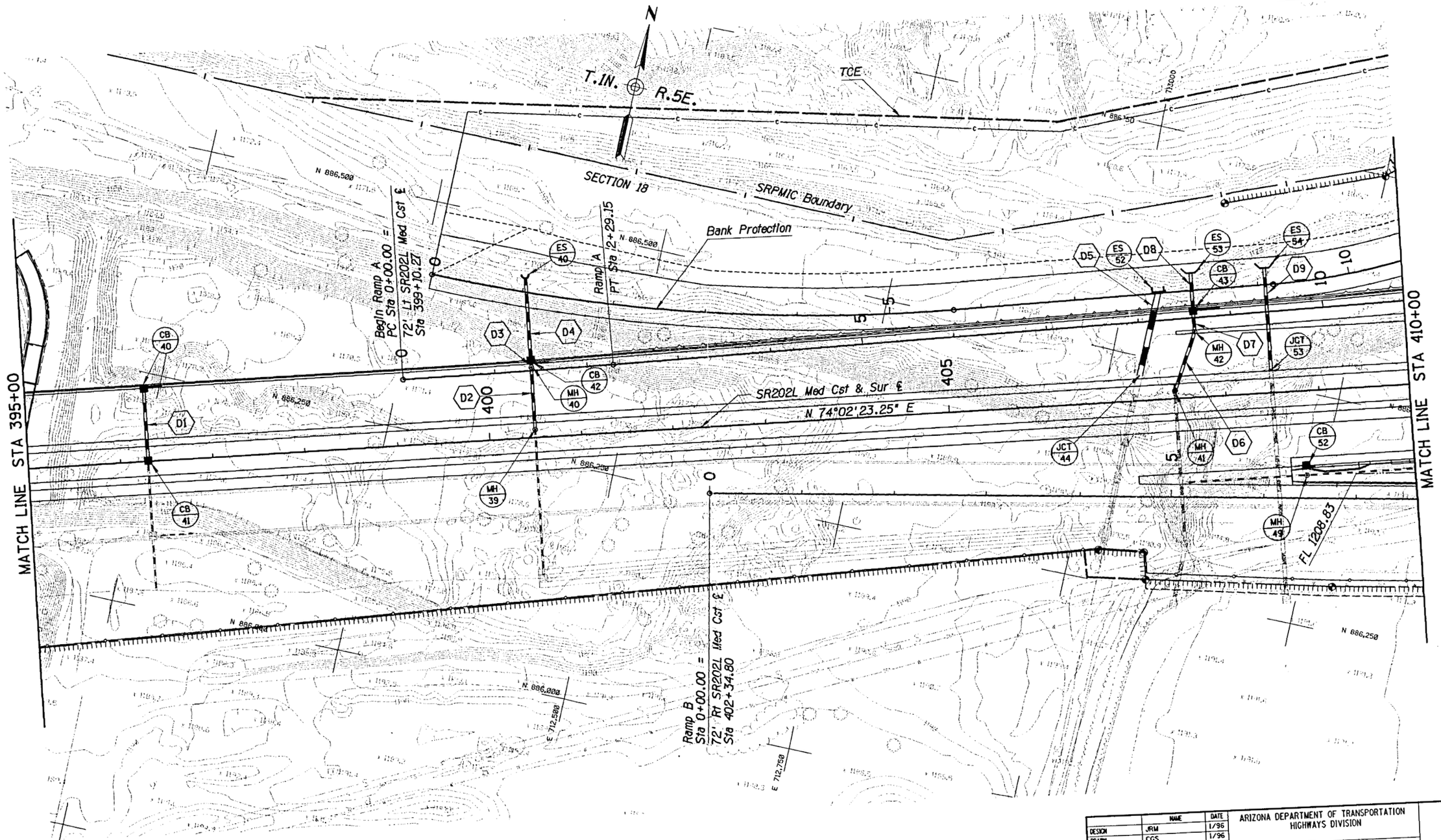

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 395+00 TO STA 410+00

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD | DWG NO. D-1.5

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

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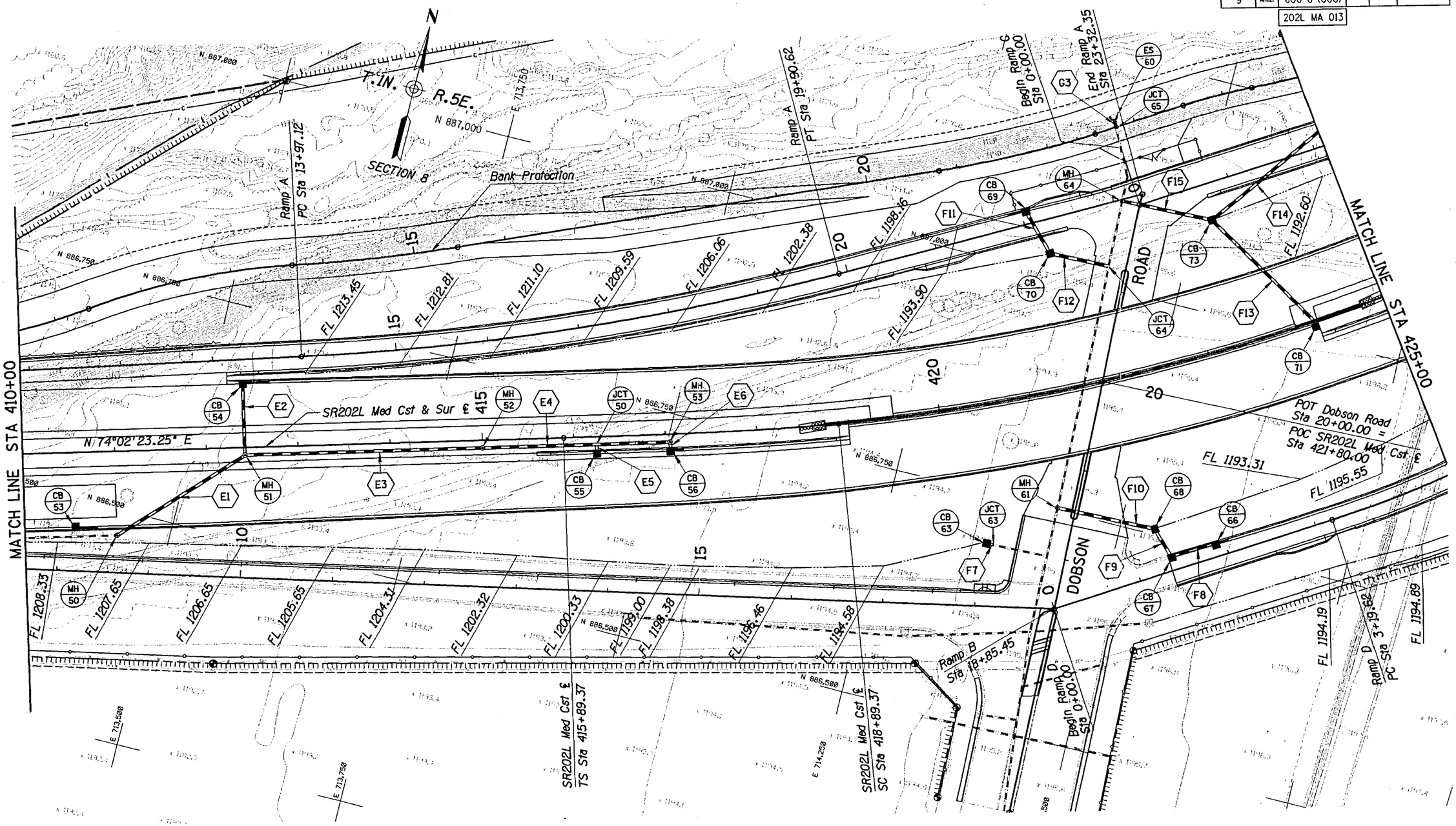

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 410+00 TO STA 425+00

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD | DWG NO. D-1.6

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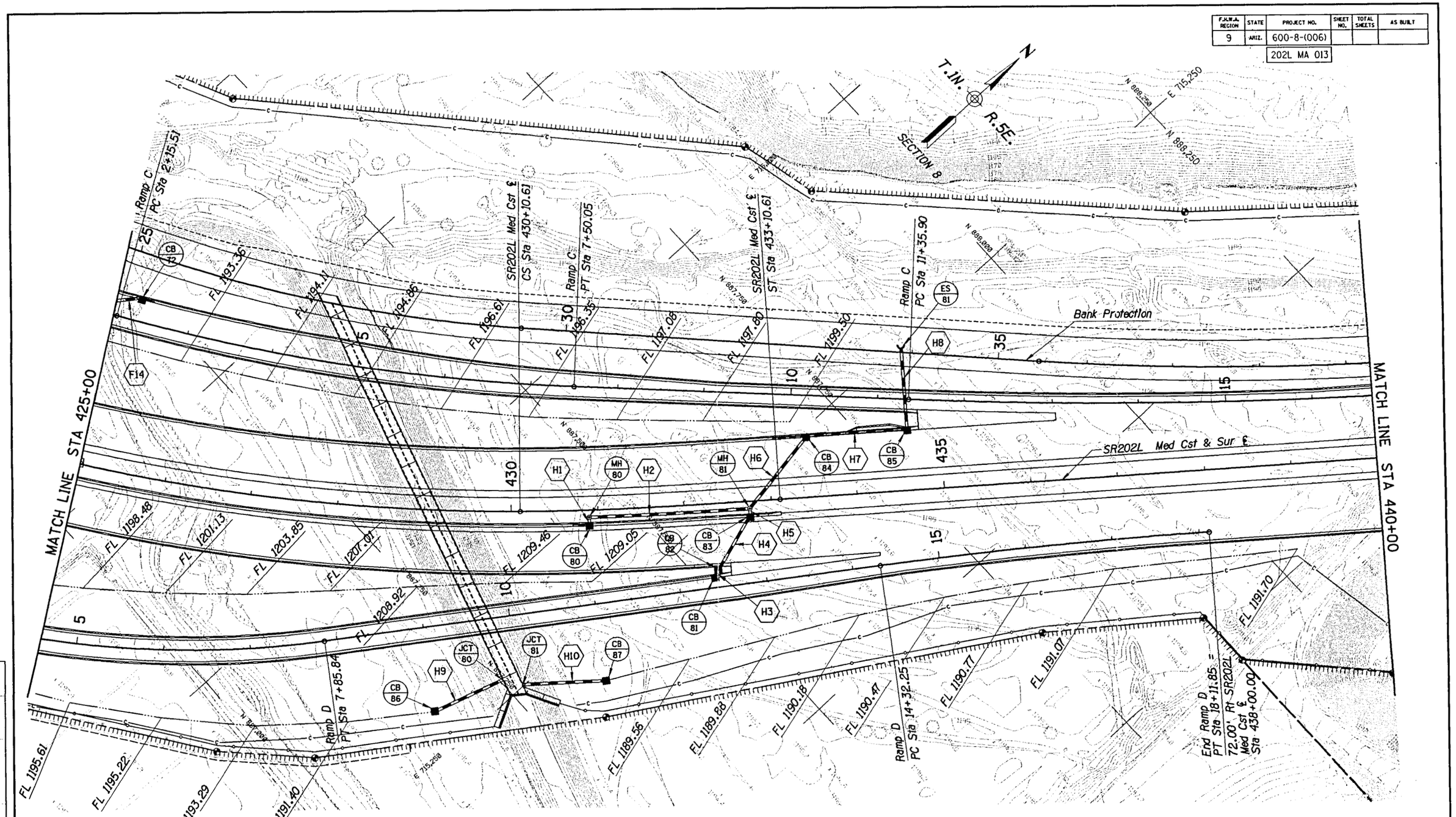

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HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 425+00 TO STA 440+00

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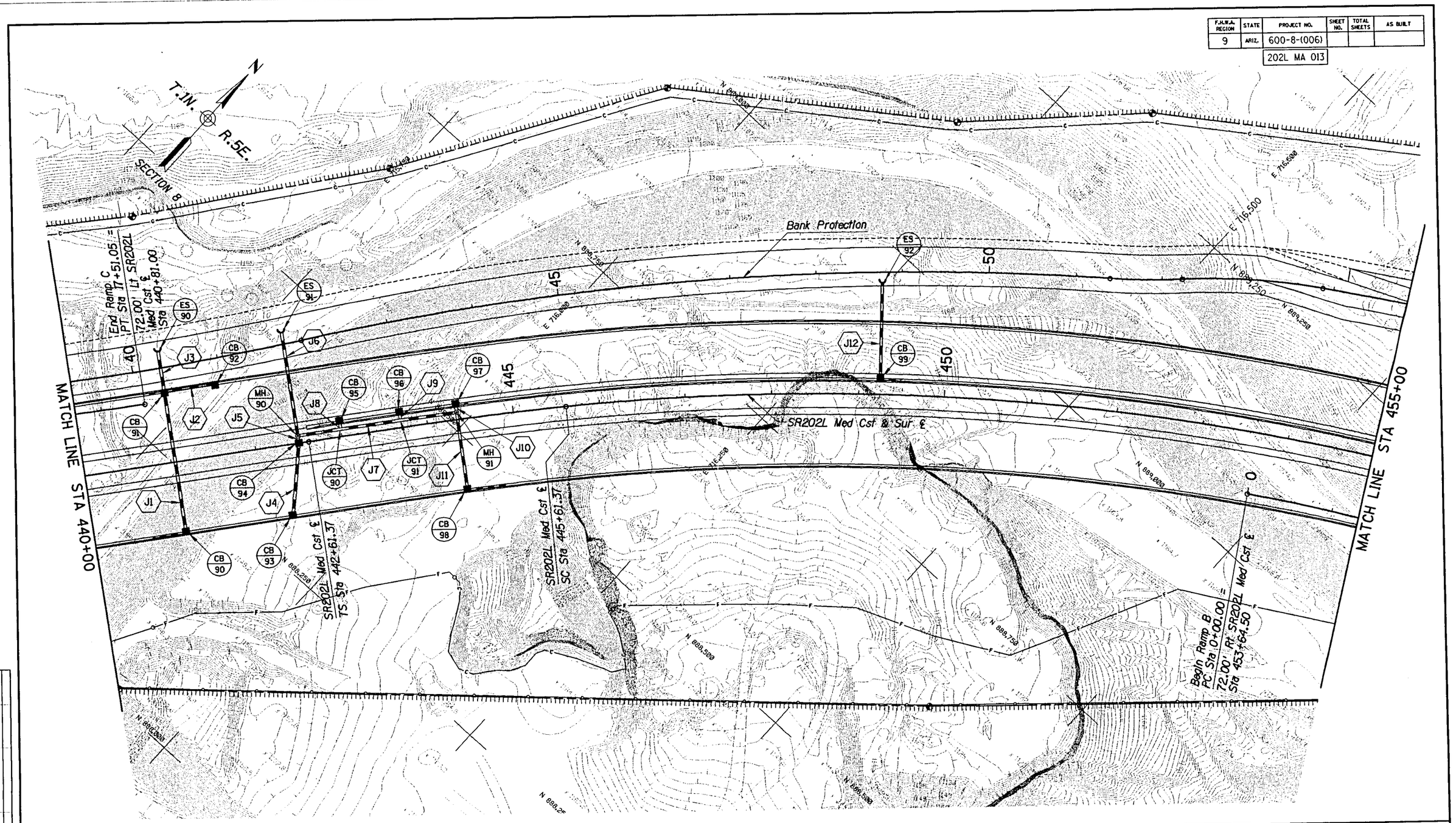

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 440+00 TO STA 455+00

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.8

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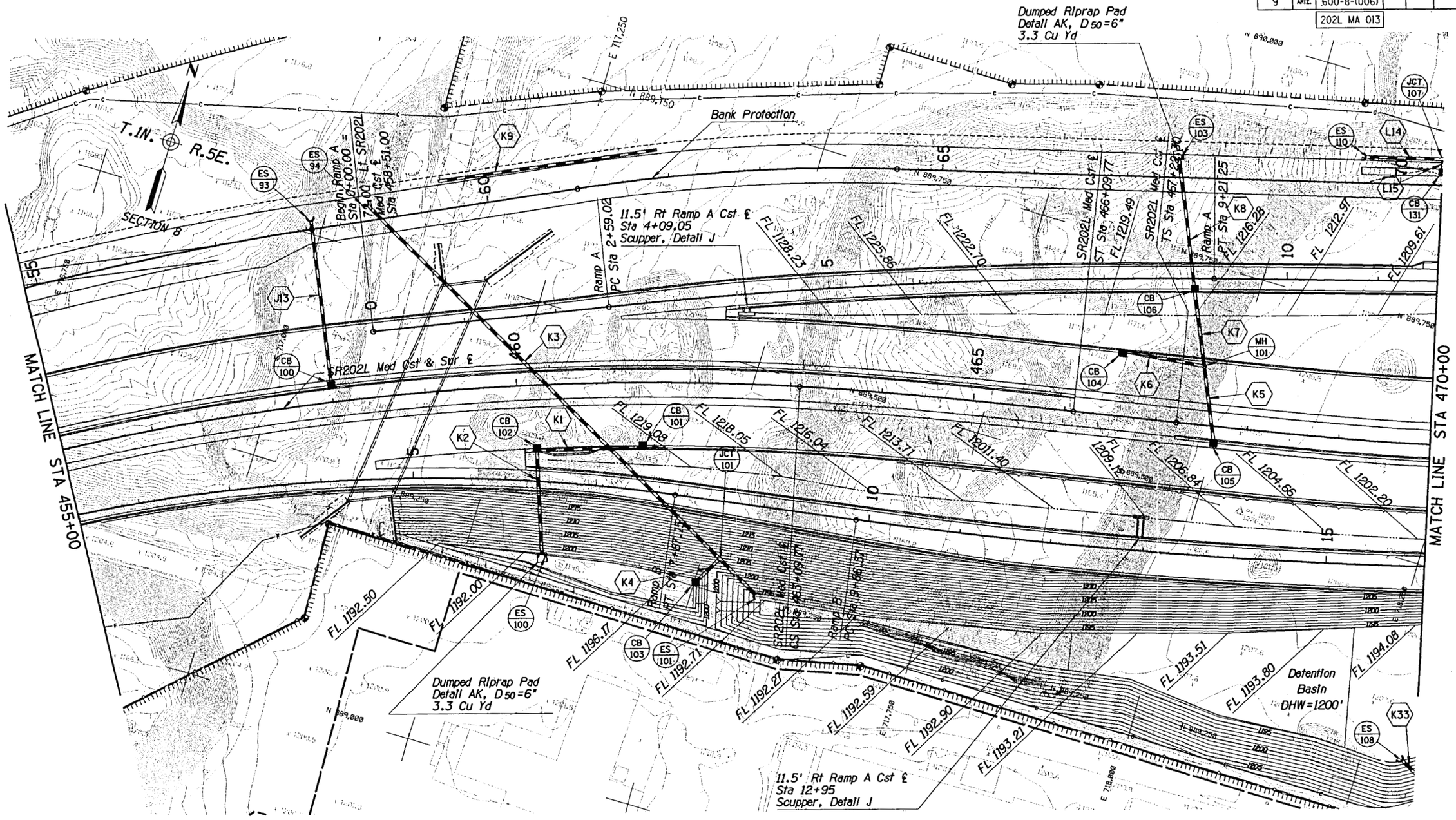

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 455+00 TO STA 470+00

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.9

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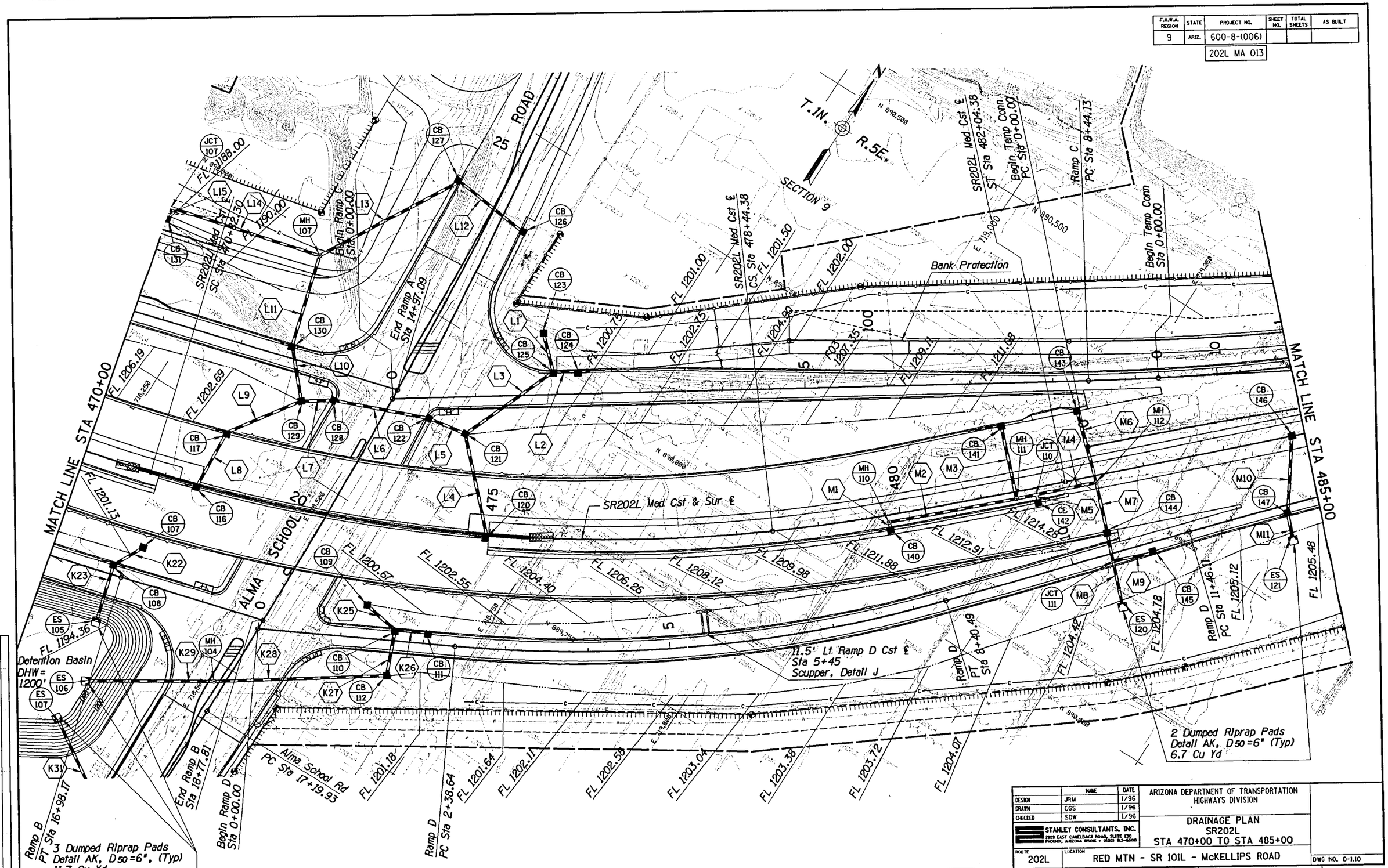

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 470+00 TO STA 485+00

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD | DWG NO. D-1.10

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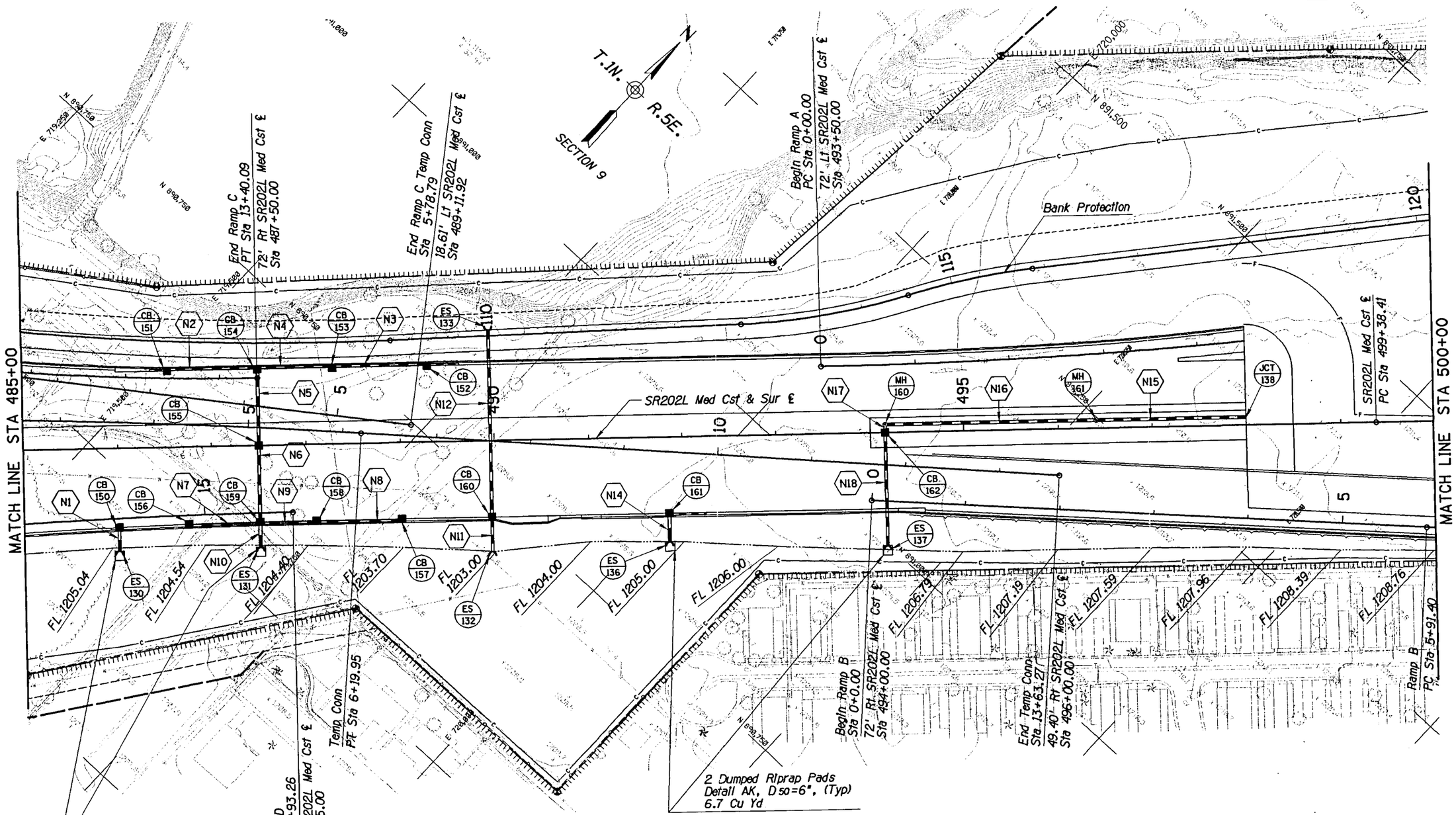

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 485+00 TO STA 500+00

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD | DWG NO. D-1.11

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

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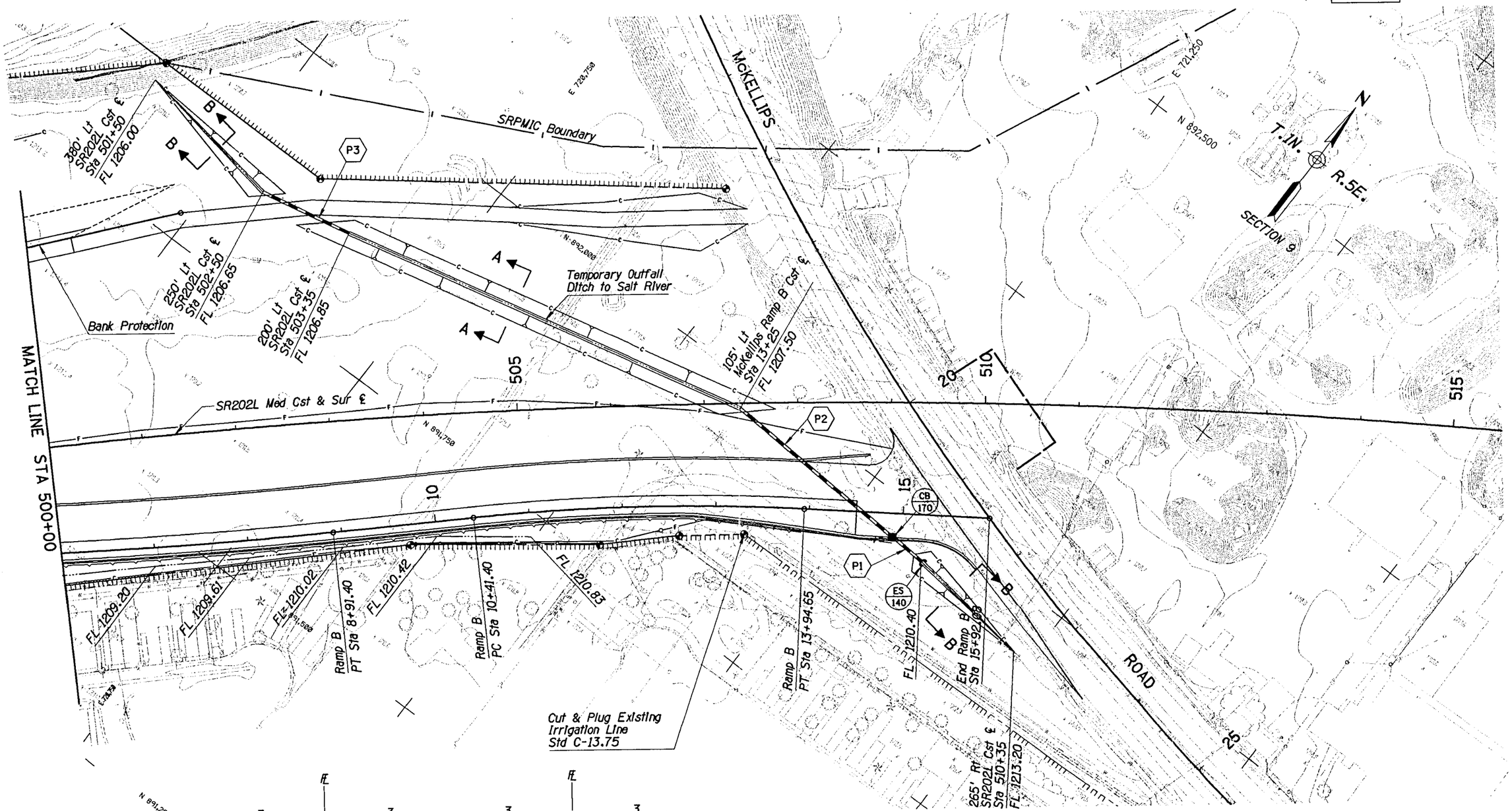
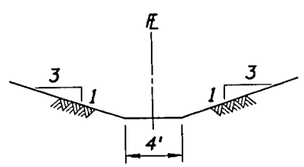
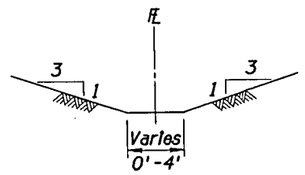




SECTION A-A
NTS



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	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85036 • (602) 312-6500

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 500+00 TO STA 515+00

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD | DWG NO. D-1.12

REVISIONS | DATE | LOCATION | SURVEY NO. | FN/SF

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

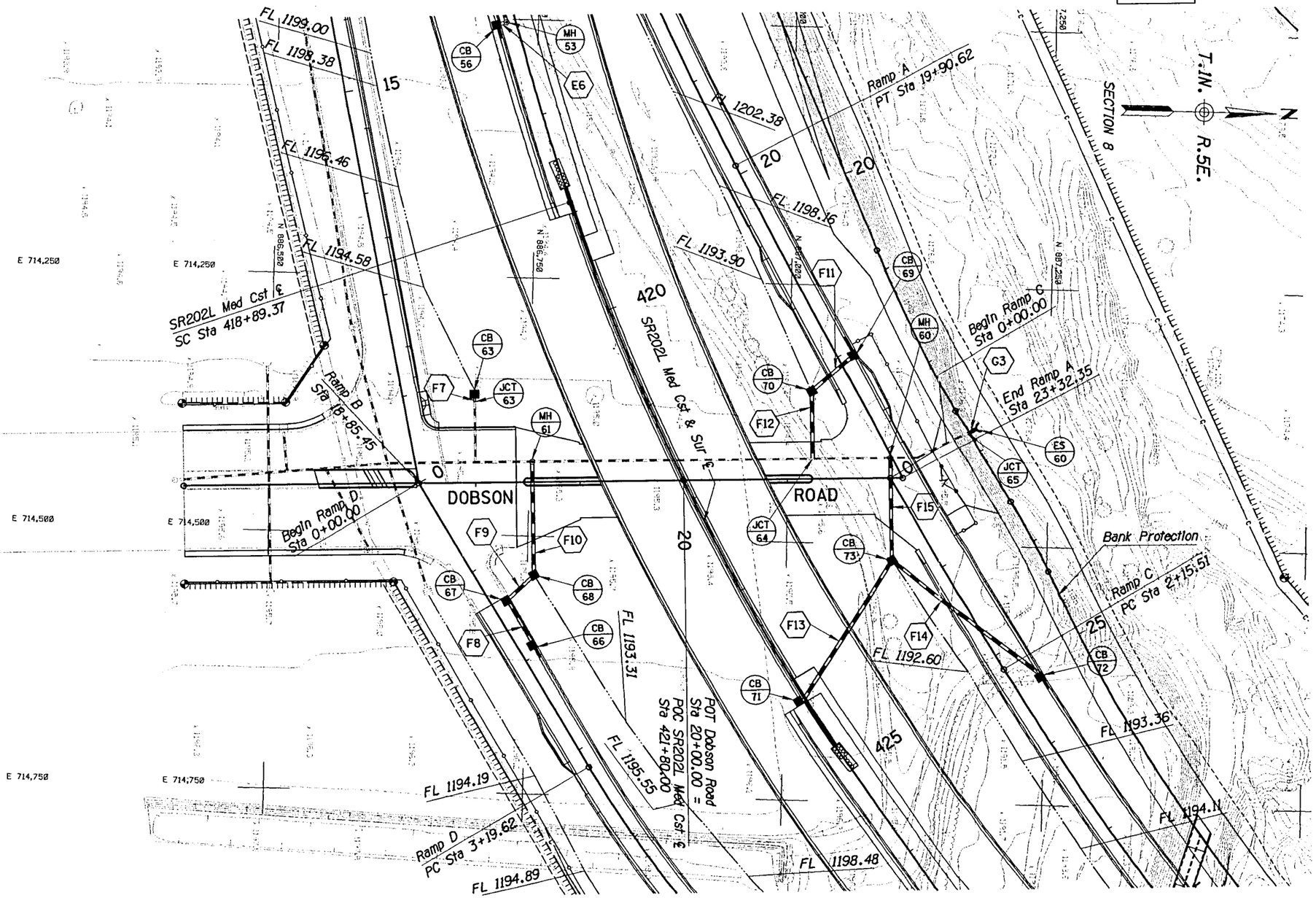
VIEW NAME: /12168/RM2D1-12.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
DOBSON ROAD

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.13

SURVEY NO.	FN#	NHS	REVISIONS	LOCATION	DATE

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C

600-8-(006)

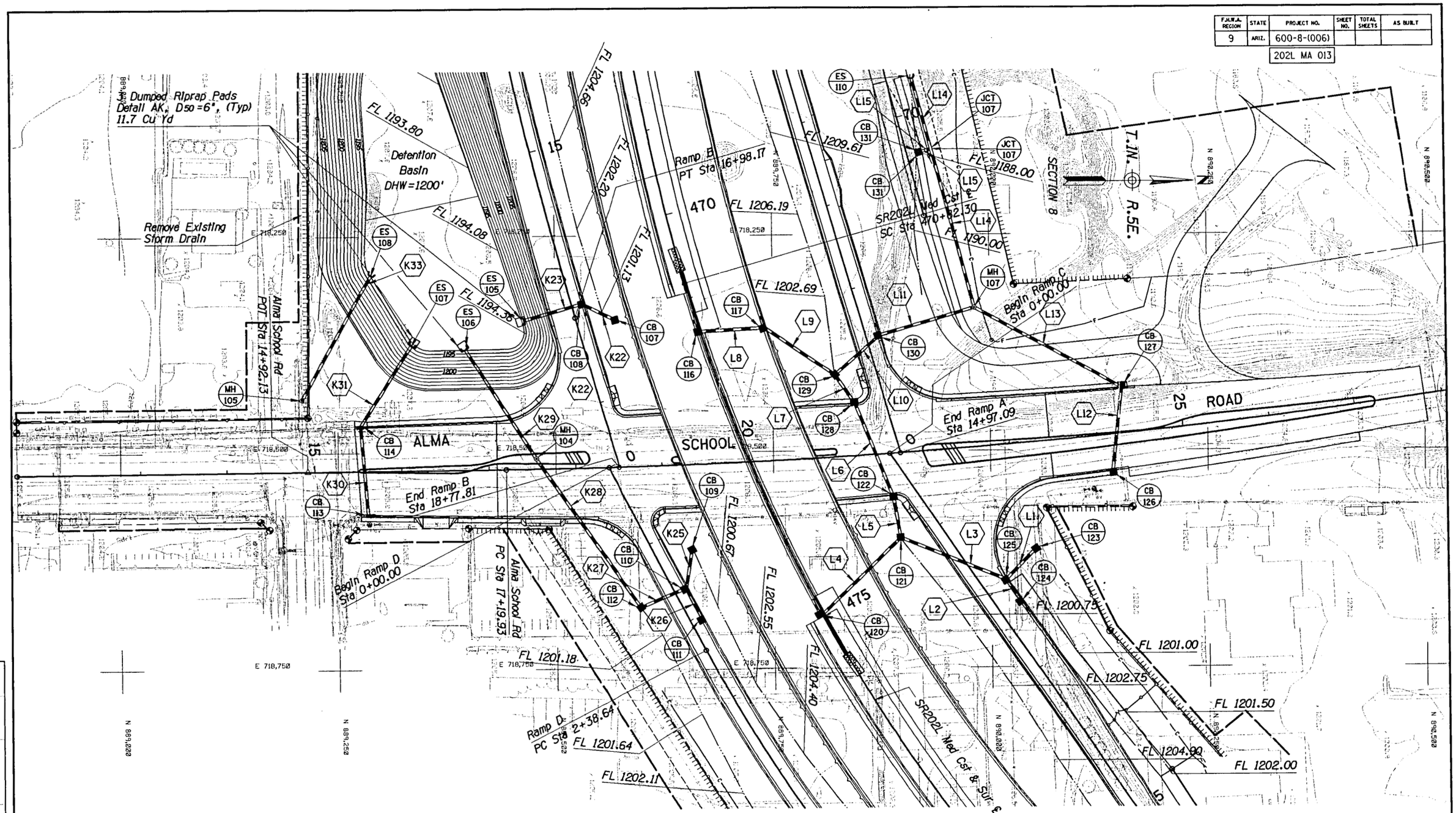
___ OF ___

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2D1-13.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 182-6000

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
ALMA SCHOOL ROAD

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.14

SURVEY NO. | FIELD BK. NO. | REVISIONS | LOCATION | DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2D1-14.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

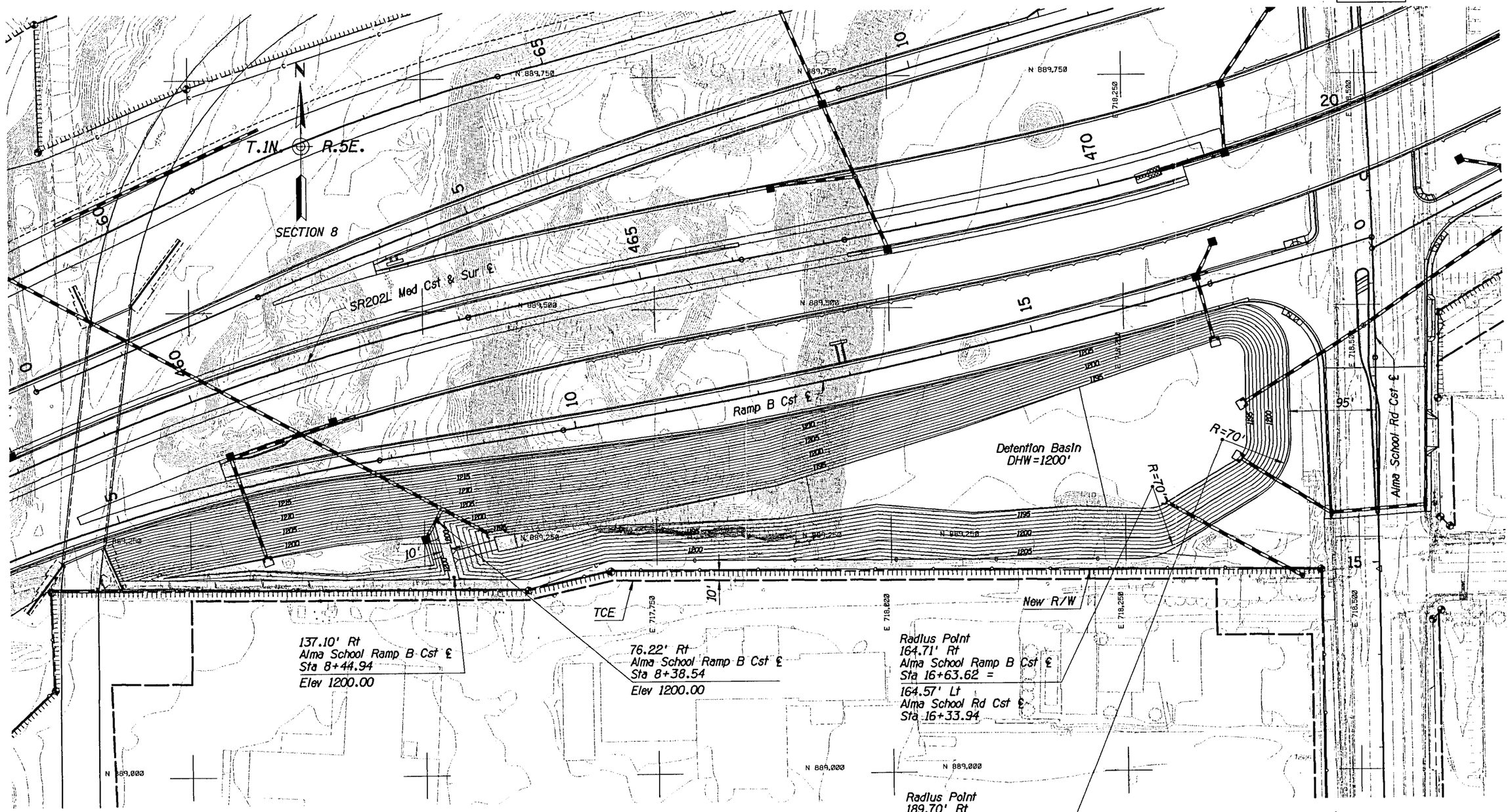
TRACS NO. H087502C

600-8-(006)

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



NOTE:
For Pipe Culvert Information, See Drainage Plans

	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 182-6600

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
DETENTION BASIN

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.15

SURVEY NO.	FINISHED	REVISIONS	LOCATION	DATE

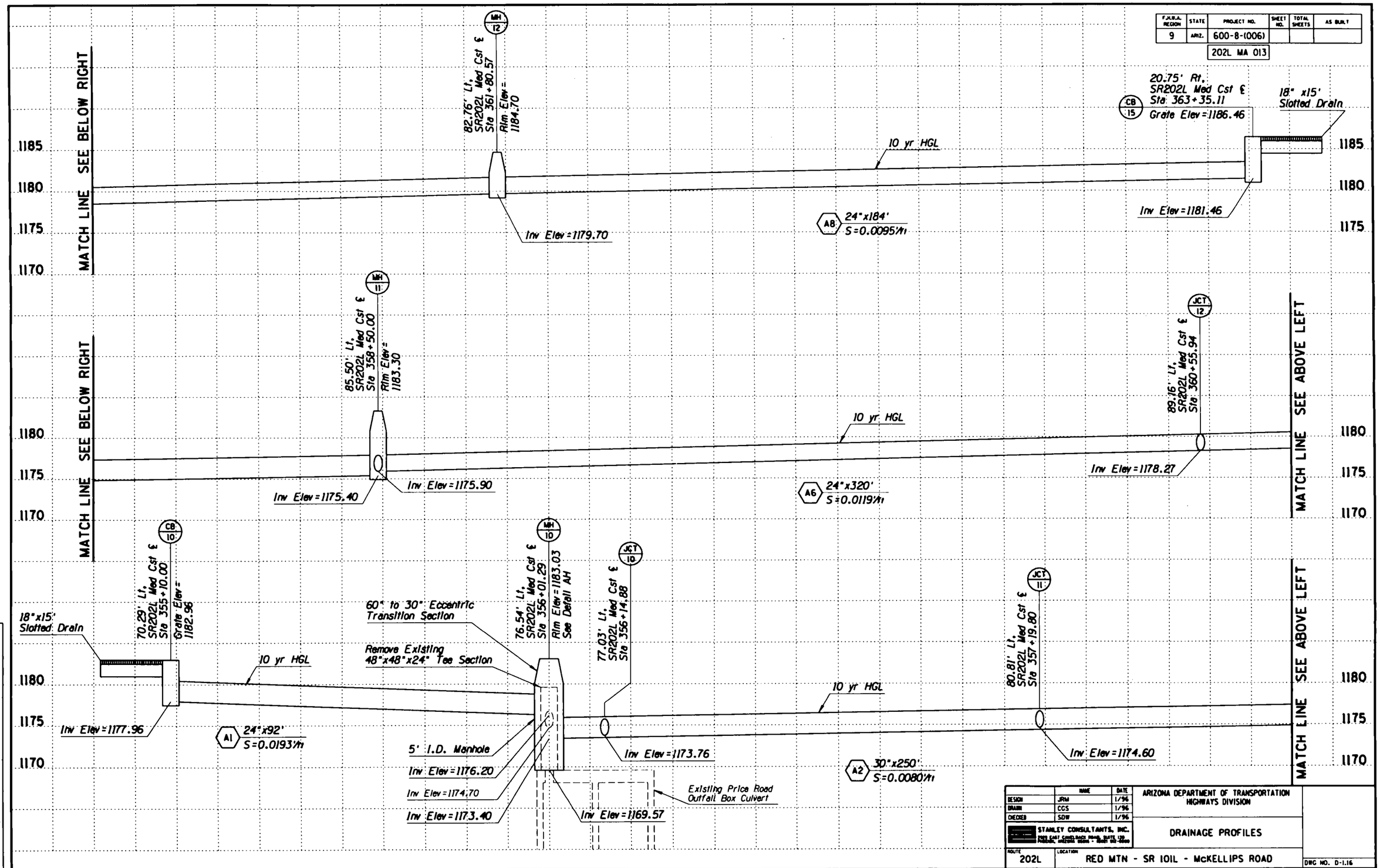
•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2D1-XX.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CCS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7955 EAST CHAPARRAL ROAD, SUITE 120
SCOTTSDALE, ARIZONA 85250 - (602) 483-8500

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.16

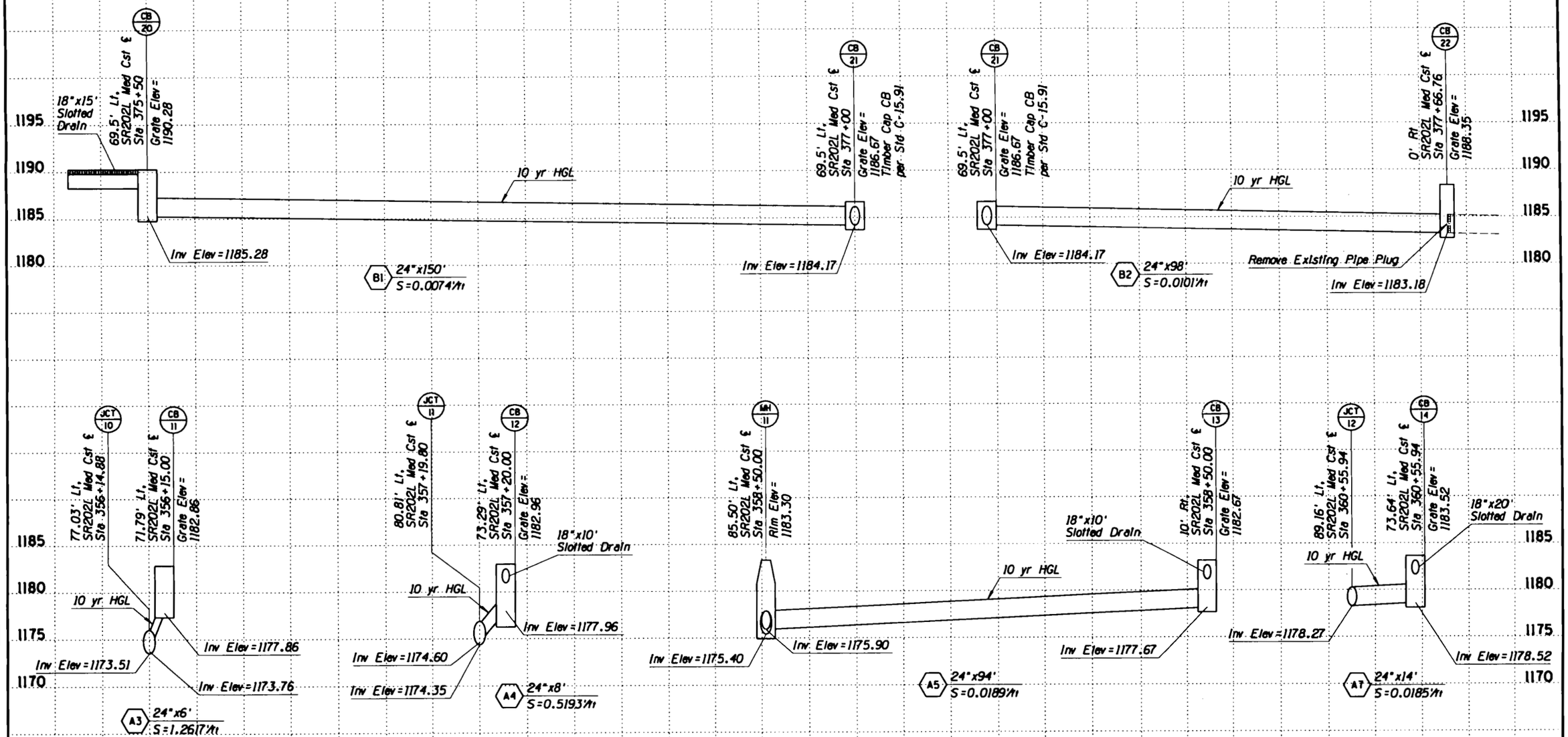
TRACS NO. H087502C | 600-8-(006) | ___ OF ___

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-16.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
2555 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85016 • (602) 955-6000

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.17

NO.	FIX	REVISION	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

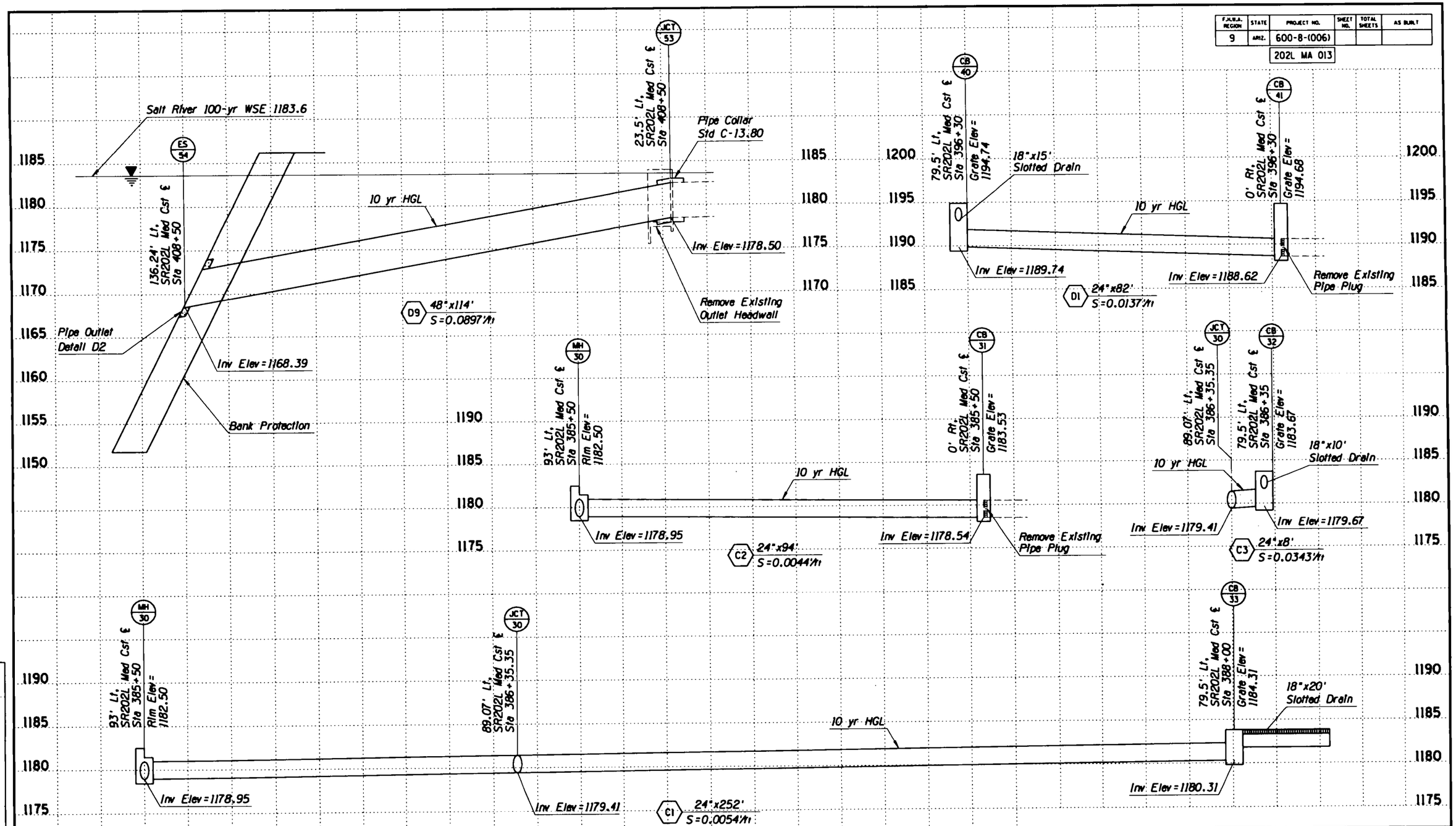
VIEW NAME: /12168/RM2D1-17.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SOW	1/96

STANLEY CONSULTANTS, INC.
2905 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85016 • (602) 952-0666

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.18

TRACS NO. H087502C

600-8-(006)

___ OF ___

SURVEY NO. | FB | NO | RE-FILMING | LOCATION | DATE

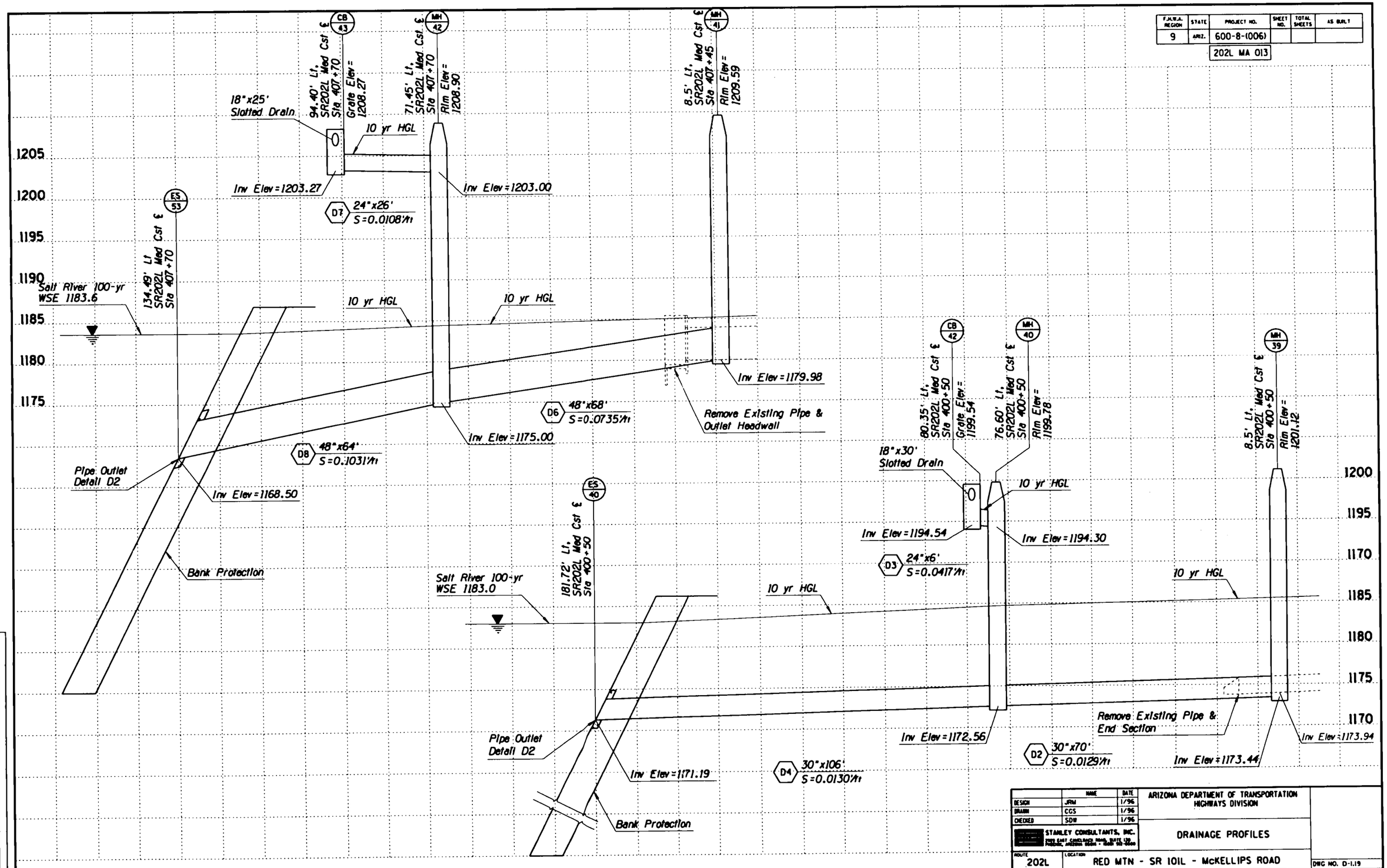
•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-18.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.19

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2D1-19.DGN

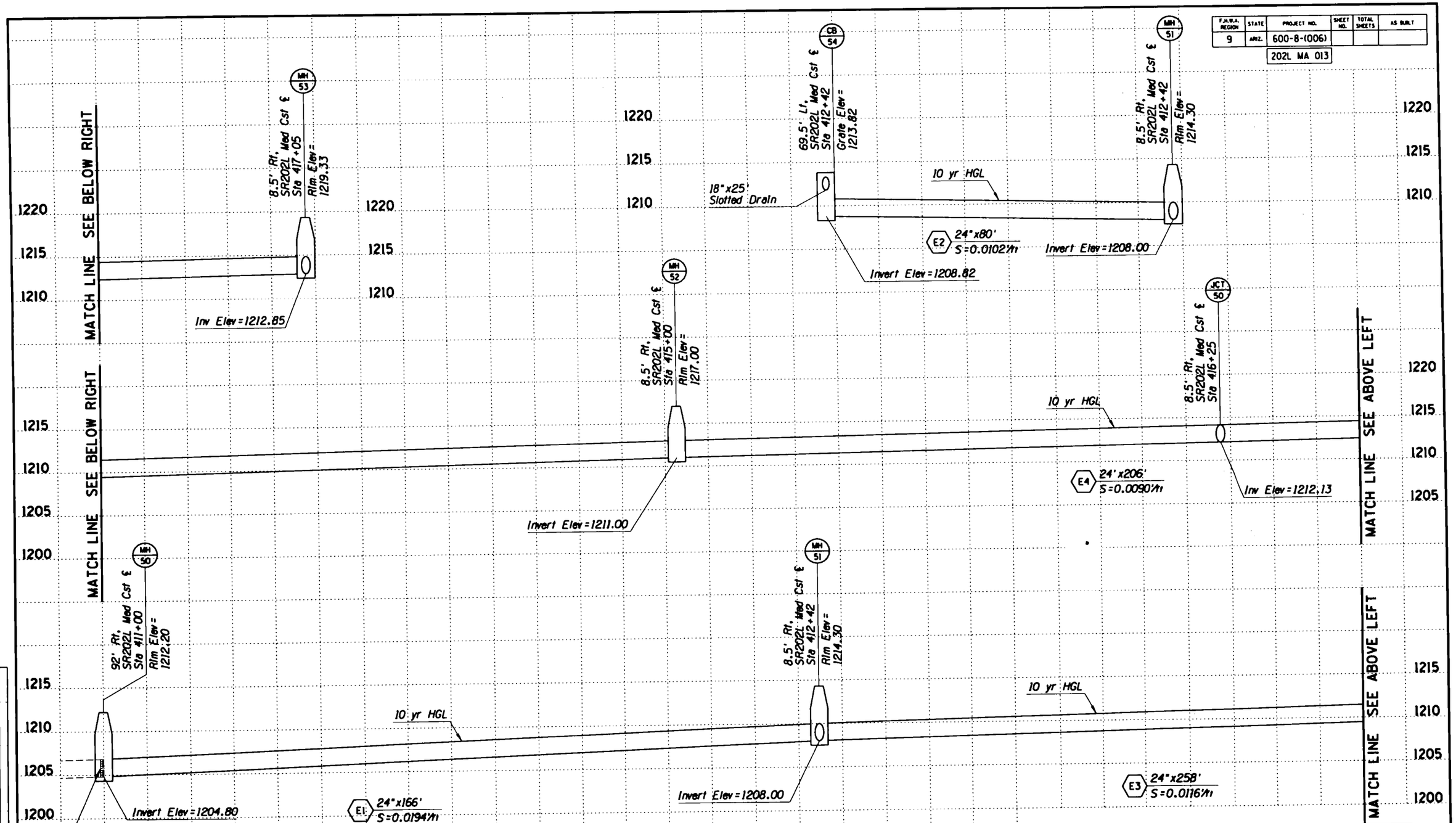
PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C

600-8-(006)

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.20

TRACS NO. H087502C

600-8-(006)

___ OF ___

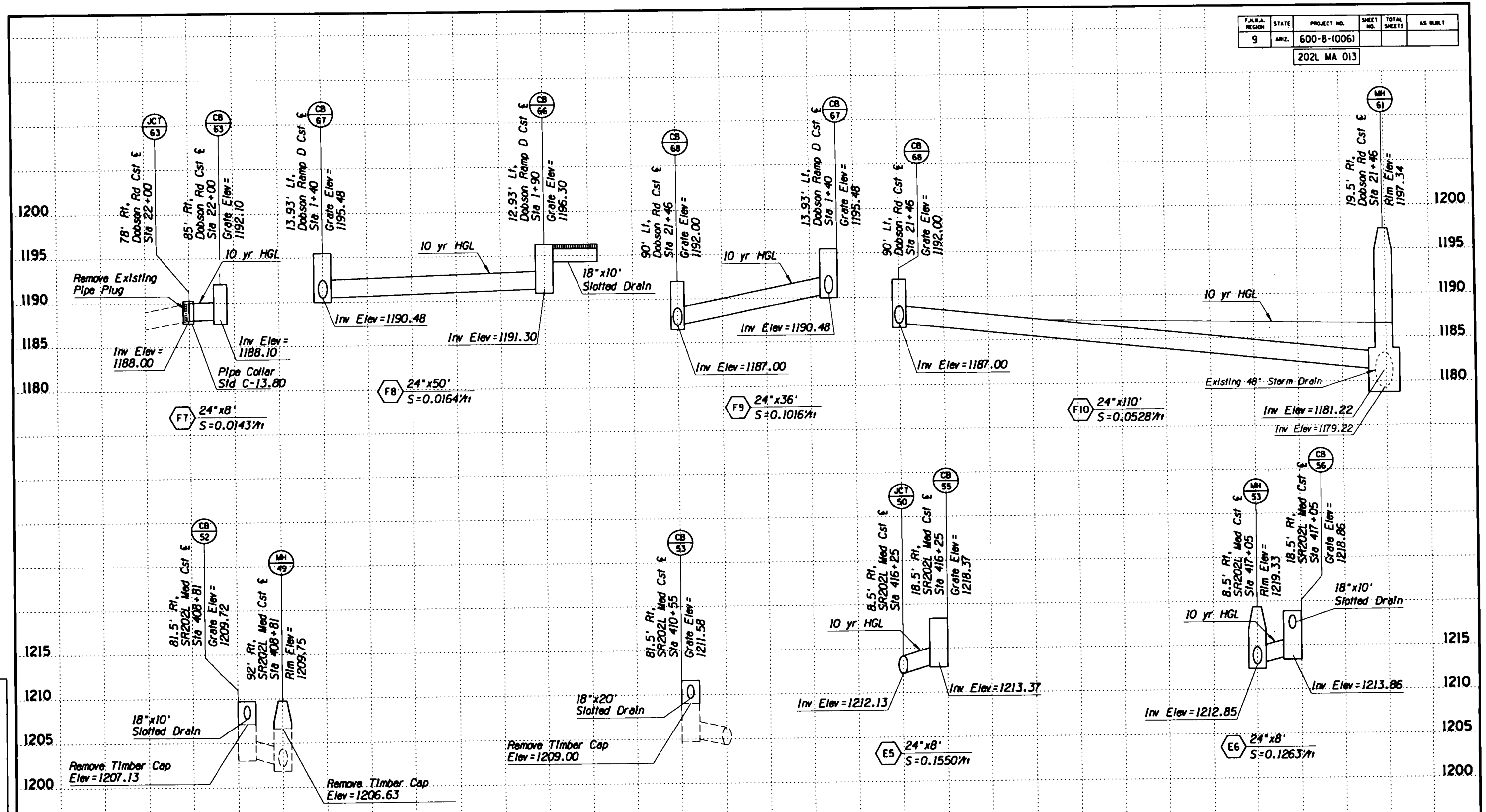
•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-20.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7900 EAST CAMELBACK ROAD, SUITE 120
SCOTTSDALE, ARIZONA 85251 • (602) 945-2600

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.21

TRACS NO. H087502C

600-8-(006)

___ OF ___

SURVEY NO. | FB | REVISIONS | DATE | LOCATION | DATE

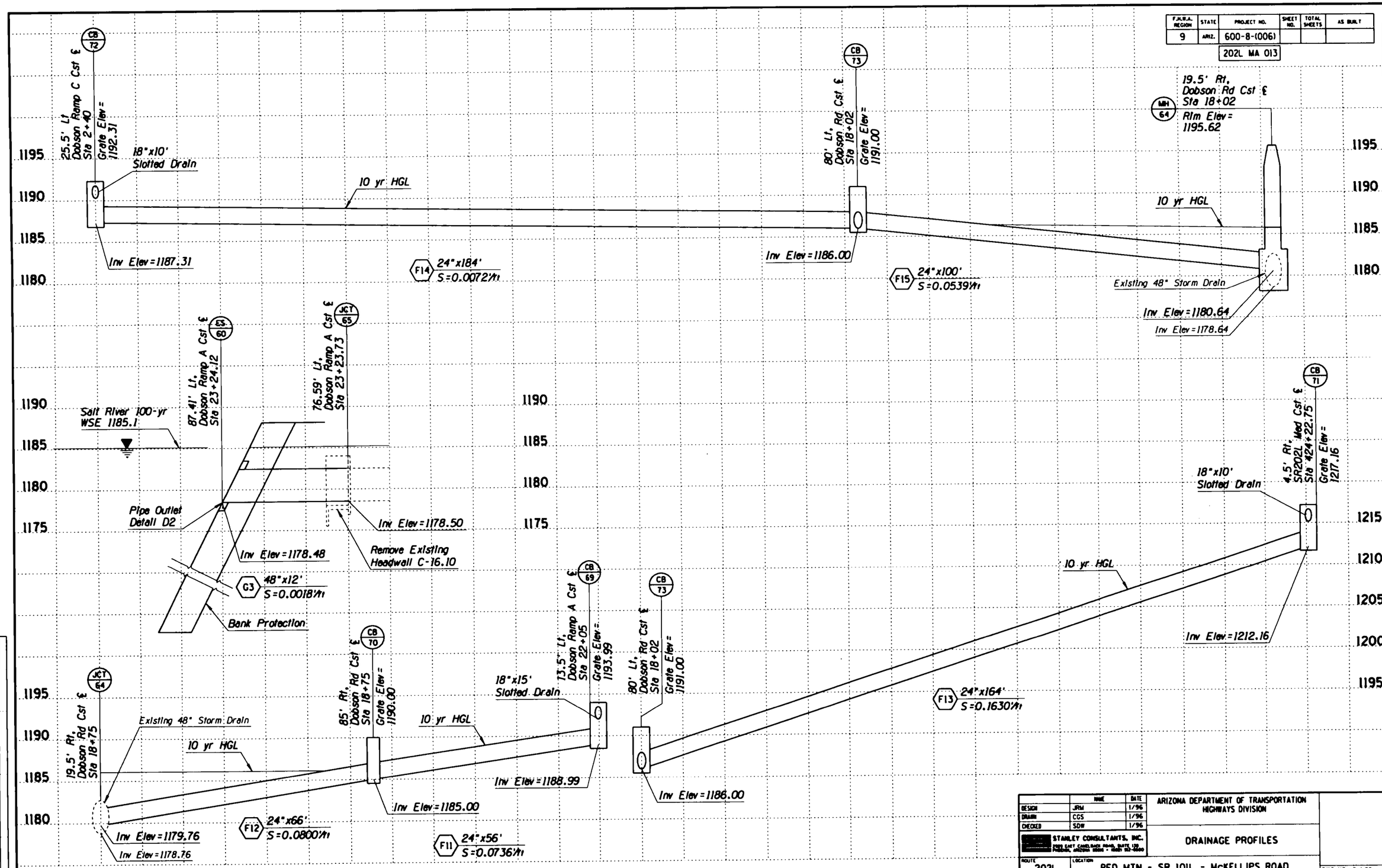
•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-21.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
3005 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85016 • (602) 912-0060

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

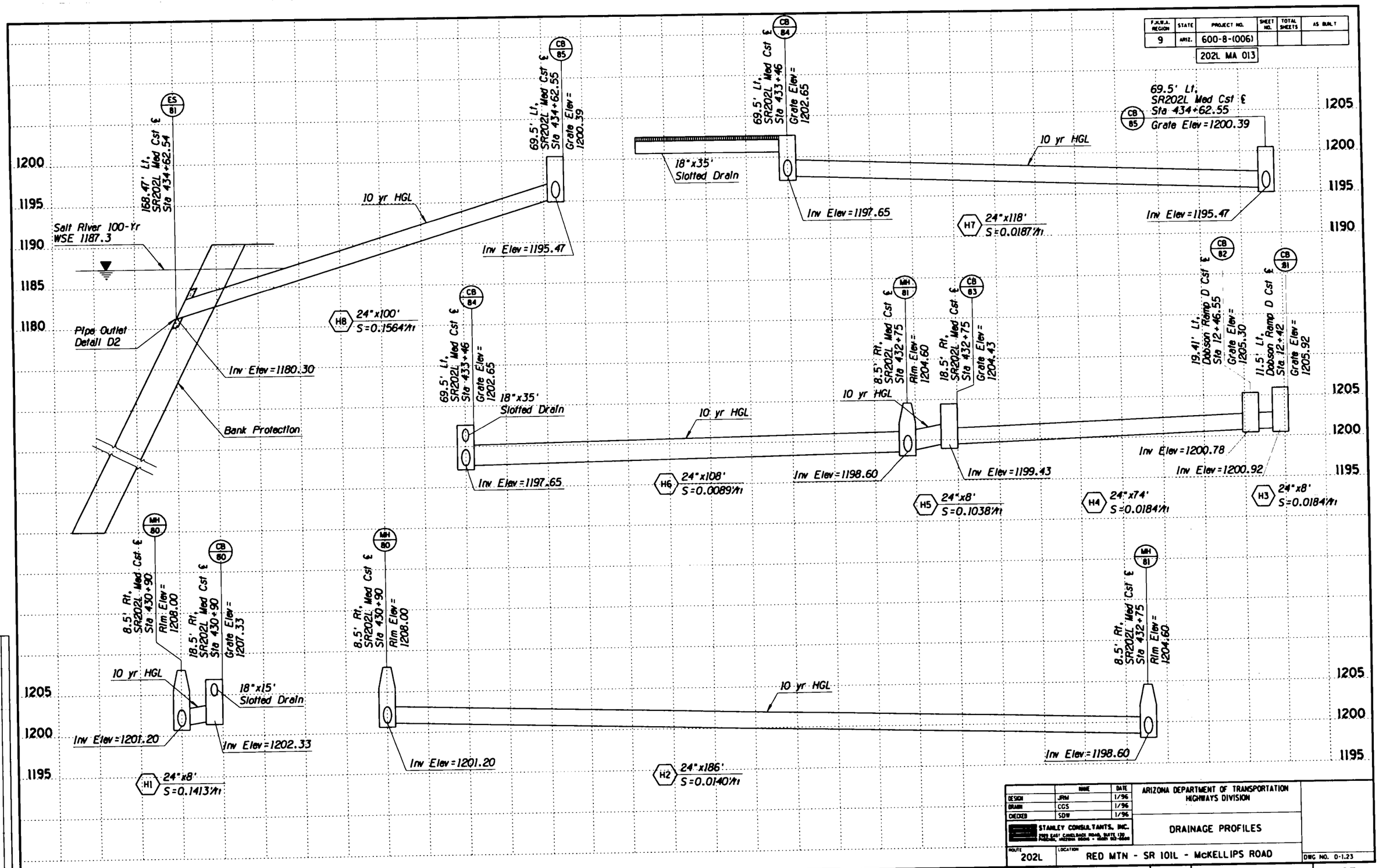
ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD | DWG NO. D-1.22

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••
VIEW NAME: /12168/RM201-22.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7900 EAST CAMELBACK ROAD, SUITE 120
SCOTTSDALE, ARIZONA 85250 • (602) 423-0666

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.23

TRACS NO. H087502C

600-8-(006)

___ OF ___

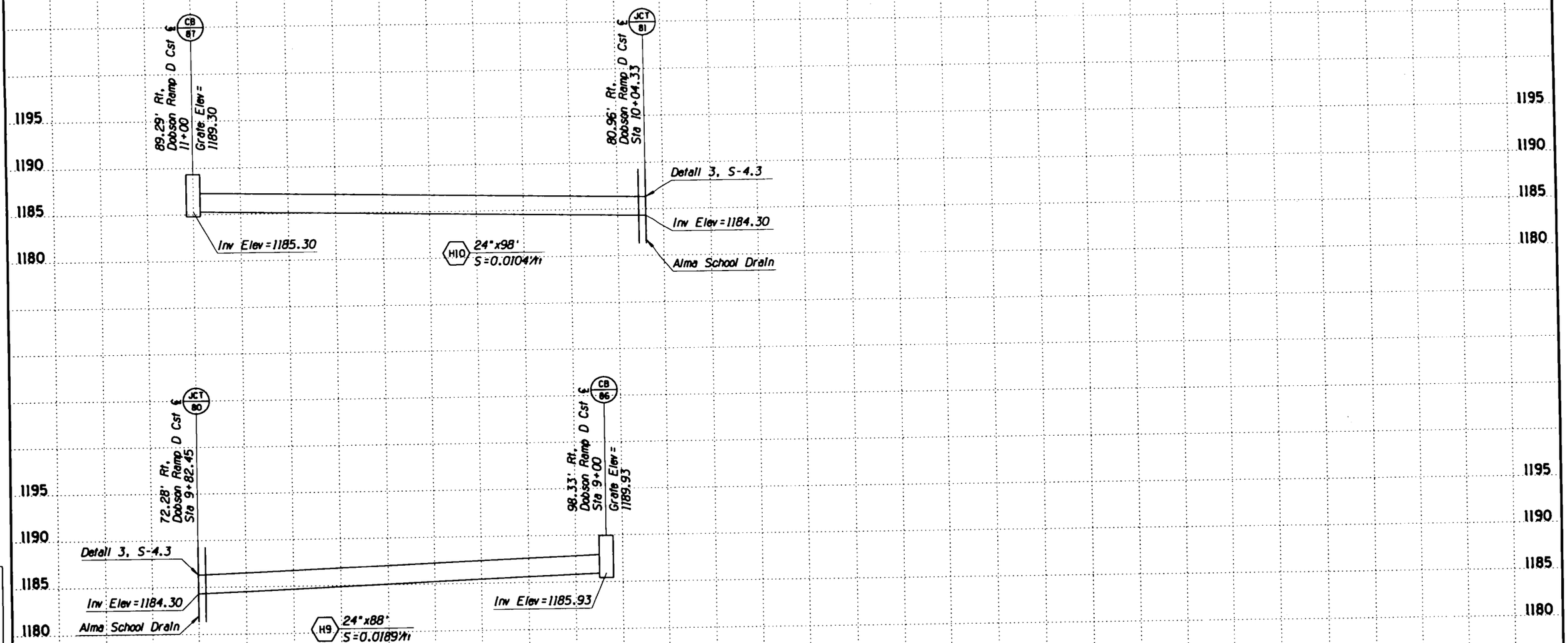
PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-23.DGN

SURVEY NO.	FB	REVISIONS	NO	LOCATION	DATE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
8900 EAST CHAPARRAL ROAD, SUITE 120
SCOTTSDALE, ARIZONA 85250 - (602) 951-4260

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.24

TRACS NO. H087502C

600-8-(006)

___ OF ___

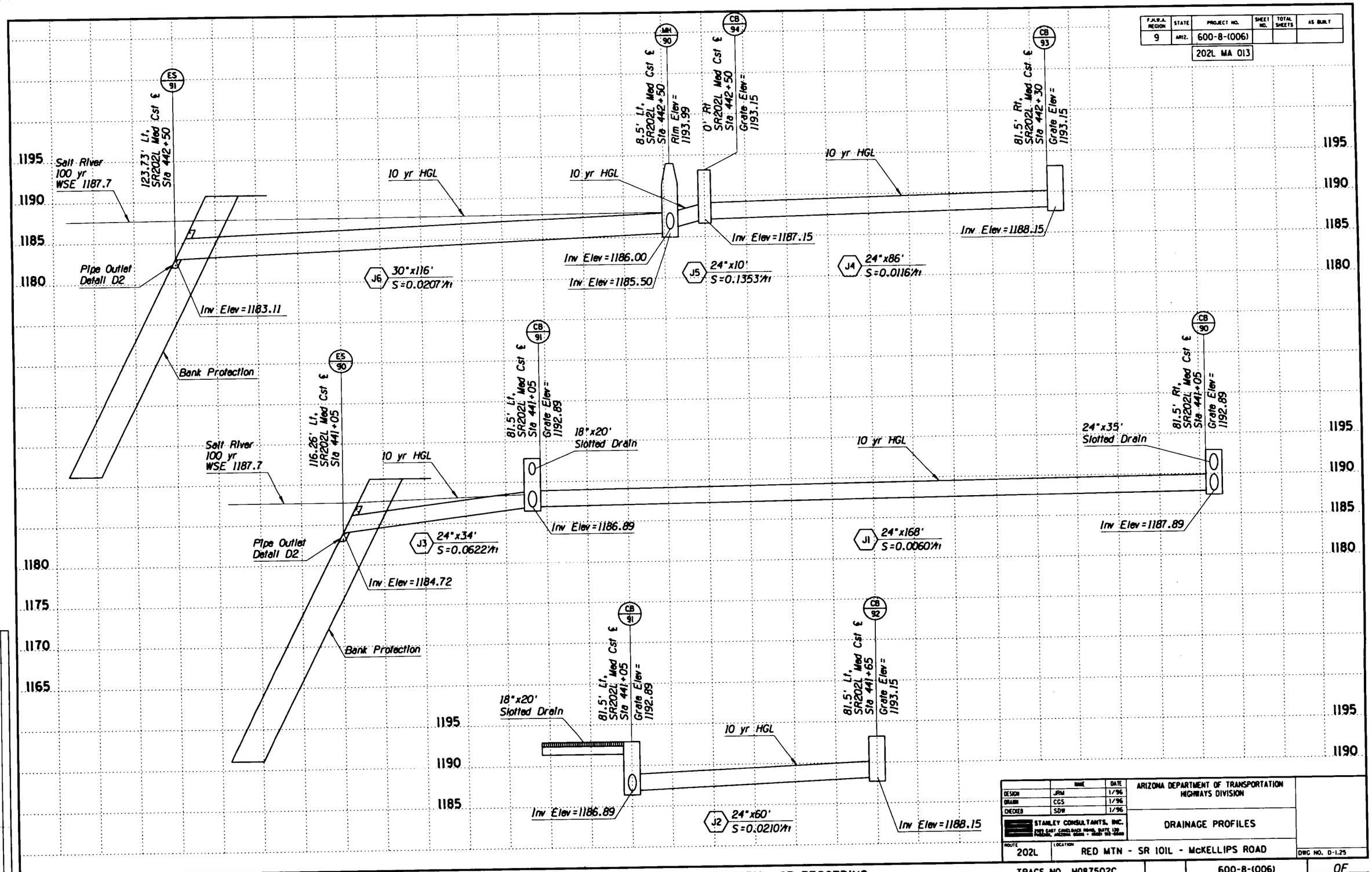
DATE	LOCATION	REVISIONS	MR	FI	SURVEY NO.

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

•••••DGN=SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-27.DGN

F.A.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
1921 EAST CONDUCTOR ROAD, SUITE 120
PHOENIX, ARIZONA 85006 • (602) 271-2000

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.25

TRACS NO. H087502C

600-8-(006)

___ OF ___

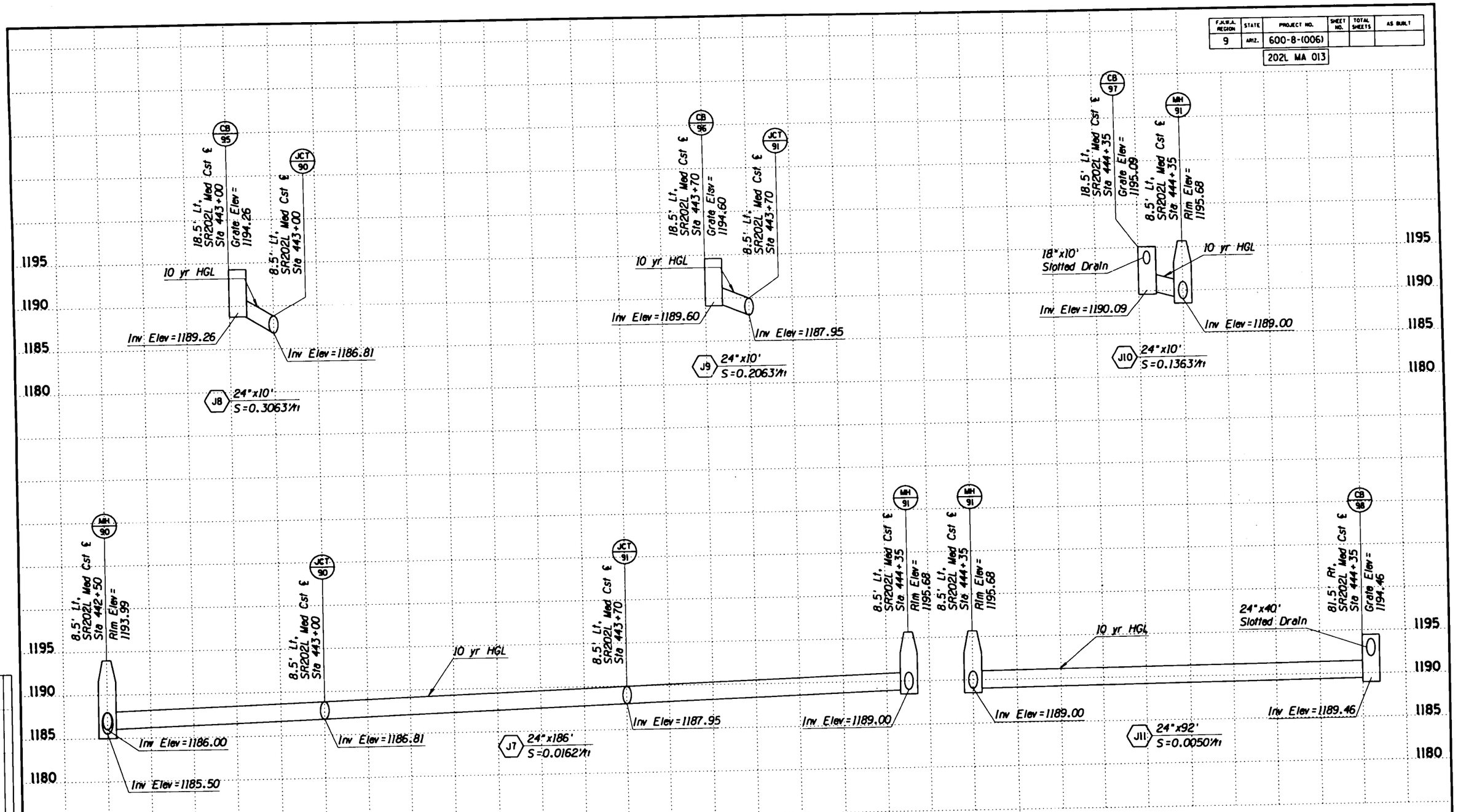
PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-24.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7095 EAST CAMELBACK ROAD, SUITE 120
SCOTTSDALE, ARIZONA 85251 - (602) 945-0666

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.26

TRACS NO. H087502C

600-8-(006)

___ OF ___

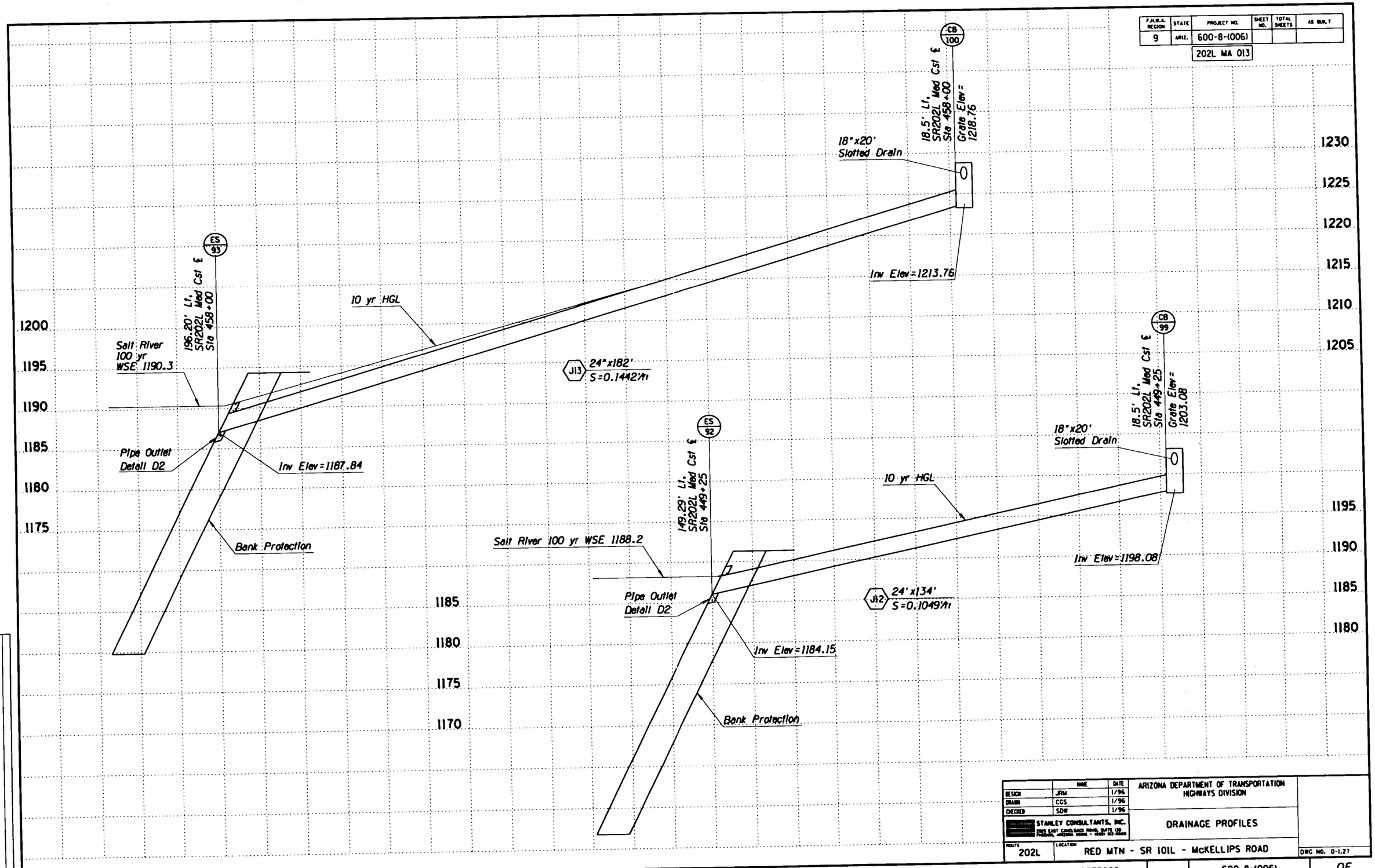
REVISIONS | DATE | LOCATION | SURVEY NO. | FIN

•••••DGN=SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-25.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7051 EAST CAMELBACK ROAD, SUITE 120
SCOTTSDALE, ARIZONA 85251 • (480) 941-2600

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD | DWG NO. D-1.27

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

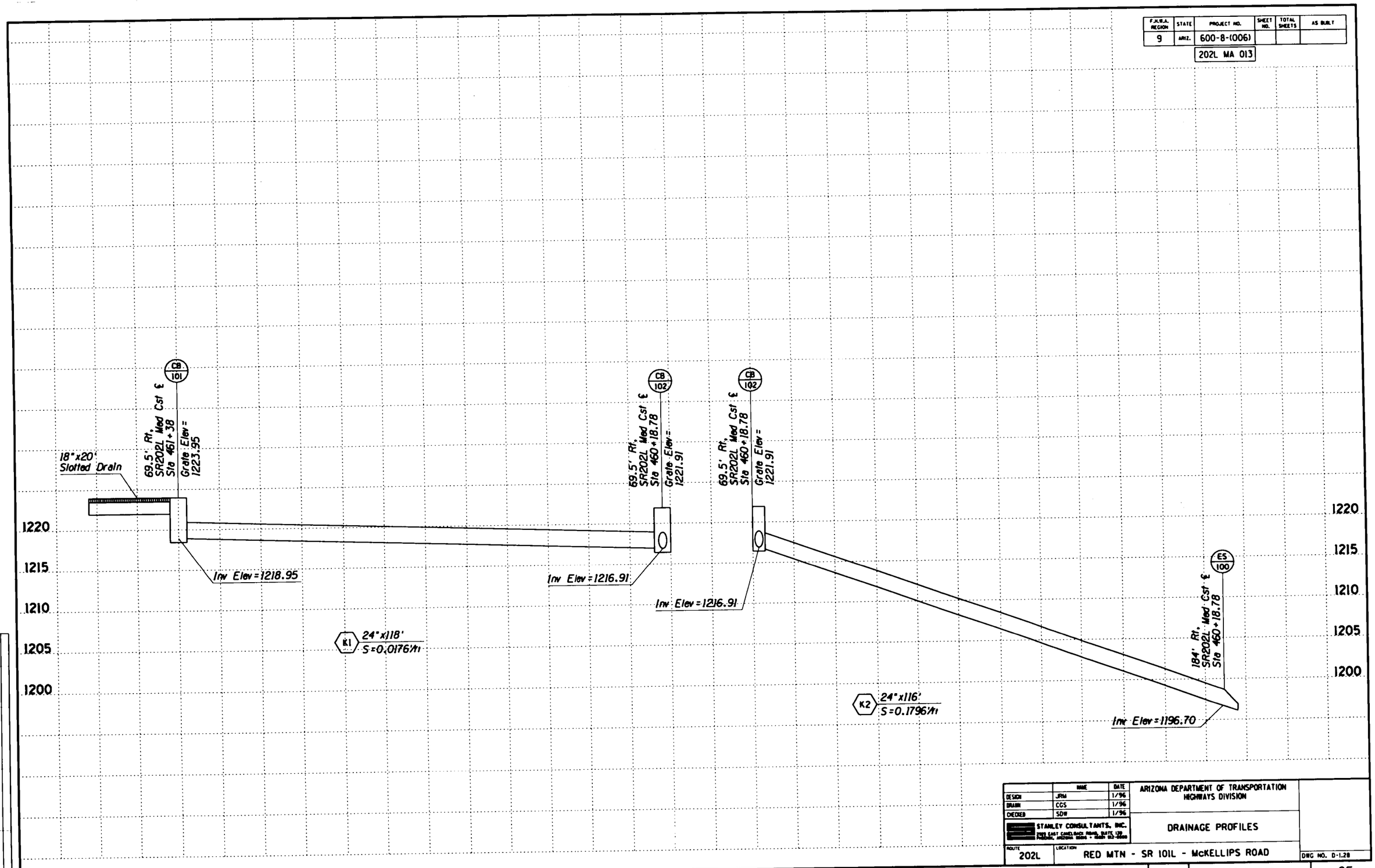
SURVEY NO.	FN	SHEET	REVISIONS	LOCATION	DATE

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

VIEW NAME: /12168/RM201-26.DGN

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7051 EAST CAMELBACK ROAD, SUITE 120
SCOTTSDALE, ARIZONA 85251 • PHONE 945-2600

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.28

TRACS NO. H087502C

600-8-(006)

___ OF ___

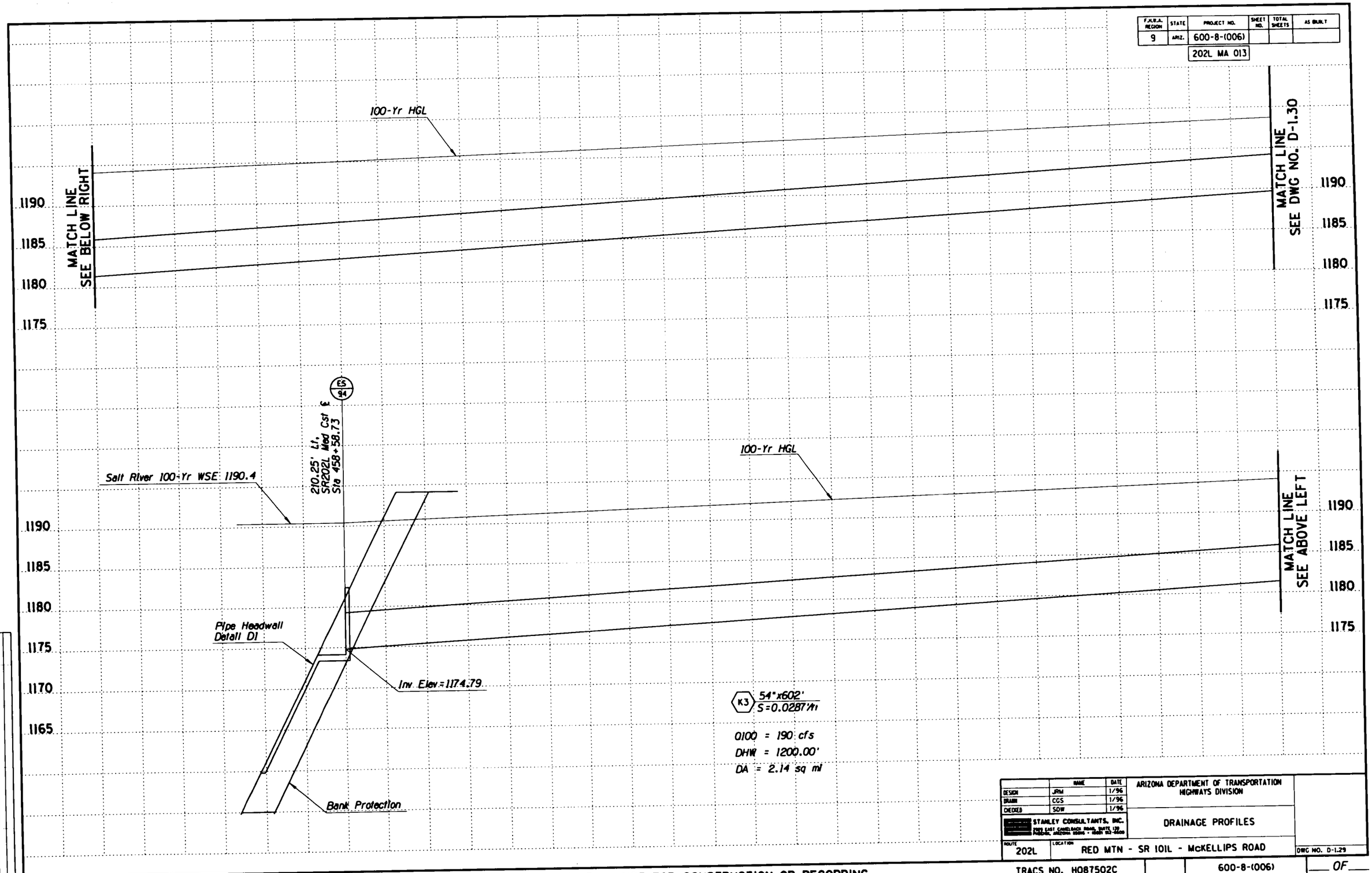
SURVEY NO. | FN | NO | REVISIONS | LOCATION | DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-28.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7955 EAST CAMELBACK ROAD, SUITE 120
SCOTTSDALE, ARIZONA 85251 • (602) 312-2600

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.29

TRACS NO. H087502C

600-8-(006)

___ OF ___

SURVEY NO. | FIL. | JOB | REVISIONS | LOCATION | DATE

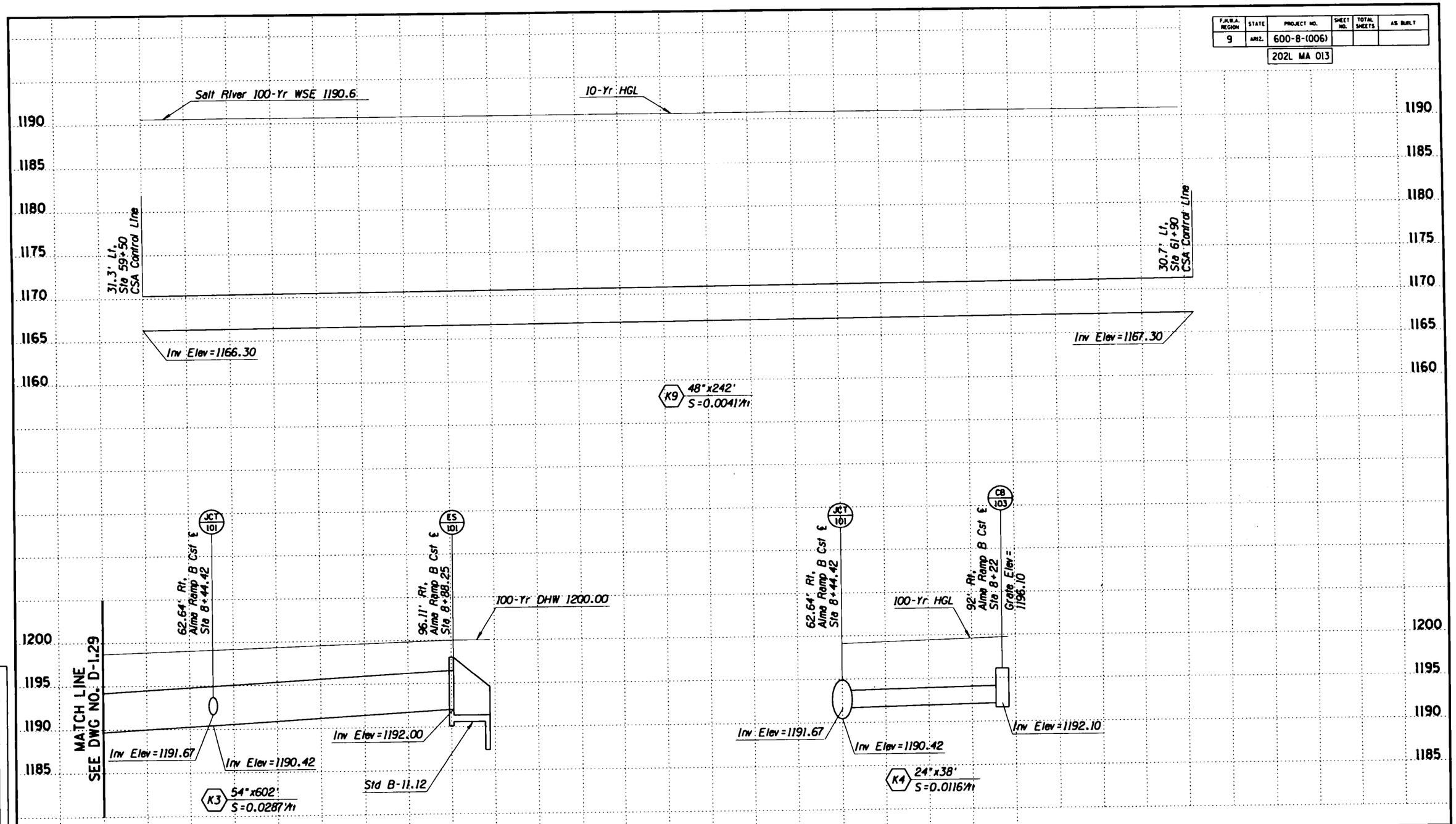
•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-29.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
1900 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85016 • (602) 153-2600

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.30

TRACS NO. H087502C

600-8-(006)

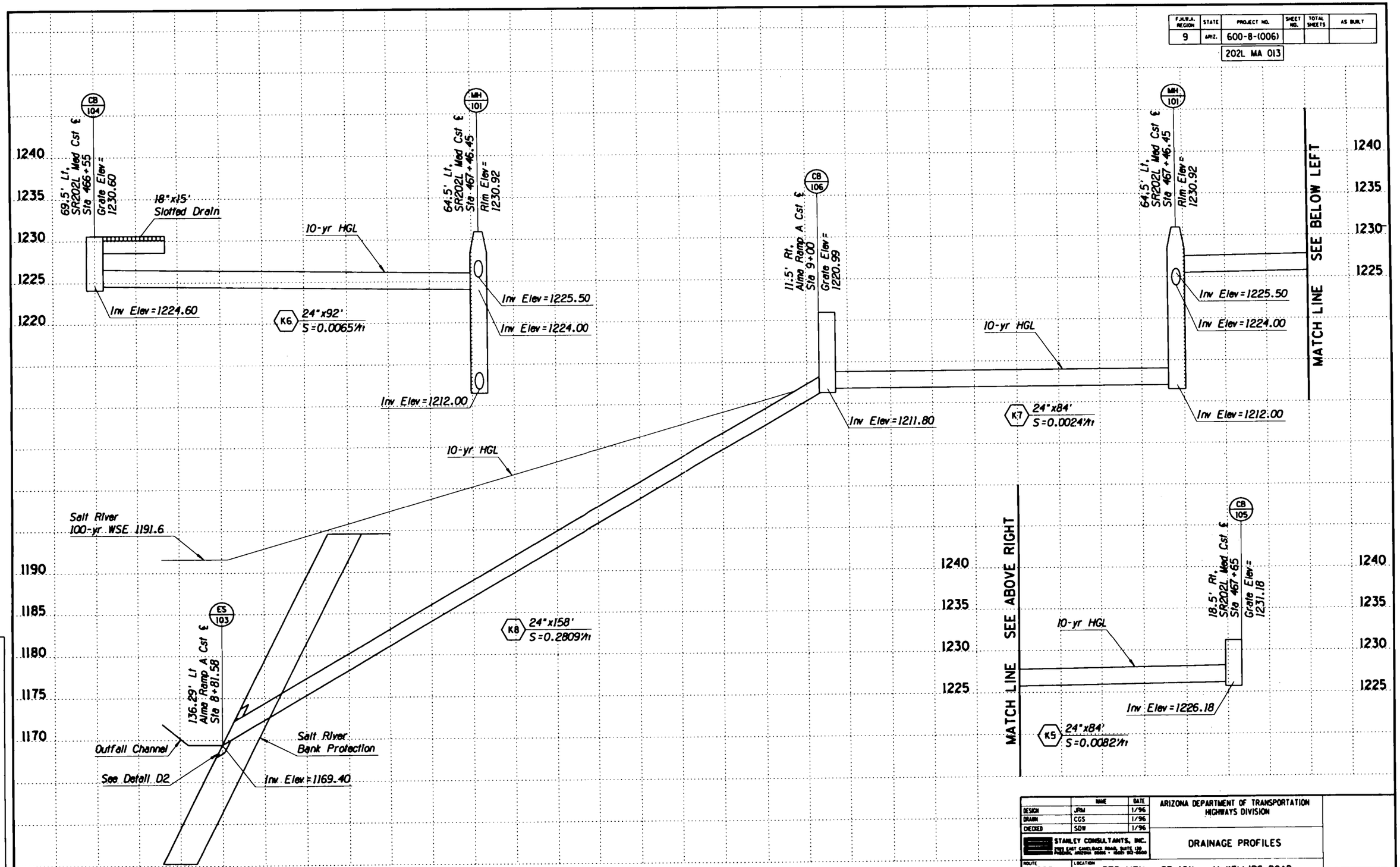
___ OF ___

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-30.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7101 EAST CAMELBACK ROAD, SUITE 120
SCOTTSDALE, ARIZONA 85251 • (602) 312-0000

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.31

NO.	REVISIONS	LOCATION	DATE

SURVEY NO. | FB | AS

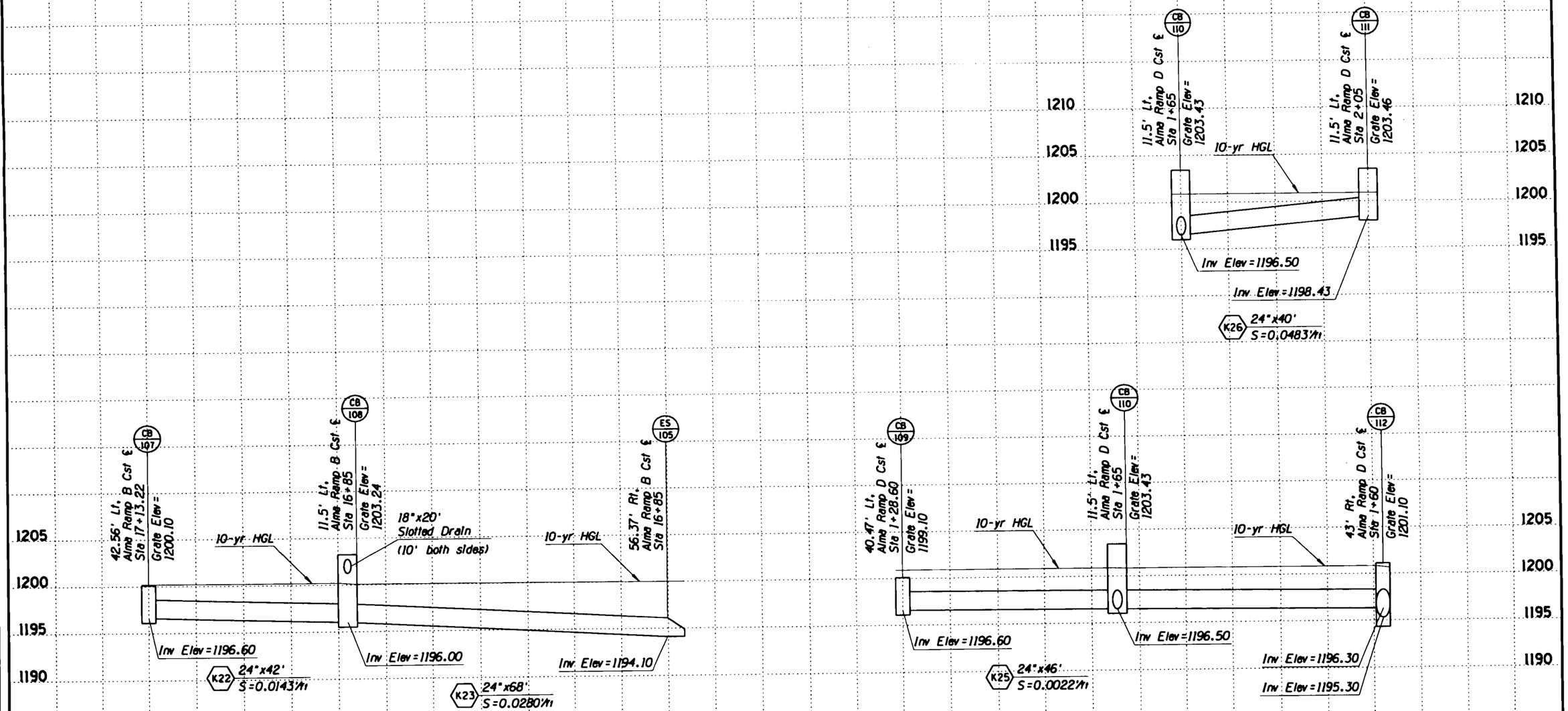
•••••DGN•SPECIFICATION••••• VIEW NAME: /12168/RM201-32.DGN
•••••SYSTIME•••••

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7051 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85018 • (602) 952-2600

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.32

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

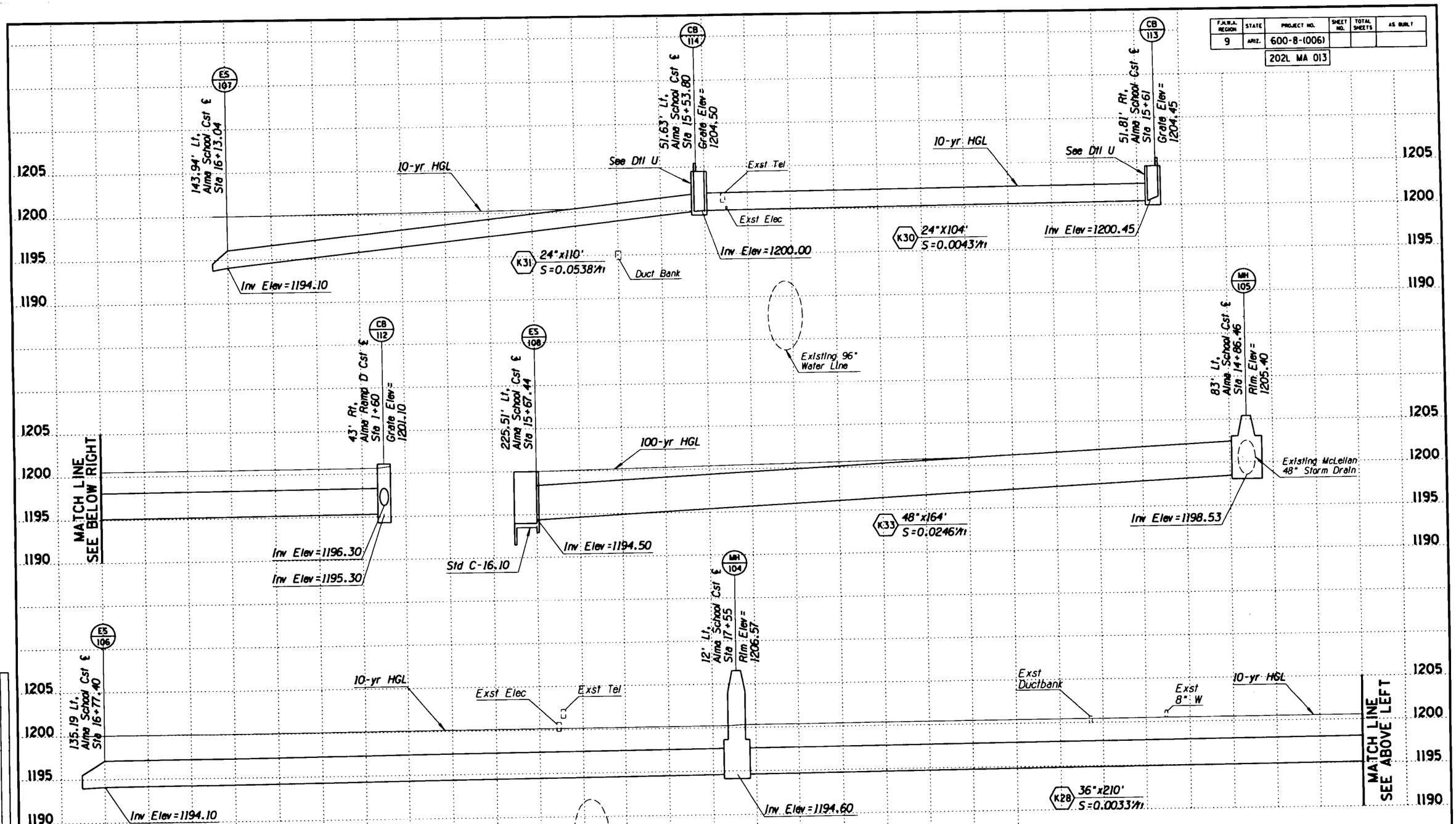
DATE | LOCATION | REVISIONS | JOB | FY | SURVEY NO.

•••••DGN=SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-33.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.A.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7955 EAST CAMELBACK ROAD, SUITE 120
SCOTTSDALE, ARIZONA 85251 • (602) 945-2600

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.33

TRACS NO. H087502C

600-8-(006)

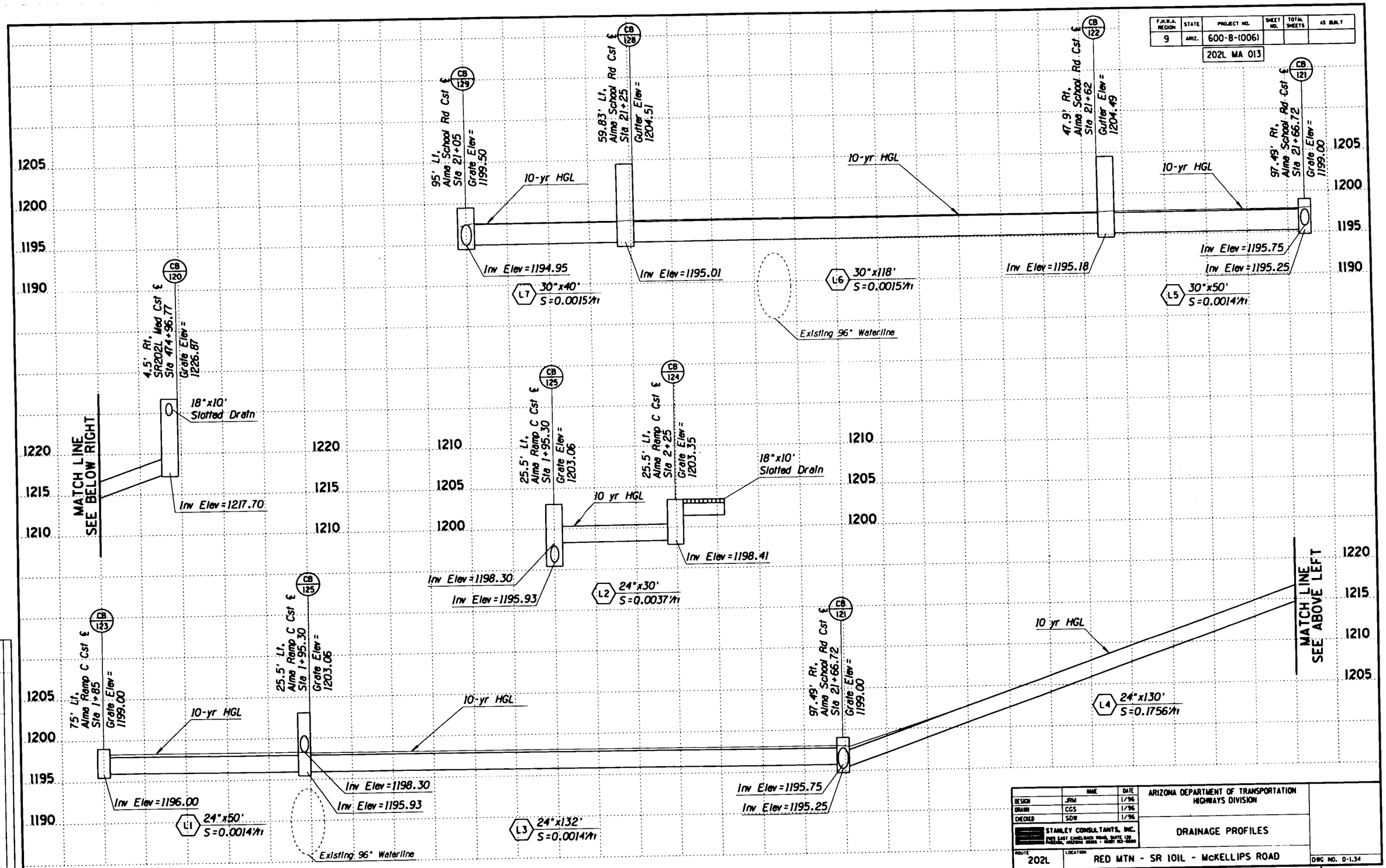
___ OF ___

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-35.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
2905 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85016 • (602) 952-0660

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD | DWG NO. D-1.34

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

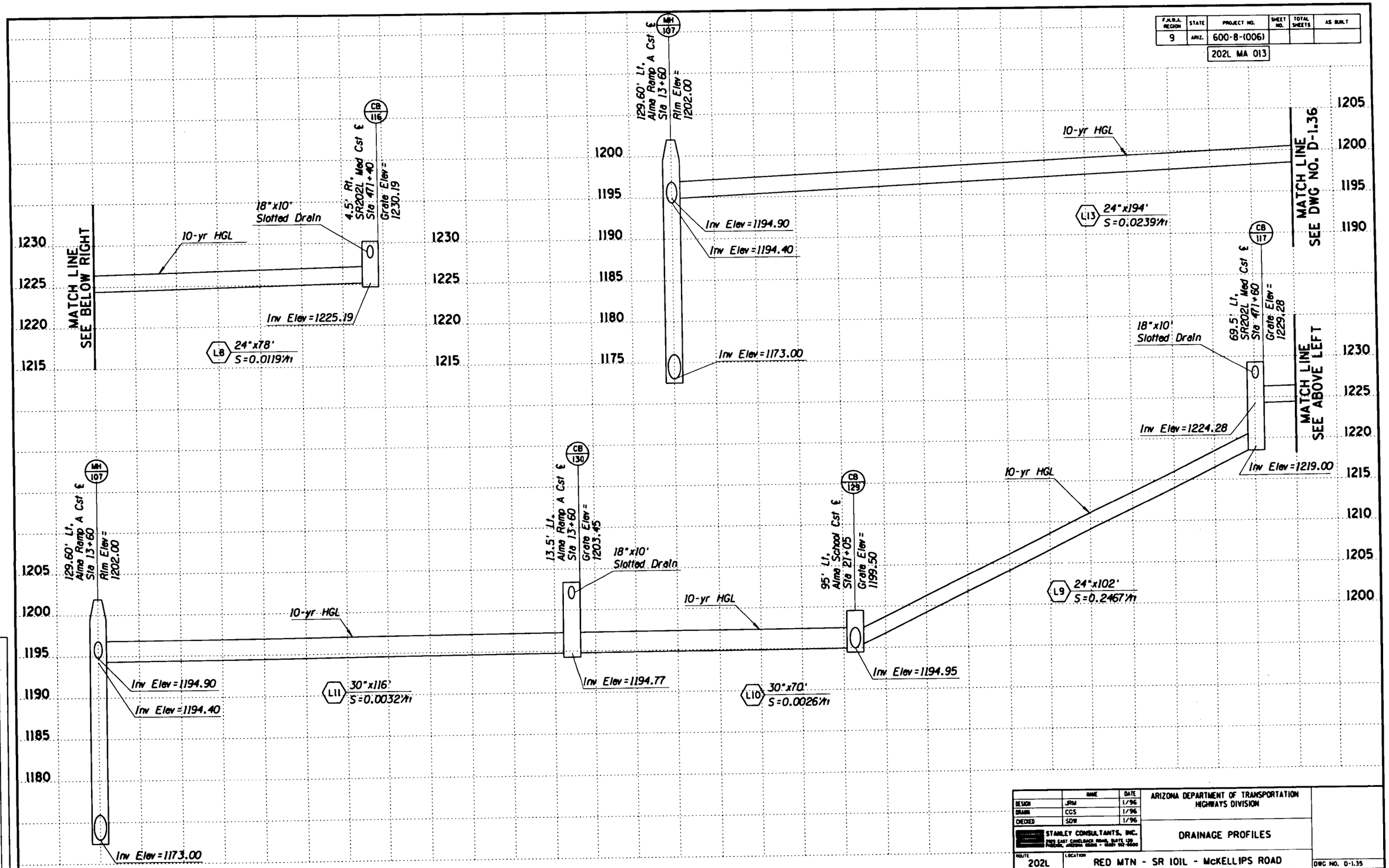
PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

•••••DGN=SPECIFICATION•••••
•••••SYSTIME•••••
VIEW NAME: /12168/RM201-36.DGN

SURVEY NO.	REVISIONS	LOCATION	DATE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7051 EAST CAMELBACK ROAD, SUITE 130
SCOTTSDALE, ARIZONA 85251 • (602) 990-2600

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.35

TRACS NO. H087502C

600-8-(006)

___ OF ___

DATE | LOCATION | REVISIONS | AS | SURVEY NO. | FB

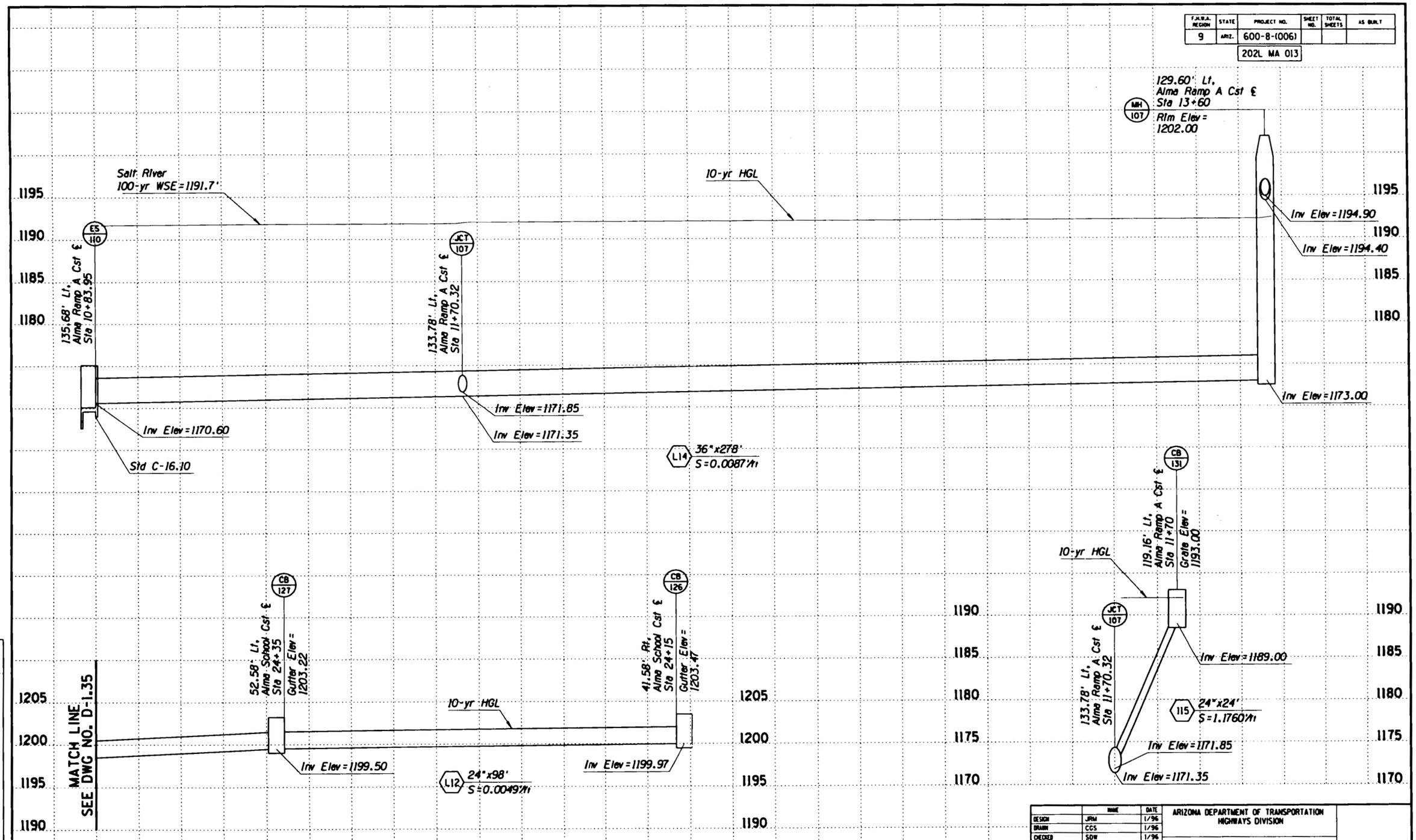
•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-37.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
2905 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 957-0800

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.36

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2D1-38.DGN

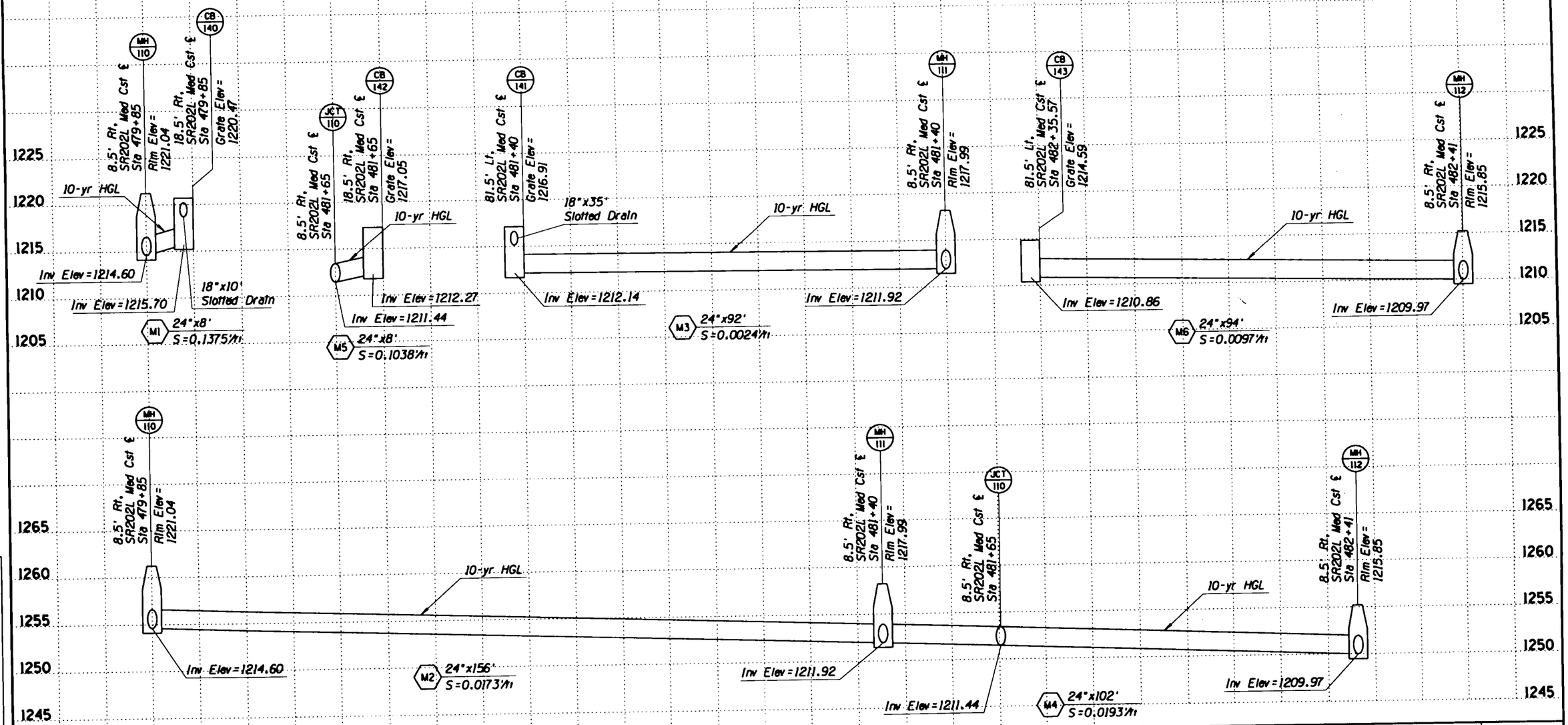
PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C

600-8-(006)

___ OF ___

F.A.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7670 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85018 - (602) 952-0880

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.37

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

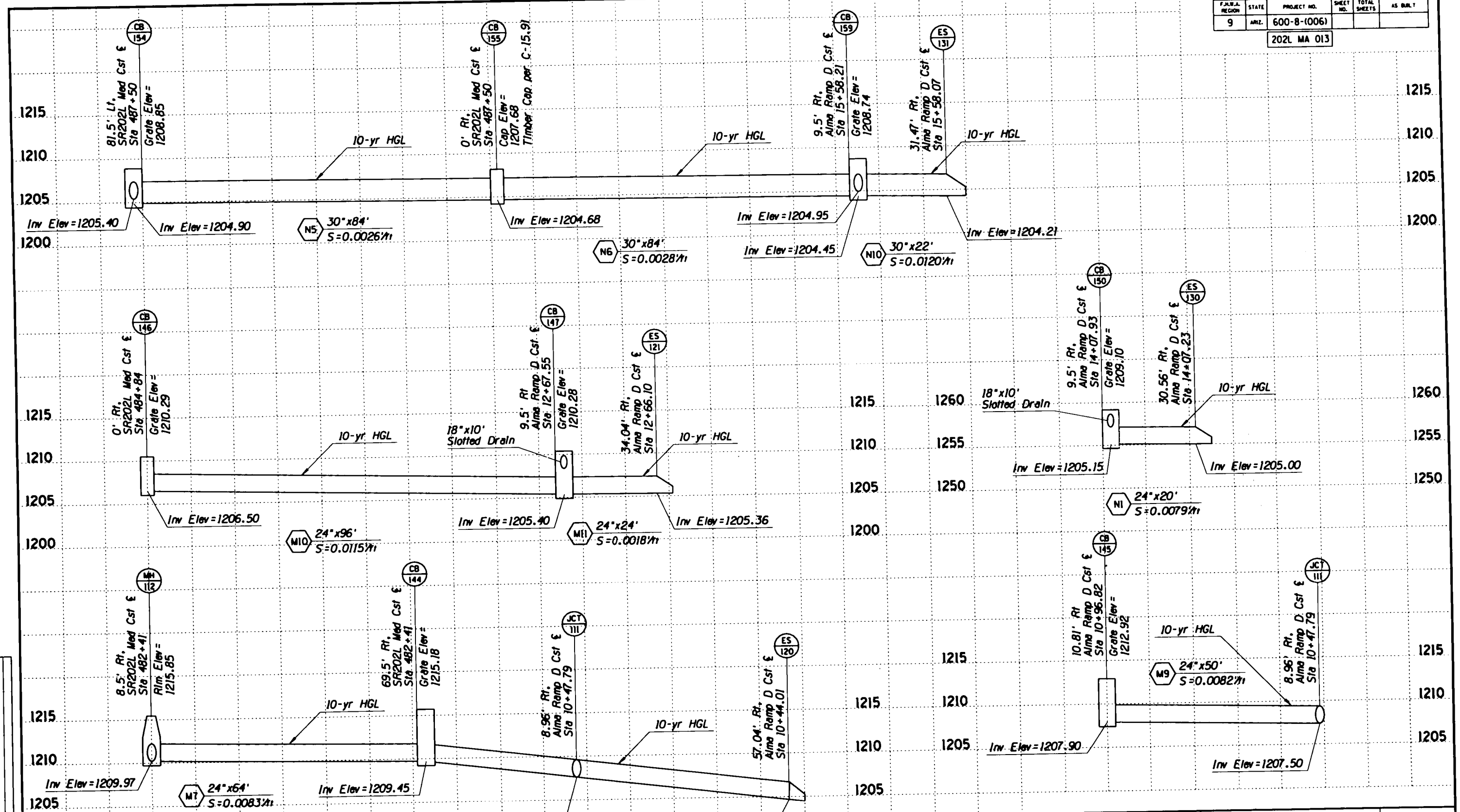
DATE | LOCATION | REVISIONS | BY | TI | SURVEY NO.

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

•••••DGN=SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2D1-39.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7051 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85018 • (602) 952-2440

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD | DWG NO. D-1.38

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

DATE | LOCATION | REVISIONS | INS | FS | SURVEY NO.

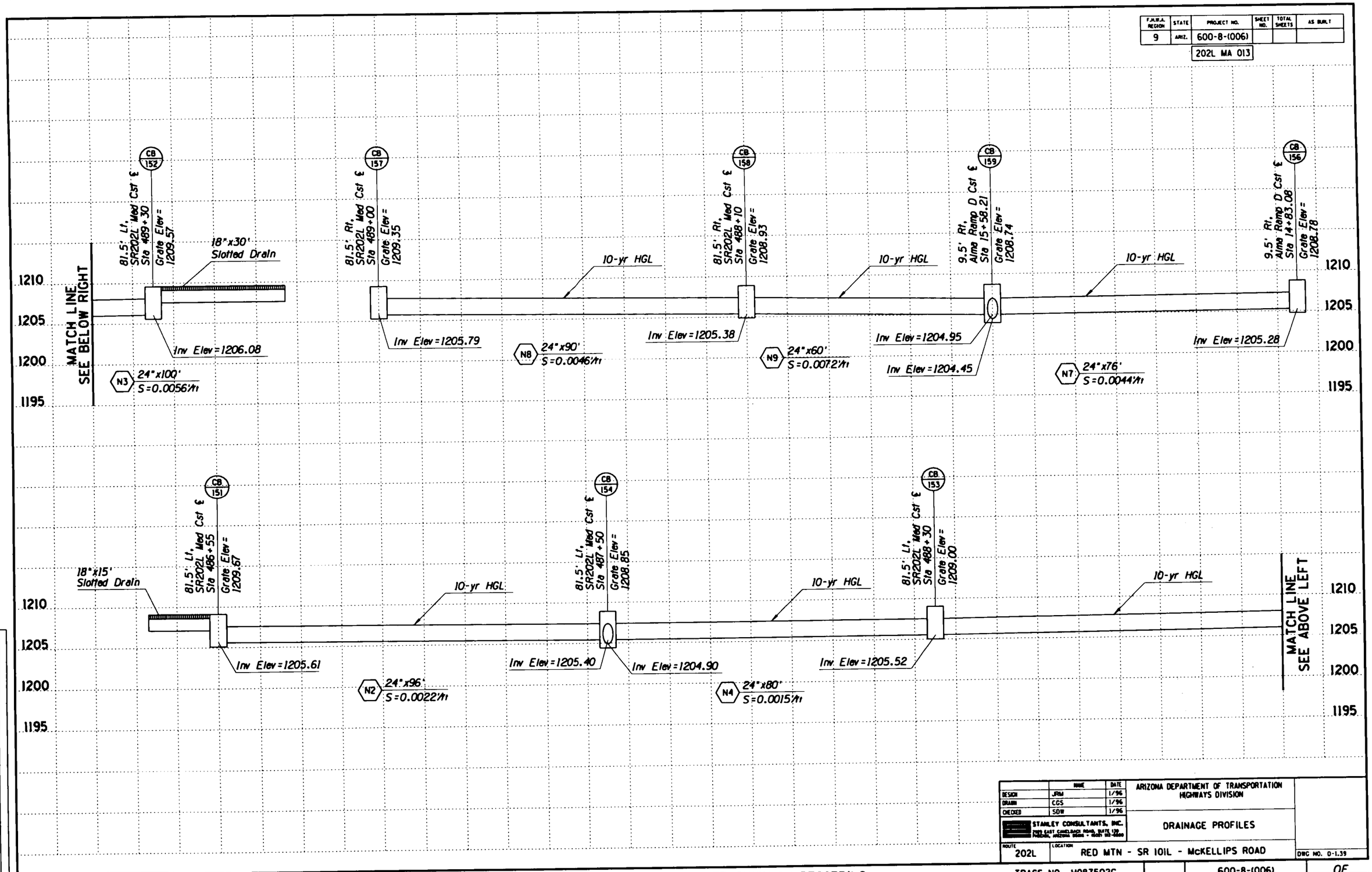
•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-40.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.A.H.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANLEY CONSULTANTS, INC.
7101 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85251 • (602) 952-0660

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.39

TRACS NO. H087502C

600-8-(006)

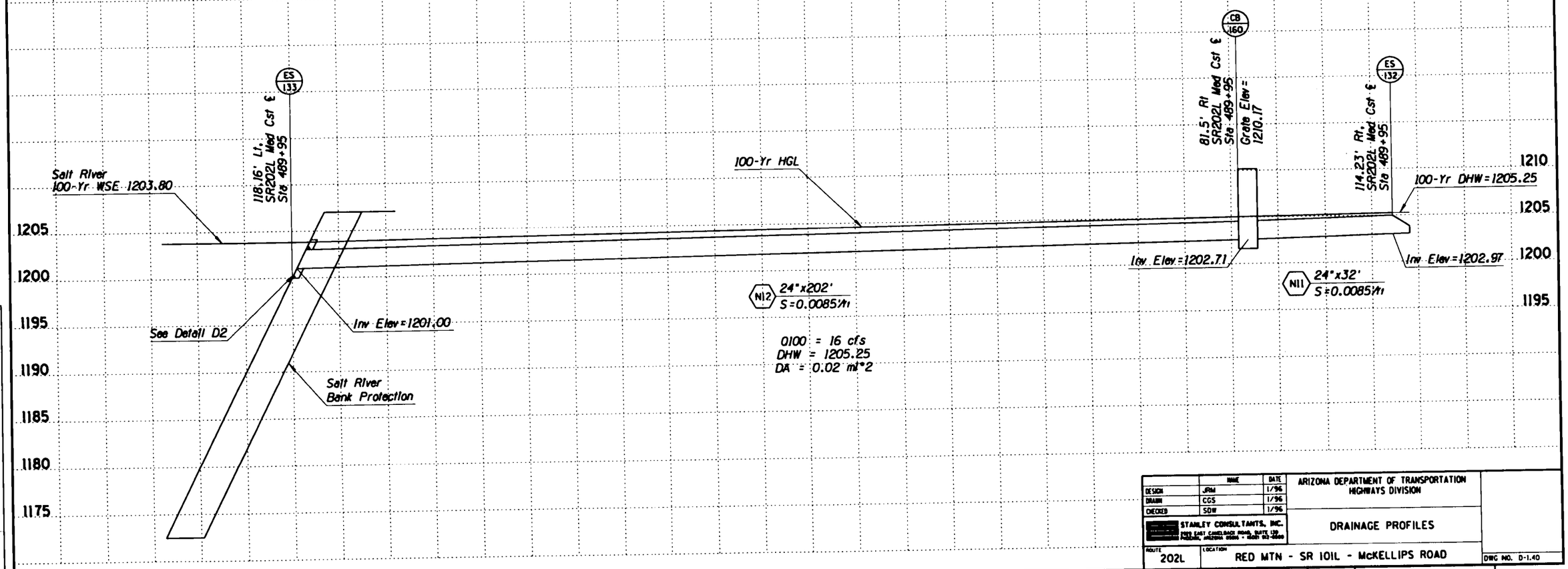
___ OF ___

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

VIEW NAME: /12168/RM201-41.DGN

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7500 EAST CAMELBACK ROAD, SUITE 120
SCOTTSDALE, ARIZONA 85251 • (602) 945-2600

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.40

TRACS NO. H087502C

600-8-(006)

___ OF ___

DATE | LOCATION | REVISIONS | BY

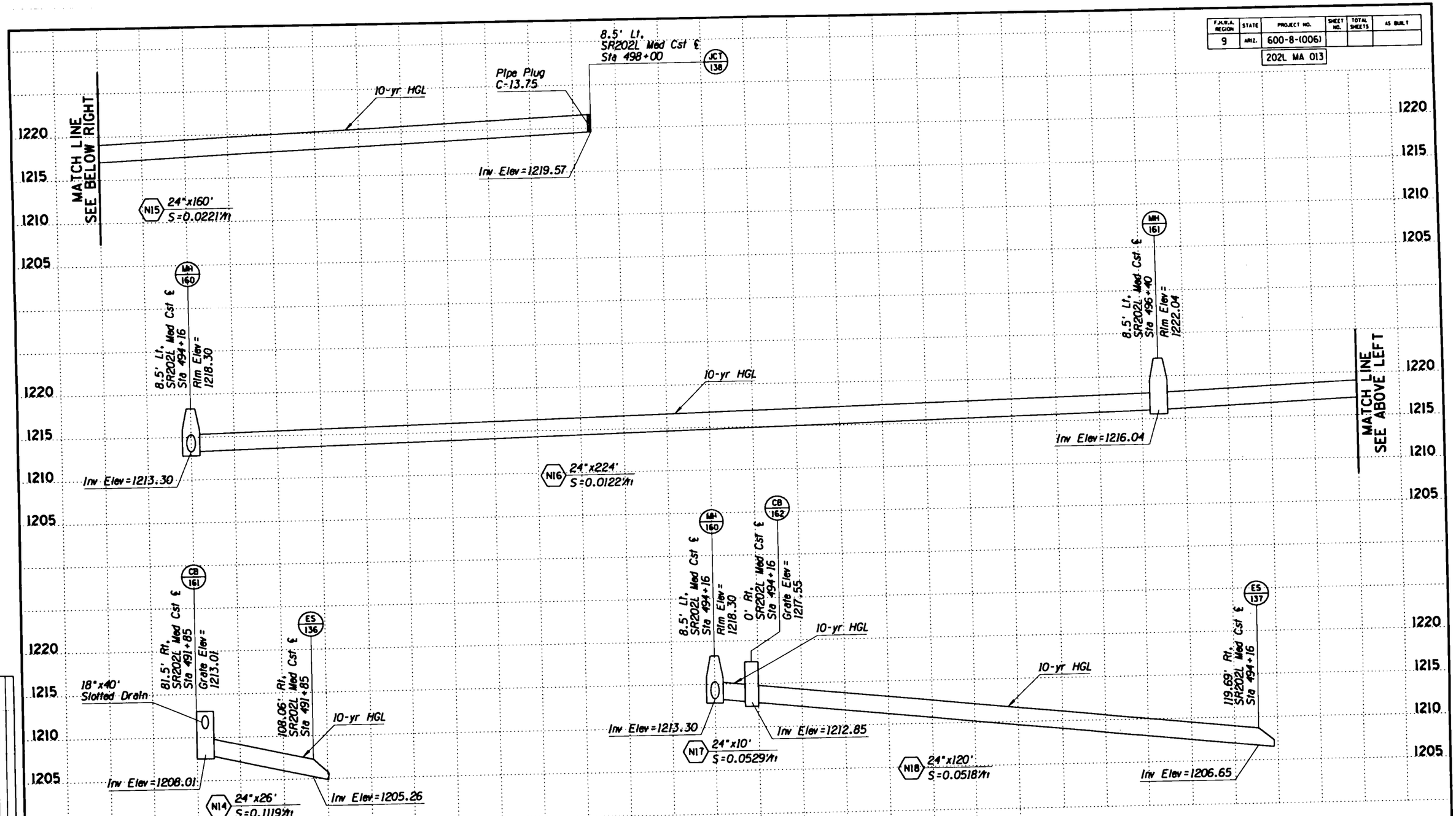
SURVEY NO.

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM201-42.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
1905 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85016 • (602) 952-0800

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD | DWG NO. D-1.41

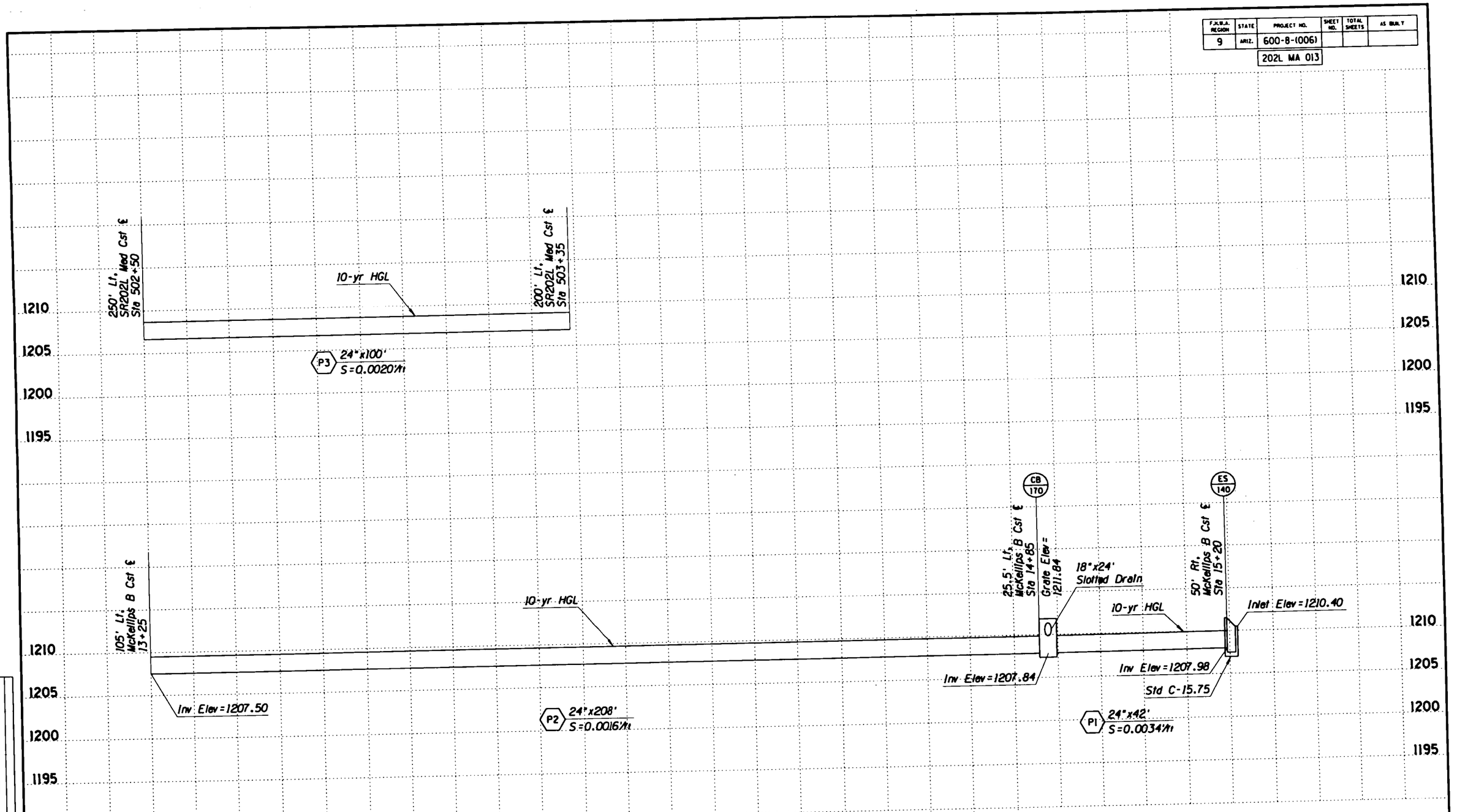
TRACS NO. H087502C | 600-8-(006) | ___ OF ___

DATE | LOCATION | REVISIONS | BY | SURVEY NO.

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

•••••DGN•SPECIFICATION••••• VIEW NAME: /12168/RM2D1-43.DGN
•••••SYSTIME•••••

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7895 EAST CHAUPARAL PARK, SUITE 130
PARADISE, ARIZONA 85253 • (602) 483-2400

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.42

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

NO.	REVISIONS	DATE	LOCATION	DATE

SURVEY NO. | F.B.

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2D1-44.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			

URBAN & RURAL

Station	Plan Ref No.	Fill Height Range (Ft.)	Size, (In.) Corrugated	Size, (In.) Smooth	Length (Ft.)	Skew (Degree)	Corrugation	Wall Thickness (In.)	Zinc	Aluminum	Bituminous	AASHTO M-294 Type C	AASHTO M-294 Type S		CHDPEPP Class	CHDPEPP Min D-Load	RCP Non Trench Class	RCP Non Trench Min D-Load	RCP Trench Class	NR CP Min Wall Thickness (In.)	NR CIP CP C-13.20 C-13.25	End Sct Manhole No. ▲	CB, MH & Jct Str Standard or Detail	Location	H (Ft)	Slotted Drn. Length (Ft)	Grate Type	Grate Elev.	Gutter Depression D (In.)	Gutter Depression L (Ft.)	Headwall Standard or Detail	Headwall Location	Pipe Ex (CY) ✱	Pipe Bk-fl (CY) ✱	Drn Ex (CY)	REMARKS
202L 355+10.00, 70.29' Lt to 356+01.29, 76.54' Lt	A1	1-3		24	92								X		III	1315	III	1315				10	C-15.92 DTL AH		5.17 13.46	15	C-15.92	1182.96 1183.03					95	26		CB10 to MH10 Price Rd Outfall Box Culvert
202L 358+50.00, 85.50' Lt to 356+01.29, 76.54' Lt	A2	5-8		30	250								X		II	880	II	880				11	C-18.10		7.90			1183.30					441	83		MH11 to MH10
202L 356+15.00, 71.79' Lt to 356+14.88, 77.03' Lt	A3	5-8		24	6								X		II	935	II	935					C-15.92 C-13.70		5.17		C-15.92	1182.86					7	2		CB11 to JCT10
202L 357+20.00, 73.29' Lt to 357+19.80, 80.81' Lt	A4	5-8		24	8								X		II	935	II	935					C-15.92 C-13.70		5.17	10	C-15.92	1182.96					9	2		CB12 to JCT11
202L 358+50.00, 10.00' Rt to 358+50.00, 85.50' Lt	A5	3-5		24	94								X		II	660	II	660					C-15.92		5.17	10	C-15.92	1182.67					101	27		CB13 to MH11
202L 361+80.57, 82.76' Lt to 358+50.00, 85.50' Lt	A6	3-5		24	320								X		II	660	II	660				12	C-18.10		5			1184.70					384	91		MH12 to MH11
202L 360+55.94, 73.64' Lt to 360+55.94, 89.16' Lt	A7	1-3		24	14								X		III	1315	III	1315					C-15.91 C-13.70		5.25	20	C-15.91	1183.52					12	4		CB14 to JCT12
202L 363+35.11, 20.75' Rt to 361+80.57, 82.76' Lt	A8	1-3		24	184								X		III	1315	III	1315					C-15.91		5.25	15	C-15.91	1186.46					161	52		CB15 to MH12
202L 375+50.00, 69.50' Lt to 377+00.00, 69.50' Lt	B1	1-3		24	150								X		III	1315	III	1315					C-15.92		5.17	15	C-15.92	1190.28					119	43		CB20 to CB21
202L 377+00.00, 69.50' Lt to 377+66.76, 0' Rt	B2	1-3		24	98								X		III	1315	III	1315					C-15.91 C-15.80		2.75 5.17		C-15.91 C-15.80	1186.67 1188.35					87	28		CB21 to CB22 Timber Cap CB21 per C-15.91
202L 388+00.00, 79.50' Lt to 385+50.00, 93.00' Lt	C1	1-3		24	252								X		III	1315	III	1315					C-15.92		4.17	20	C-15.92	1184.31					169	72		CB33 to MH30
202L 385+50.00, 93.00' Lt to 385+50.00, 0' Rt	C2	1-3		24	94								X		III	1315	III	1315				30	C-18.10 C-15.80		3.55 4.99		C-15.80	1182.50 1183.53					70	27		MH30 to CB31
202L 386+35.00, 79.50' Lt to 386+35.35, 89.07' Lt	C3	1-3		24	8								X		III	1315	III	1315					C-15.92 C-13.70		5.17	10	C-15.92	1183.67					5	2		CB32 to JCT30
202L 396+30.00, 79.5' Lt to 396+30.00, 0' Rt	D1	1-3		24	82								X		III	1315	III	1315					C-15.92 C-15.80		5.17 6.06	15	C-15.92 C-15.80	1194.74 1194.68					79	23		CB40 to CB41
202L 400+50.00, 8.50' Lt to 400+50.00, 76.60' Lt	D2	25-30		30	70										V	2910	V	2335				39	C-18.10		27.68			1201.12					366	23		MH39 to MH40 Remove Existing End Section

CSP - Corrugated Steel Pipe
RCP - Reinforced Concrete Pipe
NRCP - Non-Reinforced Concrete Pipe
NRCIPCP-Non-Reinforced Cast-In Place Concrete Pipe
CHDPEPP-Corrugated High Density Polyethylene Plastic Pipe

Reference numbers correspond to numbers in hexagons on PLAN SHEETS.

◐ The Pipe Has Been Designed For A Fill Height Range As Indicated With The Fill Height Equal To Or Greater Than The Lower Number And Not Exceeding The Higher Number. Fill Heights Are The Maximum Measured From The Top Of Pipe To The Highest Point Of Subgrade Over The Pipe. Should Field Conditions Vary From The Range Indicated, Contact Design For Reevaluation Of Pipe Design Requirements.

■ The Minimum D-LOAD Needed To Produce A 0.01 Inch Crack. RCP May Be Provided By Either Min. D-LOAD Or Class.

✱ PIPE EXCAVATION & PIPE BACKFILL Will Not Be Measured For Payment.

● When Bituminous Coating Is Specified For Either Structural Plate Pipe Or Corrugated Metal Pipe, It Shall Be Applied In Accordance With AASHTO M 243 Or AASHTO M 190, Type A, Respectively, And Coated On Both The Inside And The Outside Of The Pipe Unless Otherwise Specified In These Drawings.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

▲ Include FRAME & COVER STD. C-18.10 & C-18.20

	NAME	DATE
DESIGN	JRM	1/96
DRAWN	MAC	1/96
CHECKED	MRC	1/96

STANLEY CONSULTANTS, INC.
5900 EAST CONSTITUTION ROAD, SUITE 120
TUCSON, ARIZONA 85706 • (520) 519-3800

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

NEW PIPE SUMMARY SHEET

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD | DWG NO. C-4.9

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

REV. DATE: 02-08-89

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••
VIEW NAME: /12168/RM2C4PIP.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			

URBAN & RURAL

Station	Plan Ref No.	Fill Height Range (Ft.)	Size, (In.) Corrugated	Size, (In.) Smooth	Length (Ft.)	Skew (Degree)	Corrugation	Wall Thickness (In.)	Zinc	Aluminum	Bituminous	AASHTO M-294 Type C	AASHTO M-294 Type S		CSP Class	CSP Min D-Load	CHDPEPP Class	CHDPEPP Min D-Load	RCP Non Trench Class	RCP Non Trench Min D-Load	RCP Trench Class	Min Wall Thickness (In.)	NR CP C-13.20	NR CIP CP C-13.25	Manhole No.	End Sct Standard or Detail	End Sct ▲	CB, MH & Jct Str Location	CB, MH & Jct Str H (Ft)	CB, MH & Jct Str Slotted Drn. Length (Ft)	Grate Type	Grate Elev.	Gutter Depression D (In.)	Gutter Depression L (Ft.)	Headwall Standard or Detail	Headwall Location	Pipe Ex (CY) ✱	Pipe Bk-fl (CY) ✱	Drn Ex (CY)	REMARKS
202L 400+50.00, 80.35' Lt to 400+50.00, 76.60' Lt	D3	1-3		24	6								X		III	1315	III	1315								C-15.92		5.17	30	C-15.92	1199.54						5	2		CB42 to MH40
202L 400+50.00, 76.60' Lt to 400+50.00, 181.72' Lt	D4	25-30		30	106										V	2885	V	2240					DTL D2		40	C-18.10		27.22			1199.78						417	35		MH40 to ES40
202L 407+07.56 25.60' Lt to 407+33.62, 116.60' Lt	D5	25-30		72	96										V	2740	V	2400								C-13.80									DTL D1		1080	140		JCT44 to ES52 Remove Existing Headwall
202L 407+45.00, 8.5' Lt to 407+70.00, 71.45' Lt	D6	25-30		48	68										V	2800	V	2565							41	C-18.10		29.61			1209.59						546	20		MH41 to MH42
202L 407+70.00, 71.45' Lt to 407+70.00, 94.40' Lt	D7	1-3		24	26								X		III	1315	III	1315								C-15.92		5.17	25	C-15.92	1208.27						23	8		CB43 to MH42
202L 407+70.00, 71.45' Lt to 407+70.00, 134.49' Lt	D8	25-30		48	64										V	2800	V	2565					DTL D2		42	C-18.10		33.90									370	48		MH42 to ES53
															V	2800	V	2565								C-13.80											674	86		JCT53 to ES54
202L 408+50.00, 23.50' Lt to 408+50.00, 136.24' Lt	D9	25-30		48	114																		DTL D2		51	C-18.10		6.3			1214.30						210	48		MH51 to MH50
202L 412+42.00, 8.50' Rt to 411+00.00, 92.00' Rt	E1	5-8		24	166								X		II	935	II	935								C-15.92		5.17	25	C-15.92	1213.82						79	23		CB54 to MH51
202L 412+42.00, 69.50' Lt to 412+42.00, 8.50' Rt	E2	1-3		24	80								X		III	1315	III	1315							52	C-18.10		6.0			1217.00						296	74		MH52 to MH51
202L 415+00.00, 8.50' Rt to 412+42.00, 8.50' Rt	E3	3-5		24	258								X		II	660	II	660							53	C-18.10		6.48			1219.33						240	59		MH53 to MH52
202L 417+05.00, 8.50' Rt to 415+00.00, 8.50' Rt	E4	3-5		24	206								X		II	660	II	660								C-15.91 C-13.70		5.25		C-15.91	1218.37						7	3		CB55 to JCT50
202L 416+25.00, 18.50' Rt to 416+25.00, 8.50' Rt	E5	1-3		24	8								X		III	1315	III	1315								C-15.91		5.25	10	C-15.91	1218.86						8	3		CB56 to MH53
202L 417+05.00, 18.50' Rt to 417+05.00, 8.50' Rt	E6	1-3		24	8								X		III	1315	III	1315																						CB52 Remove Timber Cap
202L 408+81.00, 81.50' Rt																										C-15.91		2.76	10	C-15.91	1209.72									MH49 Remove Timber Cap
202L 408+81.00, 92.00' Rt																									49	C-18.40					1209.75									CB53 Remove Timber Cap
202L 410+55.00, 81.50' Rt																										C-15.92		2.75	20	C-15.92	1211.58									CB63 to JCT63
Dobson Rd 22+00, 85' Rt to 22+00, 78.00' Rt	F7	1-3		24	8										III	1315	III	1315								C-15.80 C-13.80		4		C-15.80	1192.10						7	3		

CSP - Corrugated Steel Pipe
RCP - Reinforced Concrete Pipe
NRCP - Non-Reinforced Concrete Pipe
NRCIPCP-Non-Reinforced Cast-In Place Concrete Pipe
CHDPEPP-Corrugated High Density Polyethylene Plastic Pipe

Reference numbers correspond to numbers in hexagons on PLAN SHEETS.

◒ The Pipe Has Been Designed For A Fill Height Range As Indicated With The Fill Height Equal To Or Greater Than The Lower Number And Not Exceeding The Higher Number. Fill Heights Are The Maximum Measured From The Top Of Pipe To The Highest Point Of Subgrade Over The Pipe. Should Field Conditions Vary From The Range Indicated, Contact Design For Reevaluation Of Pipe Design Requirements.

■ The Minimum D-LOAD Needed To Produce A 0.01 Inch Crack. RCP May Be Provided By Either Min. D-LOAD Or Class.

✱ PIPE EXCAVATION & PIPE BACKFILL WILL Not Be Measured For Payment.

● When Bituminous Coating Is Specified For Either Structural Plate Pipe Or Corrugated Metal Pipe, It Shall Be Applied In Accordance With AASHTO M 243 Or AASHTO M 190, Type A, Respectively, And Coated On Both The Inside And The Outside Of The Pipe Unless Otherwise Specified In These Drawings.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

▲ Include FRAME & COVER STD. C-18.10 & C-18.20

	NAME	DATE
DESIGN	JRM	1/96
DRAWN	MAC	1/96
CHECKED	MRC	1/96

STANLEY CONSULTANTS, INC.
5945 EAST CHANDLER ROAD, SUITE 120
PHOENIX, ARIZONA 85054 • (602) 923-0880

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

NEW PIPE SUMMARY SHEET

ROUTE 202L
LOCATION RED MTN - SR 101L - McKELLIPS ROAD
DWG NO. C-4.10

TRACS NO. H087502C
600-8-(006)
___ OF ___

REV. DATE: 02-08-89

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

•••••DGN=SPECIFICATION•••••
•••••SYSTIME•••••
VIEW NAME: /12168/RM2C4P12.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			

URBAN & RURAL

Station	Plan Ref No.	Fill Height Range (Ft.)	Size, (In.) Corrugated	Size, (In.) Smooth	Length (Ft.)	Skew (Degree)	Corrugation	Wall Thickness (In.)	Zinc	Aluminum	Bituminous Allowable Coating	AASHTO M-294 Type C	AASHTO M-294 Type S		CSP Class	CSP Min D-Load	RCP Non Trench Class	RCP Non Trench Min D-Load	RCP Trench Class	NRCP Min Wall Thickness (In.)	NRCIPCP C-13.20 C-13.25	Manhole No.	End Sct 3 Standard or Detail	CB, MH & Jct Str Location	H (Ft)	Slotted Drn. Length (Ft)	Grate Type	Grate Elev.	Gutter Depression D (In.)	Gutter Depression L (Ft.)	Headwall Standard or Detail	Headwall Location	Pipe Ex (CY) *	Pipe Bk fl (CY)*	Drn Ex (CY)	REMARKS
Dobson D 1+90, 12.93 Lt to 1+40, 13.93' Lt	F8	1-3		24	50								X		III	1315	III	1315					C-15.91		5.25	10	C-15.91	1196.30					40	14		CB66 to CB67
Dobson D 1+40, 13.93' Lt to Dobson 21+46, 90' Lt	F9	1-3		24	36								X		III	1315	III	1315					C-15.91		5.25		C-15.91	1195.48					35	10		CB67 to CB68
Dobson 21+46, 90' Lt to 21+46, 19.5' Rt	F10	11-15		24	110										IV	1570	IV	1570				61	C-15.80 C-18.10		5 18.12		C-15.80	1192.00 1197.34					208	31		CB68 to MH61
Dobson A 22+05, 13.5' Lt to Dobson 18+75, 85' Rt	F11	1-3		24	56								X		III	1315	III	1315					C-15.92		5.17	15	C-15.92	1193.99					49	16		CB69 to CB70
Dobson Rd 18+75, 85' Rt to 18+75, 19.5' Rt	F12	11-15		24	66										IV	1570	IV	1570					C-15.80 C-13.70		5		C-15.80	1190.00					120	19		CB70 to JCT64
202L 424+22.75, 4.5' Rt to Dobson 18+02, 80' Lt	F13	8-11		24	164										III	1230	III	1230					C-15.92		5.17		C-15.92	1217.16					157	47		CB71 to CB73
Dobson C 2+40, 25.5' Lt to Dobson 18+02, 80' Lt	F14	1-3		24	184								X		III	1315	III	1315					C-15.92		5.17	10	C-15.92	1192.31					161	52		CB72 to CB73
Dobson Rd 18+02, 80' Lt to 18+02, 19.5' Rt	F15	11-15		24	100										IV	1570	IV	1570				64	C-15.80 C-18.10		5 16.98		C-15.80	1191.00 1195.62					179	29		CB73 to MH64
Dobson A 23+23.73, 76.59' Lt to 23+24.12, 87.41' Lt	G3	5-8		48	12								X		II	845	II	845					C-13.80								D1I D1		27	9		JCT65 to ES60 Remove Existing Headwall
202L 430+90, 18.5' Rt to 430+90, 8.5' Rt	H1	1-3		24	8								X		III	1315	III	1315					C-15.91		5.25	15	C-15.91	1207.33					8	2		CB80 to MH80
202L 430+90, 8.50' Rt to 432+75, 8.50' Rt	H2	3-5		24	186								X		II	660	II	660				80	C-18.10		6.8			1208.00					222	53		MH80 to MH81
Dobson D 12+42, 11.5' Lt to 12+46.55, 19.41' Lt	H3	1-3		24	8								X		III	1315	III	1315					C-15.91		5.17		C-15.91	1205.92					7	2		CB81 to CB82
Dobson D 12+46.55, 19.41' Lt to 202L 432+75, 18.50' Rt	H4	1-3		24	74								X		III	1315	III	1315					C-15.80		4.52		C-15.80	1205.30					62	21		CB82 to CB83
202L 432+75, 18.5' Rt to 432+75, 8.5' Rt	H5	1-3		24	8								X		III	1315	III	1315					C-15.91		5.25		C-15.91	1204.43					8	2		CB83 to MH81
202L 432+75, 8.5' Rt to 433+46, 69.5' Lt	H6	1-3		24	108								X		III	1315	III	1315				81	C-18.10		6			1204.60					95	31		MH81 to CB84
202L 433+46, 69.5' Lt to 434+62.55, 69.5' Lt	H7	1-3		24	118								X		III	1315	III	1315					C-15.92		5.17	35	C-15.92	1202.65					93	34		CB84 to CB85

CSP - Corrugated Steel Pipe
RCP - Reinforced Concrete Pipe
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NRCIPCP-Non-Reinforced Cast-In Place Concrete Pipe
CHDPEPP-Corrugated High Density Polyethylene Plastic Pipe

Reference numbers correspond to numbers in hexagons on PLAN SHEETS.

The Pipe Has Been Designed For A Fill Height Range As Indicated With The Fill Height Equal To Or Greater Than The Lower Number And Not Exceeding The Higher Number. Fill Heights Are The Maximum Measured From The Top Of Pipe To The Highest Point Of Subgrade Over The Pipe. Should Field Conditions Vary From The Range Indicated, Contact Design For Reevaluation Of Pipe Design Requirements.

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When Bituminous Coating Is Specified For Either Structural Plate Pipe Or Corrugated Metal Pipe, It Shall Be Applied In Accordance With AASHTO M 243 Or AASHTO M 190, Type A, Respectively, And Coated On Both The Inside And The Outside Of The Pipe Unless Otherwise Specified In These Drawings.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

Include FRAME & COVER STD. C-18.10 & C-18.20

	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	MRC	1/96

STANLEY CONSULTANTS, INC.
5583 East Camelback Road, Suite 120
Phoenix, Arizona 85018 - (602) 253-2266

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

NEW PIPE SUMMARY SHEET

ROUTE 202L — LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. G-4.11

TRACS NO. H087502C — 600-8-(006) — ___ OF ___

REV. DATE: 02-08-89

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

•••••DGN=SPECIFICATION••••• VIEW NAME: /12168/RM2G4P13.DGN
•••••SYSTIME•••••

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			

URBAN & RURAL

Station	Plan Ref No.	Fill Height Range (Ft.)	Size, (In.) Corrugated	Size, (In.) Smooth	Length (Ft.)	Skew (Degree)	Corrugation	Wall Thickness (In.)	Zinc	Aluminum	Bituminous	AASHTO M-294 Type C	AASHTO M-294 Type S			CHDPEPP Class	CHDPEPP Min D-Load	RCP Non Trench Class	RCP Non Trench Min D-Load	RCP Trench Class	NR CP Min Wall Thickness (In.)	NR CIP CP C-13.20 C-13.25	End Sct	Manhole No. ▲	CB, MH & Jct Str Standard or Detail	Location	H (Ft)	Slotted Drn. Length (Ft)	Headwall Grate Type	Grate Elev.	Gutter Depression D (In.)	Gutter Depression L (Ft.)	Headwall Standard or Detail	Headwall Location	Pipe Ex (CY) ✱	Pipe Bk-fl (CY)✱	Drn Ex (CY)	REMARKS
202L 434+62.35, 69.5' Lt to 434+62.35, 168.47' Lt	H8	1-3		24	100											III	1315	III	1315			DTL D2			C-15.91		5.17		C-15.91	1200.39					131	28		CB85 to ES81
Dobson D 9+00, 98.33' Rt to 9+82.45, 72.28' Rt	H9	1-3		24	88								X			III	1315	III	1315						C-15.80 Dtl 3		4		C-15.80	1189.93					92	25		CB86 to JCT80 See Dtl 3, S-4.3
Dobson D 11+00, 89.29' Lt to 10+04.33, 80.96' Lt	H10	1-3		24	98								X			III	1315	III	1315						C-15.80 Dtl 3		4		C-15.80	1189.30					102	28		CB87 to JCT81 See Dtl 3, S-4.3
202L 441+05, 81.5' Rt to 441+05, 81.5' Lt	J1	1-3		24	168								X			III	1315	III	1315						C-15.92		5.17	35	C-15.92	1192.89					151	48		CB90 to CB91
202L 441+65, 81.5' Lt to 441+05, 81.5' Lt	J2	1-3		24	60								X			III	1315	III	1315						C-15.92		5.17		C-15.92	1193.15					54	17		CB92 to CB91
202L 441.05, 81.5' Lt to 441.05, 116.26' Lt	J3	3-5		24	34											II	660	II	660			DTL D2			C-15.92		6.17	20	C-15.92	1192.89					36	10		CB91 to ES90
202L 442+30, 81.5' Rt to 442+50, 0' Rt	J4	1-3		24	86								X			III	1315	III	1315						C-15.92		5.17		C-15.92	1193.15					84	24		CB93 to CB94
202L 442+50, 0' Rt to 442+50, 8.5' Lt	J5	3-5		24	10								X			II	660	II	660						C-15.80		6		C-15.80	1193.15					13	3		CB94 to MH90
202L 442+50, 8.5' Lt to 442+50, 123.73' Lt	J6	3-5		30	116											II	620	II	620			DTL D2		90	C-18.10		8.49			1193.99					189	39		MH90 to ES91
202L 444+35, 8.5' Lt to 442+50, 8.50' Lt	J7	3-5		24	186								X			II	660	II	660					91	C-18.10		6.68			1195.68					251	53		MH91 to MH90
202L 443+00, 18.5' Lt to 443+00, 8.5' Lt	J8	1-3		24	10								X			III	1315	III	1315						C-15.91 C-13.70		5.25		C-15.91	1194.26					11	3		CB95 to JCT90
202L 443+70, 18.5' Lt to 443+70, 8.5' Lt	J9	1-3		24	10								X			III	1315	III	1315						C-15.91 C-13.70		5.25		C-15.91	1194.60					11	3		CB96 to JCT91
202L 444+35, 18.5' Lt to 444+35, 8.5' Lt	J10	1-3		24	10								X			III	1315	III	1315						C-15.91		5.25	10	C-15.91	1195.09					11	3		CB97 to MH91
202L 444+35, 81.5' Rt to 444+35, 8.5' Lt	J11	1-3		24	92								X			III	1315	III	1315						C-15.92		5.17	40	C-15.92	1194.46					95	26		CB98 to MH91
202L 449+25, 18.5' Lt to 449+25, 149.29' Lt	J12	11-15		24	134											IV	1570	IV	1570			DTL D2			C-15.91		5.25	20	C-15.91	1203.08					143	38		CB99 to ES92
202L 458+00, 18.5' Lt to 458+00, 196.2' Lt	J13	20-25		24	182											V	2415	V	2140			DTL D2			C-15.91		5.25	20	C-15.91	1218.76					170	52		CB100 to ES93

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NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

▲ Include FRAME & COVER STD. C-18.10 & C-18.20

	NAME	DATE
DESIGN	JRM	1/96
DRAWN	MAC	1/96
CHECKED	MRC	1/96

STANLEY CONSULTANTS, INC.
7051 EAST CAMELBACK ROAD, SUITE 130
SCOTTSDALE, ARIZONA 85266 • (602) 992-5640

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

NEW PIPE SUMMARY SHEET

ROUTE 202L LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. C-4.12

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

REV. DATE: 02-08-89

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

•••••DGN=SPECIFICATION••••• VIEW NAME: /12168/RM2G4PI4.DGN
•••••SYSTIME•••••

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			

URBAN & RURAL

Station	Plan Ref No. ⬡	Fill Height Range (Ft.) ◐	Size, (In.) Corrugated	Size, (In.) Smooth	Length (Ft.)	Skew (Degree)	Corrugation	CSP Wall Thickness (In.)	CSP Allowable Coating: Zinc	CSP Allowable Coating: Aluminum	CSP Allowable Coating: Bituminous	CHDPEPP AASHTO M-294 Type C	CHDPEPP AASHTO M-294 Type S		RCP Non Trench Class	RCP Non Trench ■Min D-Load	RCP Trench Class	RCP Trench ■Min D-Load	Class	NR CP Min Wall Thickness (In.)	NR CIP CP C-13.20 C-13.25	End Sct	Manhole No. 3▲	CB, MH & Jct Str Standard or Detail	CB, MH & Jct Str Location	CB, MH & Jct Str H (Ft)	CB, MH & Jct Str Slotted Drn. Length (Ft)	CB, MH & Jct Str Grate Type	CB, MH & Jct Str Grate Elev.	CB, MH & Jct Str Gutter Depression D (In.)	CB, MH & Jct Str Gutter Depression L (Ft.)	Headwall Standard or Detail	Headwall Location	QUANTITIES Pipe Ex (CY) ✱	QUANTITIES Pipe Bk-fl (CY) ✱	QUANTITIES Drn Ex (CY)	REMARKS
202L 461+38, 69.5' Rt to 460+18.78, 69.5' Rt	K1	1-3		24	118								X		III	1315	III	1315						C-15.92		5.17	20	C-15.92	1223.95					98	34		CB101 to CB102
202L 460+18.78, 69.5' Rt to 460+18.78, 184' Rt	K2	1-3		24	116										III	1315	III	1315			C-13.20			C-15.91		5.25		C-15.91	1221.91					75	33		CB102 to ES100
Alma B 8+88.25, 96.11' Rt to 202L 458+58.73, 210.25' Lt	K3	30-40		54	602											NA	V	2995														8-11.2 D1 D1		4400	650		ES101 to ES94
Alma B 8+22, 92' Rt to 8+44.42, 62.94' Rt	K4	1-3		24	38										III	1315	III	1315						C-15.80 C-13.70		4		C-15.80	1196.10					33	11		CB103 to JCT101
202L 467+65, 18.5' Rt to 467+46.45, 64.5' Lt	K5	1-3		24	84								X		III	1315	III	1315						C-15.91		5.25		C-15.91	1231.18					71	24		CB105 to MH101
202L 466+55, 69.5' Lt to 467+46.45, 64.5' Lt	K6	3-5		24	92								X		II	660	II	660						C-15.92		6.17	15	C-15.92	1230.60					97	26		CB104 to MH101
202L 467+46.45, 64.5' Lt to Alma A 9+00, 11.5' Rt	K7	15-20		24	84										IV	1940	IV	1885				101		C-18.10		18.92			1230.92					193	24		MH101 to CB106
Alma A 9+00, 11.5' Rt to 8+81.58, 136.29' Lt	K8	20-25		24	158										V	2035	V	2885			D1 D2			C-15.91		9.44		C-15.91	1220.99					447	45		CB106 to ES103
CSA 59+50, 31.3' Lt to 61+90, 30.7' Lt	K9	20-25		48	242										V	2315	V	2270																			Pipe Under Haul Road
Alma B 17+13.22, 42.56' Lt to 16+85, 11.5' Lt	K22	1-3		24	42								X		III	1315	III	1315						C-15.80		3.5		C-15.80	1200.10					39	12		CB107 to CB108
Alma B 16+85, 11.5' Lt to 16+85, 56.37' Rt	K23	1-3		24	68								X		III	1315	III	1315			C-13.20			C-15.91		7.24		C-15.91	1203.24					55	19		CB108 to ES105
Alma D 1+28.60, 40.47' Lt to 1+65, 11.5' Lt	K25	1-3		24	46								X		III	1315	III	1315						C-15.80		2.5		C-15.80	1199.10					32	13		CB109 to CB110
Alma D 2+05, 11.5' Lt to 1+65, 11.5' Lt	K26	1-3		24	40								X		III	1315	III	1315						C-15.91		5.28		C-15.91	1203.46					40	11		CB111 to CB110
Alma D 1+65, 11.5' Lt to 1+60, 43' Rt	K27	1-3		24	58								X		III	1315	III	1315						C-15.91		7.18		C-15.91	1203.43					60	16		CB110 to CB112
Alma D 1+60, 43' Rt to Alma 17+55, 12' Lt	K28	1-3		36	210								X		II	900	II	900						C-15.80		5.80		C-15.80						184	60		CB112 to MH104
Alma 17+55, 12' Lt to 16+77.40, 135.19' Lt	K29	1-3		36	146								X		II	900	II	900			C-13.20			C-18.10		8.97			1206.57					175	42		MH104 to ES106

CSP - Corrugated Steel Pipe
RCP - Reinforced Concrete Pipe
NRCP - Non-Reinforced Concrete Pipe
NRCIPCP-Non-Reinforced Cast-in Place Concrete Pipe
CHDPEPP-Corrugated High Density Polyethylene Plastic Pipe

⬡ Reference numbers correspond to numbers in hexagons on PLAN SHEETS.

◐ The Pipe Has Been Designed For A Fill Height Range As Indicated With The Fill Height Equal To Or Greater Than The Lower Number And Not Exceeding The Higher Number. Fill Heights Are The Maximum Measured From The Top Of Pipe To The Highest Point Of Subgrade Over The Pipe. Should Field Conditions Vary From The Range Indicated, Contact Design For Reevaluation Of Pipe Design Requirements.

■ The Minimum D-LOAD Needed To Produce A 0.01 Inch Crack. RCP May Be Provided By Either Min. D-LOAD Or Class.

✱ PIPE EXCAVATION & PIPE BACKFILL WILL Not Be Measured For Payment.

● When Bituminous Coating Is Specified For Either Structural Plate Pipe Or Corrugated Metal Pipe, It Shall Be Applied In Accordance With AASHTO M 243 Or AASHTO M 190, Type A, Respectively, And Coated On Both The Inside And The Outside Of The Pipe Unless Otherwise Specified In These Drawings.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

▲ Include FRAME & COVER STD. C-18.10 & C-18.20

	NAME	DATE
DESIGN	JRM	1/96
DRAWN	MAC	1/96
CHECKED	MRC	1/96

STANLEY CONSULTANTS, INC.
2905 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85016 • (602) 912-0066

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

NEW PIPE SUMMARY SHEET

ROUTE 202L
LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. C-4.13

TRACS NO. H087502C

600-8-(006)

___ OF ___

REV. DATE: 02-08-89

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

•••••DGN=SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2G4P15.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			

URBAN & RURAL

Station	Plan Ref No.	Fill Height Range (Ft.)	Size, (In.) Corrugated	Size, (In.) Smooth	Length (Ft.)	Skew (Degree)	Corrugation	CSP Wall Thickness (In.)	CSP Zinc	CSP Aluminum	CSP Bituminous (Allowable Coating)	CHDPEPP AASHTO M-294 Type C	CHDPEPP AASHTO M-294 Type S		RCP Class	RCP Min D-Load	RCP Class	RCP Min D-Load	RCP Class	NR CP Min Wall Thickness (In.)	NR CIP CP C-13.20 C-13.25	End Sct	Manhole No.	Standard or Detail	CB, MH & Jct Str Location	CB, MH & Jct Str H (Ft)	CB, MH & Jct Str Slotted Drn. Length (Ft)	CB, MH & Jct Str Grate Type	CB, MH & Jct Str Grate Elev.	CB, MH & Jct Str Gutter Depression D (In.)	CB, MH & Jct Str Gutter Depression L (Ft.)	Headwall Standard or Detail	Headwall Location	Pipe Ex (CY) *	Pipe Bk-fl (CY) *	Drn Ex (CY)	REMARKS
Alma 15+61, 51.81' Rt to 15+53.80, 51.63' Lt	K30	1-3		24	104								X		III	1315	III	1315						D+1 U		4		D+1 U	1204.45					69	30		CB113 to CB114
Alma 15+53.80, 51.63' Lt to 16+13.04, 143.94' Lt	K31	1-3		24	110								X		III	1315	III	1315			C-13.20			D+1 U		4.5		D+1 U	1204.50					64	31		CB114 to ES107
Alma 14+86.46, 83' Lt to 15+67.44, 225.51' Lt	K33	1-3		48	164										II	695	II	695					105	C-18.10					1205.40			C-16.10		234	62		MH105 to ES108
Alma C 1+85, 75' Lt to 1+95.30, 25.5' Lt	L1	1-3		24	50								X		III	1315	III	1315						C-15.80		3		C-15.80	1199.00					45	14		CB123 to CB125
Alma C 2+25, 25.5' Lt to 1+95.30, 25.5' Lt	L2	1-3		24	30								X		III	1315	III	1315						C-15.91		5.19	10	C-15.91	1203.35					24	9		CB124 to CB125
Alma C 1+95.30, 25.5' Lt to Alma 21+66.72, 99.49' Rt	L3	1-3		24	132								X		III	1315	III	1315						C-15.30		7.29		EF-1	1203.06					127	38		CB125 to CB121
202L 474+96.77, 4.5' Rt to Alma 21+66.72, 99.49' Rt	L4	11-15		24	130								X		IV	1570	IV	1570						C-15.92		9.34	10	C-15.92	1226.87					147	37		CB120 to CB121
Alma 21+66.72, 99.49' Rt to 21+62, 47.9' Rt	L5	1-3		30	50								X		III	1065	III	1065						C-15.80		3.75		C-15.80	1199.00					63	17		CB121 to CB122
Alma 21+62, 47.9' Rt to 21+25, 59.83' Lt	L6	5-8		30	118								X		II	880	II	880						C-15.20		9.89			1204.49					200	39		CB122 to CB128
Alma 21+25, 59.83' Lt to 21+05, 95' Lt	L7	1-3		30	40								X		III	1065	III	1065						C-15.20		10.8			1204.51					56	13		CB128 to CB129 3' Wing
202L 471+40, 4.5' Rt to 471+60, 69.5' Lt	L8	1-3		24	78								X		III	1315	III	1315						C-15.92		5.17	10	C-15.92	1230.19					64	22		CB116 to CB117
202L 471+60, 69.5' Lt to Alma 21+05, 95' Lt	L9	1-3		24	102								X		III	1315	III	1315						C-15.92		10.45	10	C-15.92	1229.28					136	29		CB117 to CB129
Alma 21+05, 95' Lt to Alma A 13+60, 13.5' Lt	L10	1-3		30	70								X		III	1065	III	1065						C-15.80		5		C-15.80	1199.50					94	23		CB129 to CB130
Alma A 13+60, 13.5' Lt to 13+60, 129.60' Lt	L11	1-3		30	116								X		III	1065	III	1065						C-15.91		8.93		C-15.91	1203.45					167	39		CB130 to MH107
Alma 24+15, 41.58' Rt to 24+35, 52.58' Lt	L12	1-3		24	98								X		III	1315	III	1315						C-15.20		4.08			1203.47					55	28		CB126 to CB127
Alma 24+35, 52.58' Lt to Alma A 13+60, 129.60' Lt	L13	1-3		24	194								X		III	1315	III	1315						C-15.20		4.30			1203.22					167	55		CB127 to MH107 3' Wing In Reverse Direction

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CHDPEPP-Corrugated High Density Polyethylene Plastic Pipe

Reference numbers correspond to numbers in hexagons on PLAN SHEETS.

The Pipe Has Been Designed For A Fill Height Range As Indicated With The Fill Height Equal To Or Greater Than The Lower Number And Not Exceeding The Higher Number. Fill Heights Are The Maximum Measured From The Top Of Pipe To The Highest Point Of Subgrade Over The Pipe. Should Field Conditions Vary From The Range Indicated, Contact Design For Reevaluation Of Pipe Design Requirements.

The Minimum D-LOAD Needed To Produce A 0.01 Inch Crack. RCP May Be Provided By Either Min. D-LOAD Or Class.

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When Bituminous Coating Is Specified For Either Structural Plate Pipe Or Corrugated Metal Pipe, It Shall Be Applied In Accordance With AASHTO M 243 Or AASHTO M 190, Type A, Respectively, And Coated On Both The Inside And The Outside Of The Pipe Unless Otherwise Specified In These Drawings.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

Include FRAME & COVER STD. C-18.10 & C-18.20

	NAME	DATE
DESIGN	JRM	1/96
DRAWN	MAC	1/96
CHECKED	MRC	1/96

STANLEY CONSULTANTS, INC.
2901 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85016 • (602) 955-6660

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

NEW PIPE SUMMARY SHEET

ROUTE 202L LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. G-4.14

TRACS NO. H087502C

600-8-(006)

___ OF ___

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

•••••DGN=SPECIFICATION•••••
•••••SYSTIME•••••
VIEW NAME: /12168/RM2G4P16.DGN

REV. DATE: 02-08-89

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			

URBAN & RURAL

Station	Plan Ref No.	Fill Height Range (Ft.)	Size, (In.) Corrugated	Size, (In.) Smooth	Length (Ft.)	Skew (Degree)	Corrugation	Wall Thickness (In.)	Allowable Coating: Zinc	Allowable Coating: Aluminum	Allowable Coating: Bituminous	AASHTO M-294 Type C	AASHTO M-294 Type S		CHDPEPP Class	CHDPEPP Min D-Load	RCP Non Trench Class	RCP Non Trench Min D-Load	RCP Trench Class	Min Wall Thickness (In.)	NR CP C-13.20	NR CIP CP C-13.25	End Set Manhole No. 3▲	End Treatment Standard or Detail	CB, MH & Jct Str Location	CB, MH & Jct Str H (Ft)	CB, MH & Jct Str Slotted Drn. Length (Ft)	CB, MH & Jct Str Grate Type	CB, MH & Jct Str Grate Elev.	CB, MH & Jct Str Gutter Depression D (In.)	CB, MH & Jct Str Gutter Depression L (Ft.)	Headwall Standard or Detail	Headwall Location	Quantities Pipe Ex (CY) *	Quantities Pipe Bk-fl (CY)*	Quantities Drn Ex (CY)	Remarks
Alma A 13+60, 129.6' Lt to 10+83.95, 135.68' Lt	L14			36	278										V	2820	V	2155				107	C-18.10		29			1202.00			C-16.10		1290	159		MH107 to ES110
Alma A 11+70, 119.16' Lt to 11+70.32, 133.78' Lt	L15			24	24										IV	1940	IV	1885					C-15.80 C-13.70		4		C-15.80	1193.00					51	7		CB131 to JCT107
202L 479+85, 18.5' Rt to 479+85, 8.5' Rt	M1	1-3		24	8								X		III	1315	III	1315					C-15.91		5.02	10	C-15.91	1220.47					8	2		CB140 to MH110
202L 479+85, 8.5' Rt to 481+40, 8.5' Rt	M2	1-3		24	156								X		II	660	II	660				110	C-18.10		6.44			1221.04					182	44		MH110 to MH111
202L 481+40, 81.5' Lt to 481+40, 8.5' Rt	M3	1-3		24	92								X		III	1315	III	1315					C-15.92		4.94	35	C-15.92	1216.91					88	26		CB141 to MH111
202L 481+40, 8.5' Rt to 482+41, 8.5' Rt	M4	1-3		24	102								X		III	1315	III	1315				111	C-18.10		6.07			1217.99					114	29		MH111 to MH112
202L 481+65, 18.5' Rt to 481+65, 8.5' Rt	M5	1-3		24	8								X		III	1315	III	1315					C-15.91		5.03		C-15.91	1217.05					8	2		CB142 to JCT110
202L 482+35.57, 81.5' Lt to 482+41, 8.5' Rt	M6	1-3		24	94								X		III	1315	III	1315					C-13.70 C-15.91		3.98		C-15.91	1214.59					81	27		CB143 to MH112
202L 482+41, 8.5' Rt to 482+41, 69.5' Rt	M7	1-3		24	64								X		III	1315	III	1315				112	C-18.10		5.88			1215.85					66	18		MH112 to CB144
202L 482+41, 69.5' Rt to Alma D 10+44.01, 57.04' Rt	M8	1-3		24	84								X		III	1315	III	1315			C-13.20		C-15.91		5.98		C-15.91	1215.18					59	24		CB144 to ES120
Alma D 10+96.82, 10.81' Rt to 10+47.79, 8.96' Rt	M9	1-3		24	50								X		III	1315	III	1315					C-15.91 C-13.70		5.27		C-15.91	1212.92					42	14		CB145 to JCT111
202L 484+84, 0' Rt to Alma D 12+67.55, 9.5' Rt	M10	1-3		24	96								X		III	1315	III	1315					C-15.80		3.79		C-15.80	1210.29					79	27		CB146 to CB147
Alma D 12+67.55, 9.5' Rt to 12+66.10, 34.04' Rt	M11	1-3		24	24								X		III	1315	III	1315			C-13.20		C-15.91		5.16	10	C-15.91	1210.28					15	7		CB147 to ES121
Alma D 14+07.93, 9.5' Rt to 14+07.23, 30.56 Rt	N1	1-3		24	20								X		IIII	1315	IIII	1315			C-13.20		C-15.91		4.20	10	C-15.91	1209.10					11	6		CB150 to ES130
202L 486+55, 81.5' Lt to 487+50, 81.5' Lt	N2	1-3		24	96								X		III	1315	III	1315					C-15.92		4.23	15	C-15.92	1209.67					54	27		CB151 to CB154
202L 489+30, 81.5' Lt to 488+30, 81.5' Lt	N3	1-3		24	100								X		III	1315	III	1315					C-15.92		3.66	30	C-15.92	1209.57					57	28		CB152 to CB153

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⬡ Reference numbers correspond to numbers in hexagons on PLAN SHEETS.

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NOTE:
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▲ Include FRAME & COVER STD. C-18.10 & C-18.20

	NAME	DATE
DESIGN	JRM	1/96
DRAWN	MAC	1/96
CHECKED	MRC	1/96

STANLEY CONSULTANTS, INC.
5005 EAST CONSTITUTION ROAD, SUITE 120
TUCSON, ARIZONA 85706 • (520) 573-4206

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

NEW PIPE SUMMARY SHEET

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. C-4.15

REV. DATE: 02-08-89

SURVEY NO. | LINE | REVISIONS | LOCATION | DATE

•••••DGN=SPECIFICATION•••••
•••••SYSTIME•••••
VIEW NAME: /12168/RM2C4P17.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013

URBAN & RURAL

Station	Plan Ref No.	Fill Height Range (Ft.)	Size, (In.) Corrugated	Size, (In.) Smooth	Length (Ft.)	Skew (Degree)	CSP Corrugation	CSP Wall Thickness (In.)	CSP Allowable Coating: Zinc	CSP Allowable Coating: Aluminum	CSP Allowable Coating: Bituminous	CHDPEPP AASHTO M-294 Type C	CHDPEPP AASHTO M-294 Type S		RCP Non Trench Class	RCP Non Trench Min D-Load	RCP Trench Class	RCP Trench Min D-Load	NR CP Class	NR CIP CP Min Wall Thickness (In.)	NR CIP CP C-13.20 C-13.25	End Sct Manhole No. 3▲	End Treatment Standard or Detail	CB, MH & Jct Str Location	CB, MH & Jct Str H (Ft)	CB, MH & Jct Str Slotted Drn. Length (Ft)	CB, MH & Jct Str Grate Type	CB, MH & Jct Str Grate Elev.	CB, MH & Jct Str Gutter Depression D (In.)	CB, MH & Jct Str Gutter Depression L (Ft.)	Headwall Standard or Detail	Headwall Location	Quantities Pipe Ex (CY) ✱	Quantities Pipe Bk-fl (CY)✱	Quantities Drn Ex (CY)	Remarks
202L 488+30, 81.5' Lt to 487+50, 81.5' Lt	N4	1-3		24	80								X		III	1315	III	1315					C-15.92		3.65		C-15.92	1209.00					45	23		CB153 to CB154
202L 487+50, 81.5' Lt to 487+50, 0' Rt	N5	1-3		30	84								X		III	1065	III	1065					C-15.92		4.12		C-15.92	1208.85					79	28		CB154 to CB155
202L 487+50, 0' Rt to Alma D 15+58.21, 9.5' Rt	N6	1-3		30	84								X		III	1065	III	1065					C-15.80		3		C-15.80	1207.68					84	28		CB155 to CB159 Timber Cap Per C-15.91
Alma D 14+83.08, 9.5' Rt to 15+58.21, 9.5' Rt	N7	1-3		24	76								X		III	1315	III	1315					C-15.91		3.75		C-15.91	1208.78					48	22		CB156 to CB159
202L 489+00, 81.5' Rt to 488+10, 81.5' Rt	N8	1-3		24	90								X		III	1315	III	1315					C-15.91		3.81		C-15.91	1209.35					53	26		CB157 to CB158
202L 488+10, 81.5' Rt to Alma D 15+58.21, 9.5' Rt	N9	1-3		24	60								X		III	1315	III	1315					C-15.91		3.80		C-15.91	1208.93					38	17		CB158 to CB159
Alma D 15+58.21, 9.5' Rt to 15+58.07, 31.47' Rt	N10	1-3		30	22								X		III	1065	III	1065					C-15.91		4.54		C-15.91	1208.74					15	7		CB159 to ES131
202L 489+95, 114.23' Rt to 489+95, 81.5' Rt	N11	1-3		24	32								X		III	1315	III	1315			C-13.20 C-13.20												28	9		ES132 to CB160
202L 489+95, 81.5' Rt to 489+95, 118.16' Lt	N12	1-3		24	202										III	1315	III	1315			DTL D2		C-15.91		7.71		C-15.91	1210.17					236	57		CB160 to ES133
202L 491+85, 81.50' Rt to 491+85, 108.08' Rt	N14	1-3		24	26								X		III	1315	III	1315			C-13.20		C-15.92		5.17	40	C-15.92	1213.01					17	7		CB161 to ES136
202L 498+00, 8.5' Lt to 496+40, 8.5' Lt	N15	1-3		24	160								X		III	1315	III	1315					C-13.75										153	46		JCT138 to MH161 Pipe Plug
202L 496+40, 8.5' Lt to 494+16, 8.5' Lt	N16	1-3		24	224								X		III	1315	III	1315				161	C-18.10		6			1222.04					233	64		MH161 to MH160
202L 494+16, 8.5' Lt to 494+16, 0' Rt	N17	1-3		24	10								X		III	1315	III	1315				160	C-18.10		5			1218.30					9	3		MH160 to CB162
202L 494+16, 0' Rt to 494+16, 119.69' Rt	N18	1-3		24	120								X		III	1315	III	1315			C-13.20		C-15.80		4.7		C-15.80	1217.55					72	34		CB162 to ES137

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CHDPEPP-Corrugated High Density Polyethylene Plastic Pipe

⬡ Reference numbers correspond to numbers in hexagons on PLAN SHEETS.

◒ The Pipe Has Been Designed For A Fill Height Range As Indicated With The Fill Height Equal To Or Greater Than The Lower Number And Not Exceeding The Higher Number. Fill Heights Are The Maximum Measured From The Top Of Pipe To The Highest Point Of Subgrade Over The Pipe. Should Field Conditions Vary From The Range Indicated, Contact Design For Reevaluation Of Pipe Design Requirements.

■ The Minimum D-LOAD Needed To Produce A 0.01 Inch Crack. RCP May Be Provided By Either Min. D-LOAD Or Class.

✱ PIPE EXCAVATION & PIPE BACKFILL WILL Not Be Measured For Payment.

● When Bituminous Coating Is Specified For Either Structural Plate Pipe Or Corrugated Metal Pipe, It Shall Be Applied In Accordance With AASHTO M 243 Or AASHTO M 190, Type A, Respectively, And Coated On Both The Inside And The Outside Of The Pipe Unless Otherwise Specified In These Drawings.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

▲ Include FRAME & COVER STD. C-18.10 & C-18.20

	NAME	DATE
DESIGN	JRM	1/96
DRAWN	MAC	1/96
CHECKED	MRC	1/96

STANLEY CONSULTANTS, INC.
2905 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85016 • (602) 957-0866

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

NEW PIPE SUMMARY SHEET

ROUTE 202L
LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. C-4.16

REV. DATE: 02-08-89

SURVEY NO. | DATE | REVISIONS | LOCATION | DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••
VIEW NAME: /12168/RM2G4P18.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			

URBAN & RURAL

Station	Plan Ref No.	Fill Height Range (Ft.)	Size, (In.) Corrugated	Size, (In.) Smooth	Length (Ft.)	Skew (Degree)	Corrugation	Wall Thickness (In.)	Zinc	Aluminum	Bituminous	AASHTO M-294 Type C	AASHTO M-294 Type S			CSP Class	CSP Min D-Load	CHDPEPP Class	CHDPEPP Min D-Load	RCP Class	NR CP Min Wall Thickness (In.)	NR CIP CP C-13.20 C-13.25	End Sct Manhole No. 3▲	Standard or Detail	Location	H (Ft.)	Slotted Drn. Length (Ft.)	Grate Type	Grate Elev.	Gutter Depression D (In.)	Gutter Depression L (Ft.)	Headwall Standard or Detail	Headwall Location	Pipe Ex (CY)✱	Pipe Bk-fl (CY)✱	Drn Ex (CY)	REMARKS
McKellips B 15+20, 50' Rt to 14+85, 25.5' Rt	P1	1-3		24	42								X			III	1315	III	1315					C-15.75		3.42		NA	1210.40					28	12	30	ES140 to CB170
McKellips B 14+85, 25.5' Rt to 13+25, 105' Lt	P2	1-3		24	208								X			III	1315	III	1315					C-15.91		4.25	10	C-15.91	1211.84					143	59	1060	CB170 to Ditch
202L 503+35, 200' Lt to 502+50, 250' Lt	P3	1-3		24	100								X			III	1315	III	1315															49	28	155	Access Road Culvert

CSP - Corrugated Steel Pipe
RCP - Reinforced Concrete Pipe
NRCP - Non-Reinforced Concrete Pipe
NRCIPCP-Non-Reinforced Cast-In Place Concrete Pipe
CHDPEPP-Corrugated High Density Polyethylene Plastic Pipe

⬡ Reference numbers correspond to numbers in hexagons on PLAN SHEETS.

◒ The Pipe Has Been Designed For A Fill Height Range As Indicated With The Fill Height Equal To Or Greater Than The Lower Number And Not Exceeding The Higher Number. Fill Heights Are The Maximum Measured From The Top Of Pipe To The Highest Point Of Subgrade Over The Pipe. Should Field Conditions Vary From The Range Indicated, Contact Design For Reevaluation Of Pipe Design Requirements.

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● When Bituminous Coating Is Specified For Either Structural Plate Pipe Or Corrugated Metal Pipe, It Shall Be Applied In Accordance With AASHTO M 243 Or AASHTO M 190, Type A, Respectively, And Coated On Both The Inside And The Outside Of The Pipe Unless Otherwise Specified In These Drawings.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

▲ Include FRAME & COVER STD. C-18.10 & C-18.20

	NAME	DATE
DESIGN	JRM	1/96
DRAWN	MAC	1/96
CHECKED	MRC	1/96

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

NEW PIPE SUMMARY SHEET

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD | DWG NO. C-4.17

REV. DATE: 02-08-89

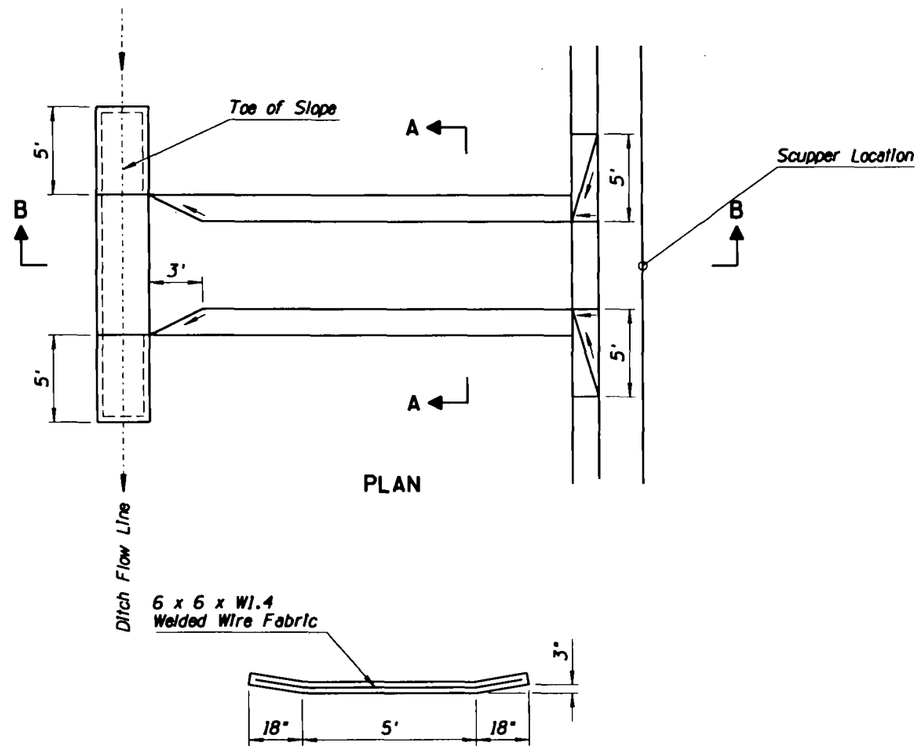
SURVEY NO. | LINE | REVISIONS | LOCATION | DATE

•••••DGN=SPECIFICATION••••• VIEW NAME: /12168/RM2C4P19.DGN
•••••SYSTIME•••••

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



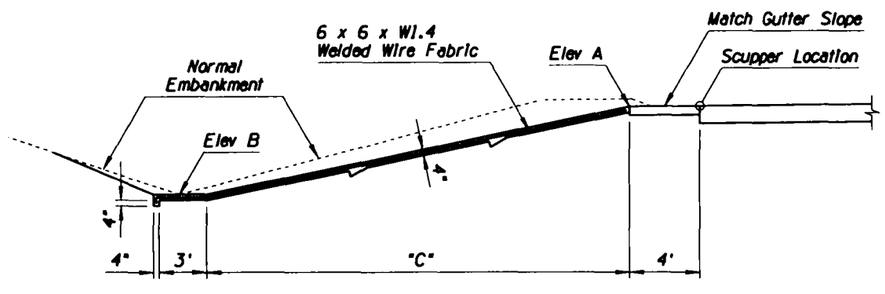
PLAN

SECTION A-A

SCUPPER LOCATION	ELEVATION		DIST "C"
	A	B	
11.5' Rt Alma School Ramp A Cst ℄ Sta 4+09.05	1229.33	1228.35	4.39'
11.5' Lt Alma School Ramp B Cst ℄ Sta 12+95	1212.45	1209.23	19.97'
11.5' Lt Alma School Ramp D Cst ℄ Sta 5+45	1211.13	1207.10	24.90'

Notes:

1. All Concrete Shall be Class B.
2. For Spillway Details Not Shown, See Std C-04.10.



SECTION B-B

DETAIL J

CURB OPENING WITH SPILLWAY

	NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
DESIGN	RSB	1/96	
DRAWN	CGS	1/96	
CHECKED	SW	1/96	
	STANLEY CONSULTANTS, INC.		DETAIL J
ROUTE 202L	LOCATION RED MTN - SR 101L - McKELLIPS ROAD		DWG NO. C-5.9

SURVEY NO.	PLANS	REVISIONS	LOCATION	DATE

EXHIBIT II

HEC-1 Schematic Diagram

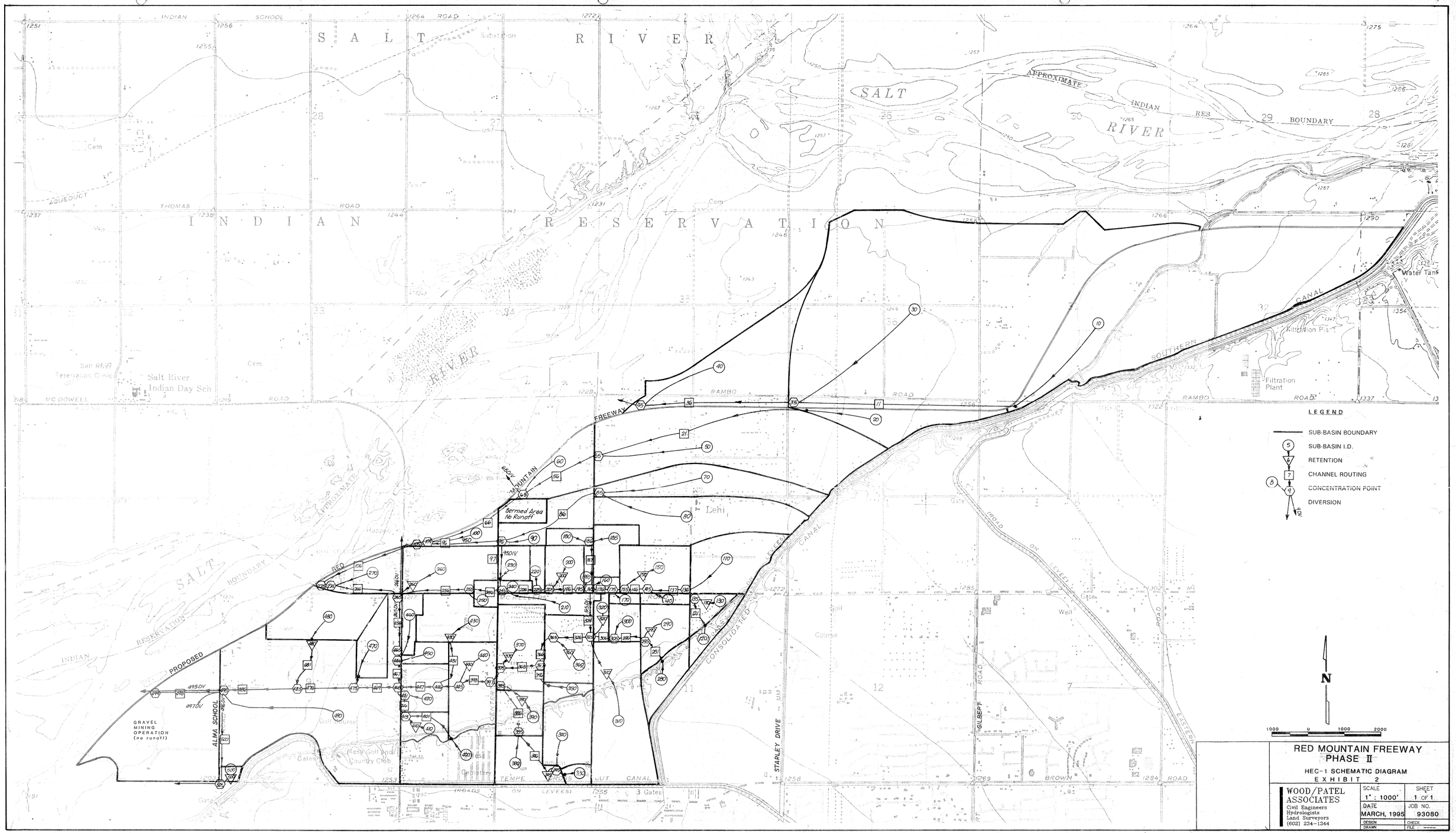
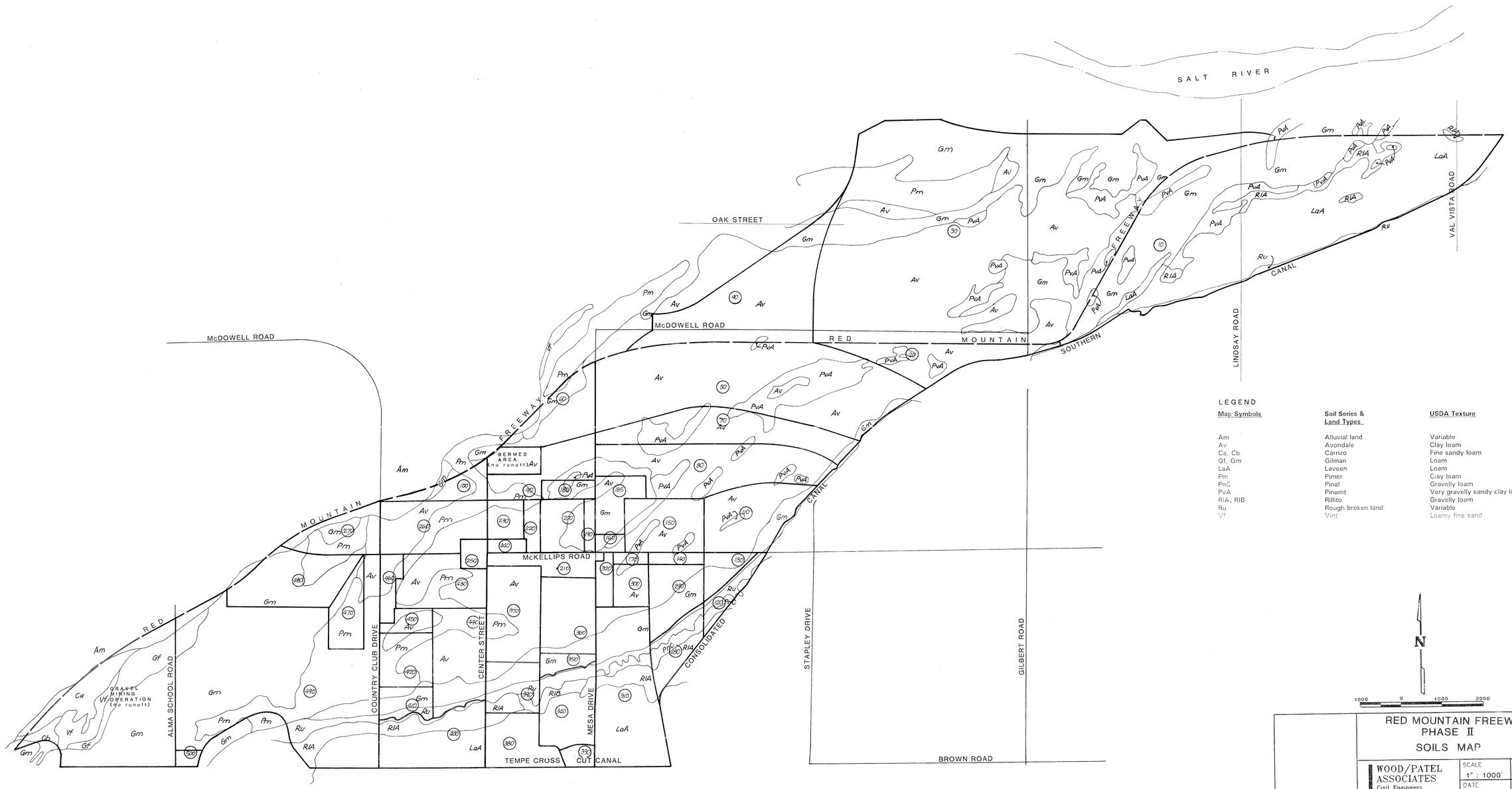

SALT RIVER INDIAN RESERVATION
INDIAN SCHOOL ROAD
THOMAS ROAD
AQUEDUCT
MC DOWELL ROAD
RAMBO ROAD
RED MOUNTAIN FREEWAY
PROPOSED
Bermed Area No Runoff
GRAVEL MINING OPERATION (no runoff)
ALMA SCHOOL
STAPLEY DRIVE
GILBERT ROAD
BROWN ROAD
EASTERN CANAL
SOUTHERN CANAL
CONSOLIDATED CANAL
TEMPE CUT CANAL
ROADS ON LEVEES
Lehi
Water Tank
Filtration Plant
Salt River Indian Day Sch
Salt River Reservation Clinic
Mesa Golf and Country Club
Golf Course
Cemetery
Substation
APPROXIMATE INDIAN RES BOUNDARY
LEGEND
SUB-BASIN BOUNDARY
SUB-BASIN I.D.
RETENTION
CHANNEL ROUTING
CONCENTRATION POINT
DIVERSION
N
1000 0 1000 2000
RED MOUNTAIN FREEWAY
PHASE II
HEC-1 SCHEMATIC DIAGRAM
EXHIBIT 2
WOOD/PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344
SCALE 1" : 1000'
SHEET 1 OF 1
DATE MARCH, 1995
JOB NO. 93080
DESIGN
DRAWN
CHECK
FILE

EXHIBIT III

Soils Map



LEGEND

Map Symbols	Soil Series & Land Types	USDA Texture
Am	Alluvial land	Variable
Av	Avondale	Clay loam
Ca, Cb	Carrizo	Fine sandy loam
Gf, Gm	Gilman	Loam
LaA	Laveen	Loam
Pm	Pimer	Clay loam
PnC	Pinal	Gravelly loam
PvA	Pinamt	Very gravelly sandy clay loam
RlA, RlB	Rillito	Gravelly loam
Ru	Rough broken land	Variable
Vf	Vint	Loamy fine sand

RED MOUNTAIN FREEWAY
PHASE II
SOILS MAP

WOOD/PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344

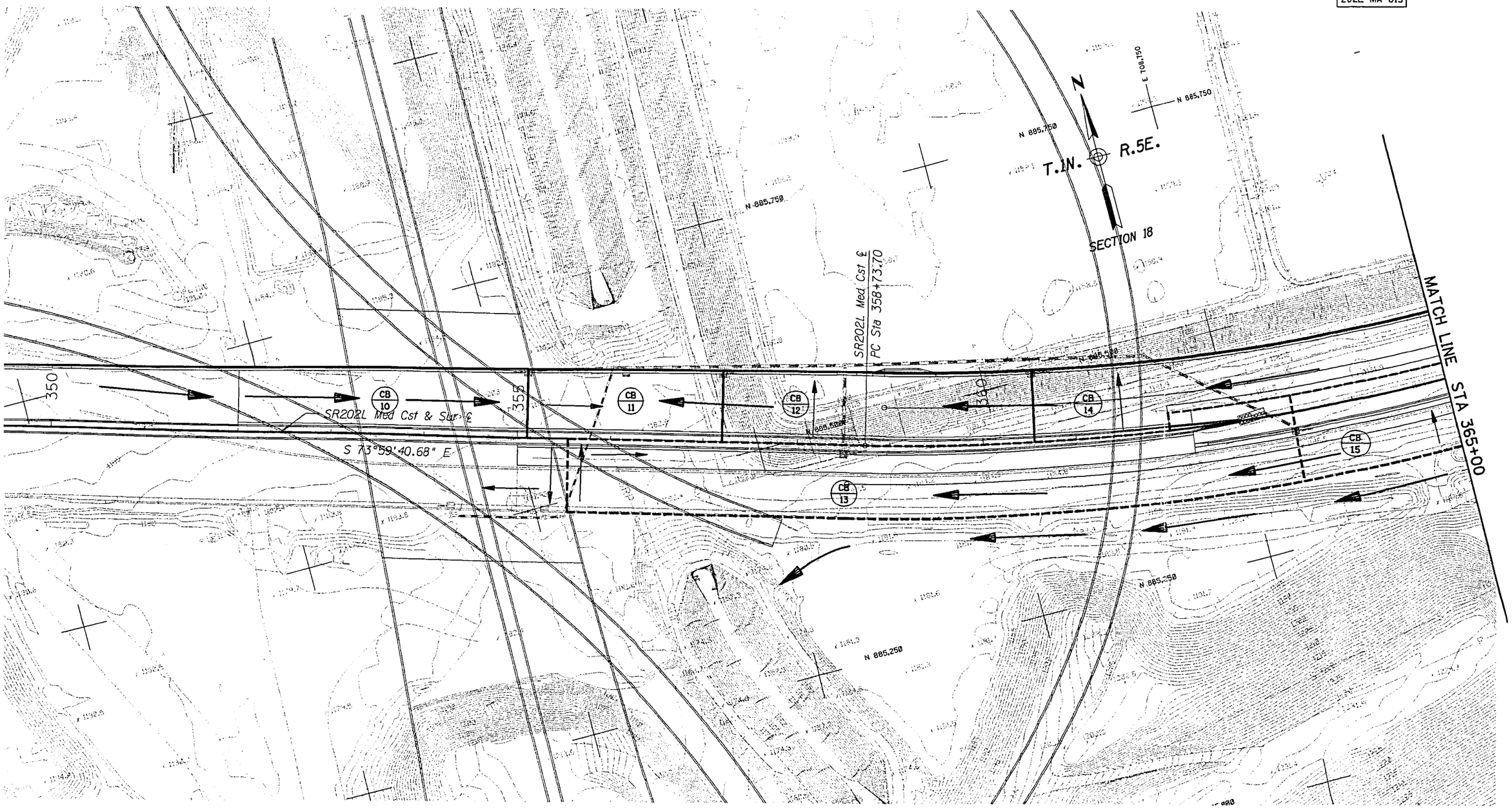
SCALE	SHEET
1" = 1000'	1 OF 1
DATE	JOB NO.
MARCH, 1995	93080
DESIGN	CHECK
DRAWN	FILE

EXHIBIT IV

Roadway Drainage Area Map

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



NOTE:
Dashed Line Indicates Eastbound & Median Contributing Drainage Area Boundaries.

	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SOW	1/96

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 350+00 TO STA 365+00

ROUTE 202L | LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.1

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2DRN02.DGN

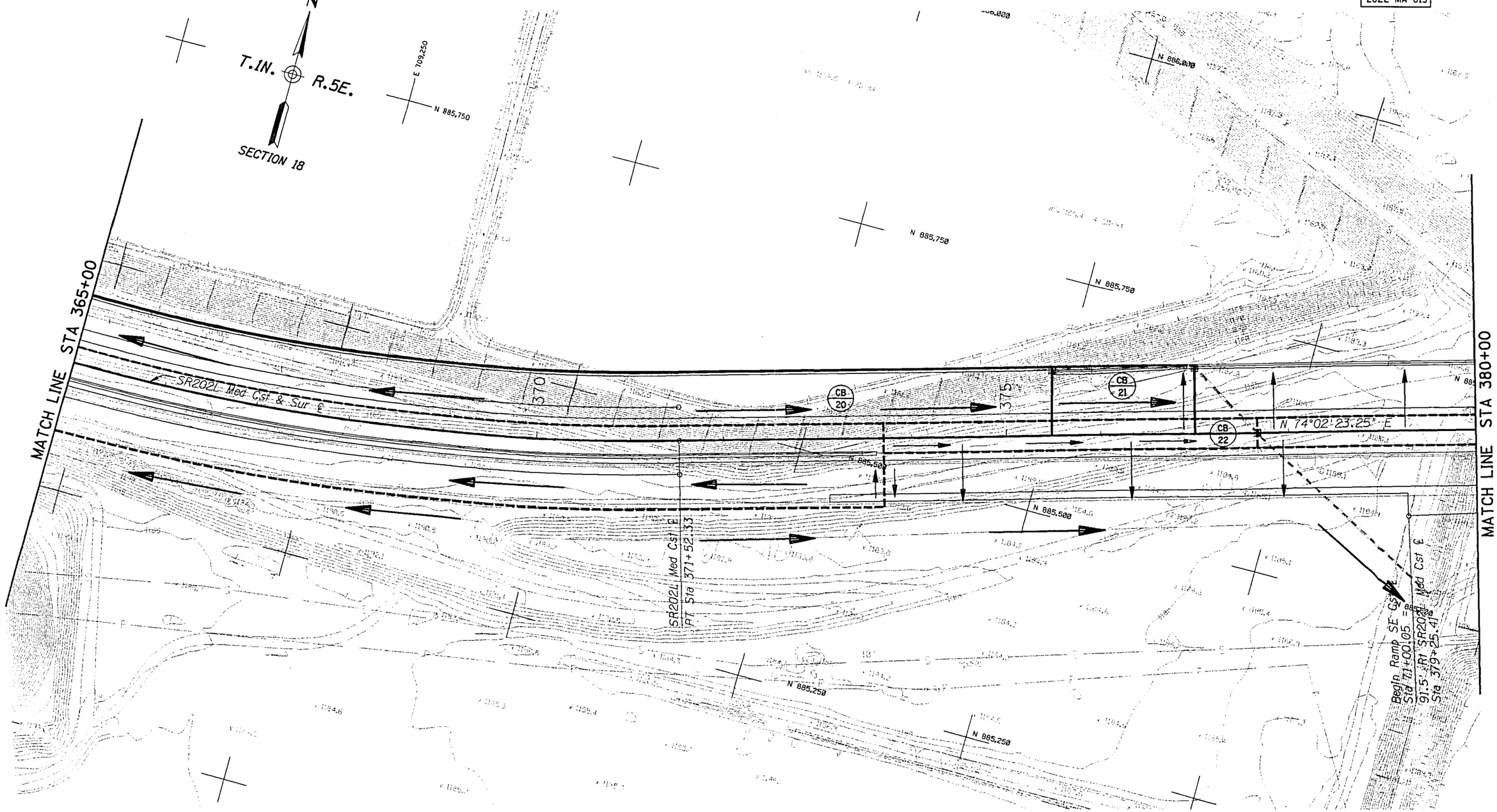
PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

CONSTRUCTION DISPLAY ON

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SOW	1/96

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 365+00 TO STA 380+00

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.2

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

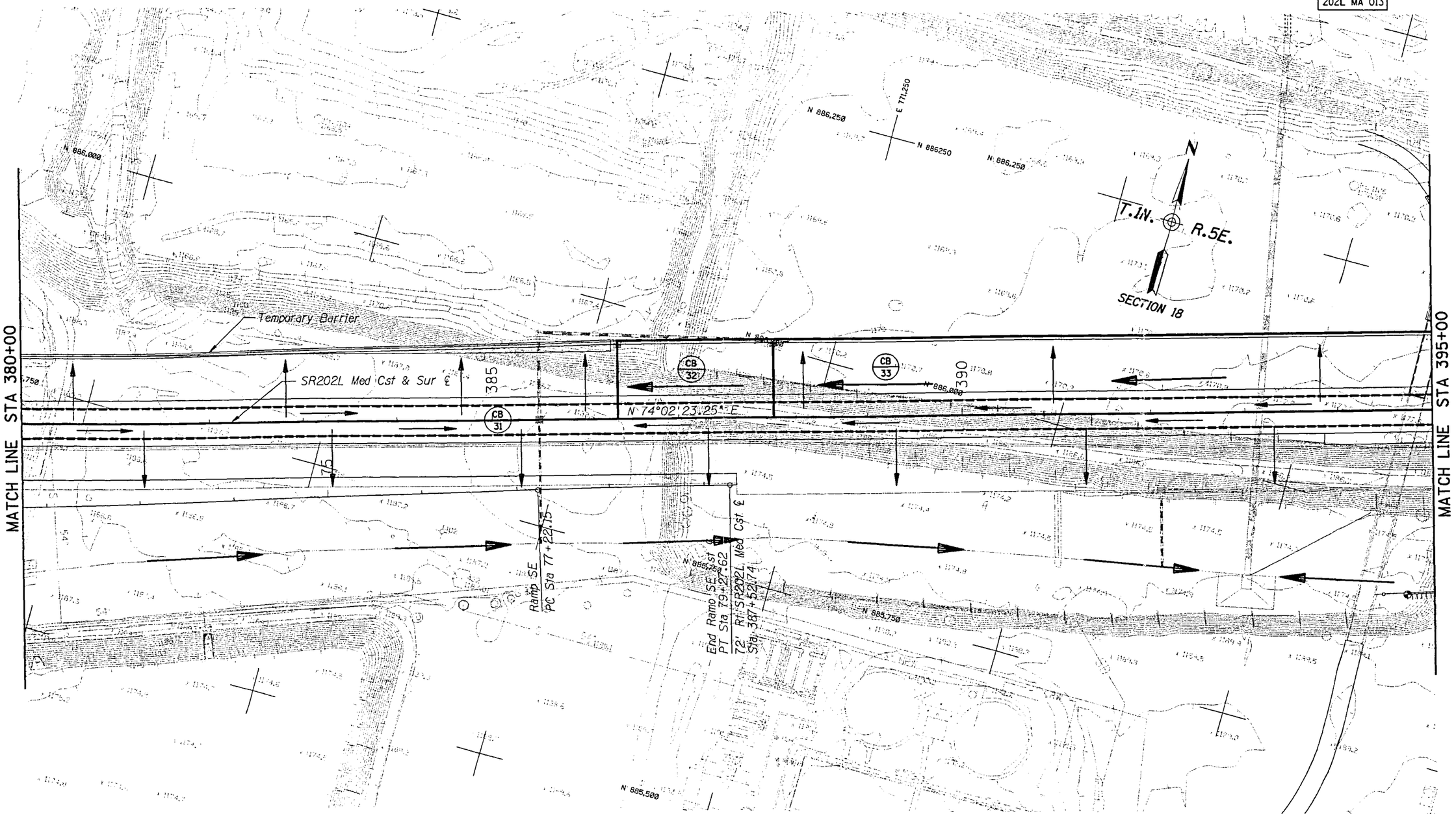
VIEW NAME: /12168/RM2DRN03.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 380+00 TO STA 395+00

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.3

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2DRN04.DGN

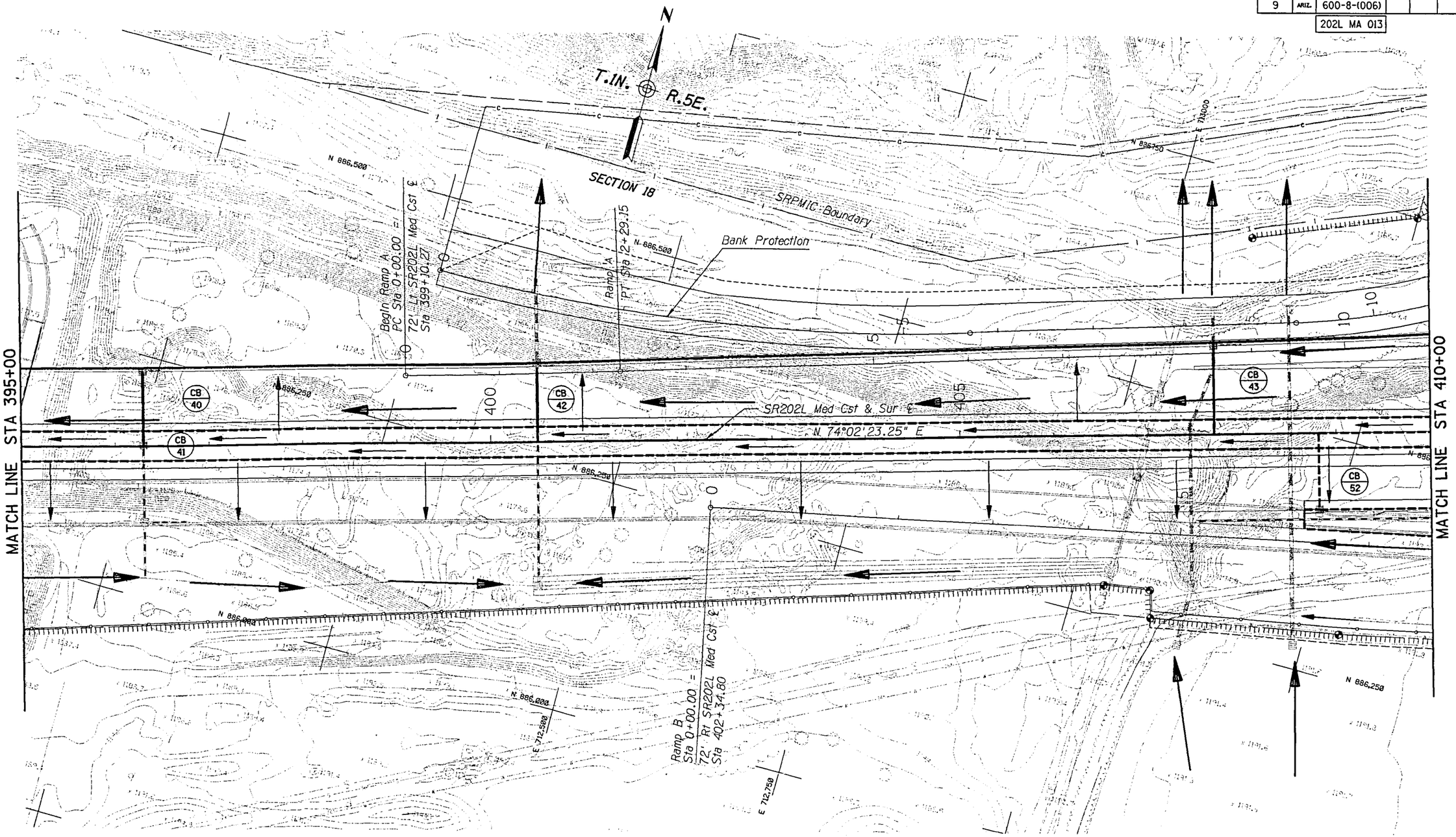
PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C

600-8-(006)

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			
		202L MA 013			



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DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 395+00 TO STA 410+00

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.4

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

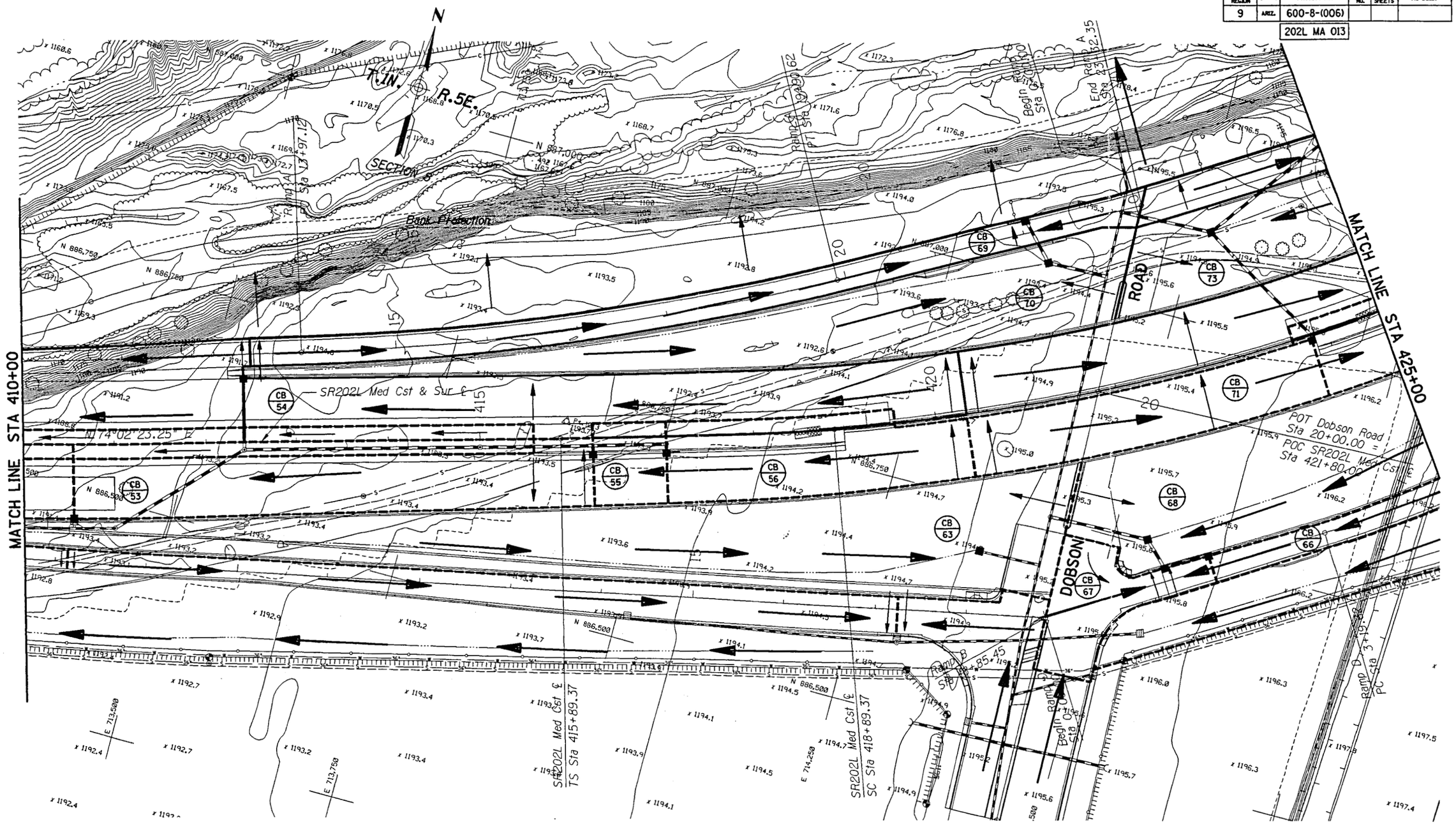
VIEW NAME: /12168/RM2DRN05.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



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DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
7025 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85018 • (602) 952-8500

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 410+00 TO STA 425+00

ROUTE: 202L
LOCATION: RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.5

SURVEY NO.	D PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

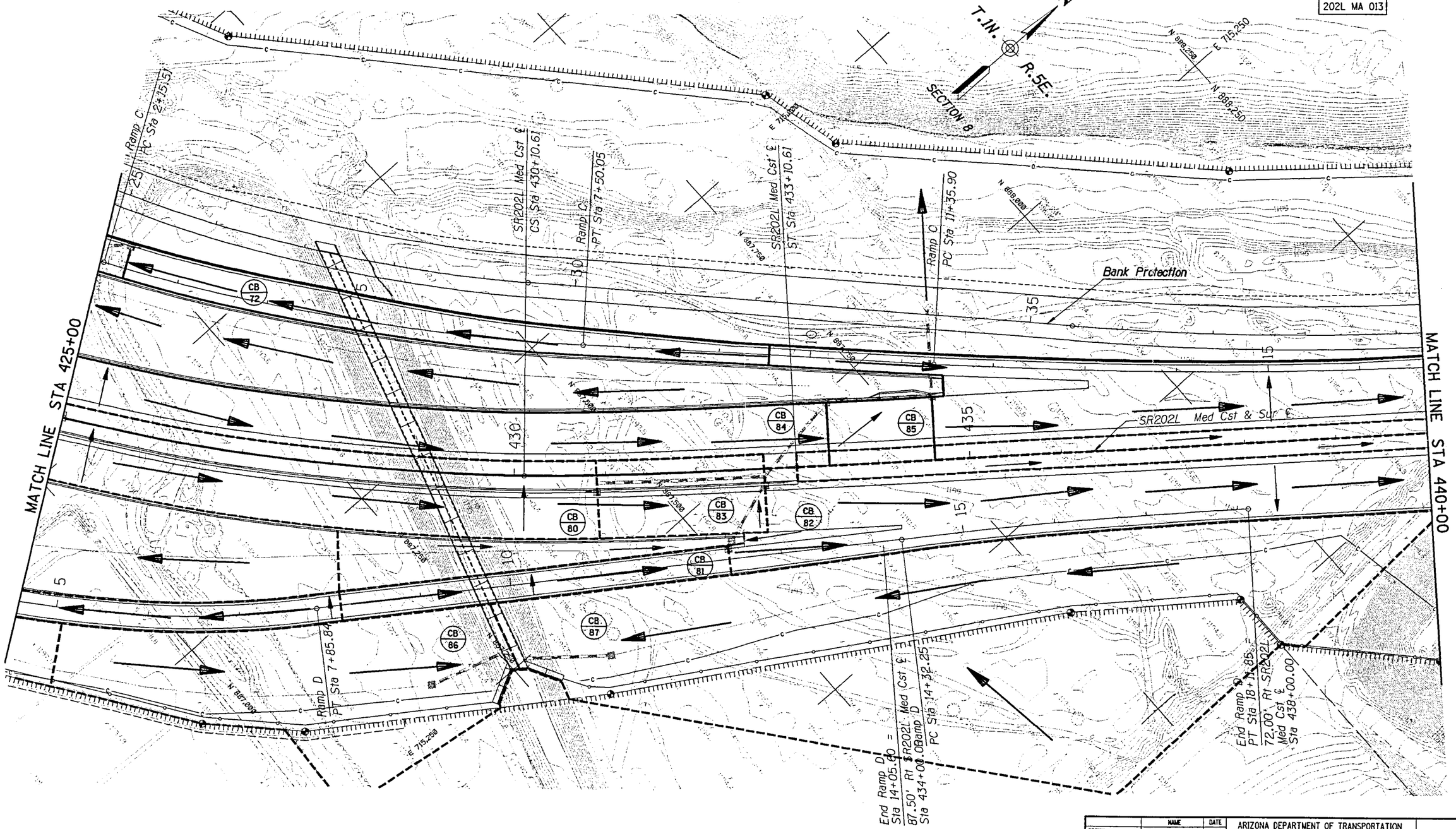
VIEW NAME: /12168/RM2DRN06.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



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DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 425+00 TO STA 440+00

ROUTE: 202L
LOCATION: RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.6

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2DRN07.DGN

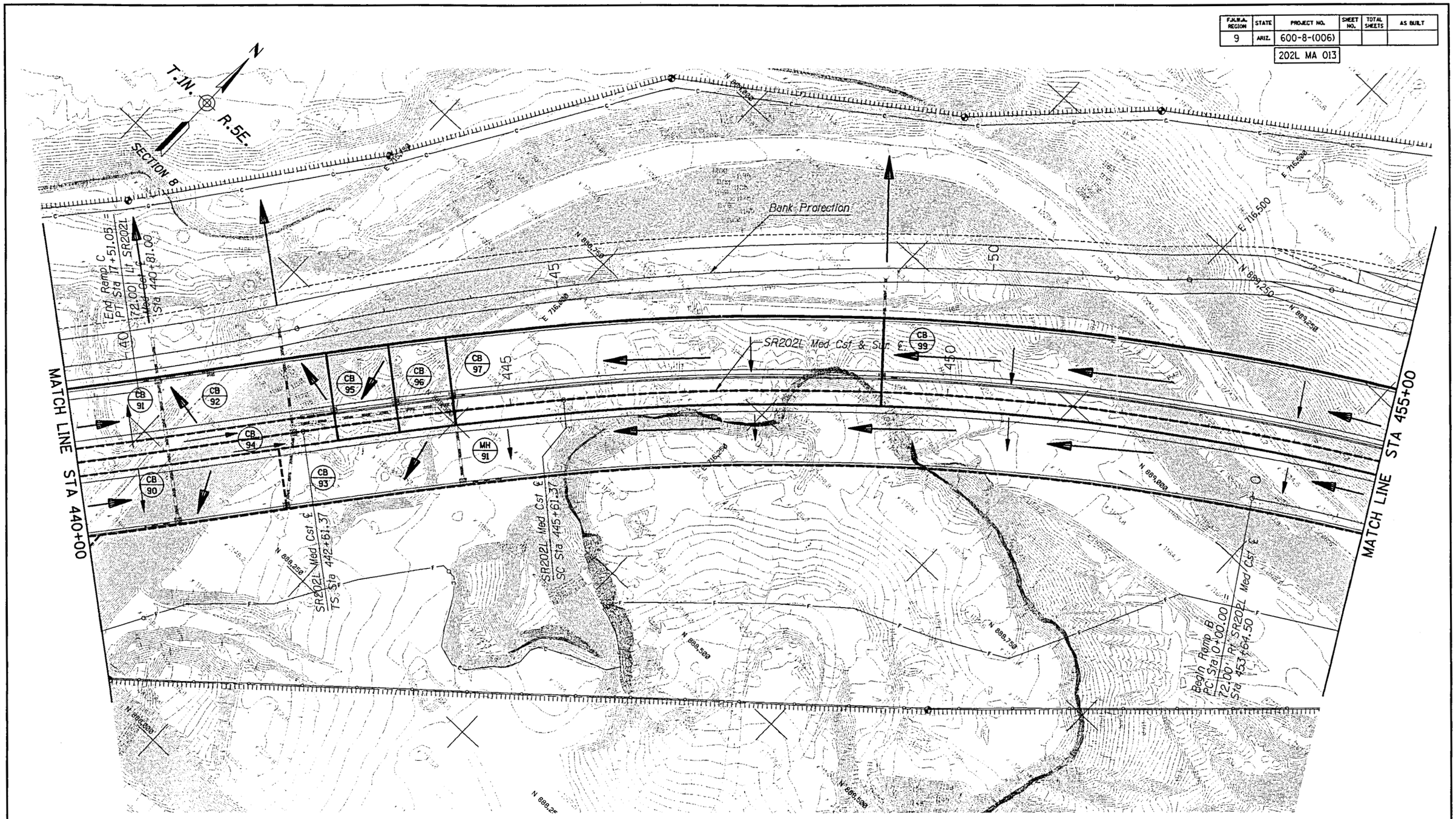
PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

CONSTRUCTION DISPLAY ON

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



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DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

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2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6000

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 440+00 TO STA 455+00

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.7

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2DRN08.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C

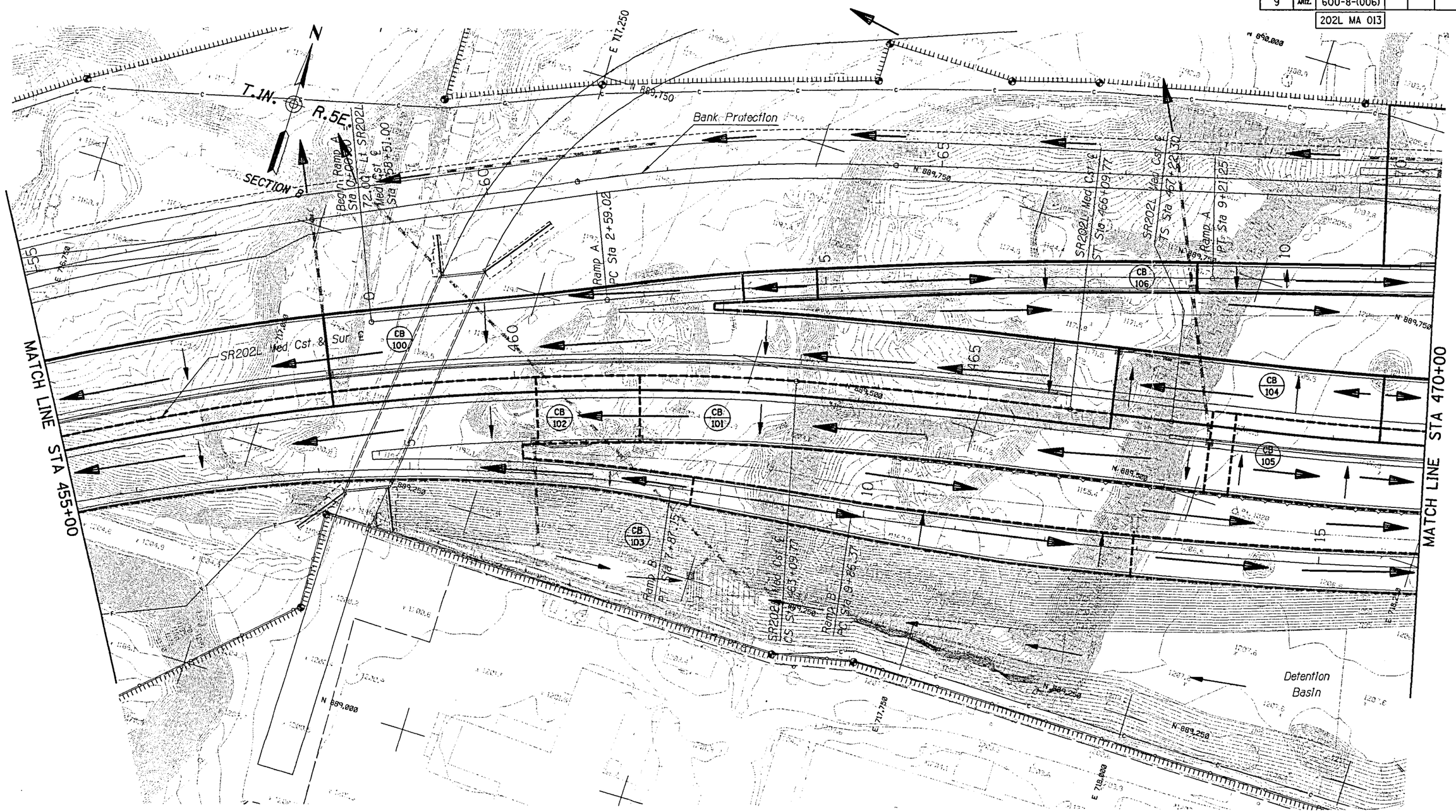
600-8-(006)

___ OF ___

CONSTRUCTION DISPLAY ON

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



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DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

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PHOENIX, ARIZONA 85016 • (602) 912-6500

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 455+00 TO STA 470+00

ROUTE: 202L
LOCATION: RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.8

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2DRN09.DGN

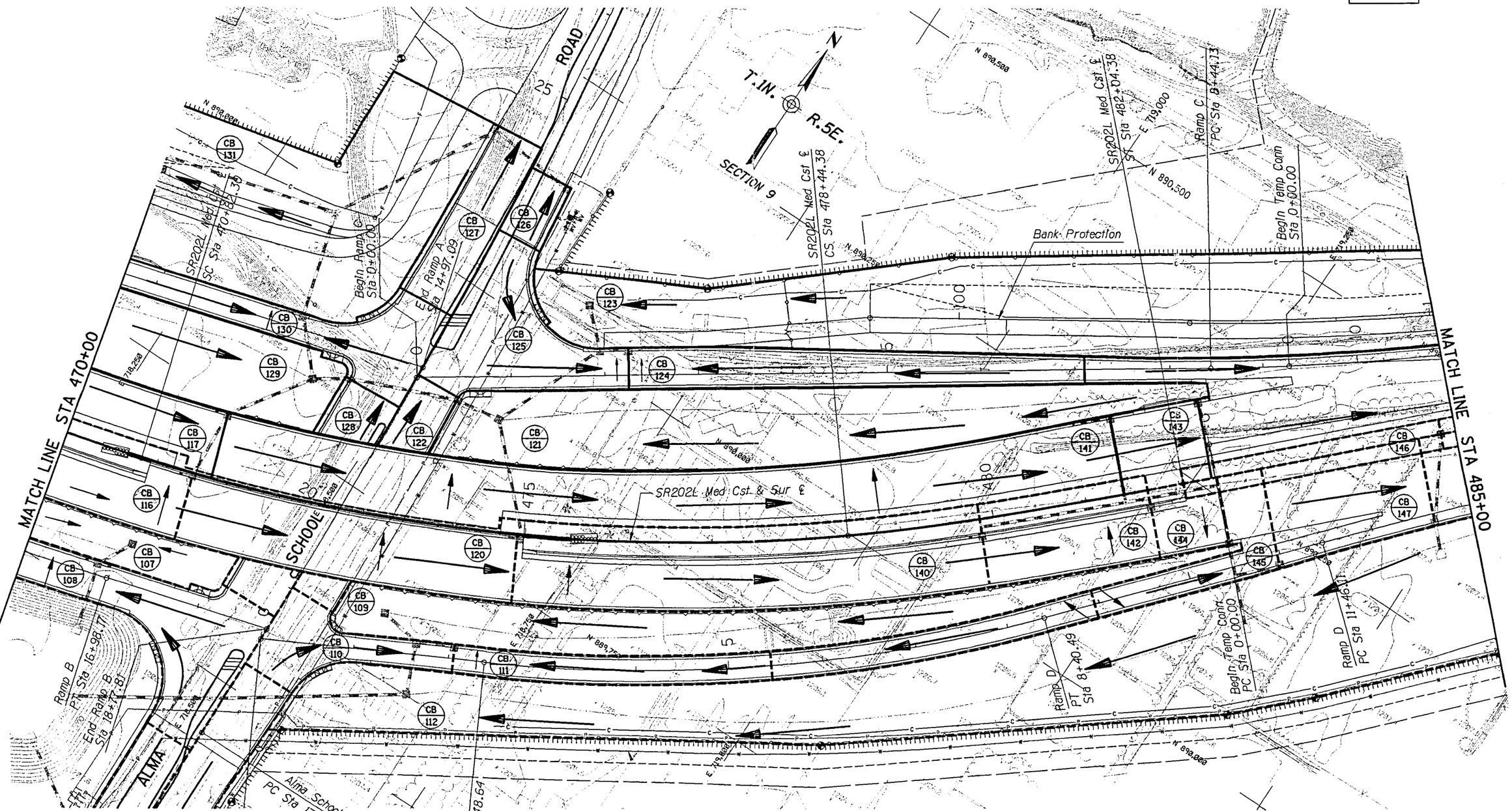
PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

CONSTRUCTION DISPLAY ON

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

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2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 470+00 TO STA 485+00

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.9

SURVEY NO. | FINISH PLANS | REVISIONS | LOCATION | DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

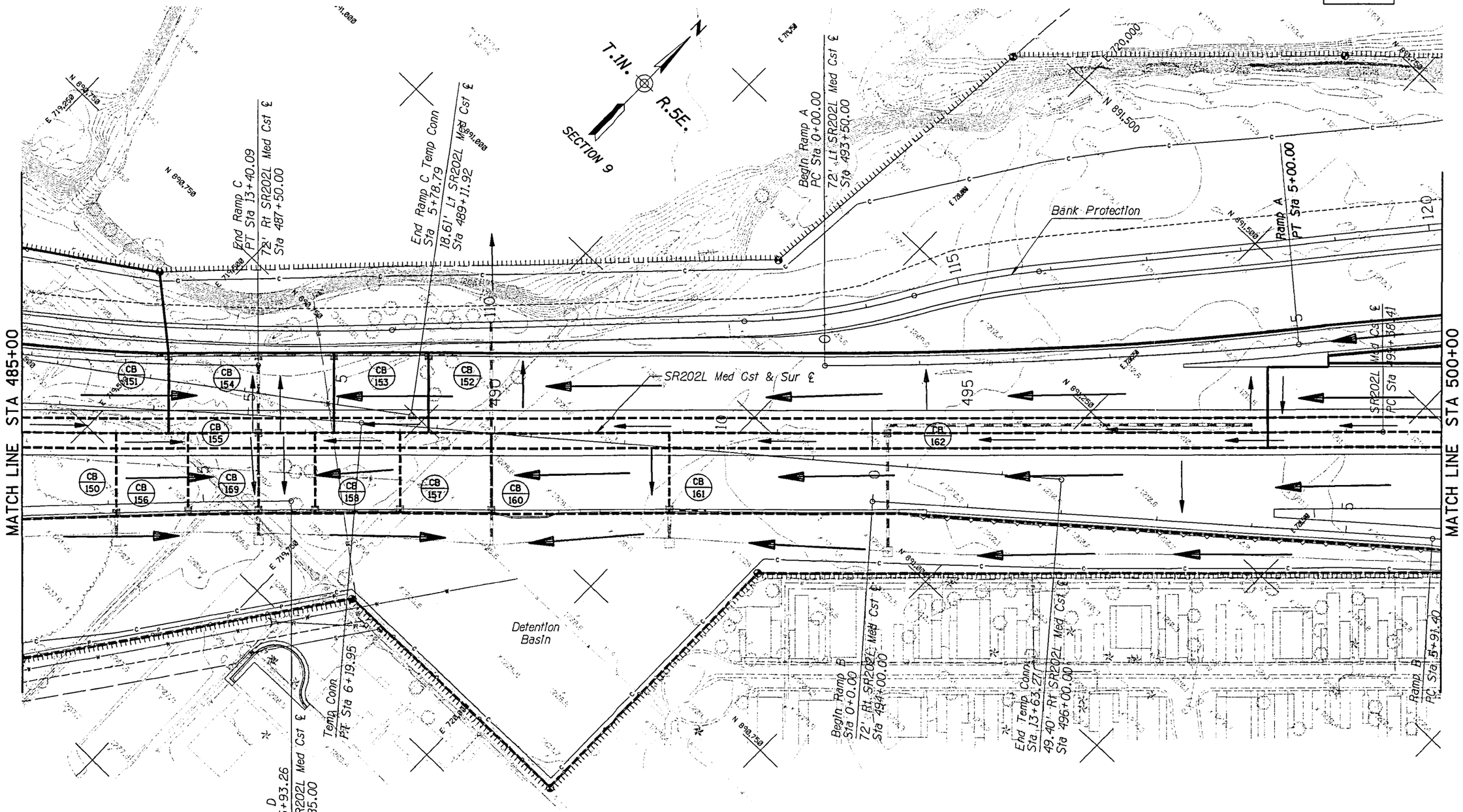
VIEW NAME: /12168/RM2DRN10.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6600

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 485+00 TO STA 500+00

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.10

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2DRN11.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

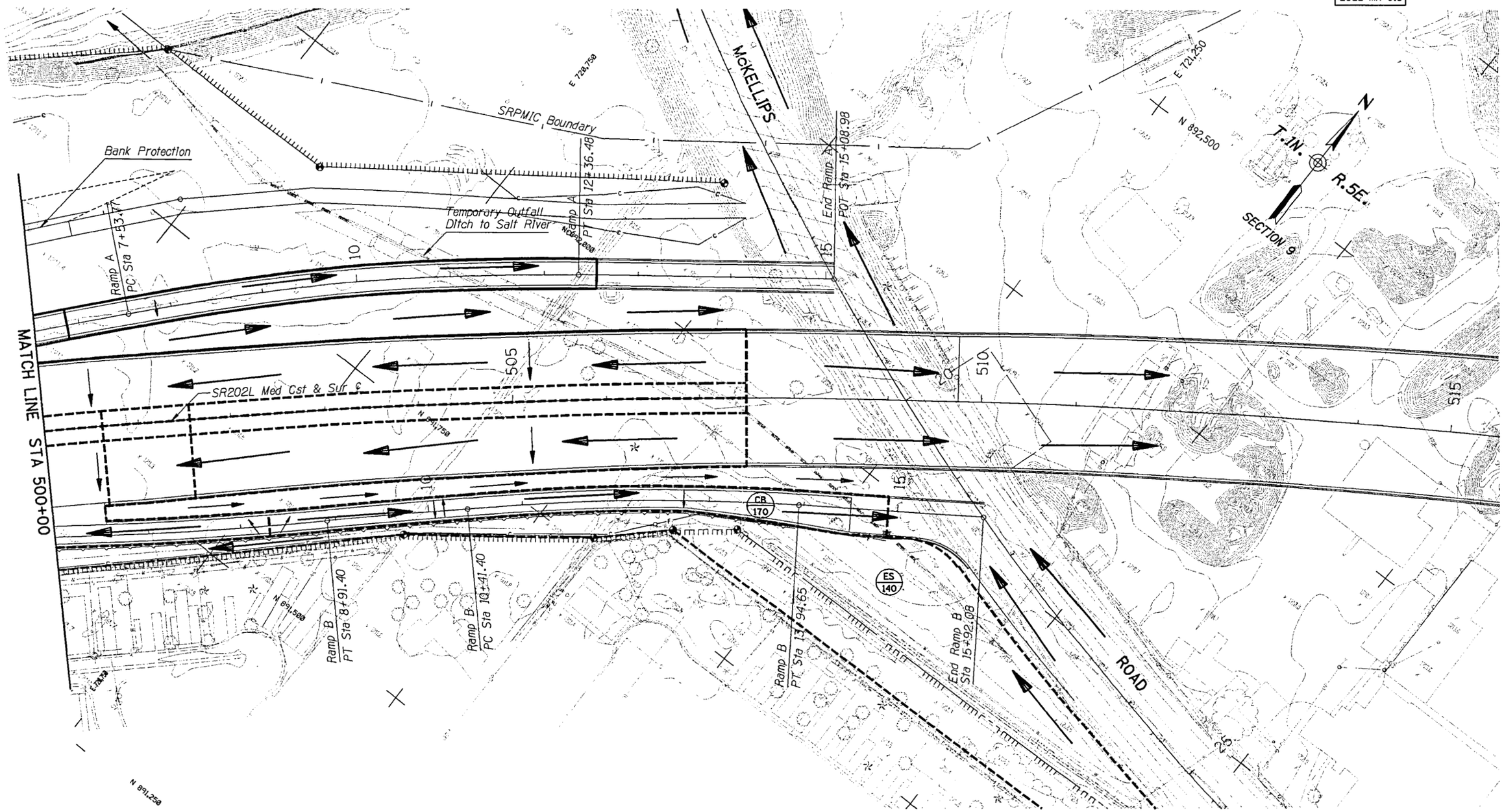
TRACS NO. H087502C

600-8-(006)

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



NOTE:
Local drainage will be ditched to the Salt River with this project. The storm drain system for McKellips road will be developed with the McKellips Road to Country Club Drive Project.

	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
2925 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 313-4500

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
SR202L
STA 500+00 TO STA 515+00

ROUTE 202L
LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.11

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2DRN12.DGN

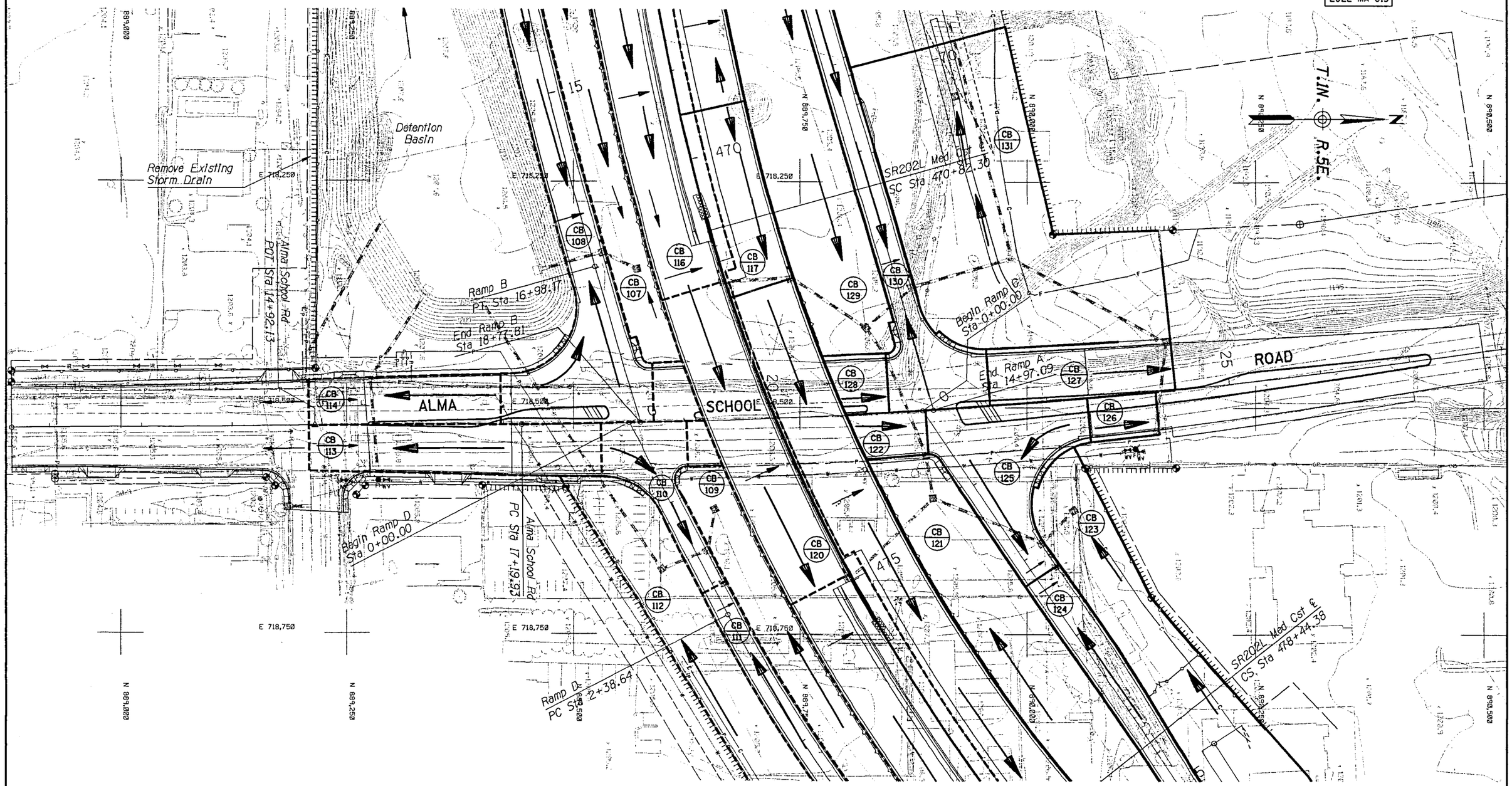
PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

CONSTRUCTION DISPLAY ON

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	600-8-(006)			

202L MA 013



	NAME	DATE
DESIGN	JRM	1/96
DRAWN	CGS	1/96
CHECKED	SDW	1/96

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 382-2500

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
ALMA SCHOOL ROAD

ROUTE 202L

LOCATION RED MTN - SR 101L - McKELLIPS ROAD

DWG NO. D-1.12

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12168/RM2DRNI4.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. H087502C | 600-8-(006) | ___ OF ___

CONSTRUCTION DISPLAY ON

APPENDIX A

Phase II HEC-1 Analysis

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  01/16/96  TIME  08:55:27  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 551-1748             *
*                                      *
****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID   RED MOUNTAIN FREEWAY DRAINAGE ANALYSIS
  2           ID   PHASE II - DOBSON ROAD TO MESA DRIVE
  3           ID   100-YEAR, 24-HOUR STORM
  4           ID   HEC-1 HYPOTHETHICAL RAINFALL DISTRIBUTION
  5           ID   RAINFALL DEPTHS IN PH RECORD BASED ON PREFRE OUTPUT
  6           ID   CLARK UNIT HYDROGRAPH
  7           ID   GREEN-AMPT SOIL LOSS PARAMETERS
  8           ID   NORMAL DEPTH CHANNEL ROUTING
  9           ID   IN GENERAL, URBANIZED AREAS IN THE CITY OF MESA BUILT BETWEEN 1973
 10           ID   AND 1987 WERE DESIGNED TO RETAIN THE 50-YEAR, 24-HOUR RAINFALL; FROM 1987
 11           ID   TO PRESENT, THE RETENTION REQUIREMENT IS THE 100-YEAR, 2-HOUR RAINFALL.
 12           ID   DIVERSIONS ALONG MAJOR STREETS WERE ESTIMATED BASED ON AS-BUILT ROADWAY
 13           ID   AND STORM DRAIN PLANS, STORM DRAIN STUDY REPORTS, AND FIELD INSPECTION.
 14           ID   ** FLOW TAKEN ACROSS RED MOUNTAIN FREEWAY AT CP 65C **
 15           ID   FILENAME: RMP2_65D.DAT
 16           IT       2                    720
 17           IO       5
              *DIAGRAM

 18           KK     10S
 19           KM   RUNOFF FROM SUBBASIN 10
 20           BA    .868
 21           PH                     .71    1.41    2.38    2.59    2.73    3.00    3.30    3.60
 22           LG     .47     .25     4.9     .53       1
 23           UC   5.395   5.350
 24           UA       0       3       5       8      12      20      43      75      90      96
 25           UA     100

 26           KK     11R
 27           KM   ROUTE 10S TO 35C
 28           RS      16    FLOW      -1
 29           RC    .035    .030    .035    6000   .0030
 30           RX       0       1     101     109     119     127     227     228
 31           RY     103     100      99      97      97      99     100     103

 32           KK     30S
 33           KM   RUNOFF FROM SUBBASIN 30
 34           BA   1.411
 35           LG     .48     .15     7.5     .09       1
 36           UC   5.693   4.256
 37           UA       0       3       5       8      12      20      43      75      90      96
 38           UA     100

 39           KK     35C
 40           KM   COMBINE 11C AND 30S
 41           HC       2

 42           KK     36R
 43           KM   ROUTE 35C TO 45C
 44           RS      12    FLOW      -1
 45           RC    .035    .030    .035    4800   .0025
 46           RX       0       1     101     109     169     177     277     278
 47           RY     103     100      99      97      97      99     100     103
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48          KK     40S
  49          KM   RUNOFF FROM SUBBASIN 40
  50          BA    .279
  51          LG     .50     .15     9.6     .04       0
  52          UC   3.785   4.248
  53          UA       0       3       5       8      12      20      43      75      90      96
  54          UA     100

  55          KK     45C
  56          KM   COMBINE 36R AND 40S
  57          HC       2

  58          KK     20S
  59          KM   RUNOFF FROM SUBBASIN 20
  60          BA    .108
  61          LG     .14     .15     8.5     .09      14
  62          UC    .603    .830
  63          UA       0       5      16      30      65      77      84      90      94      97
  64          UA     100

  65          KK     21R
  66          KM   ROUTE 20S TO 55C
  67          RS      60    FLOW      -1
  68          RC    .040    .040    .040    5800   .0022
  69          RX       0       1     101     102     352     353     503     504
  70          RY     103     100      99      98      98      99      99     110

  71          KK     50S
  72          KM   RUNOFF FROM SUBBASIN 50
  73          BA    .489
  74          LG     .14     .15     8.5     .08      14
  75          UC    .840    .670
  76          UA       0       5      16      30      65      77      84      90      94      97
  77          UA     100

  78          KK     55C
  79          KM   COMBINE 21R AND 50S
  80          HC       2

  81          KK     56R
  82          KM   ROUTE 55C TO 65C
  83          RS      12    FLOW      -1
  84          RC    .040    .040    .040    3000   .0037
  85          RX       0       1     101     102     352     353     503     504
  86          RY     103     100      99      98      98      99      99     110

  87          KK     60S
  88          KM   RUNOFF FROM SUBBASIN 60
  89          BA    .115
  90          LG      .2     .16     7.0     .13      29
  91          UC    .344    .247
  92          UA       0       5      16      30      65      77      84      90      94      97
  93          UA     100
```

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  94          KK     65C
  95          KM   COMBINE 56R AND 60S
  96          HC       2

  97          KK   65DIV
  98          KM   DIVERT 65C ACROSS FRWY TO SALT RIVER
  99          DT   65DIV
 100          DI       0    5000
 101          DQ       0    5000

 102          KK     66R
 103          KM   ROUTE 65C TO 105C
 104          RS      14    FLOW      -1
 105          RC    .035    .030    .035    3000   .0003
 106          RX       0       1     101     109     169     177     277     278
 107          RY     103     100      99      97      97      99     100     103

 108          KK     70S
 109          KM   RUNOFF FROM SUBBASIN 70
 110          BA    .164
 111          LG     .14     .15     7.8     .11      14
 112          UC    .690    .831
 113          UA       0       5      16      30      65      77      84      90      94      97
 114          UA     100

 115          KK     80S
 116          KM   RUNOFF FROM SUBBASIN 80
 117          BA    .202
 118          LG     .13     .15     8.1     .09      15
 119          UC    .630    .595
 120          UA       0       5      16      30      65      77      84      90      94      97
 121          UA     100

 122          KK     85C
 123          KM   COMBINE 70S AND 80S
 124          HC       2

 125          KK     86R
 126          KM   ROUTE 85C TO 95C
 127          RS      27    FLOW      -1
 128          RC    .040    .040    .040    2900   .0017
 129          RX       0       1     101     102     352     353     503     504
 130          RY     103     100      99      98      98      99      99     110

 131          KK     90S
 132          KM   RUNOFF FROM SUBBASIN 90
 133          BA    .068
 134          LG     .26     .15     8.5     .07      12
 135          UC    .524    .478
 136          UA       0       5      16      30      65      77      84      90      94      97
 137          UA     100
```

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 138          KK     95C
 139          KM   COMBINE 86R AND 90S
 140          HC       2

 141          KK     95D
 142          KM   DIVERT 95C SOUTH ON CENTER STREET
 143          DT   95DIV
 144          DI       0    5000
 145          DQ       0    5000

 146          KK     96R
 147          KM   ROUTE 95D TO 105C
 148          RS       5    FLOW      -1
 149          RC    .030    .016    .035    2650   .0023
 150          RX       0     0.1      30    30.1      55    55.1     355   355.1
 151          RY     102    99.5      99    98.6    98.6      99    99.5     102

 152          KK    100S
 153          KM   RUNOFF FROM SUBBASIN 100
 154          BA    .073
 155          LG     .45     .21     6.5     .13       8
 156          UC   2.474   3.387
 157          UA       0       3       5       8      12      20      43      75      90      96
 158          UA     100

 159          KK    104C
 160          KM   COMBINE 96R AND 100S
 161          HC       2

 162          KK    105C
 163          KM   COMBINE 66R AND 104C
 164          HC       2

 165          KK    106R
 166          KM   ROUTE 105C TO 225C
 167          RS       4    FLOW      -1
 168          RC    .035    .030    .035    2700   .0059
 169          RX       0       1     101     109     169     177     277     278
 170          RY     103     100      99      97      97      99     100     103

 171          KK    110S
 172          KM   RUNOFF FROM SUBBASIN 110
 173          BA    .130
 174          LG     .36     .15     7.8     .09       7
 175          UC   2.822   2.997
 176          UA       0       3       5       8      12      20      43      75      90      96
 177          UA     100

 178          KK    120S
 179          KM   RUNOFF FROM SUBBASIN 120
 180          BA    .030
 181          LG     .12     .25     4.2     .50      34
 182          UC    .107    .026
 183          UA       0       5      16      30      65      77      84      90      94      97
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 184          UA     100

 185          KK    121R
 186          KM   ROUTE 120S TO 135C
 187          RS       2    FLOW      -1
 188          RC    .030    .016    .030    1250   .0152
 189          RX       0     0.1      30    30.1      74    74.1     104   104.1
 190          RY     102     100      99    98.7    98.7      99     100     102

 191          KK    130S
 192          KM   RUNOFF FROM SUBBASIN 130
 193          BA    .028
 194          LG     .12     .19     6.7     .15      32
 195          UC    .214    .209
 196          UA       0       5      16      30      65      77      84      90      94      97
 197          UA     100

 198          KK   130RT
 199          KM   UNKNOWN STORM RETENTION IN SUBBASIN 130
 200          RS       1    STOR       0
 201          SV       0       3       3
 202          SE      99     100     105
 203          SS     100     100    2.63     1.5

 204          KK    135C
 205          KM   COMBINE 121R AND 130RT
 206          HC       2

 207          KK    136C
 208          KM   COMBINE 135C AND 110S
 209          HC       2

 210          KK    137R
 211          KM   ROUTE 136C WEST ON MCKELLIPS ROAD
 212          RS       5    FLOW      -1
 213          RC    .030    .016    .030    1400   .0026
 214          RX       0     0.1      50    50.1     118   118.1     168     169
 215          RY     102    99.5      99    98.6    98.6      99    99.5     102

 216          KK    140S
 217          KM   RUNOFF FROM SUBBASIN 140
 218          BA    .015
 219          LG     .07     .15     9.6     .04      85
 220          UC    .126    .151
 221          UA       0       5      16      30      65      77      84      90      94      97
 222          UA     100

 223          KK    145C
 224          KM   COMBINE 137R AND 140S
 225          HC       2
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 226          KK    146R
 227          KM   ROUTE 145C TO 155C
 228          RS       2    FLOW      -1
 229          RC    .030    .016    .030     500   .0008
 230          RX       0     0.1      50    50.1     118   118.1     168     169
 231          RY     102    99.5      99    98.6    98.6      99    99.5     102

 232          KK    150S
 233          KM   RUNOFF FROM SUBBASIN 150
 234          BA    .084
 235          LG     .11     .15     7.8     .09      43
 236          UC    .305    .259
 237          UA       0       5      16      30      65      77      84      90      94      97
 238          UA     100

 239          KK   150RT
 240          KM   FIELD-ESTIMATED RETENTION IN SUBBASIN 150
 241          RS       1    STOR       0
 242          SV       0       3       3
 243          SE    97.5     100     105
 244          SS     100     200    2.63     1.5

 245          KK    155C
 246          KM   COMBINE 146R AND 150S
 247          HC       2

 248          KK    170S
 249          KM   RUNOFF FROM SUBBASIN 170
 250          BA    .007
 251          LG     .07     .16     7.0     .11      85
 252          UC    .105    .125
 253          UA       0       5      16      30      65      77      84      90      94      97
 254          UA     100

 255          KK    175C
 256          KM   COMBINE 155C AND 170S
 257          HC       2

 258          KK    176R
 259          KM   ROUTE 175C TO 165C
 260          RS       2    FLOW      -1
 261          RC    .030    .016    .030     650   .0011
 262          RX       0     0.1      50    50.1     118   118.1     168     169
 263          RY     102    99.5      99    98.6    98.6      99    99.5     102

 264          KK    160S
 265          KM   RUNOFF FROM SUBBASIN 160
 266          BA    .014
 267          LG     .10     .16     7.0     .13      54
 268          UC    .146    .154
 269          UA       0       5      16      30      65      77      84      90      94      97
 270          UA     100
```

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 271          KK    180S
 272          KM   RUNOFF FROM SUBBASIN 180
 273          BA    .028
 274          LG     .12      .15      7.1      .13       35
 275          UC    .244     .228
 276          UA       0        5       16       30       65       77       84       90       94       97
 277          UA     100

 278          KK    185S
 279          KM   RUNOFF FROM SUBBASIN 185
 280          BA    .056
 281          LG     .12      .25      5.5      .25       35
 282          UC    .240     .147
 283          UA       0        5       16       30       65       77       84       90       94       97
 284          UA     100

 285          KK    186C
 286          KM   COMBINE 180S AND 185S
 287          HC       2

 288          KK    187R
 289          KM   ROUTE 186C TO 165C
 290          RS       5     FLOW       -1
 291          RC    .016     .030     .016     1350    .0004
 292          RX       0      0.1       50     50.1      114    114.1      164      165
 293          RY     102     99.5       99     98.6     98.6       99     99.5      102

 294          KK    165C
 295          KM   COMBINE 176R, 160S, AND 187R
 296          HC       3     .390

 297          KK   165DV
 298          KM   DIVERT 44 PERCENT OF FLOW SOUTH ON MESA DRIVE
 299          DT   165DV
 300          DI       0     2000
 301          DQ       0      880

 302          KK    190S
 303          KM   RUNOFF FROM SUBBASIN 190
 304          BA    .012
 305          LG     .10      .25      5.2      .27       47
 306          UC    .197     .280
 307          UA       0        5       16       30       65       77       84       90       94       97
 308          UA     100

 309          KK    195C
 310          KM   COMBINE 165C AND 190S
 311          HC       2
```

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 312          KK    196R
 313          KM   ROUTE 195C TO 205C
 314          RS       3    FLOW      -1
 315          RC    .030    .016    .030    1000   .0015
 316          RX       0     0.1      50    50.1     118   118.1     168     169
 317          RY     102    99.5      99    98.6    98.6      99    99.5     102

 318          KK    200S
 319          KM   RUNOFF FROM SUBBASIN 200
 320          BA    .048
 321          LG     .10     .15     7.8     .10      54
 322          UC    .226    .198
 323          UA       0       5      16      30      65      77      84      90      94      97
 324          UA     100

 325          KK   200RT
 326          KM   UNKNOWN STORM RETENTION IN SUBBASIN 200
 327          RS       1    STOR       0
 328          SV       0       6       6
 329          SE    95.5     100     105
 330          SS     100     450    2.63     1.5

 331          KK    205C
 332          KM   COMBINE 196R AND 200S
 333          HC       2

 334          KK    220S
 335          KM   RUNOFF FROM SUBBASIN 220
 336          BA    .019
 337          LG     .10     .15     9.6     .05      54
 338          UC    .206    .238
 339          UA       0       5      16      30      65      77      84      90      94      97
 340          UA     100

 341          KK    225C
 342          KM   COMBINE 205C AND 220S
 343          HC       2

 344          KK    226R
 345          KM   ROUTE 225C TO 245C
 346          RS       2    FLOW      -1
 347          RC    .030    .016    .030     950   .0021
 348          RX       0     0.1      50    50.1     118   118.1     168     169
 349          RY     102    99.5      99    98.6    98.6      99    99.5     102

 350          KK    210S
 351          KM   RUNOFF FROM SUBBASIN 210
 352          BA    .046
 353          LG     .08     .15     9.6     .04      75
 354          UC    .234    .281
 355          UA       0       5      16      30      65      77      84      90      94      97
 356          UA     100
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 357          KK    230S
 358          KM   RUNOFF FROM SUBBASIN 230
 359          BA    .029
 360          LG     .10     .15     9.6     .05      54
 361          UC    .220    .214
 362          UA       0       5      16      30      65      77      84      90      94      97
 363          UA     100

 364          KK    240S
 365          KM   RUNOFF FROM SUBBASIN 240
 366          BA    .012
 367          LG     .07     .15     9.6     .04      85
 368          UC    .117    .131
 369          UA       0       5      16      30      65      77      84      90      94      97
 370          UA     100

 371          KK    245C
 372          KM   COMBINE 226R, 210S, 230S, AND 240S
 373          HC       4

 374          KK    96DR
 375          KM   RETRIEVE 95DIV
 376          DR   95DIV

 377          KK     97R
 378          KM   ROUTE 96DR SOUTH ON CENTER STREET
 379          RS       3    FLOW      -1
 380          RC    .030    .016    .030    1500   .0013
 381          RX       0     0.1      25    25.1      85    85.1     110   110.1
 382          RY     102    99.5    99.5    98.6    98.6    99.5    99.5     102

 383          KK   245BC
 384          KM   COMBINE 245C AND 97R AT CENTER ST AND MCKELLIPS
 385          HC       2

 386          KK    246R
 387          KM   ROUTE 245BC TO 255C
 388          RS       1    FLOW      -1
 389          RC    .030    .016    .030     600   .0035
 390          RX       0     0.1      50    50.1     118   118.1     168     169
 391          RY     102    99.5      99    98.6    98.6      99    99.5     102

 392          KK    250S
 393          KM   RUNOFF FROM SUBBASIN 250
 394          BA    .018
 395          LG     .07     .15     9.6     .04      85
 396          UC    .107    .082
 397          UA       0       5      16      30      65      77      84      90      94      97
 398          UA     100
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 399          KK    255C
 400          KM   COMBINE 246R AND 250S
 401          HC       2

 402          KK    256R
 403          KM   ROUTE 255C TO 265C
 404          RS       5    FLOW      -1
 405          RC    .030    .016    .030    2000   .0019
 406          RX       0     0.1      50    50.1     118   118.1     168     169
 407          RY     102    99.5      99    98.6    98.6      99    99.5     102

 408          KK    260S
 409          KM   RUNOFF FROM SUBBASIN 260
 410          BA    .114
 411          LG     .09     .15     9.6     .05      56
 412          UC    .297    .250
 413          UA       0       5      16      30      65      77      84      90      94      97
 414          UA     100

 415          KK   260RT
 416          KM   50-YEAR, 24-HOUR RETENTION IN SUBBASIN 260
 417          RS       1    STOR       0
 418          SV       0      16      16
 419          SE      96     100     105
 420          SS     100     420    2.63     1.5

 421          KK    265C
 422          KM   COMBINE 256R AND 260RT
 423          HC       2

 424          KK   265DV
 425          KM   DIVERT 70 PERCENT OF FLOW SOUTH ON COUNTRY CLUB DRIVE
 426          DT   265DV
 427          DI       0    2000
 428          DQ       0    1400

 429          KK    266R
 430          KM   ROUTE 265C TO 275C
 431          RS      10    FLOW      -1
 432          RC    .030    .016    .030    2450   .0065
 433          RX       0     0.1      50    50.1     118   118.1     168     169
 434          RY     102    99.5      99    98.6    98.6      99    99.5     102

 435          KK    270S
 436          KM   RUNOFF FROM SUBBASIN 270
 437          BA    .068
 438          LG     .09     .15     7.1     .11      64
 439          UC    .203    .155
 440          UA       0       5      16      30      65      77      84      90      94      97
 441          UA     100
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 442          KK    274C
 443          KM   COMBINE 266R AND 270S
 444          HC       2

 445          KK    275C
 446          KM   COMBINE 106R AND 274C
 447          HC       2   1.525

 448          KK    280S
 449          KM   RUNOFF FROM SUBBASIN 280
 450          BA    .058
 451          LG     .15     .25     4.2     .54       5
 452          UC    .237    .084
 453          UA       0       5      16      30      65      77      84      90      94      97
 454          UA     100

 455          KK    281R
 456          KM   ROUTE 280S TO 295C
 457          RS       4    FLOW      -1
 458          RC    .030    .016    .030     800   .0176
 459          RX       0     0.1     100   100.1     900   900.1    1000  1000.1
 460          RY     102     100      99    98.7    98.7      99     100     102

 461          KK    290S
 462          KM   RUNOFF FROM SUBBASIN 290
 463          BA    .069
 464          LG     .12     .16     7.0     .14      30
 465          UC    .274    .207
 466          UA       0       5      16      30      65      77      84      90      94      97
 467          UA     100

 468          KK   290RT
 469          KM   50-YEAR, 24-HOUR STORM RETENTION IN SUBBASIN 290
 470          RS       1    STOR       0
 471          SV       0       8       8
 472          SE      96     100     105
 473          SS     100     300    2.63     1.5

 474          KK    295C
 475          KM   COMBINE 281R AND 290RT
 476          HC       2

 477          KK    296R
 478          KM   ROUTE 295C TO 305C
 479          RS       2    FLOW      -1
 480          RC    .030    .016    .030     700   .0011
 481          RX       0     0.1      30    30.1      55    55.1      85    85.1
 482          RY     102    99.5      99    98.6    98.6      99    99.5     102
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 483          KK    300S
 484          KM   RUNOFF FROM SUBBASIN 300
 485          BA    .026
 486          LG     .10      .15      9.6      .05       54
 487          UC    .187     .188
 488          UA       0        5       16       30       65       77       84       90       94       97
 489          UA     100

 490          KK    305C
 491          KM   COMBINE 296R AND 300S
 492          HC       2

 493          KK    306R
 494          KM   ROUTE 305C TO 325C
 495          RS       2     FLOW       -1
 496          RC    .030     .016     .030      600    .0008
 497          RX       0      0.1       30     30.1       55     55.1       85     85.1
 498          RY     102     99.5       99     98.6     98.6       99     99.5      102

 499          KK    310S
 500          KM   RUNOFF FROM SUBBASIN 310
 501          BA    .210
 502          LG     .11      .25      5.0      .32       36
 503          UC    .451     .405
 504          UA       0        5       16       30       65       77       84       90       94       97
 505          UA     100

 506          KK   310RT
 507          KM   50-YEAR, 24-HOUR STORM RETENTION IN SUBBASIN 310
 508          RS       1     STOR        0
 509          SV       0       22       22
 510          SE      96      100      105
 511          SS     100      490     2.63      1.5

 512          KK    320S
 513          KM   RUNOFF FROM SUBBASIN 320
 514          BA    .027
 515          LG     .10      .15      9.6      .05       54
 516          UC    .216     .234
 517          UA       0        5       16       30       65       77       84       90       94       97
 518          UA     100

 519          KK   320RT
 520          KM   UNKNOW RETENTION IN SUBBASIN 320
 521          RS       1     STOR        0
 522          SV       0        3        3
 523          SE      96      100      105
 524          SS     100      180     2.63      1.5
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 525          KK   324DR
 526          KM   RETRIEVE FLOW DIVERTED FROM 165C
 527          DR   165DV

 528          KK    324R
 529          KM   ROUTE 324DR TO 325C
 530          RS       4    FLOW      -1
 531          RC    .030    .016    .030    1350   .0014
 532          RX       0     0.1      50    50.1     114   114.1     164     165
 533          RY     102    99.5      99    98.6    98.6      99    99.5     102

 534          KK    325C
 535          KM   COMBINE 306R, 310RT, 320S, AND 324R
 536          HC       4   .5586

 537          KK    326R
 538          KM   ROUTE 325C TO 365C
 539          RS       3    FLOW      -1
 540          RC    .030    .016    .030    1250   .0014
 541          RX       0     0.1      30    30.1      80    80.1     110   110.1
 542          RY     102    99.5      99    98.6    98.6      99    99.5     102

 543          KK    360S
 544          KM   RUNOFF FROM SUBBASIN 360
 545          BA    .090
 546          LG     .12     .15     9.0     .07      35
 547          UC    .240    .160
 548          UA       0       5      16      30      65      77      84      90      94      97
 549          UA     100

 550          KK   360RT
 551          KM   100-YEAR, 2-HOUR STORM RETENTION IN SUBBASIN 360
 552          RS       1    STOR       0
 553          SV       0      10      10
 554          SE      96     100     105
 555          SS     100     330    2.63     1.5

 556          KK    365C
 557          KM   COMBINE 326R AND 360RT
 558          HC       2

 559          KK    366R
 560          KM   ROUTE 365C TO 367C
 561          RS       1    FLOW      -1
 562          RC    .030    .016    .030     800   .0023
 563          RX       0     0.1     130   130.1     155   155.1     185   185.1
 564          RY     102    99.5      99    98.6    98.6      99    99.5     102

 565          KK    350S
 566          KM   RUNOFF FROM SUBBASIN 350
 567          BA    .018
 568          LG     .13     .25     5.0     .33      22
 569          UC    .118    .059
 570          UA       0       5      16      30      65      77      84      90      94      97
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 571          UA     100

 572          KK    356R
 573          KM   ROUTE 355C TO 367C
 574          RS       1    FLOW      -1
 575          RC    .030    .016    .030     500   .0080
 576          RX       0     0.1      30    30.1      55    55.1      85    85.1
 577          RY     102    99.5      99    98.6    98.6      99    99.5     102

 578          KK    367C
 579          KM   COMBINE 366R AND 356R
 580          HC       2

 581          KK    368R
 582          KM   ROUTE 367C TO 375C
 583          RS       4    FLOW      -1
 584          RC    .030    .016    .030    1250   .0010
 585          RX       0     0.1      30    30.1     105   105.1     135   135.1
 586          RY     102    99.5      99    98.6    98.6      99    99.5     102

 587          KK    370S
 588          KM   RUNOFF FROM SUBBASIN 370
 589          BA    .107
 590          LG     .12     .15     9.6     .05      35
 591          UC    .390    .335
 592          UA       0       5      16      30      65      77      84      90      94      97
 593          UA     100

 594          KK   370RT
 595          KM   FIELD-ESTIMATED RETENTION IN SUBBASIN 370
 596          RS       1    STOR       0
 597          SV       0     2.8     2.8
 598          SE      96     100     105
 599          SS     100     100    2.63     1.5

 600          KK    375C
 601          KM   COMBINE 368R AND 370RT
 602          HC       2

 603          KK    330S
 604          KM   RUNOFF FROM SUBBASIN 330
 605          BA    .013
 606          LG     .10     .25     5.0     .29      54
 607          UC    .113    .081
 608          UA       0       5      16      30      65      77      84      90      94      97
 609          UA     100

 610          KK    340S
 611          KM   RUNOFF FROM SUBBASIN 340
 612          BA    .082
 613          LG     .12     .25     4.8     .37      35
 614          UC    .255    .182
 615          UA       0       5      16      30      65      77      84      90      94      97
 616          UA     100
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 617          KK    345C
 618          KM   COMBINE 330S AND 340S
 619          HC       2

 620          KK   345RT
 621          KM   RETENTION IN SUBBASINS 330 AND 345 - PUMPED INTO TEMPE CANAL
 622          RS       1    STOR       0
 623          SV       0      30      30
 624          SE      96     100     105
 625          SS     100     400    2.63     1.5

 626          KK    346R
 627          KM   ROUTE 345C TO 355C
 628          RS       4    FLOW      -1
 629          RC    .030    .016    .030     550   .0091
 630          RX       0     0.1     100   100.1     400   400.1     500   500.1
 631          RY     102     100      99    98.7    98.7      99     100     102

 632          KK    380S
 633          KM   RUNOFF FROM SUBBASIN 380
 634          BA    .070
 635          LG     .50     .25     5.0     .37      10
 636          UC    .356    .240
 637          UA       0       5      16      30      65      77      84      90      94      97
 638          UA     100

 639          KK    385C
 640          KM   COMBINE 346R AND 380S
 641          HC       2

 642          KK    386R
 643          KM   ROUTE 380S TO 395C
 644          RS       4    FLOW      -1
 645          RC    .030    .030    .030    1900   .0043
 646          RX       0     0.1      30    30.1   330.1   330.2     360     361
 647          RY     102    99.5      99    98.6    98.6      99    99.5     102

 648          KK    390S
 649          KM   RUNOFF FROM SUBBASIN 390
 650          BA    .063
 651          LG     .11     .25     5.4     .25      45
 652          UC    .235    .204
 653          UA       0       5      16      30      65      77      84      90      94      97
 654          UA     100

 655          KK   390RT
 656          KM   50-YEAR, 24-HOUR AND 100-YEAR, 2-HOUR STORM RETENTION IN SUBBASIN 390
 657          RS       1    STOR       0
 658          SV       0       7       7
 659          SE      96     100     105
 660          SS     100     276    2.63     1.5
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 661          KK    395C
 662          KM   COMBINE 386R AND 390RT
 663          HC       2

 664          KK    397C
 665          KM   COMBINE 375C AND 395C
 666          HC       2

 667          KK    398R
 668          KM   ROUTE 397C TO 445C
 669          RS       4    FLOW      -1
 670          RC    .030    .016    .030    1800   .0021
 671          RX       0     0.1      30    30.1     105   105.1     135   135.1
 672          RY     102    99.5      99    98.6    98.6      99    99.5     102

 673          KK    440S
 674          KM   RUNOFF FROM SUBBASIN 440
 675          BA    .116
 676          LG     .11     .15     8.1     .09      39
 677          UC    .310    .190
 678          UA       0       5      16      30      65      77      84      90      94      97
 679          UA     100

 680          KK   440RT
 681          KM   UNKNOWN STORM RETENTION IN SUBBASIN 440
 682          RS       1    STOR       0
 683          SV       0      13      13
 684          SE    94.5     100     105
 685          SS     100     400    2.63     1.5

 686          KK    445C
 687          KM   COMBINE 398R AND 440RT
 688          HC       2

 689          KK    430S
 690          KM   RUNOFF FROM SUBBASIN 430
 691          BA    .092
 692          LG     .11     .15     9.6     .05      36
 693          UC    .254    .127
 694          UA       0       5      16      30      65      77      84      90      94      97
 695          UA     100

 696          KK   430RT
 697          KM   UNKNOWN STORM RETENTION IN SUBBASIN 430
 698          RS       1    STOR       0
 699          SV       0      11      11
 700          SE      96     100     105
 701          SS     100     350    2.63     1.5
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 702          KK    431R
 703          KM   ROUTE 430RT TO 446C
 704          RS       7    FLOW      -1
 705          RC    .030    .016    .030    1350   .0004
 706          RX       0     0.1      30    30.1      55    55.1      85    85.1
 707          RY     102    99.5      99    98.6    98.6      99    99.5     102

 708          KK    446C
 709          KM   COMBINE 445C AND 431R
 710          HC       2

 711          KK    447R
 712          KM   ROUTE 446C TO 468C
 713          RS       3    FLOW      -1
 714          RC    .030    .016    .030    1350   .0014
 715          RX       0     0.1      50    50.1     114   114.1     164     165
 716          RY     102    99.5      99    98.6    98.6      99    99.5     102

 717          KK    400S
 718          KM   RUNOFF FROM SUBBASIN 400
 719          BA    .125
 720          LG     .47     .25     4.8     .40       5
 721          UC    .371    .123
 722          UA       0       5      16      30      65      77      84      90      94      97
 723          UA     100

 724          KK    401R
 725          KM   ROUTE 400S TO 415C
 726          RS       3    FLOW      -1
 727          RC    .030    .016    .030    1900   .0105
 728          RX       0     0.1      50    50.1     114   114.1     164     165
 729          RY     102    99.5      99    98.6    98.6      99    99.5     102

 730          KK    410S
 731          KM   RUNOFF FROM SUBBASIN 410
 732          BA    .035
 733          LG     .10     .25     5.3     .26      47
 734          UC    .148    .130
 735          UA       0       5      16      30      65      77      84      90      94      97
 736          UA     100

 737          KK   410RT
 738          KM   UNKNOWN STORM RETENTION IN SUBBASIN 410
 739          RS       1    STOR       0
 740          SV       0       4       4
 741          SE    95.5     100     105
 742          SS     100     330    2.63     1.5

 743          KK    415C
 744          KM   COMBINE 400S AND 410RT
 745          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  746         KK    416R
  747         KM   ROUTE 415C TO 421C
  748         RS       1    FLOW      -1
  749         RC    .030    .016    .030     650   .0091
  750         RX       0     0.1      50    50.1     114   114.1     164     165
  751         RY     102    99.5      99    98.6    98.6      99    99.5     102

  752         KK    420S
  753         KM   RUNOFF FROM SUBBASIN 420
  754         BA    .065
  755         LG     .11     .15     9.6     .05      40
  756         UC    .208    .141
  757         UA       0       5      16      30      65      77      84      90      94      97
  758         UA     100

  759         KK    421C
  760         KM   COMBINE 416R AND 420S
  761         HC       2

  762         KK   459DR
  763         KM   RETRIEVE DIVERTED FLOW FROM 265C
  764         DR   265DV

  765         KK   266DV
  766         KM   DIVERT 94 CFS INTO COUNTRY CLUB STORM DRAIN
  767         DT   266DV
  768         DI       0      94    2000
  769         DQ       0      94      94

  770         KK    459R
  771         KM   ROUTE REMAINING FLOW FROM 265C TO 465C
  772         RS       7    FLOW      -1
  773         RC    .030    .016    .030    1700   .0006
  774         RX       0     0.1      50    50.1     114   114.1     164     165
  775         RY     102    99.5      99    98.6    98.6      99    99.5     102

  776         KK    460S
  777         KM   RUNOFF FROM SUBBASIN 460
  778         BA    .026
  779         LG     .07     .15     9.6     .04      85
  780         UC    .186    .229
  781         UA       0       5      16      30      65      77      84      90      94      97
  782         UA     100

  783         KK    465C
  784         KM   COMBINE 459R AND 460S
  785         HC       2   .5090

  786         KK    450S
  787         KM   RUNOFF FROM SUBBASIN 450
  788         BA    .026
  789         LG     .50     .15     9.6     .07      10
  790         UC    .347    .300
  791         UA       0       5      16      30      65      77      84      90      94      97
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 792          UA     100

 793          KK    466C
 794          KM   COMBINE 465C AND 450S
 795          HC       2

 796          KK    467R
 797          KM   ROUTE 466C TO 468C
 798          RS       2    FLOW      -1
 799          RC    .030    .016    .030     700   .0014
 800          RX       0     0.1      50    50.1     114   114.1     164     165
 801          RY     102    99.5      99    98.6    98.6      99    99.5     102

 802          KK    468C
 803          KM   COMBINE 447R, 421C, AND 467R
 804          HC       3

 805          KK    469R
 806          KM   ROUTE 468C TO 475C
 807          RS       2    FLOW      -1
 808          RC    .030    .016    .030    1250   .0017
 809          RX       0     0.1      50    50.1     114   114.1     164     165
 810          RY     102    99.5      99    98.6    98.6      99    99.5     102

 811          KK    470S
 812          KM   RUNOFF FROM SUBBASIN 470
 813          BA    .056
 814          LG     .10     .15     8.5     .07      54
 815          UC    .225    .193
 816          UA       0       5      16      30      65      77      84      90      94      97
 817          UA     100

 818          KK    475C
 819          KM   COMBINE 469R AND 470S
 820          HC       2

 821          KK    476R
 822          KM   ROUTE 475C TO 485C
 823          RS       3    FLOW      -1
 824          RC    .030    .016    .030    1650   .0015
 825          RX       0     0.1      50    50.1     114   114.1     164     165
 826          RY     102    99.5      99    98.6    98.6      99    99.5     102

 827          KK    480S
 828          KM   RUNOFF FROM SUBBASIN 480
 829          BA    .128
 830          LG     .09     .25     5.8     .20      57
 831          UC    .226    .154
 832          UA       0       5      16      30      65      77      84      90      94      97
 833          UA     100
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 834          KK   480RT
 835          KM   UNKNOWN STORM RETENTION IN SUBBASIN 480
 836          RS       1    STOR       0
 837          SV       0      15      15
 838          SE    97.5     100     105
 839          SS     100    1200    2.63     1.5

 840          KK    481R
 841          KM   ROUTE 480RT TO 485C
 842          RS       4    FLOW      -1
 843          RC    .030    .016    .030    1300    .001
 844          RX       0     0.1      30    30.1      55    55.1      85    85.1
 845          RY     102    99.5      99    98.6    98.6      99    99.5     102

 846          KK    485C
 847          KM   COMBINE 476R AND 481R
 848          HC       2

 849          KK    486R
 850          KM   ROUTE 485C TO 495C
 851          RS       4    FLOW      -1
 852          RC    .030    .016    .030    2150   .0015
 853          RX       0     0.1      50    50.1     114   114.1     164     165
 854          RY     102    99.5      99    98.6    98.6      99    99.5     102

 855          KK    490S
 856          KM   RUNOFF FROM SUBBASIN 490
 857          BA    .611
 858          LG     .23     .25     5.8     .19      31
 859          UC    .540    .317
 860          UA       0       5      16      30      65      77      84      90      94      97
 861          UA     100

 862          KK    495C
 863          KM   COMBINE 486R AND 490S
 864          HC       2

 865          KK   495DV
 866          KM   DIVERT 98 CFS INTO MCLELLAN RD STORM DRAIN
 867          DT   495DV
 868          DI       0      98    2000
 869          DQ       0      98      98

 870          KK   496DV
 871          KM   DIVERT 12% OF REMAINING FLOW SOUTH ON ALMA SCHOOL ROAD
 872          DT   496DV
 873          DI       0    2000
 874          DQ       0     240
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 875          KK   497DV
 876          KM   DIVERT 87% OF REMAINING FLOW INTO GRAVEL MINING PITS IN SUBBASIN 510
 877          DT   497DV
 878          DI       0    2000
 879          DQ       0    1740

 880          KK    498R
 881          KM   ROUTE REMAINING FLOW WEST TO MCLELLAN STORM DRAIN OUTLET DITCH
 882          RS       3    FLOW      -1
 883          RC    .035    .035    .035     900   .0032
 884          RX     950     951     979     980     992    1000    1024    1036
 885          RY    1209  1203.9  1203.9    1204  1204.1    1204    1204    1209

 886          KK   499DR
 887          KM   RETRIEVE MCLELLAN STORM DRAIN FLOW (OPERATION 495DV)
 888          DR   495DV

 889          KK    499C
 890          KM   COMBINE MCLELLAN STORM DRAIN FLOW WITH OVERLAND FLOW
 891          HC       2

 892          KK  REDMTN
 893          KM   RUNOFF FROM RED MTN. FWY. CONTRIBUTING TO DETENTION BASIN
 894          BA   .0281
 895          LG    .077     .32     5.0     .25      46
 896          UC    .144    .208
 897          UA       0       5      16      30      65      77      84      90      94      97
 898          UA     100

 899          KK    500C
 900          KM   COMBINE MCLELLAN STORM DRAIN, OVERLAND FLOW, AND RUNOFF FROM RED MTN FWY
 901          HC       2

 902          KK   BASIN
 903          KM       RESERVOIR ROUTE OF OUTFALL DETENTION BASIN AT ALMA SCHOOL AND MCLELLAN
 904          KM       54" OUTLET PIPE W/ 10-YR OR 100-YR SALT RIVER TAILWATER
 905          KO       3
 906          RS       1    STOR      -1       0
 907          SA       0   0.008   0.180   0.856   1.534   1.856   2.337
 908          SE  1191.9    1192    1193    1194    1195    1197    1200
 909          SQ       0      40      80     120     160     180
 910          SE    1192  1194.5  1195.8    1197  1198.6  1199.5

 911          KK   500DR
 912          KM   RETRIEVE FLOW DIVERTED SOUTH ON ALMA SCHOOL ROAD
 913          DR   496DV

 914          KK    500R
 915          KM   ROUTE 500DR ALONG ALMA SCHOOL ROAD TO ALMA SCHOOL DRAIN
 916          RS       9    FLOW      -1
 917          RC    .035    .016    .035    2500   .0015
 918          RX    42.8    42.9    67.9      68     132   132.1   142.1   147.1
 919          RY  105.86  100.86   99.86   99.56   99.56   99.86  100.86  105.86
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 920          KK    500S
 921          KM   RUNOFF FROM SUBBASIN 500
 922          BA    .011
 923          LG     .10      .25      5.0      .29       54
 924          UC    .100     .090
 925          UA       0        5       16       30       65       77       84       90       94       97
 926          UA     100

 927          KK   500RT
 928          KM   UNKNOWN STORM RETENTION IN SUBBASIN 500
 929          RS       1     STOR        0
 930          SV       0        1        1
 931          SE      99      100      105
 932          SS     100      200     2.63      1.5

 933          KK    505C
 934          KM   COMBINE 500R AND 500S; FLOW INTO ALMA SCHOOL DRAIN
 935          HC       2
 936          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

 No.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  18         10S
               V
               V
  26         11R
               .
               .
  32           .         30S
               .           .
               .           .
  39         35C............
               V
               V
  42         36R
               .
               .
  48           .         40S
               .           .
               .           .
  55         45C............
               .
               .
  58           .         20S
               .           V
               .           V
  65           .         21R
               .           .
               .           .
  71           .           .         50S
               .           .           .
               .           .           .
  78           .         55C............
               .           V
               .           V
  81           .         56R
               .           .
               .           .
  87           .           .         60S
               .           .           .
               .           .           .
  94           .         65C............
               .           .
               .           .
  99           .           .-------->   65DIV
  97           .       65DIV
               .           V
               .           V
 102           .         66R
               .           .
               .           .
               .           .         70S
               .           .           .
               .           .           .
 115           .           .           .         80S
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                .           .           .           .
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122             .           .        85C............
                .           .          V
                .           .          V
125             .           .        86R
                .           .           .
                .           .           .
131             .           .           .        90S
                .           .           .           .
                .           .           .           .
138             .           .        95C............
                .           .           .
                .           .           .
143             .           .           .-------->   95DIV
141             .           .        95D
                .           .          V
                .           .          V
146             .           .        96R
                .           .           .
                .           .           .
152             .           .           .       100S
                .           .           .           .
                .           .           .           .
159             .           .       104C............
                .           .           .
                .           .           .
162             .       105C............
                .          V
                .          V
                .       106R
                .           .
                .           .
171             .           .       110S
                .           .           .
                .           .           .
178             .           .           .       120S
                .           .           .          V
                .           .           .          V
185             .           .           .       121R
                .           .           .           .
                .           .           .           .
191             .           .           .           .        130S
                .           .           .           .           V
                .           .           .           .           V
198             .           .           .           .       130RT
                .           .           .           .           .
                .           .           .           .           .
204             .           .           .       135C............
                .           .           .           .
                .           .           .           .
207             .           .       136C............
                .           .          V
                .           .          V
210             .           .       137R
                .           .           .
                .           .           .
216             .           .           .       140S
                .           .           .           .
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223          .            .        145C............
             .            .           V
             .            .           V
226          .            .        146R
             .            .           .
             .            .           .
232          .            .           .        150S
             .            .           .           V
             .            .           .           V
239          .            .           .       150RT
             .            .           .           .
             .            .           .           .
245          .            .        155C............
             .            .           .
             .            .           .
248          .            .           .        170S
             .            .           .           .
             .            .           .           .
255          .            .        175C............
             .            .           V
             .            .           V
258          .            .        176R
             .            .           .
             .            .           .
264          .            .           .        160S
             .            .           .           .
             .            .           .           .
271          .            .           .           .        180S
             .            .           .           .           .
             .            .           .           .           .
             .            .           .           .           .        185S
             .            .           .           .           .           .
             .            .           .           .           .           .
285          .            .           .           .        186C............
             .            .           .           .           V
             .            .           .           .           V
288          .            .           .           .        187R
             .            .           .           .           .
             .            .           .           .           .
294          .            .        165C........................
             .            .           .
             .            .           .
299          .            .           .-------->   165DV
297          .            .        165DV
             .            .           .
             .            .           .
302          .            .           .        190S
             .            .           .           .
             .            .           .           .
309          .            .        195C............
             .            .           V
             .            .           V
312          .            .        196R
             .            .           .
             .            .           .
             .            .           .        200S
             .            .           .           V
             .            .           .           V
325          .            .           .       200RT
             .            .           .           .
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                .           .
331             .           .       205C............
                .           .           .
                .           .           .
                .           .           .        220S
                .           .           .           .
                .           .           .           .
341             .           .       225C............
                .           .           V
                .           .           V
344             .           .       226R
                .           .           .
                .           .           .
350             .           .           .        210S
                .           .           .           .
                .           .           .           .
357             .           .           .           .        230S
                .           .           .           .           .
                .           .           .           .           .
364             .           .           .           .           .        240S
                .           .           .           .           .           .
                .           .           .           .           .           .
371             .           .       245C.....................................
                .           .           .
                .           .           .
376             .           .           .           .<-------   95DIV
374             .           .           .        96DR
                .           .           .           V
                .           .           .           V
3--             .           .           .         97R
                .           .           .           .
                .           .           .           .
383             .           .      245BC............
                .           .           V
                .           .           V
386             .           .       246R
                .           .           .
                .           .           .
392             .           .           .        250S
                .           .           .           .
                .           .           .           .
399             .           .       255C............
                .           .           V
                .           .           V
402             .           .       256R
                .           .           .
                .           .           .
408             .           .           .        260S
                .           .           .           V
                .           .           .           V
415             .           .           .       260RT
                .           .           .           .
                .           .           .           .
421             .           .       265C............
                .           .           .
                .           .           .
4--             .           .           .-------->   265DV
424             .           .      265DV
                .           .           V
                .           .           V
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429          .           .        266R
             .           .           .
             .           .           .
435          .           .           .        270S
             .           .           .           .
             .           .           .           .
442          .           .        274C............
             .           .           .
             .           .           .
445          .        275C............
             .           .
             .           .
448          .           .        280S
             .           .           V
             .           .           V
455          .           .        281R
             .           .           .
             .           .           .
461          .           .           .        290S
             .           .           .           v
             .           .           .           V
468          .           .           .       290RT
             .           .           .           .
             .           .           .           .
474          .           .        295C............
             .           .           V
             .           .           V
477          .           .        296R
             .           .           .
             .           .           .
             .           .           .        300S
             .           .           .           .
             .           .           .           .
490          .           .        305C............
             .           .           V
             .           .           V
493          .           .        306R
             .           .           .
             .           .           .
499          .           .           .        310S
             .           .           .           V
             .           .           .           V
506          .           .           .       310RT
             .           .           .           .
             .           .           .           .
512          .           .           .           .        320S
             .           .           .           .           V
             .           .           .           .           V
519          .           .           .           .       320RT
             .           .           .           .           .
             .           .           .           .           .
527          .           .           .           .           .           .<-------   165DV
525          .           .           .           .           .       324DR
             .           .           .           .           .           V
             .           .           .           .           .           V
             .           .           .           .           .        324R
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534          .           .        325C.................................
             .           .           V
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                 .         .         V
537              .         .      326R
                 .         .         .
                 .         .         .
                 .         .         .        360S
                 .         .         .           V
                 .         .         .           V
550              .         .         .       360RT
                 .         .         .           .
                 .         .         .           .
556              .         .      365C............
                 .         .         V
                 .         .         V
559              .         .      366R
                 .         .         .
                 .         .         .
565              .         .         .        350S
                 .         .         .           V
                 .         .         .           V
572              .         .         .        356R
                 .         .         .           .
                 .         .         .           .
578              .         .      367C............
                 .         .         V
                 .         .         V
581              .         .      368R
                 .         .         .
                 .         .         .
587              .         .         .        370S
                 .         .         .           V
                 .         .         .           V
594              .         .         .       370RT
                 .         .         .           .
                 .         .         .           .
600              .         .      375C............
                 .         .         .
                 .         .         .
603              .         .         .        330S
                 .         .         .           .
                 .         .         .           .
610              .         .         .           .        340S
                 .         .         .           .           .
                 .         .         .           .           .
617              .         .         .        345C............
                 .         .         .           V
                 .         .         .           V
620              .         .         .       345RT
                 .         .         .           V
                 .         .         .           V
626              .         .         .        346R
                 .         .         .           .
                 .         .         .           .
632              .         .         .           .        380S
                 .         .         .           .           .
                 .         .         .           .           .
                 .         .         .        385C............
                 .         .         .           V
                 .         .         .           V
642              .         .         .        386R
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648                                               .        390S
                                                  .           V
                                                  .           V
                                                  .       390RT
                                                  .           .
                                                  .           .
661                                       395C............
                                                  .
                                                  .
664                                397C............
                                      V
                                      V
667                                398R
                                      .
                                      .
673                                       440S
                                                  V
                                                  V
680                                      440RT
                                                  .
                                                  .
686                                445C............
                                      .
                                      .
689                                       430S
                                                  V
                                                  V
696                                      430RT
                                                  V
                                                  V
702                                       431R
                                                  .
                                                  .
708                                446C............
                                      V
                                      V
711                                447R
                                      .
                                      .
717                                       400S
                                                  V
                                                  V
724                                       401R
                                                  .
                                                  .
730                                                       410S
                                                  .           V
                                                  .           V
737                                                      410RT
                                                  .           .
                                                  .           .
743                                       415C............
                                                  V
                                                  V
- -                                         416R
                                                  .
                                                  .
752                                                       420S
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                .           .           .           .           .
759             .           .           .       421C............
                .           .           .           .
                .           .           .           .
                .           .           .           .           .<-------   265DV
762             .           .           .           .       459DR
                .           .           .           .           .
                .           .           .           .           .
767             .           .           .           .           .------->   266DV
765             .           .           .           .       266DV
                .           .           .           .           V
                .           .           .           .           V
770             .           .           .           .        459R
                .           .           .           .           .
                .           .           .           .           .
776             .           .           .           .           .        460S
                .           .           .           .           .           .
                .           .           .           .           .           .
783             .           .           .           .        465C............
                .           .           .           .           .
                .           .           .           .           .
786             .           .           .           .           .        450S
                .           .           .           .           .           .
                .           .           .           .           .           .
793             .           .           .           .        466C............
                .           .           .           .           V
                .           .           .           .           V
796             .           .           .           .        467R
                .           .           .           .           .
                .           .           .           .           .
                .           .       468C........................
                .           .          V
                .           .          V
805             .           .       469R
                .           .           .
                .           .           .
811             .           .           .       470S
                .           .           .           .
                .           .           .           .
818             .           .       475C............
                .           .          V
                .           .          V
821             .           .       476R
                .           .           .
                .           .           .
827             .           .           .       480S
                .           .           .           V
                .           .           .           V
834             .           .           .      480RT
                .           .           .           V
                .           .           .           V
840             .           .           .       481R
                .           .           .           .
                .           .           .           .
846             .           .       485C............
                .           .          V
                .           .          V
849             .           .       486R
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                .           .           .
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855          .          .          .        490S
             .          .          .           .
             .          .          .           .
862          .          .       495C............
             .          .          .
             .          .          .
867          .          .          .-------->   495DV
865          .          .      495DV
             .          .          .
             .          .          .
872          .          .          .-------->   496DV
870          .          .      496DV
             .          .          .
             .          .          .
877          .          .          .-------->   497DV
875          .          .      497DV
             .          .          V
             .          .          V
880          .          .       498R
             .          .          .
             .          .          .
888          .          .          .           .<-------   495DV
886          .          .          .       499DR
             .          .          .           .
             .          .          .           .
889          .          .       499C............
             .          .          .
             .          .          .
892          .          .          .      REDMTN
             .          .          .           .
             .          .          .           .
899          .          .       500C............
             .          .          V
             .          .          V
902          .          .      BASIN
             .          .          .
             .          .          .
913          .          .          .           .<-------   496DV
911          .          .          .       500DR
             .          .          .           V
             .          .          .           V
914          .          .          .        500R
             .          .          .           .
             .          .          .           .
920          .          .          .           .        500S
             .          .          .           .           V
             .          .          .           .           V
927          .          .          .           .       500RT
             .          .          .           .           .
             .          .          .           .           .
933          .          .          .        505C............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  01/16/96  TIME  08:55:27  *
*                                      *
****************************************
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****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 551-1748             *
*                                      *
****************************************
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RED MOUNTAIN FREEWAY DRAINAGE ANALYSIS
PHASE II - DOBSON ROAD TO MESA DRIVE
100-YEAR, 24-HOUR STORM
HEC-1 HYPOTHETHICAL RAINFALL DISTRIBUTION
RAINFALL DEPTHS IN PH RECORD BASED ON PREFRE OUTPUT
CLARK UNIT HYDROGRAPH
GREEN-AMPT SOIL LOSS PARAMETERS
NORMAL DEPTH CHANNEL ROUTING
IN GENERAL, URBANIZED AREAS IN THE CITY OF MESA BUILT BETWEEN 1973
AND 1987 WERE DESIGNED TO RETAIN THE 50-YEAR, 24-HOUR RAINFALL; FROM 1987
TO PRESENT, THE RETENTION REQUIREMENT IS THE 100-YEAR, 2-HOUR RAINFALL.
DIVERSIONS ALONG MAJOR STREETS WERE ESTIMATED BASED ON AS-BUILT ROADWAY
AND STORM DRAIN PLANS, STORM DRAIN STUDY REPORTS, AND FIELD INSPECTION.
** FLOW TAKEN ACROSS RED MOUNTAIN FREEWAY AT CP 65C **
FILENAME: RMP2_65D.DAT

```
O          OUTPUT CONTROL VARIABLES
                IPRNT          5  PRINT CONTROL
                IPLOT          0  PLOT CONTROL
                QSCAL         0.  HYDROGRAPH PLOT SCALE

IT         HYDROGRAPH TIME DATA
                 NMIN          2  MINUTES IN COMPUTATION INTERVAL
                IDATE      1   0  STARTING DATE
                ITIME       0000  STARTING TIME
                   NQ        720  NUMBER OF HYDROGRAPH ORDINATES
               NDDATE      1   0  ENDING DATE
               NDTIME       2358  ENDING TIME
               ICENT         19  CENTURY MARK

          COMPUTATION INTERVAL    0.03 HOURS
               TOTAL TIME BASE   23.97 HOURS

     ENGLISH UNITS
          DRAINAGE AREA          SQUARE MILES
          PRECIPITATION DEPTH    INCHES
          LENGTH, ELEVATION      FEET
          FLOW                   CUBIC FEET PER SECOND
          STORAGE VOLUME         ACRE-FEET
          SURFACE AREA           ACRES
          TEMPERATURE            DEGREES FAHRENHEIT
```

*** ***

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          **************
          *            *
902 KK    *     BASIN  *
          *            *
          **************

905 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

             HYDROGRAPH ROUTING DATA

906 RS          STORAGE ROUTING
                      NSTPS           1  NUMBER OF SUBREACHES
                       ITYP        STOR  TYPE OF INITIAL CONDITION
                      RSVRIC       -1.00  INITIAL CONDITION
                           X        0.00 WORKING R AND D COEFFICIENT

907 SA                AREA         0.0       0.0       0.2       0.9       1.5       1.9       2.3

908 SE          ELEVATION     1191.90   1192.00   1193.00   1194.00   1195.00   1197.00   1200.00

909 SQ          DISCHARGE          0.       40.       80.      120.      160.      180.

910 SE          ELEVATION     1192.00   1194.50   1195.80   1197.00   1198.60   1199.50

                                                                  ***

                                                COMPUTED STORAGE-ELEVATION DATA

           STORAGE       0.00      0.00      0.08      0.55      1.73      5.12     11.39
         ELEVATION    1191.90   1192.00   1193.00   1194.00   1195.00   1197.00   1200.00

                                                COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

           STORAGE       0.00      0.00      0.08      0.55      1.06      1.73      3.01      5.12      8.28     10.24
           OUTFLOW       0.00      0.00     16.00     32.00     40.00     55.38     80.00    120.00    160.00    180.00
         ELEVATION    1191.90   1192.00   1193.00   1194.00   1194.50   1195.00   1195.80   1197.00   1198.60   1199.50

           STORAGE      11.39
           OUTFLOW     191.11
         ELEVATION    1200.00

     ***            ***            ***            ***            ***

                          HYDROGRAPH AT STATION    BASIN

 PEAK FLOW     TIME                              MAXIMUM AVERAGE FLOW
   (CFS)       (HR)                    6-HR       24-HR       72-HR     23.97-HR
    190.      13.43          (CFS)     120.         40.         40.         40.
                            (INCHES)   0.520       0.698       0.698       0.698
                            (AC-FT)     59.         80.         80.         80.

PF-  STORAGE   TIME                              MAXIMUM AVERAGE STORAGE
     -FT)      (HR)                    6-HR       24-HR       72-HR     23.97-HR
      11.      13.43                     6.          2.          2.          2.

 PEAK STAGE    TIME                              MAXIMUM AVERAGE STAGE
```

(FEET)	(HR)	6-HR	24-HR	72-HR	23.97-HR
1199.94	13.43	1197.23	1193.95	1193.95	1193.95

CUMULATIVE AREA = 2.14 SQ MI

RUNOFF SUMMARY

FLOW IN CUBIC FEET PER SECOND

TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	10S	90.	16.40	68.	20.	20.	0.87		
ROUTED TO	11R	90.	16.83	68.	20.	20.	0.87	98.72	16.83
HYDROGRAPH AT	30S	280.	16.60	202.	59.	59.	1.41		
2 COMBINED AT	35C	368.	16.67	269.	79.	79.	2.28		
ROUTED TO	36R	368.	16.93	269.	78.	78.	2.28	98.68	16.93
HYDROGRAPH AT	40S	66.	15.27	45.	13.	13.	0.28		
2 COMBINED AT	45C	417.	16.87	305.	92.	92.	2.56		
HYDROGRAPH AT	20S	111.	12.50	26.	7.	7.	0.11		
ROUTED TO	21R	103.	13.80	26.	7.	7.	0.11	98.32	13.80
HYDROGRAPH AT	50S	542.	12.57	118.	31.	31.	0.49		
2 COMBINED AT	55C	544.	12.57	143.	37.	37.	0.60		
ROUTED TO	56R	536.	12.83	143.	37.	37.	0.60	98.91	12.83
HYDROGRAPH AT	60S	252.	12.23	28.	8.	8.	0.12		
2 COMBINED AT	65C	592.	12.77	171.	45.	45.	0.71		
DIVERSION TO	65DIV	592.	0.03	171.	45.	45.	0.71		
HYDROGRAPH AT	65DIV	0.	0.03	0.	0.	0.	0.71		
ROUTED TO	66R	0.	0.03	0.	0.	0.	0.71	97.00	0.00
HYDROGRAPH AT	70S	162.	12.53	38.	10.	10.	0.16		
HYDROGRAPH AT	80S	253.	12.43	49.	13.	13.	0.20		
2 COMBINED AT	85C	414.	12.47	87.	23.	23.	0.37		
ROUTED TO	86R	408.	12.87	87.	23.	23.	0.37	98.98	12.87
HYDROGRAPH AT	90S	100.	12.37	16.	4.	4.	0.07		
2 COMBINED AT	95C	462.	12.83	103.	27.	27.	0.43		
DIVERSION TO	95DIV	462.	0.03	103.	27.	27.	0.43		
HYDROGRAPH AT	95D	0.	0.03	0.	0.	0.	0.43		
ROUTED TO	96R	0.	0.03	0.	0.	0.	0.43	98.60	0.00

HYDROGRAPH AT	100S	20.	14.20	12.	4.	4.	0.07		
2 COMBINED AT	104C	20.	14.20	12.	4.	4.	0.51		
2 COMBINED AT	105C	20.	14.20	12.	4.	4.	1.22		
ROUTED TO	106R	20.	14.70	12.	4.	4.	1.22	97.18	14.70
HYDROGRAPH AT	110S	42.	14.43	24.	7.	7.	0.13		
HYDROGRAPH AT	120S	135.	12.03	6.	2.	2.	0.03		
ROUTED TO	121R	125.	12.07	6.	2.	2.	0.03	99.13	12.07
HYDROGRAPH AT	130S	70.	12.17	7.	2.	2.	0.03		
ROUTED TO	130RT	21.	12.60	1.	0.	0.	0.03	100.28	12.60
2 COMBINED AT	135C	125.	12.07	7.	2.	2.	0.06		
2 COMBINED AT	136C	126.	12.07	29.	9.	9.	0.19		
ROUTED TO	137R	109.	12.17	29.	9.	9.	0.19	99.12	12.17
HYDROGRAPH AT	140S	48.	12.10	5.	1.	1.	0.01		
2 COMBINED AT	145C	153.	12.17	33.	10.	10.	0.20		
ROUTED TO	146R	139.	12.23	33.	10.	10.	0.20	99.42	12.23
HYDROGRAPH AT	150S	190.	12.20	22.	6.	6.	0.08		
ROUTED TO	150RT	190.	12.20	18.	5.	5.	0.08	100.48	12.60
2 COMBINED AT	155C	327.	12.23	51.	15.	15.	0.29		
HYDROGRAPH AT	170S	24.	12.10	2.	1.	1.	0.01		
2 COMBINED AT	175C	342.	12.23	52.	16.	16.	0.29		
ROUTED TO	176R	330.	12.30	52.	16.	16.	0.29	99.77	12.30
HYDROGRAPH AT	160S	43.	12.10	4.	1.	1.	0.01		
HYDROGRAPH AT	180S	68.	12.17	7.	2.	2.	0.03		
HYDROGRAPH AT	185S	156.	12.13	13.	4.	4.	0.06		
2 COMBINED AT	186C	222.	12.17	20.	5.	5.	0.08		
ROUTED TO	187R	191.	12.37	20.	5.	5.	0.08	99.91	12.37
3 COMBINED AT	165C	528.	12.33	75.	22.	22.	0.39		
DIVERSION TO	165DV	232.	12.33	33.	10.	10.	0.39		
HYDROGRAPH AT	165DV	296.	12.33	42.	12.	12.	0.39		
HYDROGRAPH AT	190S	26.	12.17	3.	1.	1.	0.01		

2 COMBINED AT	195C	316.	12.30	45.	13.	13.	0.40		
ROUTED TO	196R	303.	12.40	45.	13.	13.	0.40	99.64	12.40
HYDROGRAPH AT	200S	128.	12.17	13.	4.	4.	0.05		
ROUTED TO	200RT	34.	12.63	2.	1.	1.	0.05	100.12	12.63
2 COMBINED AT	205C	303.	12.40	47.	14.	14.	0.45		
HYDROGRAPH AT	220S	48.	12.17	5.	2.	2.	0.02		
2 COMBINED AT	225C	333.	12.40	52.	15.	15.	0.47		
ROUTED TO	226R	320.	12.47	52.	15.	15.	0.47	99.58	12.47
HYDROGRAPH AT	210S	106.	12.17	14.	4.	4.	0.05		
HYDROGRAPH AT	230S	76.	12.17	8.	2.	2.	0.03		
HYDROGRAPH AT	240S	41.	12.10	4.	1.	1.	0.01		
4 COMBINED AT	245C	438.	12.43	77.	23.	23.	0.56		
HYDROGRAPH AT	96DR	462.	12.83	103.	27.	27.	0.00		
ROUTED TO	97R	457.	12.93	103.	27.	27.	0.00	100.15	12.93
2 COMBINED AT	245BC	629.	12.87	180.	50.	50.	0.56		
ROUTED TO	246R	623.	12.90	180.	50.	50.	0.56	99.81	12.90
HYDROGRAPH AT	250S	72.	12.07	6.	2.	2.	0.02		
2 COMBINED AT	255C	626.	12.90	185.	51.	51.	0.58		
ROUTED TO	256R	613.	13.03	185.	51.	51.	0.58	100.00	13.03
HYDROGRAPH AT	260S	268.	12.20	33.	9.	9.	0.11		
ROUTED TO	260RT	25.	13.10	4.	1.	1.	0.11	100.07	13.10
2 COMBINED AT	265C	622.	13.10	188.	52.	52.	0.69		
DIVERSION TO	265DV	435.	13.10	132.	37.	37.	0.69		
HYDROGRAPH AT	265DV	187.	13.10	56.	16.	16.	0.69		
ROUTED TO	266R	184.	13.17	56.	16.	16.	0.69	99.14	13.17
HYDROGRAPH AT	270S	204.	12.13	19.	6.	6.	0.07		
2 COMBINED AT	274C	216.	12.13	75.	21.	21.	0.76		
2 COMBINED AT	275C	216.	12.13	85.	25.	25.	1.98		
HYDROGRAPH AT	280S	171.	12.13	9.	2.	2.	0.06		
ROUTED TO	281R	164.	12.17	9.	2.	2.	0.06	98.75	12.17

HYDROGRAPH AT	290S	170.	12.17	17.	5.	5.	0.07		
ROUTED TO	290RT	28.	12.77	2.	1.	1.	0.07	100.09	12.77
2 COMBINED AT	295C	164.	12.17	11.	3.	3.	0.13		
ROUTED TO	296R	150.	12.27	11.	3.	3.	0.13	99.84	12.27
HYDROGRAPH AT	300S	73.	12.13	7.	2.	2.	0.03		
2 COMBINED AT	305C	211.	12.23	18.	5.	5.	0.15		
ROUTED TO	306R	203.	12.30	18.	5.	5.	0.15	100.14	12.30
HYDROGRAPH AT	310S	318.	12.30	47.	13.	13.	0.21		
ROUTED TO	310RT	57.	13.23	7.	2.	2.	0.21	100.17	13.23
HYDROGRAPH AT	320S	68.	12.17	8.	2.	2.	0.03		
ROUTED TO	320RT	33.	12.50	2.	1.	1.	0.03	100.25	12.50
HYDROGRAPH AT	324DR	232.	12.33	33.	10.	10.	0.00		
ROUTED TO	324R	215.	12.47	33.	10.	10.	0.00	99.52	12.47
4 COMBINED AT	325C	363.	12.40	59.	17.	17.	0.39		
ROUTED TO	326R	355.	12.47	59.	17.	17.	0.39	99.97	12.47
HYDROGRAPH AT	360S	258.	12.13	24.	6.	6.	0.09		
ROUTED TO	360RT	104.	12.47	5.	1.	1.	0.09	100.33	12.53
2 COMBINED AT	365C	459.	12.47	64.	18.	18.	0.48		
ROUTED TO	366R	400.	12.60	64.	18.	18.	0.48	99.96	12.60
HYDROGRAPH AT	350S	71.	12.07	4.	1.	1.	0.02		
ROUTED TO	356R	68.	12.10	4.	1.	1.	0.02	99.11	12.10
2 COMBINED AT	367C	403.	12.60	67.	19.	19.	0.50		
ROUTED TO	368R	393.	12.67	67.	19.	19.	0.50	99.91	12.67
HYDROGRAPH AT	370S	207.	12.27	29.	8.	8.	0.11		
ROUTED TO	370RT	207.	12.27	25.	6.	6.	0.11	100.81	12.27
2 COMBINED AT	375C	505.	12.67	92.	26.	26.	0.61		
HYDROGRAPH AT	330S	49.	12.07	3.	1.	1.	0.01		
HYDROGRAPH AT	340S	201.	12.17	18.	5.	5.	0.08		
2 COMBINED AT	345C	239.	12.13	21.	6.	6.	0.09		
ROUTED TO	345RT	0.	0.03	0.	0.	0.	0.09	97.56	23.97

ROUTED TO	346R	0.	0.03	0.	0.	0.	0.09	98.70	0.00
HYDROGRAPH AT	380S	125.	12.23	11.	3.	3.	0.07		
2 COMBINED AT	385C	125.	12.23	11.	3.	3.	0.16		
ROUTED TO	386R	93.	12.53	11.	3.	3.	0.16	98.83	12.53
HYDROGRAPH AT	390S	156.	12.17	15.	4.	4.	0.06		
ROUTED TO	390RT	40.	12.63	3.	1.	1.	0.06	100.11	12.63
2 COMBINED AT	395C	125.	12.63	14.	4.	4.	0.23		
2 COMBINED AT	397C	629.	12.63	106.	30.	30.	0.83		
ROUTED TO	398R	606.	12.73	105.	29.	29.	0.83	99.96	12.73
HYDROGRAPH AT	440S	298.	12.20	31.	8.	8.	0.12		
ROUTED TO	440RT	115.	12.57	6.	2.	2.	0.12	100.28	12.57
2 COMBINED AT	445C	664.	12.73	111.	31.	31.	0.95		
HYDROGRAPH AT	430S	287.	12.13	25.	7.	7.	0.09		
ROUTED TO	430RT	86.	12.50	4.	1.	1.	0.09	100.17	12.70
ROUTED TO	431R	38.	12.87	4.	1.	1.	0.09	99.43	12.87
2 COMBINED AT	446C	688.	12.73	116.	32.	32.	1.04		
ROUTED TO	447R	670.	12.80	115.	32.	32.	1.04	100.22	12.80
HYDROGRAPH AT	400S	289.	12.20	19.	5.	5.	0.13		
ROUTED TO	401R	278.	12.27	19.	5.	5.	0.13	99.21	12.27
HYDROGRAPH AT	410S	110.	12.10	9.	2.	2.	0.04		
ROUTED TO	410RT	24.	12.50	1.	0.	0.	0.04	100.07	12.50
2 COMBINED AT	415C	278.	12.27	21.	5.	5.	0.16		
ROUTED TO	416R	273.	12.30	21.	5.	5.	0.16	99.23	12.30
HYDROGRAPH AT	420S	202.	12.13	18.	5.	5.	0.06		
2 COMBINED AT	421C	416.	12.23	38.	10.	10.	0.22		
HYDROGRAPH AT	459DR	435.	13.10	132.	37.	37.	0.00		
DIVERSION TO	266DV	94.	13.10	63.	19.	19.	0.00		
HYDROGRAPH AT	266DV	341.	13.10	69.	17.	17.	0.00		
ROUTED TO	459R	330.	13.23	69.	17.	17.	0.00	100.00	13.23
HYDROGRAPH AT	460S	68.	12.13	8.	2.	2.	0.03		

2 COMBINED AT	465C	334.	13.23	77.	20.	20.	0.03		
HYDROGRAPH AT	450S	50.	12.23	6.	1.	1.	0.03		
2 COMBINED AT	466C	338.	13.23	83.	21.	21.	0.05		
ROUTED TO	467R	335.	13.27	83.	21.	21.	0.05	99.74	13.27
3 COMBINED AT	468C	1014.	12.80	234.	64.	64.	1.32		
ROUTED TO	469R	1001.	12.87	233.	64.	64.	1.32	100.49	12.87
HYDROGRAPH AT	470S	152.	12.17	16.	4.	4.	0.06		
2 COMBINED AT	475C	1016.	12.87	248.	68.	68.	1.37		
ROUTED TO	476R	997.	12.93	248.	68.	68.	1.37	100.55	12.93
HYDROGRAPH AT	480S	369.	12.13	34.	10.	10.	0.13		
ROUTED TO	480RT	120.	12.50	7.	2.	2.	0.13	100.09	12.50
ROUTED TO	481R	67.	12.73	7.	2.	2.	0.13	99.48	12.73
2 COMBINED AT	485C	1034.	12.93	255.	70.	70.	1.50		
ROUTED TO	486R	1016.	13.03	255.	70.	70.	1.50	100.57	13.03
HYDROGRAPH AT	490S	1038.	12.30	141.	38.	38.	0.61		
2 COMBINED AT	495C	1415.	12.53	392.	108.	108.	2.11		
DIVERSION TO	495DV	98.	12.53	78.	29.	29.	2.11		
HYDROGRAPH AT	495DV	1317.	12.53	314.	79.	79.	2.11		
DIVERSION TO	496DV	158.	12.53	38.	9.	9.	2.11		
HYDROGRAPH AT	496DV	1159.	12.53	276.	69.	69.	2.11		
DIVERSION TO	497DV	1009.	12.53	240.	60.	60.	2.11		
HYDROGRAPH AT	497DV	151.	12.53	36.	9.	9.	2.11		
ROUTED TO	498R	149.	12.60	36.	9.	9.	2.11	1204.88	12.60
HYDROGRAPH AT	499DR	98.	11.87	78.	29.	29.	0.00		
2 COMBINED AT	499C	247.	12.60	114.	38.	38.	2.11		
HYDROGRAPH AT	REDMTN	71.	12.13	7.	2.	2.	0.03		
2 COMBINED AT	500C	267.	12.53	121.	40.	40.	2.14		
ROUTED TO	BASIN	190.	13.43	120.	40.	40.	2.14	1199.94	13.43
HYDROGRAPH AT	500DR	158.	12.53	38.	9.	9.	0.00		
ROUTED TO	500R	155.	12.70	38.	9.	9.	0.00	100.33	12.70

HYDROGRAPH AT	500S	41.	12.07	3.	1.	1.	0.01		
ROUTED TO	500RT	24.	12.20	1.	0.	0.	0.01	100.19	12.20
2 COMBINED AT	505C	157.	12.67	39.	10.	10.	0.01		

*** NORMAL END OF HEC-1 ***

APPENDIX B

Catch Basin Runoff and Inlet Calculations

RED MTN. FREEWAY PHASE II
STP 600-8-(006)
ADOT RATIONAL METHOD
10-YEAR STORM
SCI Project No: 12168

SITE SPECIFIC
I-D-F CURVE PARAMETERS
(for 10-YR return frequency storm)

Computed by: JEM Date: 1/22/96
Checked by: _____ Date: _____
Approved by: _____ Date: _____

Power Curve Regression: (5 min < Tc < 60 min)

y = (10^m)*(x^b)

Reg. Coeff.	10-Year Duration Range (min)			
	5 to 10	10 to 15	15 to 30	30 to 60
m	-0.393	-0.427	-0.571	-0.689
b	0.317	0.291	0.204	0.169

NOTES:
1. Runoff Coefficients are area-weighted when more than one land use is present.
2. The minimum time of concentration is 10 minutes per ADOT.
3. Calculated discharges rounded to 0.1 cfs for design.

Drainage Area Station to Station	Length (ft)	Width (ft)	Area (ac)	Ratio of Total Runoff Coefficient C1	C2	C3	Avg. C	Design Tc (hr)	I (in/hr)	Q (cfs)	Inlet No.	Station	Type	U/S Flowby Qc (cfs)	Inlet No.	Total Flow Qt (cfs)	Slotted Drain (ft)	Flow Spread (ft)	Intercepted Flow Qi (cfs)	Cst. Phase I	II	III	Comments
FREEWAY MAINLINE																							
347+70 - 349+75 E.B.	205	79	0.37	1.00			0.95	0.17	4.20	1.5	405	349+75	C-15.91	0.2	347+70	1.7	NA	7.7	1.2				PBQD Global Design
355+50 - 363+35 E.B.	785	79	1.42	1.00			0.95	0.17	4.20	5.7	13	358+50	C-15.92	0.2	363+35	5.9	10	10.1	5.9	x			CB in sump
363+35 - 373+70 E.B.	1035	95	2.26	0.69	0.31		0.87	0.17	4.20	8.3	15	363+35	C-15.91	0.0	NA	8.3	15	9.0	8.1	x			
346+25 - 348+60 W.B.	235	79	0.43	1.00			0.95	0.17	4.20	1.7	409	348+60	C-15.91	0.3	346+25	2.0	NA	8.4	1.6				PBQD Global Design
348+60 - 355+10 W.B.	650	73	1.09	1.00			0.95	0.17	4.20	4.3	10	355+10	C-15.92	0.4	348+60	4.7	15	17.3	4.7	x			Flanking Basin
371+55 - 360+55 W.B.	1100	79	1.99	1.00			0.95	0.17	4.20	7.9	14	360+55	C-15.92	0.0	NA	7.9	20	8.9	7.8	x			
360+55 - 357+20 W.B.	335	79	0.61	1.00			0.95	0.17	4.20	2.4	12	357+20	C-15.92	0.1	360+55	2.5	10	12.6	2.5	x			Flanking Basin
355+10 - 357+20 W.B.	105	79	0.38	1.00			0.95	0.17	4.20	1.5	11	356+15	C-15.92	0.0	NA	1.5	NA	12.2	1.5	x			CB in sump
371+55 - 375+50 W.B.	435	73.5	0.73	1.00			0.95	0.17	4.20	2.9	20	375+50	C-15.92	0.0	NA	2.9	15	10.9	2.9	x			
375+50 - 377+00 W.B.	150	73.5	0.25	1.00			0.95	0.17	4.20	1.0	21	377+00	C-15.91	0.0	NA	1.0	NA	5.7	1.0	x			W to N/S Ramp Gore
373+70 - 377+67	397	32	0.29		1.00		0.70	0.17	4.20	0.9	22	377+67	C-15.80	0.0	NA	0.9	NA	NA	0.9	x			Median Inlet
377+00 - 386+35 W.B.	922	97	2.05	1.00			0.95	0.17	4.20	8.2	NA	385+50	C-18.10	0.0	NA	8.2	NA	NA	8.2	x			Future Ramp System
396+30 - 388+00 W.B.	830	83.5	1.59	1.00			0.95	0.17	4.20	6.3	33	388+00	C-15.92	0.0	NA	6.3	20	15.2	6.1	x			
388+00 - 386+35 W.B.	165	83.5	0.32	1.00			0.95	0.17	4.20	1.3	32	386+35	C-15.92	0.2	388+00	1.5	5	10.3	1.5	x			End of temporary barrier
377+67 - 396+30	1863	32	1.37		1.00		0.70	0.17	4.20	4.0	31	385+50	C-15.80	0.0	NA	4.0	NA	NA	4.0		x		Median Inlet
400+50 - 396+30 W.B.	420	79.8	0.77	1.00			0.95	0.17	4.20	3.1	40	396+30	C-15.92	0.0	400+50	3.1	15	9.0	3.1		x		
415+59 - 396+30	1929	32	1.42		1.00		0.70	0.17	4.20	4.2	41	396+30	C-15.80	0.0	NA	4.2	NA	NA	4.2		x		Median Inlet
407+70 - 400+50 W.B.	720	90.95	1.50	1.00			0.95	0.17	4.20	6.0	42	400+50	C-15.92	0.0	NA	6.0	30	12.5	6.0		x		
412+42 - 407+45 W.B.	472	109.2	1.18	1.00			0.95	0.17	4.20	4.7	43	407+70	C-15.92	0.0	NA	4.7	25	11.7	4.7		x		
420+35 - 417+05 E.B.	330	97.5	0.57	0.69	0.31		0.87	0.17	4.20	2.1	56	417+05	C-15.91	0.0	NA	2.1	10	8.3	2.1		x		
417+05 - 416+25 E.B.	80	80	0.15	0.65	0.35		0.86	0.17	4.20	0.5	55	416+25	C-15.91	0.0	NA	0.5	0	3.7	0.5		x		
416+25 - 410+55 E.B.	570	81	1.08	1.00			0.95	0.17	4.20	4.3	53	410+55	C-15.92	0.0	NA	4.3	20	11.2	4.3	x	x		Remove Timber Cap
410+55 - 408+81 E.B.	174	85.5	0.34	1.00			0.95	0.17	4.20	1.4	52	408+81	C-15.91	0.0	NA	1.4	5	6.2	1.3	x	x		Remove Timber Cap
420+35 - 412+42 W.B.	793	73.5	1.34	1.00			0.95	0.17	4.20	5.3	54	412+42	C-15.92	0.0	NA	5.3	25	12.4	5.3		x		
DOBSON T.I.																							
INFIELD CB																							
Ramp A	900	NA	1.19		1.00		0.70	0.17	4.20	3.5	70	Infield	C-15.80	0.0	NA	3.5	NA	NA	3.5		x		
Ramp B	1140	NA	1.96		1.00		0.70	0.22	3.72	5.1	63	Infield	C-15.80	0.0	NA	5.1	NA	NA	5.1		x		
Ramp C	900	NA	1.67		1.00		0.70	0.18	4.11	4.8	73	Infield	C-15.80	0.0	NA	4.8	NA	NA	4.8		x		
Ramp D	900	NA	1.89		1.00		0.70	0.18	4.09	5.4	68	Infield	C-15.80	0.0	NA	5.4	NA	NA	5.4		x		
Ramp D @ Gore	450	NA	0.23		1.00		0.70	0.17	4.20	0.7	81	Infield	C-15.80	0.0	NA	0.7	NA	NA	5.4		x		
DOBSON ROAD																							
RAMP A																							
13+45 - 23+32	860	NA	0.75	1.00			0.95	0.17	4.20	3.0	69	22+05	C-15.92	0.0	NA	3.0	15	7.0	3.0		x		Alternative C-15.30, EF-1
RAMP B																							
8+10 - 14+30	620	NA	0.50	1.00			0.95	0.17	4.20	2.0	NA	14+30	C-15.91	0.0	NA	2.0	10	6.6	2.0	x			
14+30 - 17+25	295	NA	0.68	1.00			0.95	0.17	4.20	2.7	NA	17+25	C-15.20	0.0	NA	2.7	6.58	13.7	2.7	x			
RAMP C																							
0+00 - 9+75	770	NA	0.89	1.00			0.95	0.17	4.20	3.6	72	2+40	C-15.92	0.0	NA	3.6	10	7.2	3.6		x		CB in sump

RED MTN. FREEWAY PHASE II
STP 600-8-(006)
ADOT RATIONAL METHOD
10-YEAR STORM
SCI Project No: 12168

SITE SPECIFIC
I-D-F CURVE PARAMETERS
(for 10-YR return frequency storm)

Computed by: JKM Date: 1/22/96
Checked by: Date:
Approved by: Date:

Power Curve Regression: (5 min < Tc < 60 min)

y = (10^m)*(x^b)

Reg. Coeff.	10-Year Duration Range (min)			
	5 to 10	10 to 15	15 to 30	30 to 60
m	-0.393	-0.427	-0.571	-0.689
b	0.317	0.291	0.204	0.169

NOTES:
1. Runoff Coefficients are area-weighted when more than one land use is present.
2. The minimum time of concentration is 10 minutes per ADOT.
3. Calculated discharges rounded to 0.1 cfs for design.

Drainage Area Station to Station	Length (ft)	Width (ft)	Area (ac)	Ratio of Total Runoff Coefficient C1	C2	C3	Avg. C	Design Tc (hr)	i (in/hr)	Q (cfs)	Inlet No.	Station	Type	U/S Flowby Qc (cfs)	Inlet No.	Total Flow Qt (cfs)	Slotted Drain (ft)	Flow Spread (ft)	Intercepted Flow Qi (cfs)	Cst. Phase I	II	III	Comments
RAMP D																							
0+00 - 1+90	140	NA	0.33	1.00			0.95	0.17	4.20	1.3	67	1+40	C-15.91	0.0	NA	1.3	10	1.8	1.3	x			CB in sump
1+90 - 8+12	622	NA	0.50	1.00			0.95	0.17	4.20	2.0	66	1+90	C-15.91	0.0	NA	2.0	10	6.5	2.0	x			
8+12 - 12+42	430	33	0.33	1.00			0.95	0.17	4.20	1.3	81	12+42	C-15.91	0.0	NA	1.3	0	4.1	1.3	x			
RAMP D SOUTH R/W																							
East of Alma Drain	300	NA	1.56		1.00		0.70	0.17	4.20	4.6	86	R/W	C-15.80	0.0	NA	4.6	NA	NA	4.6	x			Outfall to Alma School Drain
West of Alma Drain	800	NA	4.22		1.00		0.70	0.20	3.88	11.5	87	R/W	C-15.80	0.0	NA	11.5	NA	NA	11.5	x			Outfall to Alma School Drain
FREEWAY MAINLINE																							
420+35 - 424+23 E.B.	388	73.5	0.65	1.00			0.95	0.17	4.20	2.6	71	424+23	C-15.92	0.0	NA	2.6	10	5.5	2.6	x			Interim sump
424+23 - 430+90 E.B.	667	89.5	1.37	0.66	0.34		0.87	0.17	4.20	5.0	80	430+90	C-15.91	0.0	NA	5.0	15	7.2	5.0	x			
430+90 - 432+75 E.B.	185	89.5	0.38	0.66	0.34		0.87	0.17	4.20	1.4	83	432+75	C-15.91	0.0	NA	1.4	0	9.0	1.4	x			
433+46 - 420+35 W.B.	1311	73.5	2.21	1.00			0.95	0.17	4.20	8.8	84	433+46	C-15.92	0.0	NA	8.8	35	13.6	8.8	x			
433+46 - 434+63 W.B.	116	73.5	0.20	1.00			0.95	0.17	4.20	0.8	85	434+63	C-15.91	0.1	84	0.9	0	3.8	0.9	x			
432+75 - 444+35 E.B.	1160	NA	2.52	1.00			0.95	0.17	4.20	10.1	90	441+05	C-15.92	0.0	NA	10.1	35	12.1	10.1	x			CB in sump
460+18 - 444+35 E.B.	1583	NA	3.39	1.00			0.95	0.17	4.20	13.5	98	444+35	C-15.92	0.0	NA	13.5	40	14.6	13.4	x			
442+30 - 444+35 E.B.	205	85.5	0.40	1.00			0.95	0.17	4.20	1.6	93	442+30	C-15.92	0.1	98	1.7	0	9.1	1.3	x			Flanking Basin
432+75 - 442+50	995	32	0.73		1.00		0.70	0.17	4.20	2.1	94	442+30	C-15.80	0.0	NA	2.1	NA	NA	0.6	x			Median Inlet
434+63 - 443+00 W.B.	642	NA	1.92	1.00			0.95	0.17	4.20	7.7	91	441+05	C-15.92	0.0	NA	7.7	20	14.1	7.7	x			CB in sump
441+65 - 443+00 W.B.	135	85.5	0.32	1.00			0.95	0.17	4.20	1.3	92	441+65	C-15.92	0.0	NA	1.3	0	11.1	1.0	x			Flanking Basin
469+50 - 466+55 W.B.	295	73.5	0.50	1.00			0.95	0.17	4.20	2.0	104	466+55	C-15.92	0.0	NA	2.0	15	15.0	2.0	x			
466+55 - 458+00 W.B.	855	NA	2.13	0.70	0.30		0.88	0.17	4.20	7.8	100	458+00	C-15.91	0.0	NA	7.8	20	7.9	7.8	x			
458+00 - 449+25 W.B.	875	101.5	2.04	0.70	0.30		0.88	0.17	4.20	7.5	99	449+25	C-15.91	0.0	NA	7.5	20	7.7	7.6	x			
449+25 - 444+35 W.B.	490	101.5	1.14	0.70	0.30		0.88	0.17	4.20	4.2	97	444+35	C-15.91	0.0	NA	4.2	10	9.0	4.1	x			
444+35 - 443+70 W.B.	65	101.5	0.15	0.70	0.30		0.88	0.17	4.20	0.6	96	443+70	C-15.91	0.0	NA	0.6	0	7.7	0.6	x			
443+00 - 443+70 W.B.	70	85.5	0.14	1.00			0.95	0.17	4.20	0.6	95	443+00	C-15.91	0.0	NA	0.6	0	7.2	0.6	x			
469+50 - 471+60 W.B.	320	73.5	0.54	1.00			0.95	0.17	4.20	2.2	117	471+60	C-15.92	0.0	NA	2.2	10	5.7	2.2	x			
467+90 - 467+65 E.B.	25	89.5	0.05	0.69	0.31		0.87	0.17	4.20	0.2	105	467+65	C-15.91	0.0	NA	0.2	0	2.2	0.2	x			
467+65 - 461+38 E.B.	627	73.5	1.06	1.00			0.95	0.17	4.20	4.2	101	461+38	C-15.92	0.0	NA	4.2	20	6.4	4.2	x			
461+38 - 460+19 E.B.	119	73.5	0.20	1.00			0.95	0.17	4.20	0.8	102	460+19	C-15.91	0.0	NA	0.8	0	2.9	0.8	x			
467+90 - 471+40 E.B.	350	89.5	0.72	0.66	0.34		0.87	0.17	4.20	2.6	116	471+40	C-15.92	0.0	NA	2.6	10	6.3	2.6	x			
471+40 - 475+00 E.B.	360	73.5	0.61	1.00			0.95	0.17	4.20	2.4	120	474+97	C-15.92	0.0	NA	2.4	10	5.0	2.4	x			
ALMA SCHOOL T.I.																							
RAMP A																							
4+09 - 4+90	90	33	0.07	1.00			0.95	0.17	4.20	0.3	NA	4+09	Scupper	0.0	NA	0.3	NA	NA	0.3	x			Scupper
4+90 - 9+00	410	33	0.31	1.00			0.95	0.17	4.20	1.2	106	9+00	C-15.91	0.0	NA	1.2	NA	3.6	1.2	x			
9+00 - 15+00	600	33	0.45	1.00			0.95	0.17	4.20	1.8	130	13+60	C-15.91	0.1	128	1.9	10	2.4	1.9	x			CB in sump
RAMP B																							
8+05 - 12+95	490	NA	0.45	1.00			0.95	0.17	4.20	1.8	NA	12+95	Scupper	0.0	NA	1.8	NA	6.3	1.5	x			
12+95 - 17+15	420	NA	0.80	1.00			0.95	0.17	4.20	3.2	108	16+85	C-15.91	0.3	Scupper	3.5	20	10.6	3.5	x			CB in sump
RAMP C																							
7+10 - 2+25	485	NA	0.44	1.00			0.95	0.17	4.20	1.8	124	2+25	C-15.91	0.0	NA	1.8	10	6.4	1.8	x			
0+00 - 2+25	195	NA	0.47	1.00			0.95	0.17	4.20	1.9	125	1+95	C-15.30	0.1	122	2.0	0	13.9	2.0	x			CB in sump, EF-1 Grate

RED MTN. FREEWAY PHASE II
STP 600-8-(006)
ADOT RATIONAL METHOD
10-YEAR STORM
SCI Project No: 12168

SITE SPECIFIC
I-D-F CURVE PARAMETERS
(for 10-YR return frequency storm)

Computed by: JRM Date: 1/22/96
Checked by: Date:
Approved by: Date:

Power Curve Regression: (5 min < Tc < 60 min)

y = (10^m)*(x^b)

Reg. Coeff.	10-Year Duration Range (min) 5 to 10	10 to 15	15 to 30	30 to 60
m	-0.393	-0.427	-0.571	-0.689
b	0.317	0.291	0.204	0.169

NOTES:
1. Runoff Coefficients are area-weighted when more than one land use is present.
2. The minimum time of concentration is 10 minutes per ADOT.
3. Calculated discharges rounded to 0.1 cfs for design.

Drainage Area Station to Station	Length (ft)	Width (ft)	Area (ac)	Ratio of Total Runoff Coefficient C1	C2	C3	Avg. C	Design Tc (hr)	i (in/hr)	Q (cfs)	Inlet No.	Station	Type	U/S Flowby Qc (cfs)	Inlet No.	Total Flow Qt (cfs)	Slotted Drain (ft)	Flow Spread (ft)	Intercepted Flow Qi (cfs)	Cst. Phase I	II	III	Comments
RAMP D																							
0+00 - 2+05	165	NA	0.23	1.00			0.95	0.17	4.20	0.9	110	1+65	C-15.91	0.1	2+05	1.0	0	6.8	1.0	x			CB in sump
2+05 - 5+45	340	31	0.24	1.00			0.95	0.17	4.20	1.0	111	2+05	C-15.91	0.0	NA	1.0	0	6.2	1.0	x			
5+45 - 8+95	350	31	0.25	1.00			0.95	0.17	4.20	1.0	NA	5+45	Scupper	0.0	NA	1.0	0	3.0	1.0	x			Scupper
INFIELD CB																							
Ramp A	900	NA	1.53		1.00		0.70	0.17	4.20	4.5	129	Off road	C-15.80	0.3	Scupper	4.8	NA	NA	4.8	x			
Ramp A R/W	360	NA	1.90		1.00		0.70	0.17	4.20	5.6	131	Off road	C-15.80	0.0	NA	5.6	NA	NA	4.8	x			
Ramp B	1000	NA	1.12		1.00		0.70	0.21	3.80	3.0	107	Off road	C-15.80	1.5	Scupper	4.5	NA	NA	4.5	x			
Ramp C	700	NA	1.22		1.00		0.70	0.17	4.20	3.6	121	Off road	C-15.80	0.0	NA	3.6	NA	NA	3.6	x			
Ramp C R/W	900	80	1.65		1.00		0.70	0.17	4.20	4.9	123	Off road	C-15.80	0.0	NA	4.9	NA	NA	4.8	x			
Ramp D	850	NA	0.86		1.00		0.70	0.18	4.05	2.4	109	Off road	C-15.80	1.0	Scupper	3.4	NA	NA	3.4	x			
Ramp D R/W	1135	NA	7.33	0.60	0.40		0.85	0.39	2.73	17.0	112	Off road	C-15.80	0.0	NA	17.0	NA	NA	17.0	x			
ALMA SCHOOL ROAD																							
14+92 - 17+00 S.B.	208	NA	0.28	1.00			0.95	0.17	4.20	1.1	114	15+54	Mag Dtl	0.0	NA	1.1	NA	2.8	1.1	x			CB in sump
18+50 - 21+25 S.B.	128	66	0.19	1.00			0.95	0.17	4.20	0.8	128	21+25	C-15.20	0.0	NA	0.8	NA	6.0	0.8	x			3' Wing
24+35 - 22+20 S.B.	198	59.8	0.27	1.00			0.95	0.17	4.20	1.1	127	24+35	C-15.20	0.0	NA	1.1	NA	9.6	1.1	x			3' Wing in Reverse Direction
14+92 - 18+00 N.B.	308	57	0.40	1.00			0.95	0.17	4.20	1.6	113	15+61	Mag Dtl	0.0	NA	1.6	NA	3.0	1.6	x			CB in sump
19+00 - 21+62 N.B.	262	NA	0.13	1.00			0.95	0.17	4.20	0.5	122	21+62	C-15.20	0.0	NA	0.5	0	4.4	0.5	x			
23+45 - 24+15 N.B.	70	47.5	0.08	1.00			0.95	0.17	4.20	0.3	126	24+15	C-15.20	0.0	NA	0.3	0	4.1	0.3	x			
FREEWAY MAINLINE																							
475+00 - 479+85 E.B.	485	89.5	1.00	0.66	0.34		0.87	0.17	4.20	3.6	140	479+85	C-15.91	0.0	NA	3.6	10	6.6	3.6	x			
479+85 - 481+65 E.B.	180	89.5	0.37	0.66	0.34		0.87	0.17	4.20	1.3	142	481+65	C-15.91	0.0	NA	1.3	0	8.8	1.3	x			
481+65 - 482+41 E.B.	76	73.5	0.13	1.00			0.95	0.17	4.20	0.5	144	482+41	C-15.91	0.0	NA	0.5	0	2.3	0.5	x			
482+41 - 482+90 E.B.	49	NA	0.23	1.00			0.95	0.17	4.20	0.9	145	482+90	C-15.91	0.0	NA	0.9	0	4.0	0.9	x			Alma D Sta 10+97
482+90 - 484+60 E.B.	170	101	0.39	1.00			0.95	0.17	4.20	1.6	147	484+60	C-15.91	0.0	NA	1.6	10	5.4	1.6	x			Alma D Sta 12+68
484+60 - 486+00 E.B.	140	91	0.29	1.00			0.95	0.17	4.20	1.2	150	486+00	C-15.91	0.0	NA	1.2	10	5.5	1.2	x			Alma D Sta 14+08
486+00 - 486+75 E.B.	75	87	0.15	1.00			0.95	0.17	4.20	0.6	156	486+75	C-15.91	0.0	NA	0.6	0	4.6	0.6	x			
486+75 - 488+10 E.B.	135	85.5	0.26	1.00			0.95	0.17	4.20	1.0	159	487+50	C-15.91	0.0	NA	1.0	0	6.5	1.0	x			CB in sump
488+10 - 489+00 E.B.	90	85.5	0.18	1.00			0.95	0.17	4.20	0.7	158	488+10	C-15.91	0.0	NA	0.7	0	6.5	0.7	x			
489+00 - 489+95 E.B.	95	85.5	0.19	1.00			0.95	0.17	4.20	0.8	157	489+00	C-15.91	0.1	160	0.9	0	5.2	0.9	x			
489+95 - 491+85 E.B.	190	85.5	0.37	1.00			0.95	0.17	4.20	1.5	160	489+95	C-15.91	0.1	161	1.6	0	6.8	1.5	x			
491+85 - 500+69 E.B.	884	103.5	2.10	1.00			0.95	0.17	4.20	8.4	161	491+85	C-15.92	0.0	NA	8.4	35	13.3	8.3	x			
500+69 - 501+65 E.B.	96	85.1	0.19	1.00			0.95	0.17	4.20	0.8	NA	500+69	C-15.91	0.0	NA	0.8	0	3.4	0.8		x		Future Ramp Gore
501+65 - 507+79 E.B.	614	82.8	1.17	1.00			0.95	0.17	4.20	4.7	NA	501+65	C-15.92	0.0	NA	4.7	25	10.1	4.7		x		
MEDIAN INLETS																							
482+04 - 485+00	296	32	0.22		1.00		0.70	0.17	4.20	0.6	146	484+84	C-15.80	0.0	NA	0.6	NA	NA	0.6	x			
485+00 - 494+16	916	32	0.67		1.00		0.70	0.17	4.20	2.0	155	487+50	C-15.80	0.0	NA	2.0	NA	NA	2.0	x	x		Timber cap with Phase II
494+16 - 498+10	410	32	0.30		1.00		0.70	0.17	4.20	0.9	162	494+16	C-15.80	0.0	NA	0.9	NA	NA	0.9	x			
471+60 - 481+40 W.B.	980	NA	1.82	1.00			0.95	0.17	4.20	7.3	141	481+40	C-15.92	0.0	NA	7.3	35	12.0	7.3	x			
481+40 - 482+36 W.B.	96	85.5	0.19	1.00			0.95	0.17	4.20	0.8	143	482+36	C-15.91	0.0	NA	0.8	0	2.9	0.8	x			
482+36 - 486+55 W.B.	419	NA	1.09	1.00			0.95	0.17	4.20	4.3	151	486+55	C-15.92	0.0	NA	4.3	15	13.9	4.2	x			
486+55 - 488+30 W.B.	175	85.5	0.34	1.00			0.95	0.17	4.20	1.4	154	487+50	C-15.92	0.2	151, 153	1.6	0	12.2	1.6	x			CB in sump
488+30 - 489+30 W.B.	100	85.5	0.20	1.00			0.95	0.17	4.20	0.8	153	488+30	C-15.92	0.0	NA	0.8	0	6.3	0.7	x			
489+30 - 498+10 W.B.	880	NA	1.98	1.00			0.95	0.17	4.20	7.9	152	489+30	C-15.92	0.0	NA	7.9	30	15.6	7.9	x			
498+10 - 499+20 W.B.	110	89.5	0.23	0.70	0.30		0.88	0.17	4.20	0.8	NA	498+10	C-15.91	0.0	NA	0.8	0	7.8	0.8		x		
499+20 - 502+10 W.B.	290	89.5	0.60	0.70	0.30		0.88	0.17	4.20	2.2	NA	499+20	C-15.91	0.0	NA	2.2	10	8.4	2.2		x		
502+10 - 507+79 W.B.	569	89.5	1.17	0.70	0.30		0.88	0.17	4.20	4.3	NA	502+10	C-15.91	0.0	NA	4.3	15	9.9	4.3		x		

RED MTN. FREEWAY PHASE II
STP 600-8-(006)
ADOT RATIONAL METHOD
10-YEAR STORM
SCI Project No: 12168

SITE SPECIFIC
I-D-F CURVE PARAMETERS
(for 10-YR return frequency storm)

Computed by: JRM Date: 1/22/96
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b	0.317	0.291	0.204	0.169

NOTES:
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2. The minimum time of concentration is 10 minutes per ADOT.
3. Calculated discharges rounded to 0.1 cfs for design.

Drainage Area Station to Station	Length (ft)	Width (ft)	Area (ac)	Ratio of Total Runoff Coefficient C1	C2	C3	Avg. C	Design Tc (hr)	i (in/hr)	Q (cfs)	Inlet No.	Station	Type	U/S Flowby Qc (cfs)	Inlet No.	Total Flow Qt (cfs)	Slotted Drain (ft)	Flow Spread (ft)	Intercepted Flow Qi (cfs)	Cst. Phase I	II	III	Comments
McKELLIPS T.I.																							
RAMP A																							
6+90 - 12+75	585	33	0.44	1.00			0.95	0.17	4.20	1.8	NA	12+75	C-15.91	0.0	NA	1.8	0	6.6	1.8			x	
12+75 - 15+09	234	33	0.18	1.00			0.95	0.17	4.20	0.7	NA	14+00	C-15.92	0.0	NA	0.7	0	6.7	0.7			x	CB in sump
RAMP B																							
6+68 - 8+30	162	27	0.10	1.00			0.95	0.17	4.20	0.4	NA	6+69	Scupper	0.0	NA	0.4	0	2.3	0.4			x	
8+30 - 9+80	150	27	0.09	1.00			0.95	0.17	4.20	0.4	NA	9+80	Scupper	0.0	NA	0.4	0	NA	0.4			x	
9+80 - 14+85	505	NA	0.76	1.00			0.95	0.17	4.20	3.0	170	14+85	C-15.91	0.0	NA	3.0	10	6.4	3.0		x		
INFIELDS																							
Ramp A	850	NA	0.79		1.00		0.70	0.17	4.18	2.3	NA	Off road	C-15.80	0.0	NA	2.3	NA	NA	2.3			x	
Ramp B	750	NA	0.35		1.00		0.70	0.17	4.17	1.0	NA	Off road	C-15.80	0.8	Scuppers	1.8	NA	NA	1.8			x	
Ramp B R/W	650	NA	2.12		1.00		0.70	0.20	3.85	5.7	104	Off road	C-15.75	0.0	NA	5.7	NA	NA	5.7		x		Drop Inlet

RED MTN. FREEWAY PHASE II
STP 600-8-(006)
ADOT RATIONAL METHOD
10-YEAR STORM
SCI Project No: 12168

NOTES:
1. Runoff Coefficients are area-weighted when more than one land use is present.
2. The minimum time of concentration is 10 minutes per ADOT.
3. Calculated discharges rounded to 0.1 cfs for design.
4. Inlet depths are calculated using ADOT design criteria.

Variable	Description	Value
Cw	Weir Coefficient	3.00
P	Perimeter	8.3
	Perimeter Debris Factor	0.75
Co	Orifice Coefficient	0.67
A	Area of Grate (C-15.80	4.09
	Area Debris Factor	0.50

Computed by: JRM Date: 1/22/96
Checked by: _____ Date: _____
Approved by: _____ Date: _____

Drainage Area Station to Station	Area (ac)	Avg. C	Design Tc (hr)	Design I (in/hr)	Q (cfs)	Inlet No.	Inlet Station	Inlet Type	U/S Flowby Qc (cfs)	U/S Flowby Inlet No.	Total Flow Qt (cfs)	Depth at Inlet (ft) Weir	Depth at Inlet (ft) Orifice	Depth at Inlet (ft) Design	Depth Control	Cst. Phase II	Cst. Phase III
373+70 - 377+67	0.3	0.7	0.2	4.2	0.9	22.0	377+67	C-15.80	0.0	NA	0.9	0.13	0.01	0.13	Weir	x	
377+67 - 396+30	1.4	0.7	0.2	4.2	4.0	31.0	385+50	C-15.80	0.0	NA	4.0	0.36	0.13	0.36	Weir	x	
415+59 - 396+30	1.4	0.7	0.2	4.2	4.2	41.0	396+30	C-15.80	0.0	NA	4.2	0.37	0.15	0.37	Weir	x	
DOBSON T.I.																	
INFIELD CB																	
Ramp A	1.2	0.7	0.2	4.2	3.5	70.0	Infield	C-15.80	0.0	NA	3.5	0.33	0.10	0.33	Weir	x	
Ramp B	2.0	0.7	0.2	3.7	5.1	63.0	Infield	C-15.80	0.0	NA	5.1	0.42	0.22	0.42	Weir	x	
Ramp C	1.7	0.7	0.2	4.1	4.8	73.0	Infield	C-15.80	0.0	NA	4.8	0.41	0.19	0.41	Weir	x	
Ramp D	1.9	0.7	0.2	4.1	5.4	68.0	Infield	C-15.80	0.0	NA	5.4	0.44	0.24	0.44	Weir	x	
Ramp D @ Gore	0.2	0.7	0.2	4.2	0.7	81.0	Infield	C-15.80	0.0	NA	0.7	0.11	0.00	0.11	Weir	x	
RAMP D SOUTH R/W																	
East of Alma Drain	1.6	0.7	0.2	4.2	4.6	86.0	R/W	C-15.80	0.0	NA	4.6	0.39	0.18	0.39	Weir	x	
West of Alma Drain	4.2	0.7	0.2	3.9	11.5	87.0	R/W	C-15.80	0.0	NA	11.5	0.73	1.10	1.10	Orifice	x	
432+75 - 442+50	0.7	0.7	0.2	4.2	2.1	94.0	442+30	C-15.80	0.0	NA	2.1	0.23	0.04	0.23	Weir	x	
INFIELD CB																	
Ramp A	1.5	0.7	0.2	4.2	4.5	129.0	Off road	C-15.80	0.3	Scupper	4.8	0.41	0.19	0.41	Weir	x	
Ramp A R/W	1.9	0.7	0.2	4.2	5.6	131.0	Off road	C-15.80	0.0	NA	5.6	0.45	0.26	0.45	Weir	x	
Ramp B	1.1	0.7	0.2	3.8	3.0	107.0	Off road	C-15.80	1.5	Scupper	4.5	0.39	0.17	0.39	Weir	x	
Ramp C	1.2	0.7	0.2	4.2	3.6	121.0	Off road	C-15.80	0.0	NA	3.6	0.33	0.11	0.33	Weir	x	
Ramp C R/W	1.7	0.7	0.2	4.2	4.9	123.0	Off road	C-15.80	0.0	NA	4.9	0.41	0.20	0.41	Weir	x	
Ramp D	0.9	0.7	0.2	4.1	2.4	109.0	Off road	C-15.80	1.0	Scupper	3.4	0.32	0.10	0.32	Weir	x	
Ramp D R/W	7.3	0.9	0.4	2.7	17.0	112.0	Off road	C-15.80	0.0	NA	17.0	0.94	2.41	2.41	Orifice	x	
MEDIAN INLETS																	
482+04 - 485+00	0.2	0.7	0.2	4.2	0.6	146.0	484+84	C-15.80	0.0	NA	0.6	0.10	0.00	0.10	Weir	x	
485+00 - 494+16	0.7	0.7	0.2	4.2	2.0	155.0	487+50	C-15.80	0.0	NA	2.0	0.23	0.03	0.23	Weir	x	x
494+16 - 498+10	0.3	0.7	0.2	4.2	0.9	162.0	494+16	C-15.80	0.0	NA	0.9	0.13	0.01	0.13	Weir	x	
INFIELDS																	
Ramp A	0.8	0.7	0.2	4.2	2.3	NA		Off road	C-15.80	0.0	NA	2.3	0.25	0.04	0.25	Weir		x
Ramp B	0.4	0.7	0.2	4.2	1.0	NA		Off road	C-15.80	0.8	Scuppers	1.8	0.21	0.03	0.21	Weir		x
Ramp B R/W	2.1	0.7	0.2	3.8	5.7	104.0		Off road	C-15.75	0.0	NA	5.7	0.45	0.27	0.45	Weir	x	

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

08-22-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 358+50
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER -
PAGE

SLOTTED DRAIN W/ GRATE--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.041
Shoulder Width-Ft.--	=	7.500
Shoulder Slope-Ft./Ft.--Ss	=	0.041
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000

GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Effective Perimeter--Ft.	=	7.350
Capture Ratio -- GRATE	=	0.500
Capture Ratio -- SLOTTED DRAIN	=	0.500
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	5.900

LENGTH	Q(Slot. Dn)	Q(Grate)	d(inches)	SPREAD,Ft.
5.000	1.828	4.072	7.317	13.260
10.000	3.247	2.652	5.773	10.134
15.000	4.148	1.751	4.640	7.843
20.000	4.550	1.351	4.074	6.697

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

08-22-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 363+35
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER - PAGE

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.750
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.053
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.053
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	8.300
SPREAD-Ft.--T	=	9.009
Average Velocity-V-fps	=	3.784
FLOW in Gutter-CFS--Q	=	4.952
% Flow in Gutter-CFS	=	59.668
Velocity of Flow in Gutter-fps	=	4.625
Depth at Curb Line-Inches--d	=	6.140

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	7.140
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	17.801
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.313	2.597	4.068	6.665	1.635	80.30
10.000	0.573	4.753	2.879	7.631	0.669	91.94
15.000	0.776	6.442	1.723	8.165	0.135	98.37
20.000	0.919	7.629	0.670	8.299	0.001	99.99
25.000	0.994	8.249	0.051	8.300	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

10-31-1995

PROJECT NAME- SR202L TRACS NO.-
HIGHWAY NAME- E.B. MAINLINE DESIGNER - VRM
LOCATION - 410+55 CHECKER - PAGE
Ver 3.30: March 1994

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.070
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	95.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	4.310
SPREAD-Ft.--T	=	11.247
Average Velocity-V-fps	=	3.055
FLOW in Gutter-CFS--Q	=	2.577
% Flow in Gutter-CFS	=	59.795
Velocity of Flow in Gutter-fps	=	3.991
Depth at Curb Line-Inches--d	=	4.099

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.099
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	21.025
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.499	2.150	1.606	3.756	0.554	87.15
15.000	0.690	2.973	1.150	4.123	0.187	95.66
20.000	0.839	3.616	0.677	4.292	0.018	99.59
25.000	0.943	4.065	0.245	4.310	0.000	100.00
30.000	0.996	4.294	0.016	4.310	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

07-27-1995

PROJECT NAME- SR202L
HIGHWAY NAME- EB MAINLINE
LOCATION - 408+81 (ULTIMATE)
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER -
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.070
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.010
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.360
SPREAD-Ft.--T	=	6.243
Average Velocity-V-fps	=	2.534
FLOW in Gutter-CFS--Q	=	1.180
% Flow in Gutter-CFS	=	86.781
Velocity of Flow in Gutter-fps	=	2.976
Depth at Curb Line-Inches--d	=	2.908

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	2.908
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	11.228
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.472	0.641	0.698	1.340	0.020	98.51
10.000	0.805	1.095	0.265	1.360	0.000	100.00
15.000	0.983	1.337	0.023	1.360	0.000	100.00
20.000	1.000	1.360	0.000	1.360	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-12-1995

PROJECT NAME- SPRAL
HIGHWAY NAME- EE MAHEIM
LOCATION - 4.0.5E (ULTIMATE)
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.070
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	4.270
SPREAD-Ft.--T	=	11.200
Average Velocity-V-fps	=	3.050
FLOW in Gutter-CFS--Q	=	2.562
% Flow in Gutter-CFS	=	59.997
Velocity of Flow in Gutter-fps	=	3.982
Depth at Curb Line-Inches--d	=	4.088

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.088
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	20.918
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.270	1.151	2.039	3.190	1.080	74.71
10.000	0.501	2.139	1.592	3.731	0.539	87.37
15.000	0.692	2.956	1.135	4.091	0.179	95.82
20.000	0.841	3.593	0.661	4.254	0.016	99.64

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

10-31-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 416+25
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JKM
CHECKER -
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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.088
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.008
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.008
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.530
SPREAD-Ft.--T	=	3.667
Average Velocity-V-fps	=	2.249
FLOW in Gutter-CFS--Q	=	0.529
% Flow in Gutter-CFS	=	99.781
Velocity of Flow in Gutter-fps	=	2.294
Depth at Curb Line-Inches--d	=	2.106

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	0.530
GUTTER FLOW at INLET-CFS--Q	=	0.529
Gutter Velocity at INLET-fps	=	2.294
Depth at INLET Curb Line-Inches--d	=	2.106
Frontal Flow Intercepted by GRATE--CFS	=	0.517
Lateral Flow Intercepted by GRATE--CFS	=	0.009
TOTAL Flow Intercepted by GRATE--CFS	=	0.526
% FLOW Intercepted	=	99.303
By-pass Flow--CFS	=	0.004

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

10-31-1995

PROJECT NAME- SR 202 L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 417+05
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JEM
CHECKER - PAGE

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.813
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.021
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.021
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	2.150
SPREAD-Ft.--T	=	8.334
Average Velocity-V-fps	=	2.436
FLOW in Gutter-CFS--Q	=	1.579
% Flow in Gutter-CFS	=	73.458
Velocity of Flow in Gutter-fps	=	3.040
Depth at Curb Line-Inches--d	=	3.493

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.493
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	9.993
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.520	1.119	1.018	2.137	0.013	99.38
10.000	0.864	1.859	0.291	2.150	0.000	100.00
15.000	1.000	2.150	0.000	2.150	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

10-24-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. [illegible]
LOCATION - 424+22.75
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER -
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.945
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.053
Shoulder Width-Ft.--	=	7.500
Shoulder Slope-Ft./Ft.--Ss	=	0.053
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	2.600
SPREAD-Ft.--T	=	5.449
Average Velocity-V-fps	=	3.134
FLOW in Gutter-CFS--Q	=	2.145
% Flow in Gutter-CFS	=	82.494
Velocity of Flow in Gutter-fps	=	3.580
Depth at Curb Line-Inches--d	=	3.876

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	3.876
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	13.735
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.395	1.028	1.382	2.410	0.190	92.70
10.000	0.700	1.820	0.753	2.574	0.026	98.99
15.000	0.906	2.357	0.243	2.600	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

10-24-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 430+90
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER - PAGE

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.869
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.039
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.039
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	4.990
SPREAD-Ft.--T	=	7.208
Average Velocity-V-fps	=	4.504
FLOW in Gutter-CFS--Q	=	3.633
% Flow in Gutter-CFS	=	72.799
Velocity of Flow in Gutter-fps	=	5.408
Depth at Curb Line-Inches--d	=	4.224

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	5.224
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	18.243
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.306	1.527	2.972	4.498	0.492	90.15
10.000	0.561	2.801	2.065	4.866	0.124	97.51
15.000	0.763	3.809	1.175	4.984	0.006	99.87
20.000	0.908	4.532	0.458	4.990	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

06-23-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - STA 432+75
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER - PAGE

GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.869
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.008
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.008
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.380
SPREAD-Ft.--T	=	8.957
Average Velocity-V-fps	=	2.822
FLOW in Gutter-CFS--Q	=	1.178
% Flow in Gutter-CFS	=	85.335
Velocity of Flow in Gutter-fps	=	3.560
Depth at Curb Line-Inches--d	=	2.588

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	1.380
GUTTER FLOW at INLET-CFS--Q	=	1.373
Gutter Velocity at INLET-fps	=	3.949
Depth at INLET Curb Line-Inches--d	=	3.169
Frontal Flow Intercepted by GRATE--CFS	=	1.342
Lateral Flow Intercepted by GRATE--CFS	=	0.022
TOTAL Flow Intercepted by GRATE--CFS	=	1.364
% FLOW Intercepted	=	98.860
By-pass Flow--CFS	=	0.016

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-06-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 44+05
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER -
PAGE

SLOTTED DRAIN W/ GRATE--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000

GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Effective Perimeter--Ft.	=	7.350
Capture Ratio -- GRATE	=	0.500
Capture Ratio -- SLOTTED DRAIN	=	0.500
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	10.170

LENGTH	Q(Slot. Dn)	Q(Grate)	d(inches)	SPREAD,Ft.
20.000	6.884	3.284	6.488	21.201
25.000	7.840	2.329	5.385	16.604
30.000	8.394	1.778	4.677	13.652
35.000	8.657	1.512	4.308	12.115
40.000	8.867	1.305	4.004	10.851

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

10-25-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 441+00
Ver 3.30: March 1994

TRACS NO.-
DESIGNER -
CHECKER - PAGE

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.469
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	7.430
SPREAD-Ft.--T	=	16.898
Average Velocity-V-fps	=	2.476
FLOW in Gutter-CFS--Q	=	3.095
% Flow in Gutter-CFS	=	41.653
Velocity of Flow in Gutter-fps	=	3.334
Depth at Curb Line-Inches--d	=	5.456

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	5.456
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	23.194
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.459	3.408	2.213	5.621	1.809	75.65
15.000	0.640	4.757	1.710	6.467	0.963	87.04
20.000	0.788	5.856	1.204	7.060	0.370	95.02
25.000	0.900	6.689	0.687	7.376	0.054	99.27
30.000	0.973	7.232	0.198	7.430	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-06-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. [illegible]
LOCATION - 442+30
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.437
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.730
SPREAD-Ft.--T	=	9.050
Average Velocity-V-fps	=	1.793
FLOW in Gutter-CFS--Q	=	1.218
% Flow in Gutter-CFS	=	70.399
Velocity of Flow in Gutter-fps	=	2.273
Depth at Curb Line-Inches--d	=	3.572

GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.350
Splash-Over Velocity--FPS	=	7.350
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	1.730
GUTTER FLOW at INLET-CFS--Q	=	1.218
Gutter Velocity at INLET-fps	=	2.273
Depth at INLET Curb Line-Inches--d	=	3.572
Frontal Flow Intercepted by GRATE--CFS	=	1.090
Lateral Flow Intercepted by GRATE--CFS	=	0.188
TOTAL Flow Intercepted by GRATE--CFS	=	1.278
% FLOW Intercepted	=	73.866
By-pass Flow--CFS	=	0.452

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-06-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. AIRLINE
LOCATION - 422-35
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JFM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.188
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.028
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.028
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	13.530
SPREAD-Ft.--T	=	14.603
Average Velocity-V-fps	=	4.388
FLOW in Gutter-CFS--Q	=	6.024
% Flow in Gutter-CFS	=	44.523
Velocity of Flow in Gutter-fps	=	5.743
Depth at Curb Line-Inches--d	=	6.035

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	6.035
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	36.373
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
20.000	0.563	7.613	3.339	10.952	2.578	80.95
25.000	0.671	9.075	2.777	11.852	1.678	87.59
30.000	0.765	10.349	2.218	12.567	0.963	92.88
35.000	0.845	11.429	1.662	13.091	0.439	96.75
40.000	0.910	12.306	1.106	13.412	0.118	99.13

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-06-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.R. FAIRLINE
LOCATION - 460+18.75
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER - PAGE

GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.756
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.048
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.048
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.810
SPREAD-Ft.--T	=	2.948
Average Velocity-V-fps	=	3.034
FLOW in Gutter-CFS--Q	=	0.807
% Flow in Gutter-CFS	=	99.596
Velocity of Flow in Gutter-fps	=	3.078
Depth at Curb Line-Inches--d	=	2.258

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	0.810
GUTTER FLOW at INLET-CFS--Q	=	0.810
Gutter Velocity at INLET-fps	=	3.373
Depth at INLET Curb Line-Inches--d	=	2.631
Frontal Flow Intercepted by GRATE--CFS	=	0.809
Lateral Flow Intercepted by GRATE--CFS	=	0.001
TOTAL Flow Intercepted by GRATE--CFS	=	0.810
% FLOW Intercepted	=	99.999
By-pass Flow--CFS	=	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-05-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 461 + 38
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - Rom
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.528
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.048
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.048
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	4.390
SPREAD-Ft.--T	=	6.421
Average Velocity-V-fps	=	4.190
FLOW in Gutter-CFS--Q	=	3.342
% Flow in Gutter-CFS	=	76.122
Velocity of Flow in Gutter-fps	=	4.923
Depth at Curb Line-Inches--d	=	4.258

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.258
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	20.157
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.517	2.269	1.799	4.067	0.323	92.65
15.000	0.711	3.123	1.177	4.300	0.090	97.95
20.000	0.860	3.776	0.609	4.385	0.005	99.88
25.000	0.959	4.211	0.179	4.390	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-05-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 467+65
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER - PAGE

GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.329
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.007
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.007
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.190
SPREAD-Ft.--T	=	2.244
Average Velocity-V-fps	=	1.131
FLOW in Gutter-CFS--Q	=	0.190
% Flow in Gutter-CFS	=	100.013
Velocity of Flow in Gutter-fps	=	1.132
Depth at Curb Line-Inches--d	=	1.796

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	0.190
GUTTER FLOW at INLET-CFS--Q	=	0.190
Gutter Velocity at INLET-fps	=	1.132
Depth at INLET Curb Line-Inches--d	=	1.797
Frontal Flow Intercepted by GRATE--CFS	=	0.190
Lateral Flow Intercepted by GRATE--CFS	=	0.000
TOTAL Flow Intercepted by GRATE--CFS	=	0.190
% FLOW Intercepted	=	100.000
By-pass Flow--CFS	=	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-11-1995

PROJECT NAME- [illegible] TRACS NO.-
HIGHWAY NAME- E.B. MAINLINE DESIGNER - JRM
LOCATION - 471+40 CHECKER - PAGE
Ver 3.30: March 1994

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.388
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.057
Shoulder Width-Ft.--	=	7.500
Shoulder Slope-Ft./Ft.--Ss	=	0.057
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	2.610
SPREAD-Ft.--T	=	6.282
Average Velocity-V-fps	=	2.260
FLOW in Gutter-CFS--Q	=	1.971
% Flow in Gutter-CFS	=	75.515
Velocity of Flow in Gutter-fps	=	2.638
Depth at Curb Line-Inches--d	=	4.587

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.587
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	10.531
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.838	2.187	0.418	2.605	0.005	99.80
15.000	0.996	2.600	0.010	2.610	0.000	100.00
20.000	1.000	2.610	0.000	2.610	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-11-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 974+96.77
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JPM
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PAGE

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.069
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.057
Shoulder Width-Ft.--	=	7.500
Shoulder Slope-Ft./Ft.--Ss	=	0.057
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	2.420
SPREAD-Ft.--T	=	4.997
Average Velocity-V-fps	=	3.262
FLOW in Gutter-CFS--Q	=	2.069
% Flow in Gutter-CFS	=	85.512
Velocity of Flow in Gutter-fps	=	3.668
Depth at Curb Line-Inches--d	=	3.708

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	3.708
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	13.702
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.701	1.697	0.705	2.402	0.018	99.28
15.000	0.907	2.196	0.224	2.420	0.000	100.00
20.000	0.999	2.417	0.003	2.420	0.000	100.00
25.000	1.000	2.420	0.000	2.420	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-11-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 479+85
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.004
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.035
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.035
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	3.620
SPREAD-Ft.--T	=	6.597
Average Velocity-V-fps	=	4.231
FLOW in Gutter-CFS--Q	=	2.833
% Flow in Gutter-CFS	=	78.252
Velocity of Flow in Gutter-fps	=	5.022
Depth at Curb Line-Inches--d	=	3.708

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	4.708
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	15.924
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.626	2.265	1.342	3.608	0.012	99.66
15.000	0.834	3.019	0.601	3.620	0.000	100.00
20.000	0.964	3.489	0.131	3.620	0.000	100.00
25.000	1.000	3.620	0.000	3.620	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-11-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 481+65
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - VKH
CHECKER -
PAGE

GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.349
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.006
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.006
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.340
SPREAD-Ft.--T	=	8.870
Average Velocity-V-fps	=	3.086
FLOW in Gutter-CFS--Q	=	1.182
% Flow in Gutter-CFS	=	88.238
Velocity of Flow in Gutter-fps	=	3.843
Depth at Curb Line-Inches--d	=	2.477

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	1.340
GUTTER FLOW at INLET-CFS--Q	=	1.340
Gutter Velocity at INLET-fps	=	4.266
Depth at INLET Curb Line-Inches--d	=	3.008
Frontal Flow Intercepted by GRATE--CFS	=	1.322
Lateral Flow Intercepted by GRATE--CFS	=	0.010
TOTAL Flow Intercepted by GRATE--CFS	=	1.332
% FLOW Intercepted	=	99.371
By-pass Flow--CFS	=	0.008

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-11-1995

PROJECT NAME- [illegible] TRACS NO.-
HIGHWAY NAME- E.B. [illegible] DESIGNER - VKM
LOCATION - 482+40.87 CHECKER - PAGE
Ver 3.30: March 1994

GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.236
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.006
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.006
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.510
SPREAD-Ft.--T	=	2.269
Average Velocity-V-fps	=	2.972
FLOW in Gutter-CFS--Q	=	0.510
% Flow in Gutter-CFS	=	100.013
Velocity of Flow in Gutter-fps	=	2.972
Depth at Curb Line-Inches--d	=	1.815

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	0.510
GUTTER FLOW at INLET-CFS--Q	=	0.510
Gutter Velocity at INLET-fps	=	3.289
Depth at INLET Curb Line-Inches--d	=	2.113
Frontal Flow Intercepted by GRATE--CFS	=	0.510
Lateral Flow Intercepted by GRATE--CFS	=	0.000
TOTAL Flow Intercepted by GRATE--CFS	=	0.510
% FLOW Intercepted	=	100.000
By-pass Flow--CFS	=	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-11-1995

PROJECT NAME- SR202L TRACS NO.-
HIGHWAY NAME- E.B. MAINLINE DESIGNER - VAM
LOCATION - 482+90 CHECKER - PAGE
Ver 3.30: March 1994

GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.748
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.930
SPREAD-Ft.--T	=	4.030
Average Velocity-V-fps	=	3.017
FLOW in Gutter-CFS--Q	=	0.909
% Flow in Gutter-CFS	=	97.755
Velocity of Flow in Gutter-fps	=	3.192
Depth at Curb Line-Inches--d	=	2.367

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	0.930
GUTTER FLOW at INLET-CFS--Q	=	0.930
Gutter Velocity at INLET-fps	=	3.486
Depth at INLET Curb Line-Inches--d	=	2.773
Frontal Flow Intercepted by GRATE--CFS	=	0.926
Lateral Flow Intercepted by GRATE--CFS	=	0.003
TOTAL Flow Intercepted by GRATE--CFS	=	0.930
% FLOW Intercepted	=	99.955
By-pass Flow--CFS	=	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-11-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 484+60
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.274
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.029
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.029
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.570
SPREAD-Ft.--T	=	5.371
Average Velocity-V-fps	=	2.929
FLOW in Gutter-CFS--Q	=	1.390
% Flow in Gutter-CFS	=	88.553
Velocity of Flow in Gutter-fps	=	3.338
Depth at Curb Line-Inches--d	=	2.999

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	3.999
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	9.418
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.893	1.402	0.168	1.570	0.000	100.00
15.000	1.000	1.570	0.000	1.570	0.000	100.00
20.000	1.000	1.570	0.000	1.570	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-11-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 486+00
Ver 3.30: March 1994

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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.659
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.029
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.029
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.170
SPREAD-Ft.--T	=	5.473
Average Velocity-V-fps	=	2.120
FLOW in Gutter-CFS--Q	=	1.028
% Flow in Gutter-CFS	=	87.870
Velocity of Flow in Gutter-fps	=	2.425
Depth at Curb Line-Inches--d	=	3.035

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	4.035
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	6.843
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.999	1.169	0.001	1.170	0.000	100.00
15.000	1.000	1.170	0.000	1.170	0.000	100.00
20.000	1.000	1.170	0.000	1.170	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-12-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 486+75
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JKM
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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.320
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.029
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.029
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.600
SPREAD-Ft.--T	=	4.622
Average Velocity-V-fps	=	1.404
FLOW in Gutter-CFS--Q	=	0.560
% Flow in Gutter-CFS	=	93.348
Velocity of Flow in Gutter-fps	=	1.546
Depth at Curb Line-Inches--d	=	2.738

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	0.600
GUTTER FLOW at INLET-CFS--Q	=	0.599
Gutter Velocity at INLET-fps	=	1.659
Depth at INLET Curb Line-Inches--d	=	3.232
Frontal Flow Intercepted by GRATE--CFS	=	0.583
Lateral Flow Intercepted by GRATE--CFS	=	0.014
TOTAL Flow Intercepted by GRATE--CFS	=	0.597
% FLOW Intercepted	=	99.545
By-pass Flow--CFS	=	0.003

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-13-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 487+50
Ver 3.30: March 1994

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GRATE INLET--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.023
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.023
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Effective Perimeter--Ft.	=	7.354
Capture Ratio -- GRATE	=	0.500
Local Gutter Depression-Inches	=	1.000
Depth at INLET Curb Line-Inches--d	=	3.125 OK
Depth at C.G. of Grate Flow--In.	=	3.089
SPREAD-Ft.--T	=	6.531
Depth for WEIR FLOW, inches	=	4.125
Depth for ORIFICE FLOW, inches	=	0.014

Q(INLET) = 1.060 cfs is Based on WEIR flow ✓

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-12-1995

PROJECT NAME- SR202L TRACS NO.-
HIGHWAY NAME- E.B. MAINLINE DESIGNER - JRM
LOCATION - 468+10 CHECKER - PAGE
Ver 3.30: March 1994

GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.263
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.710
SPREAD-Ft.--T	=	6.450
Average Velocity-V-fps	=	1.264
FLOW in Gutter-CFS--Q	=	0.607
% Flow in Gutter-CFS	=	85.489
Velocity of Flow in Gutter-fps	=	1.496
Depth at Curb Line-Inches--d	=	2.948

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	0.710
GUTTER FLOW at INLET-CFS--Q	=	0.688
Gutter Velocity at INLET-fps	=	1.619
Depth at INLET Curb Line-Inches--d	=	3.539
Frontal Flow Intercepted by GRATE--CFS	=	0.658
Lateral Flow Intercepted by GRATE--CFS	=	0.040
TOTAL Flow Intercepted by GRATE--CFS	=	0.699
% FLOW Intercepted	=	98.399
By-pass Flow--CFS	=	0.011

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-12-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 489+00
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.659
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.800
SPREAD-Ft.--T	=	5.205
Average Velocity-V-fps	=	1.920
FLOW in Gutter-CFS--Q	=	0.741
% Flow in Gutter-CFS	=	92.596
Velocity of Flow in Gutter-fps	=	2.156
Depth at Curb Line-Inches--d	=	2.649

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	0.800
GUTTER FLOW at INLET-CFS--Q	=	0.799
Gutter Velocity at INLET-fps	=	2.331
Depth at INLET Curb Line-Inches--d	=	3.146
Frontal Flow Intercepted by GRATE--CFS	=	0.782
Lateral Flow Intercepted by GRATE--CFS	=	0.013
TOTAL Flow Intercepted by GRATE--CFS	=	0.796
% FLOW Intercepted	=	99.477
By-pass Flow--CFS	=	0.004

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-12-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 489+95
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.076
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.490
SPREAD-Ft.--T	=	6.593
Average Velocity-V-fps	=	2.567
FLOW in Gutter-CFS--Q	=	1.261
% Flow in Gutter-CFS	=	84.627
Velocity of Flow in Gutter-fps	=	3.053
Depth at Curb Line-Inches--d	=	2.982

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	1.490
GUTTER FLOW at INLET-CFS--Q	=	1.434
Gutter Velocity at INLET-fps	=	3.305
Depth at INLET Curb Line-Inches--d	=	3.582
Frontal Flow Intercepted by GRATE--CFS	=	1.370
Lateral Flow Intercepted by GRATE--CFS	=	0.057
TOTAL Flow Intercepted by GRATE--CFS	=	1.427
% FLOW Intercepted	=	95.766
By-pass Flow--CFS	=	0.063

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-12-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- E.B. MAINLINE
LOCATION - 491+85
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.910
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	8.380
SPREAD-Ft.--T	=	13.257
Average Velocity-V-fps	=	4.403
FLOW in Gutter-CFS--Q	=	4.361
% Flow in Gutter-CFS	=	52.041
Velocity of Flow in Gutter-fps	=	5.844
Depth at Curb Line-Inches--d	=	4.582

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.582
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	34.672
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
20.000	0.585	4.902	2.352	7.254	1.126	86.56
25.000	0.695	5.825	1.924	7.749	0.631	92.47
30.000	0.790	6.620	1.488	8.107	0.273	96.75
35.000	0.869	7.280	1.037	8.317	0.063	99.25
40.000	0.931	7.799	0.579	8.378	0.002	99.97

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

07-25-1995

PROJECT NAME- SR202L TRACS NO.-
HIGHWAY NAME- E.B. MAINLINE DESIGNER - JRM
LOCATION - 500+69.48 CHECKER - PAGE
Ver 3.30: March 1994
(TIMBER CAP)

GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.595
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.023
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.023
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.760
SPREAD-Ft.--T	=	3.377
Average Velocity-V-fps	=	2.840
FLOW in Gutter-CFS--Q	=	0.755
% Flow in Gutter-CFS	=	99.282
Velocity of Flow in Gutter-fps	=	2.916
Depth at Curb Line-Inches--d	=	2.242

GRATE TYPE: ADOT STD.--L 2.2

Grate Length--Ft.	=	3.250
Grate Width---Ft.	=	1.500
Grate Area--Sq. Ft.	=	3.600
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	6.250
Splash-Over Velocity--FPS	=	7.250
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	0.760
GUTTER FLOW at INLET-CFS--Q	=	0.755
Gutter Velocity at INLET-fps	=	2.916
Depth at INLET Curb Line-Inches--d	=	2.242
Frontal Flow Intercepted by GRATE--CFS	=	0.658
Lateral Flow Intercepted by GRATE--CFS	=	0.036
TOTAL Flow Intercepted by GRATE--CFS	=	0.694
% FLOW Intercepted	=	91.353
By-pass Flow--CFS	=	0.066

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

07-25-1995

PROJECT NAME- SR202L
HIGHWAY NAME- E.C. MAINLINE
LOCATION - 501+65
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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(TIMBER CAP)

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.380
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.023
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.023
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	4.660
SPREAD-Ft.--T	=	10.127
Average Velocity-V-fps	=	3.542
FLOW in Gutter-CFS--Q	=	2.936
% Flow in Gutter-CFS	=	63.004
Velocity of Flow in Gutter-fps	=	4.539
Depth at Curb Line-Inches--d	=	4.105

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.105
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	22.717
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.467	2.176	1.851	4.027	0.633	86.41
15.000	0.651	3.032	1.376	4.407	0.253	94.58
20.000	0.799	3.723	0.891	4.614	0.046	99.01
25.000	0.910	4.240	0.420	4.660	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-15-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 355+17
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JKM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.169
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	4.750
SPREAD-Ft.--T	=	17.344
Average Velocity-V-fps	=	1.506
FLOW in Gutter-CFS--Q	=	1.930
% Flow in Gutter-CFS	=	40.632
Velocity of Flow in Gutter-fps	=	2.031
Depth at Curb Line-Inches--d	=	5.563

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	5.563
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	14.247
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.383	1.818	1.762	3.580	1.170	75.38
10.000	0.681	3.237	1.121	4.358	0.392	91.75
15.000	0.889	4.224	0.494	4.718	0.032	99.32
20.000	0.994	4.721	0.029	4.750	0.000	100.00
25.000	1.000	4.750	0.000	4.750	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-15-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 356+15
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JKM
CHECKER - PAGE

GRATE INLET--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000

GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Effective Perimeter--Ft.	=	7.350
Capture Ratio -- GRATE	=	0.500
Local Gutter Depression-Inches	=	0.000
Depth at INLET Curb Line-Inches--d	=	4.318
Depth at C.G. of Grate Flow--In.	=	3.579
SPREAD-Ft.--T	=	12.159
Depth for WEIR FLOW, inches	=	4.318
Depth for ORIFICE FLOW, inches	=	0.024

Q(INLET) = 1.520 cfs is Based on WEIR flow ✓

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

06-05-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 357 +20
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - VRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.225
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	2.550
SPREAD-Ft.--T	=	12.586
Average Velocity-V-fps	=	1.474
FLOW in Gutter-CFS--Q	=	1.388
% Flow in Gutter-CFS	=	54.442
Velocity of Flow in Gutter-fps	=	1.948
Depth at Curb Line-Inches--d	=	4.421

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.421
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	10.909
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.483	1.232	1.023	2.255	0.295	88.43
10.000	0.820	2.091	0.443	2.533	0.017	99.35
15.000	0.990	2.524	0.026	2.550	0.000	100.00
20.000	1.000	2.550	0.000	2.550	0.000	100.00
25.000	1.000	2.550	0.000	2.550	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

06-05-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- WB MAINLINE
LOCATION - 360+55
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.750
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.053
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.053
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	7.960
SPREAD-Ft.--T	=	8.864
Average Velocity-V-fps	=	3.746
FLOW in Gutter-CFS--Q	=	4.807
% Flow in Gutter-CFS	=	60.389
Velocity of Flow in Gutter-fps	=	4.571
Depth at Curb Line-Inches--d	=	6.048

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	6.048
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	21.101
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.267	2.129	3.707	5.835	2.125	73.31
10.000	0.497	3.958	2.819	6.777	1.183	85.14
15.000	0.688	5.475	1.967	7.442	0.518	93.50
20.000	0.837	6.663	1.166	7.829	0.131	98.35 ⇐
25.000	0.942	7.496	0.460	7.956	0.004	99.95

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

08-16-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.R. MAINLINE
LOCATION - 375+50
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.575
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	2.930
SPREAD-Ft.--T	=	10.871
Average Velocity-V-fps	=	2.207
FLOW in Gutter-CFS--Q	=	1.800
% Flow in Gutter-CFS	=	61.445
Velocity of Flow in Gutter-fps	=	2.872
Depth at Curb Line-Inches--d	=	4.009

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.009
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	14.698
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.372	1.091	1.359	2.450	0.480	83.62
10.000	0.666	1.950	0.867	2.817	0.113	96.16
15.000	0.874	2.561	0.368	2.929	0.001	99.95 ←
20.000	0.987	2.893	0.037	2.930	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

08-16-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- W.B. Riverside
LOCATION - 377+00
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.809
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.010
SPREAD-Ft.--T	=	5.675
Average Velocity-V-fps	=	2.158
FLOW in Gutter-CFS--Q	=	0.909
% Flow in Gutter-CFS	=	90.026
Velocity of Flow in Gutter-fps	=	2.477
Depth at Curb Line-Inches--d	=	2.762

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	1.010
GUTTER FLOW at INLET-CFS--Q	=	1.002
Gutter Velocity at INLET-fps	=	2.678
Depth at INLET Curb Line-Inches--d	=	3.297
Frontal Flow Intercepted by GRATE--CFS	=	0.973
Lateral Flow Intercepted by GRATE--CFS	=	0.025
TOTAL Flow Intercepted by GRATE--CFS	=	0.998
% FLOW Intercepted	=	98.799
By-pass Flow--CFS	=	0.012

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

08-16-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 386-35
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JPM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.197
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	7.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.470
SPREAD-Ft.--T	=	10.133
Average Velocity-V-fps	=	1.254
FLOW in Gutter-CFS--Q	=	0.954
% Flow in Gutter-CFS	=	64.891
Velocity of Flow in Gutter-fps	=	1.617
Depth at Curb Line-Inches--d	=	3.832

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	3.832
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	7.818
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.635	0.933	0.505	1.438	0.032	97.83

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

08-16-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 388+00
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JKM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.576
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	7.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	6.370
SPREAD-Ft.--T	=	15.203
Average Velocity-V-fps	=	2.593
FLOW in Gutter-CFS--Q	=	2.930
% Flow in Gutter-CFS	=	45.993
Velocity of Flow in Gutter-fps	=	3.473
Depth at Curb Line-Inches--d	=	5.049

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	5.049
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	22.441
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
15.000	0.657	4.183	1.525	5.708	0.662	89.61
20.000	0.805	5.130	1.033	6.163	0.207	96.76
25.000	0.915	5.831	0.527	6.358	0.012	99.81
30.000	0.983	6.261	0.109	6.370	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

08-23-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 396+30
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.444
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	7.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	3.200
SPREAD-Ft.--T	=	9.129
Average Velocity-V-fps	=	3.268
FLOW in Gutter-CFS--Q	=	2.239
% Flow in Gutter-CFS	=	69.980
Velocity of Flow in Gutter-fps	=	4.149
Depth at Curb Line-Inches--d	=	3.591

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	3.591
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	19.179
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.539	1.724	1.272	2.996	0.204	93.62
15.000	0.737	2.359	0.812	3.171	0.029	99.10
20.000	0.885	2.831	0.369	3.200	0.000	100.00
25.000	0.976	3.122	0.078	3.200	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

10-31-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- W.B. [illegible]
LOCATION - 400+50
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.263
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	7.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	6.000
SPREAD-Ft.--T	=	12.547
Average Velocity-V-fps	=	3.488
FLOW in Gutter-CFS--Q	=	3.275
% Flow in Gutter-CFS	=	54.586
Velocity of Flow in Gutter-fps	=	4.608
Depth at Curb Line-Inches--d	=	4.411

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.411
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	26.200
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.412	2.474	2.248	4.722	1.278	78.69
15.000	0.581	3.489	1.808	5.297	0.703	88.28
20.000	0.725	4.347	1.361	5.709	0.291	95.14
25.000	0.840	5.043	0.899	5.942	0.058	99.04
30.000	0.927	5.565	0.435	5.999	0.001	99.99

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

10-31-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- W.B. RAMP
LOCATION - 407+70
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JKM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.070
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	7.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	4.720
SPREAD-Ft.--T	=	11.713
Average Velocity-V-fps	=	3.110
FLOW in Gutter-CFS--Q	=	2.730
% Flow in Gutter-CFS	=	57.847
Velocity of Flow in Gutter-fps	=	4.081
Depth at Curb Line-Inches--d	=	4.211

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.211
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	22.096
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.478	2.257	1.752	4.008	0.712	84.92
15.000	0.664	3.136	1.299	4.435	0.285	93.97
20.000	0.813	3.839	0.831	4.670	0.050	98.94
25.000	0.922	4.353	0.367	4.720	0.000	100.00
30.000	0.987	4.658	0.062	4.720	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

06-16-1995

PROJECT NAME- SP2022 TRACS NO.-
HIGHWAY NAME- W.B. [illegible] DESIGNER - JRM
LOCATION - 412+42 CHECKER - PAGE
Ver 3.30: March 1994

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.070
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	5.320
SPREAD-Ft.--T	=	12.346
Average Velocity-V-fps	=	3.186
FLOW in Gutter-CFS--Q	=	2.944
% Flow in Gutter-CFS	=	55.346
Velocity of Flow in Gutter-fps	=	4.203
Depth at Curb Line-Inches--d	=	4.363

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.363
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	23.588
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.452	2.405	1.953	4.358	0.962	81.91
15.000	0.632	3.362	1.504	4.866	0.454	91.46
20.000	0.779	4.146	1.044	5.190	0.130	97.55
25.000	0.892	4.747	0.566	5.314	0.006	99.88
30.000	0.968	5.150	0.170	5.320	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

06-23-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.B. MAIN LINE
LOCATION - STA 433+46
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - VRM
CHECKER - PAGE

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.869
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	8.860
SPREAD-Ft.--T	=	13.638
Average Velocity-V-fps	=	4.417
FLOW in Gutter-CFS--Q	=	4.497
% Flow in Gutter-CFS	=	50.752
Velocity of Flow in Gutter-fps	=	5.876
Depth at Curb Line-Inches--d	=	4.673

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.673
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	35.556
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
20.000	0.573	5.078	2.473	7.552	1.308	85.23
25.000	0.682	6.045	2.046	8.091	0.769	91.32
30.000	0.777	6.882	1.612	8.494	0.366	95.87
35.000	0.856	7.586	1.165	8.751	0.109	98.77
40.000	0.920	8.149	0.703	8.852	0.008	99.91

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

06-28-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 434+62.48
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.846
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.890
SPREAD-Ft.--T	=	3.789
Average Velocity-V-fps	=	3.075
FLOW in Gutter-CFS--Q	=	0.877
% Flow in Gutter-CFS	=	98.504
Velocity of Flow in Gutter-fps	=	3.214
Depth at Curb Line-Inches--d	=	2.309

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	0.890
GUTTER FLOW at INLET-CFS--Q	=	0.877
Gutter Velocity at INLET-fps	=	3.214
Depth at INLET Curb Line-Inches--d	=	2.309
Frontal Flow Intercepted by GRATE--CFS	=	0.843
Lateral Flow Intercepted by GRATE--CFS	=	0.021
TOTAL Flow Intercepted by GRATE--CFS	=	0.864
% FLOW Intercepted	=	97.052
By-pass Flow--CFS	=	0.026

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-05-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- W. B. MAINLINE
LOCATION - 44+05
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - VRM
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SLOTTED DRAIN W/ GRATE--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000

GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Effective Perimeter--Ft.	=	7.350
Capture Ratio -- GRATE	=	0.500
Capture Ratio -- SLOTTED DRAIN	=	0.500
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	7.660

LENGTH	Q(Slot. Dn)	Q(Grate)	d(inches)	SPREAD,Ft.
10.000	3.642	4.018	7.262	24.441
15.000	4.915	2.744	5.880	18.680
20.000	5.798	1.861	4.789	14.127 ←
25.000	6.157	1.503	4.295	12.071

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

01-20-1996

PROJECT NAME- SR202L
HIGHWAY NAME- W.B MAINLINE
LOCATION - 441+65
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.199
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.015
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.015
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.300
SPREAD-Ft.--T	=	11.139
Average Velocity-V-fps	=	1.167
FLOW in Gutter-CFS--Q	=	0.833
% Flow in Gutter-CFS	=	64.109
Velocity of Flow in Gutter-fps	=	1.542
Depth at Curb Line-Inches--d	=	3.594

GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.350
Splash-Over Velocity--FPS	=	7.350
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	1.300
GUTTER FLOW at INLET-CFS--Q	=	0.833
Gutter Velocity at INLET-fps	=	1.542
Depth at INLET Curb Line-Inches--d	=	3.594
Frontal Flow Intercepted by GRATE--CFS	=	0.745
Lateral Flow Intercepted by GRATE--CFS	=	0.225
TOTAL Flow Intercepted by GRATE--CFS	=	0.970
% FLOW Intercepted	=	74.614
By-pass Flow--CFS	=	0.330

FLANKING BASIN

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-05-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 423.00
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JCH
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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.694
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.006
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.006
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.600
SPREAD-Ft.--T	=	7.211
Average Velocity-V-fps	=	1.714
FLOW in Gutter-CFS--Q	=	0.562
% Flow in Gutter-CFS	=	93.724
Velocity of Flow in Gutter-fps	=	1.999
Depth at Curb Line-Inches--d	=	2.351

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	0.600
GUTTER FLOW at INLET-CFS--Q	=	0.562
Gutter Velocity at INLET-fps	=	1.999
Depth at INLET Curb Line-Inches--d	=	2.351
Frontal Flow Intercepted by GRATE--CFS	=	0.539
Lateral Flow Intercepted by GRATE--CFS	=	0.035
TOTAL Flow Intercepted by GRATE--CFS	=	0.574
% FLOW Intercepted	=	95.646
By-pass Flow--CFS	=	0.026

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-05-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.C. Pirmint
LOCATION - 423+70
Ver 3.30: March 1994

TRACS NO.-
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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.950
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.017
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.017
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.610
SPREAD-Ft.--T	=	3.801
Average Velocity-V-fps	=	2.182
FLOW in Gutter-CFS--Q	=	0.602
% Flow in Gutter-CFS	=	98.738
Velocity of Flow in Gutter-fps	=	2.274
Depth at Curb Line-Inches--d	=	2.271

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	0.610
GUTTER FLOW at INLET-CFS--Q	=	0.610
Gutter Velocity at INLET-fps	=	2.496
Depth at INLET Curb Line-Inches--d	=	2.654
Frontal Flow Intercepted by GRATE--CFS	=	0.609
Lateral Flow Intercepted by GRATE--CFS	=	0.001
TOTAL Flow Intercepted by GRATE--CFS	=	0.610
% FLOW Intercepted	=	99.999
By-pass Flow--CFS	=	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-05-1995

PROJECT NAME- SP 262 L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 464 - 35
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JKM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.188
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.028
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.028
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	4.200
SPREAD-Ft.--T	=	8.960
Average Velocity-V-fps	=	3.396
FLOW in Gutter-CFS--Q	=	2.793
% Flow in Gutter-CFS	=	66.507
Velocity of Flow in Gutter-fps	=	4.252
Depth at Curb Line-Inches--d	=	4.154

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	5.154
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	15.442
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.641	2.692	1.457	4.148	0.052	98.77
15.000	0.850	3.568	0.632	4.200	0.000	100.00
20.000	0.974	4.090	0.110	4.200	0.000	100.00
25.000	1.000	4.200	0.000	4.200	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-05-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 449+25
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.792
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.048
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.048
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	7.490
SPREAD-Ft.--T	=	7.710
Average Velocity-V-fps	=	5.043
FLOW in Gutter-CFS--Q	=	5.066
% Flow in Gutter-CFS	=	67.641
Velocity of Flow in Gutter-fps	=	6.078
Depth at Curb Line-Inches--d	=	5.001

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	6.001
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	21.643
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.487	3.645	3.250	6.895	0.595	92.06
15.000	0.675	5.055	2.262	7.317	0.173	97.69
20.000	0.824	6.172	1.305	7.477	0.013	99.83
25.000	0.931	6.975	0.515	7.490	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-05-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 458+00
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.792
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.048
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.048
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	7.880
SPREAD-Ft.--T	=	7.868
Average Velocity-V-fps	=	5.104
FLOW in Gutter-CFS--Q	=	5.256
% Flow in Gutter-CFS	=	66.704
Velocity of Flow in Gutter-fps	=	6.166
Depth at Curb Line-Inches--d	=	5.092

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	6.092
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	22.194
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.476	3.753	3.428	7.182	0.698	91.14
15.000	0.662	5.218	2.434	7.653	0.227	97.12
20.000	0.811	6.391	1.464	7.855	0.025	99.69
25.000	0.920	7.252	0.628	7.880	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-05-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 466+55
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.539
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.009
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.009
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.990
SPREAD-Ft.--T	=	15.013
Average Velocity-V-fps	=	1.680
FLOW in Gutter-CFS--Q	=	1.160
% Flow in Gutter-CFS	=	58.285
Velocity of Flow in Gutter-fps	=	2.382
Depth at Curb Line-Inches--d	=	3.338

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	3.338
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	13.282
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.717	1.428	0.539	1.967	0.023	98.83
15.000	0.921	1.834	0.156	1.990	0.000	100.00
20.000	1.000	1.990	0.000	1.990	0.000	100.00
25.000	1.000	1.990	0.000	1.990	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-05-1995

PROJECT NAME- SR262 TRACS NO.-
HIGHWAY NAME- W.B. [illegible] DESIGNER -
LOCATION - 471+60 CHECKER - PAGE
Ver 3.30: March 1994

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.427
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.057
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.057
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	2.150
SPREAD-Ft.--T	=	5.717
Average Velocity-V-fps	=	2.235
FLOW in Gutter-CFS--Q	=	1.715
% Flow in Gutter-CFS	=	79.762
Velocity of Flow in Gutter-fps	=	2.572
Depth at Curb Line-Inches--d	=	4.201

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.201
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	9.948
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.867	1.863	0.286	2.149	0.001	99.97
15.000	1.000	2.150	0.000	2.150	0.000	100.00
20.000	1.000	2.150	0.000	2.150	0.000	100.00
25.000	1.000	2.150	0.000	2.150	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-11-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 88+90
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.301
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	7.270
SPREAD-Ft.--T	=	11.969
Average Velocity-V-fps	=	4.606
FLOW in Gutter-CFS--Q	=	4.130
% Flow in Gutter-CFS	=	56.808
Velocity of Flow in Gutter-fps	=	6.057
Depth at Curb Line-Inches--d	=	4.273

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.273
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	33.539
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
20.000	0.601	4.367	2.146	6.513	0.757	89.59
25.000	0.712	5.178	1.717	6.895	0.375	94.85
30.000	0.807	5.868	1.278	7.146	0.124	98.30
35.000	0.885	6.433	0.823	7.257	0.013	99.81
40.000	0.944	6.865	0.405	7.270	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-11-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 82+35.57
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER - PAGE

GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.259
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.750
SPREAD-Ft.--T	=	2.889
Average Velocity-V-fps	=	3.270
FLOW in Gutter-CFS--Q	=	0.750
% Flow in Gutter-CFS	=	99.973
Velocity of Flow in Gutter-fps	=	3.291
Depth at Curb Line-Inches--d	=	2.094

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	0.750
GUTTER FLOW at INLET-CFS--Q	=	0.750
Gutter Velocity at INLET-fps	=	3.637
Depth at INLET Curb Line-Inches--d	=	2.438
Frontal Flow Intercepted by GRATE--CFS	=	0.750
Lateral Flow Intercepted by GRATE--CFS	=	0.000
TOTAL Flow Intercepted by GRATE--CFS	=	0.750
% FLOW Intercepted	=	100.000
By-pass Flow--CFS	=	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-12-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 486+55
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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PAGE

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.417
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	4.350
SPREAD-Ft.--T	=	13.862
Average Velocity-V-fps	=	2.104
FLOW in Gutter-CFS--Q	=	2.176
% Flow in Gutter-CFS	=	50.019
Velocity of Flow in Gutter-fps	=	2.802
Depth at Curb Line-Inches--d	=	4.727

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	4.727
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	16.898
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.597	2.597	1.285	3.883	0.467	89.25
15.000	0.803	3.494	0.765	4.259	0.091	97.92
20.000	0.941	4.095	0.255	4.350	0.000	100.00
25.000	1.000	4.349	0.001	4.350	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-12-1995

PROJECT NAME- SR202L TRACS NO.-
HIGHWAY NAME- W.B. MAINLINE DESIGNER - JRM
LOCATION - 487+50 CHECKER - PAGE
Ver 3.30: March 1994

GRATE INLET--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000

GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Effective Perimeter--Ft.	=	7.350
Capture Ratio -- GRATE	=	0.500
Local Gutter Depression-Inches	=	0.000
Depth at INLET Curb Line-Inches--d	=	4.347
Depth at C.G. of Grate Flow--In.	=	3.607
SPREAD-Ft.--T	=	12.278
Depth for WEIR FLOW, inches	=	4.347
Depth for ORIFICE FLOW, inches	=	0.025

Q(INLET) = 1.540 cfs is Based on WEIR flow

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-12-1995

PROJECT NAME- SP202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 488+30
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.351
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.810
SPREAD-Ft.--T	=	6.404
Average Velocity-V-fps	=	1.457
FLOW in Gutter-CFS--Q	=	0.695
% Flow in Gutter-CFS	=	85.763
Velocity of Flow in Gutter-fps	=	1.721
Depth at Curb Line-Inches--d	=	2.937

GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.350
Splash-Over Velocity--FPS	=	7.350
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	0.810
GUTTER FLOW at INLET-CFS--Q	=	0.695
Gutter Velocity at INLET-fps	=	1.721
Depth at INLET Curb Line-Inches--d	=	2.937
Frontal Flow Intercepted by GRATE--CFS	=	0.640
Lateral Flow Intercepted by GRATE--CFS	=	0.086
TOTAL Flow Intercepted by GRATE--CFS	=	0.726
% FLOW Intercepted	=	89.614
By-pass Flow--CFS	=	0.084

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-12-1995

PROJECT NAME- SR202L TRACS NO.-
HIGHWAY NAME- W.B. MAINLINE DESIGNER - SKM
LOCATION - 489+30 CHECKER - PAGE
Ver 3.30: March 1994

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.790
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	7.900
SPREAD-Ft.--T	=	15.569
Average Velocity-V-fps	=	3.074
FLOW in Gutter-CFS--Q	=	3.554
% Flow in Gutter-CFS	=	44.988
Velocity of Flow in Gutter-fps	=	4.124
Depth at Curb Line-Inches--d	=	5.137

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Splash-Over Velocity--FPS	=	7.350
Depth at INLET Curb Line-Inches--d	=	5.137
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	27.189
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
20.000	0.705	5.573	1.635	7.208	0.692	91.23
25.000	0.821	6.490	1.163	7.653	0.247	96.87
30.000	0.911	7.197	0.675	7.872	0.028	99.65
35.000	0.972	7.678	0.222	7.900	0.000	100.00
40.000	1.000	7.896	0.004	7.900	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

07-25-1995

PROJECT NAME- SR202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 499+20
Ver 3.30: March 1994

TRACS NO.-
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.931
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.014
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.014
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	2.160
SPREAD-Ft.--T	=	8.347
Average Velocity-V-fps	=	3.277
FLOW in Gutter-CFS--Q	=	1.710
% Flow in Gutter-CFS	=	79.160
Velocity of Flow in Gutter-fps	=	4.109
Depth at Curb Line-Inches--d	=	2.998

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	3.998
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	12.509
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.429	0.928	1.225	2.152	0.008	99.65
10.000	0.749	1.617	0.543	2.160	0.000	100.00
15.000	0.947	2.044	0.116	2.160	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

07-25-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- W.B. MAINLINE
LOCATION - 502+10
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.279
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.023
Shoulder Width-Ft.--	=	5.500
Shoulder Slope-Ft./Ft.--Ss	=	0.023
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	4.250
SPREAD-Ft.--T	=	9.884
Average Velocity-V-fps	=	3.373
FLOW in Gutter-CFS--Q	=	2.728
% Flow in Gutter-CFS	=	64.180
Velocity of Flow in Gutter-fps	=	4.310
Depth at Curb Line-Inches--d	=	4.038

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	5.038
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	16.154
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.342	1.453	2.347	3.800	0.450	89.41
10.000	0.619	2.630	1.551	4.181	0.069	98.37
15.000	0.827	3.513	0.737	4.250	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

01-19-1996

PROJECT NAME- SR202L
HIGHWAY NAME- DOBSON RAMP A
LOCATION - 22+05
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	10.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000

GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Effective Perimeter--Ft.	=	7.350
Capture Ratio -- GRATE	=	0.500
Capture Ratio -- SLOTTED DRAIN	=	0.500
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	3.000

LENGTH	Q(Slot. Dn)	Q(Grate)	d(inches)	SPREAD,Ft.
10.000	1.926	1.074	3.646	9.357
15.000	2.250	0.749	3.087	7.027
20.000	2.449	0.549	2.696	5.399

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

10-26-1995

PROJECT NAME- SR202L
HIGHWAY NAME- WBSN RAMP C
LOCATION - 2+40
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.036
Shoulder Width-Ft.--	=	1.000
Shoulder Slope-Ft./Ft.--Ss	=	0.036
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000

GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Effective Perimeter--Ft.	=	7.350
Capture Ratio -- GRATE	=	0.500
Capture Ratio -- SLOTTED DRAIN	=	0.500
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	3.550

LENGTH	Q(Slot. Dn)	Q(Grate)	d(inches)	SPREAD,Ft.
10.000	2.232	1.317	4.023	7.194
15.000	2.617	0.934	3.414	5.779
20.000	2.855	0.695	2.986	4.787
25.000	3.013	0.536	2.667	4.048

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

01-20-1996

PROJECT NAME- SR202L
HIGHWAY NAME- DORSEN RAMP D
LOCATION - I-40
Ver 3.30: March 1994

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DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	10.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Effective Perimeter--Ft.	=	7.354
Capture Ratio -- GRATE	=	0.500
Capture Ratio -- SLOTTED DRAIN	=	0.500
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	1.300

LENGTH	Q(Slot. Dn)	Q(Grate)	d(inches)	SPREAD,Ft.
10.000	1.042	0.296	1.421	1.776 ⇐
15.000	1.218	0.082	1.050	1.313

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

10-26-1995

PROJECT NAME- SR202L
HIGHWAY NAME- DOBSON PART D
LOCATION - 1+90
Ver 3.30: March 1994

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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.011
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	1.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	2.000
SPREAD-Ft.--T	=	6.523
Average Velocity-V-fps	=	3.500
FLOW in Gutter-CFS--Q	=	1.701
% Flow in Gutter-CFS	=	85.047
Velocity of Flow in Gutter-fps	=	4.153
Depth at Curb Line-Inches--d	=	2.966

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	3.966
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	12.037
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.444	0.888	1.109	1.997	0.003	99.86
10.000	0.769	1.537	0.463	2.000	0.000	100.00
15.000	0.961	1.922	0.078	2.000	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

10-24-1995

PROJECT NAME- SR202L
HIGHWAY NAME- DOBSON RAMP D
LOCATION - 12+42
Ver 3.30: March 1994

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DESIGNER - JRM
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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	3.523
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.018
Shoulder Width-Ft.--	=	1.000
Shoulder Slope-Ft./Ft.--Ss	=	0.018
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.300
SPREAD-Ft.--T	=	4.114
Average Velocity-V-fps	=	4.254
FLOW in Gutter-CFS--Q	=	1.271
% Flow in Gutter-CFS	=	97.747
Velocity of Flow in Gutter-fps	=	4.508
Depth at Curb Line-Inches--d	=	2.353

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	1.300
GUTTER FLOW at INLET-CFS--Q	=	1.300
Gutter Velocity at INLET-fps	=	4.929
Depth at INLET Curb Line-Inches--d	=	2.757
Frontal Flow Intercepted by GRATE--CFS	=	1.295
Lateral Flow Intercepted by GRATE--CFS	=	0.004
TOTAL Flow Intercepted by GRATE--CFS	=	1.299
% FLOW Intercepted	=	99.931
By-pass Flow--CFS	=	0.001

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-21-1995

PROJECT NAME- SR202L
HIGHWAY NAME- ALMA RAMP A
LOCATION - 9+00
Ver 3.30: March 1994

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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	4.278
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.018
Shoulder Width-Ft.--	=	11.500
Shoulder Slope-Ft./Ft.--Ss	=	0.018
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.240
SPREAD-Ft.--T	=	3.626
Average Velocity-V-fps	=	4.612
FLOW in Gutter-CFS--Q	=	1.229
% Flow in Gutter-CFS	=	99.079
Velocity of Flow in Gutter-fps	=	4.767
Depth at Curb Line-Inches--d	=	2.237

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	1.240
GUTTER FLOW at INLET-CFS--Q	=	1.240
Gutter Velocity at INLET-fps	=	5.239
Depth at INLET Curb Line-Inches--d	=	2.611
Frontal Flow Intercepted by GRATE--CFS	=	1.239
Lateral Flow Intercepted by GRATE--CFS	=	0.001
TOTAL Flow Intercepted by GRATE--CFS	=	1.240
% FLOW Intercepted	=	99.998
By-pass Flow--CFS	=	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-21-1995

PROJECT NAME- SR202L
HIGHWAY NAME- ALMA RAMP A
LOCATION - 13+60
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
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SLOTTED DRAIN W/ GRATE--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	13.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Effective Perimeter--Ft.	=	7.354
Capture Ratio -- GRATE	=	0.500
Capture Ratio -- SLOTTED DRAIN	=	0.500
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	1.860

LENGTH	Q(Slot. Dn)	Q(Grate)	d(inches)	SPREAD,Ft.
5.000	1.009	0.850	2.761	5.671
10.000	1.398	0.463	1.945	2.431

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-22-1995

PROJECT NAME- SR202L
HIGHWAY NAME- ALMA RAMP B
LOCATION - 12+95
Ver 3.30: March 1994

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CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.685
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	11.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.810
SPREAD-Ft.--T	=	5.614
Average Velocity-V-fps	=	3.926
FLOW in Gutter-CFS--Q	=	1.635
% Flow in Gutter-CFS	=	90.356
Velocity of Flow in Gutter-fps	=	4.492
Depth at Curb Line-Inches--d	=	2.748

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q	=	1.810
Gutter Velocity at INLET-fps	=	4.492
GUTTER FLOW at INLET-CFS--Q	=	1.635
Depth at INLET Curb Line-Inches--d	=	1.146
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	16.461
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
3.083	0.253	0.459	1.351
6.583	0.500	0.906	0.904
9.583	0.676	1.224	0.586
13.583	0.857	1.551	0.259 ← SCUPPER
20.583	1.000	1.810	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-22-1995

PROJECT NAME- SR202L
HIGHWAY NAME- ALMA RAMP B
LOCATION - 16+85
Ver 3.30: March 1994

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SLOTTED DRAIN W/ GRATE--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	11.500
Shoulder Slope-Ft./Ft.--Ss	=	0.015
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.015
Gutter Depression-Inches--	=	0.441

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Effective Perimeter--Ft.	=	7.354
Capture Ratio -- GRATE	=	0.500
Capture Ratio -- SLOTTED DRAIN	=	0.500
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	3.470

LENGTH	Q(Slot. Dn)	Q(Grate)	d(inches)	SPREAD,Ft.
10.000	2.076	1.392	2.833	14.850
15.000	2.449	1.023	2.266	12.488
20.000	2.684	0.787	1.866	10.577 ← USE

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-20-1995

PROJECT NAME- SR202L
HIGHWAY NAME- ALMA RAMP C
LOCATION - 1+90.30 Lt
Ver 3.30: March 1994

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GRATE INLET--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	10.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.083
Gutter Depression-Inches--	=	2.499

GRATE TYPE: ADOT STD.--EF--1

Grate Length--Ft.	=	3.250
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	4.660
Effective Perimeter--Ft.	=	7.250
Capture Ratio -- GRATE	=	0.500
Local Gutter Depression-Inches	=	0.000
Depth at INLET Curb Line-Inches--d	=	5.225
Depth at C.G. of Grate Flow--In.	=	4.305
SPREAD-Ft.--T	=	13.860
Depth for WEIR FLOW, inches	=	5.225 ✓ <6"
Depth for ORIFICE FLOW, inches	=	0.059

Q(INLET) = 1.970 cfs is Based on WEIR flow

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-20-1995

PROJECT NAME- [illegible] TRACS NO.-
HIGHWAY NAME- [illegible] DESIGNER - [illegible]
LOCATION - [illegible] CHECKER - PAGE
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SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.883
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	10.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.850
SPREAD-Ft.--T	=	6.352
Average Velocity-V-fps	=	3.368
FLOW in Gutter-CFS--Q	=	1.592
% Flow in Gutter-CFS	=	86.061
Velocity of Flow in Gutter-fps	=	3.971
Depth at Curb Line-Inches--d	=	2.925

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	3.925
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	11.383
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
10.000	0.798	1.476	0.374	1.850	0.000	100.00
15.000	0.979	1.811	0.039	1.850	0.000	100.00
20.000	1.000	1.850	0.000	1.850	0.000	100.00

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

07-19-1995

PROJECT NAME- SR202L
HIGHWAY NAME- ALMA SCHOOL PHASE D
LOCATION - 1+65
Ver 3.30: March 1994

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GRATE INLET--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	11.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Effective Perimeter--Ft.	=	7.354
Capture Ratio -- GRATE	=	0.500
Local Gutter Depression-Inches	=	1.000
Depth at INLET Curb Line-Inches--d	=	3.029
Depth at C.G. of Grate Flow--In.	=	2.999
SPREAD-Ft.--T	=	6.788
Depth for WEIR FLOW, inches	=	4.029
Depth for ORIFICE FLOW, inches	=	0.012

Q(INLET) = 1.000 cfs is Based on WEIR flow

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-22-1995

PROJECT NAME- SR202L
HIGHWAY NAME- [illegible]
LOCATION - 2+05
Ver 3.30: March 1994

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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.541
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.021
Shoulder Width-Ft.--	=	11.500
Shoulder Slope-Ft./Ft.--Ss	=	0.021
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.970
SPREAD-Ft.--T	=	6.189
Average Velocity-V-fps	=	1.807
FLOW in Gutter-CFS--Q	=	0.842
% Flow in Gutter-CFS	=	86.786
Velocity of Flow in Gutter-fps	=	2.118
Depth at Curb Line-Inches--d	=	2.908

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	0.970
GUTTER FLOW at INLET-CFS--Q	=	0.947
Gutter Velocity at INLET-fps	=	2.290
Depth at INLET Curb Line-Inches--d	=	3.484
Frontal Flow Intercepted by GRATE--CFS	=	0.909
Lateral Flow Intercepted by GRATE--CFS	=	0.041
TOTAL Flow Intercepted by GRATE--CFS	=	0.950
% FLOW Intercepted	=	97.956
By-pass Flow--CFS	=	0.020

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-22-1995

PROJECT NAME- SR202L
HIGHWAY NAME- ALMA RAMP D
LOCATION - 5+45
Ver 3.30: March 1994

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CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.623
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.043
Shoulder Width-Ft.--	=	11.500
Shoulder Slope-Ft./Ft.--Ss	=	0.043
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.990
SPREAD-Ft.--T	=	3.000
Average Velocity-V-fps	=	3.702
FLOW in Gutter-CFS--Q	=	0.986
% Flow in Gutter-CFS	=	99.553
Velocity of Flow in Gutter-fps	=	3.761
Depth at Curb Line-Inches--d	=	2.258

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q	=	0.990
Gutter Velocity at INLET-fps	=	3.761
GUTTER FLOW at INLET-CFS--Q	=	0.986
Depth at INLET Curb Line-Inches--d	=	0.000
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	12.177
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
3.083	0.335	0.331	0.659
6.583	0.639	0.633	0.357
9.583	0.833	0.824	0.166
13.583	0.982	0.972	0.018 ← SCUPPER
20.583	1.000	0.990	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

07-16-1995

PROJECT NAME- SR202L
HIGHWAY NAME- ALMA SCHOOL RD.
LOCATION - 15+53.80, LT
Ver 3.30: March 1994
(DTL AA)

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CURB OPENING W/ GRATE--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	11.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.059
Gutter Depression-Inches--	=	1.000 < 2

GRATE TYPE: ADOT STD.--L 2.0

Grate Length--Ft.	=	3.250
Grate Width---Ft.	=	1.500
Grate Area--Sq. Ft.	=	2.980
Effective Perimeter--Ft.	=	6.250
Capture Ratio -- CURB OPENING	=	0.800
Capture Ratio -- CURB OPENING	=	0.800
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	1.120

LENGTH	Q(Curb Op)	Q(Grate)	d(inches)	SPREAD,Ft.
3.083	0.893	0.226	2.341	2.841
6.583	1.065	0.055	1.908	2.704
9.583	1.078	0.042	1.591	2.255
13.583	1.088	0.032	1.324	1.877
20.583	1.098	0.022	1.047	1.484

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-28-1995

PROJECT NAME- SR202L
HIGHWAY NAME- ALMA SCHOOL S.B.
LOCATION - 24+35
Ver 3.30: March 1994

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CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.145
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	10.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.000
Gutter Slope-Ft./Ft.--Sw	=	0.083
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.080
SPREAD-Ft.--T	=	9.559
Average Velocity-V-fps	=	1.038
FLOW in Gutter-CFS--Q	=	0.648
% Flow in Gutter-CFS	=	60.033
Velocity of Flow in Gutter-fps	=	1.382
Depth at Curb Line-Inches--d	=	3.814

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q	=	1.080
Gutter Velocity at INLET-fps	=	1.382
GUTTER FLOW at INLET-CFS--Q	=	0.648
Depth at INLET Curb Line-Inches--d	=	0.000
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	5.752
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
3.083	0.635	0.686	0.394
6.583	0.988	1.067	0.013
9.583	1.000	1.080	0.000
13.583	1.000	1.080	0.000
20.583	1.000	1.080	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

11-09-1995

PROJECT NAME- SR202L
HIGHWAY NAME- ALMA SCHOOL RD
LOCATION - 21+25
Ver 3.30: March 1994

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CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.438
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	4.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.000
Gutter Slope-Ft./Ft.--Sw	=	0.083
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.770
SPREAD-Ft.--T	=	6.001
Average Velocity-V-fps	=	1.582
FLOW in Gutter-CFS--Q	=	0.632
% Flow in Gutter-CFS	=	82.141
Velocity of Flow in Gutter-fps	=	1.936
Depth at Curb Line-Inches--d	=	2.960

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q	=	0.770
Gutter Velocity at INLET-fps	=	1.936
GUTTER FLOW at INLET-CFS--Q	=	0.632
Depth at INLET Curb Line-Inches--d	=	3.585
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	6.110
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
3.083	0.606	0.466	0.304
6.583	0.972	0.748	0.022
9.583	1.000	0.770	0.000
13.583	1.000	0.770	0.000
20.583	1.000	0.770	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

07-16-1995

PROJECT NAME- JR202L
HIGHWAY NAME- [illegible] RD.
LOCATION - 21+62, RT
Ver 3.30: March 1994

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CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.504
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	16.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.000
Gutter Slope-Ft./Ft.--Sw	=	0.083
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.520
SPREAD-Ft.--T	=	4.392
Average Velocity-V-fps	=	1.627
FLOW in Gutter-CFS--Q	=	0.483
% Flow in Gutter-CFS	=	92.874
Velocity of Flow in Gutter-fps	=	1.841
Depth at Curb Line-Inches--d	=	2.574

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q	=	0.520
Gutter Velocity at INLET-fps	=	2.001
GUTTER FLOW at INLET-CFS--Q	=	0.520
Depth at INLET Curb Line-Inches--d	=	4.061
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	3.881
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
3.083	0.837	0.435	0.085
6.583	1.000	0.520	0.000
9.583	1.000	0.520	0.000
13.583	1.000	0.520	0.000
20.583	1.000	0.520	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

12-28-1995

PROJECT NAME- SR202L
HIGHWAY NAME- ALMA SCHOOL N.B.
LOCATION - 24+15
Ver 3.30: March 1994

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CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.201
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	10.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.000
Gutter Slope-Ft./Ft.--Sw	=	0.083
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.300
SPREAD-Ft.--T	=	4.094
Average Velocity-V-fps	=	1.020
FLOW in Gutter-CFS--Q	=	0.284
% Flow in Gutter-CFS	=	94.621
Velocity of Flow in Gutter-fps	=	1.134
Depth at Curb Line-Inches--d	=	2.502

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q	=	0.300
Gutter Velocity at INLET-fps	=	1.134
GUTTER FLOW at INLET-CFS--Q	=	0.284
Depth at INLET Curb Line-Inches--d	=	0.000
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	3.057
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
3.083	0.948	0.284	0.016
6.583	1.000	0.300	0.000
9.583	1.000	0.300	0.000
13.583	1.000	0.300	0.000
20.583	1.000	0.300	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

07-26-1995

PROJECT NAME- SR 202L
HIGHWAY NAME- McKELLIPS RAMP F
LOCATION - 12+75
Ver 3.30: March 1994

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GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	4.992
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.009
Shoulder Width-Ft.--	=	12.000
Shoulder Slope-Ft./Ft.--Ss	=	0.009
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.770
SPREAD-Ft.--T	=	6.596
Average Velocity-V-fps	=	4.760
FLOW in Gutter-CFS--Q	=	1.645
% Flow in Gutter-CFS	=	92.935
Velocity of Flow in Gutter-fps	=	5.516
Depth at Curb Line-Inches--d	=	2.431

GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	7.354
Splash-Over Velocity--FPS	=	7.354
Local Gutter Depression-Inches	=	1.000
Flow-CFS--Q	=	1.770
GUTTER FLOW at INLET-CFS--Q	=	1.770
Gutter Velocity at INLET-fps	=	6.067
Depth at INLET Curb Line-Inches--d	=	2.899
Frontal Flow Intercepted by GRATE--CFS	=	1.754
Lateral Flow Intercepted by GRATE--CFS	=	0.008
TOTAL Flow Intercepted by GRATE--CFS	=	1.762
% FLOW Intercepted	=	99.570
By-pass Flow--CFS	=	0.008

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

07-26-1995

PROJECT NAME- SR202L
HIGHWAY NAME- MCKELLIPS RAMP A
LOCATION - ≈ 14+00
Ver 3.30: March 1994

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GRATE INLET--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	12.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000

GRATE TYPE: ADOT STD.--C15.92

Grate Length--Ft.	=	3.350
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.590
Effective Perimeter--Ft.	=	7.350
Capture Ratio -- GRATE	=	0.500
Local Gutter Depression-Inches	=	0.000
Depth at INLET Curb Line-Inches--d	=	3.017
Depth at C.G. of Grate Flow--In.	=	2.313
SPREAD-Ft.--T	=	6.735 ✓
Depth for WEIR FLOW, inches	=	3.017
Depth for ORIFICE FLOW, inches	=	0.005

Q(INLET) = 0.710 cfs is Based on WEIR flow

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

07-25-1995

PROJECT NAME- SR202L TRACS NO.-
HIGHWAY NAME- McKELLIPS RAMP (
DESIGNER - JRM
LOCATION - 6+68.65 CHECKER - PAGE
Ver 3.30: March 1994
(TIMBER CAP)

GRATE INLET DESIGN -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.426
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	9.500
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	0.400
SPREAD-Ft.--T	=	2.254
Average Velocity-V-fps	=	2.362
FLOW in Gutter-CFS--Q	=	0.400
% Flow in Gutter-CFS	=	100.013
Velocity of Flow in Gutter-fps	=	2.362
Depth at Curb Line-Inches--d	=	1.803

GRATE TYPE: ADOT STD.--L 2.2

Grate Length--Ft.	=	3.250
Grate Width---Ft.	=	1.500
Grate Area--Sq. Ft.	=	3.600
Capture Ratio -- GRATE	=	0.500
Effective Perimeter--Ft.	=	6.250
Splash-Over Velocity--FPS	=	7.250
Local Gutter Depression-Inches	=	0.000
Flow-CFS--Q	=	0.400
GUTTER FLOW at INLET-CFS--Q	=	0.400
Gutter Velocity at INLET-fps	=	2.363
Depth at INLET Curb Line-Inches--d	=	1.804
Frontal Flow Intercepted by GRATE--CFS	=	0.379
Lateral Flow Intercepted by GRATE--CFS	=	0.014
TOTAL Flow Intercepted by GRATE--CFS	=	0.393
% FLOW Intercepted	=	98.161
By-pass Flow--CFS	=	0.007

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

01-11-1996

PROJECT NAME- SR202L
HIGHWAY NAME- McKELLIPS RAMP B
LOCATION - 14 & 85
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JCM
CHECKER - PAGE

SLOTTED DRAIN W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	5.031
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	10.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.500
Gutter Slope-Ft./Ft.--Sw	=	0.067
Gutter Depression-Inches--	=	2.000
Manning's 'N	=	0.016
Flow-CFS--Q	=	3.040
SPREAD-Ft.--T	=	6.372
Average Velocity-V-fps	=	5.509
FLOW in Gutter-CFS--Q	=	2.613
% Flow in Gutter-CFS	=	85.942
Velocity of Flow in Gutter-fps	=	6.500
Depth at Curb Line-Inches--d	=	2.929

SLOTTED DRAIN--ADOT STD.--C13.60
GRATE TYPE: ADOT STD.--C15.91

Grate Length--Ft.	=	3.354
Grate Width---Ft.	=	2.000
Grate Area--Sq. Ft.	=	5.171
Splash-Over Velocity--FPS	=	7.354
Depth at INLET Curb Line-Inches--d	=	3.929
Local Gutter Depression-Inches	=	1.000
Length of opening: TOTAL Intercept--Ft.	=	18.840
Capture Ratio -- SLOTTED DRAIN	=	0.670
Capture Ratio -- GRATE	=	0.500

LENGTH	Efficiency	Q(S.D.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
5.000	0.297	0.903	2.110	3.012	0.028	99.09
10.000	0.547	1.662	1.378	3.040	0.000	99.99
15.000	0.746	2.269	0.771	3.040	0.000	100.00
20.000	0.893	2.715	0.325	3.040	0.000	100.00

APPENDIX C

Cross-Culvert Hydraulic Analyses

```
*****************************************
*  HEC-2 WATER SURFACE PROFILES         *
*                                       *
*  Version   4.6.2;  May 1991           *
*                                       *
*  RUN DATE    30AUG95    TIME   16:09:09  *
*****************************************
```

```
****************************************
*  U.S. ARMY CORPS OF ENGINEERS        *
*  HYDROLOGIC ENGINEERING CENTER       *
*  609 SECOND STREET, SUITE D          *
*  DAVIS, CALIFORNIA 95616-4687        *
*          (916) 756-1104              *
****************************************
```

```
X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                        X
XXXXXXX  XXXX     X          XXXXX    XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX             XXXXXXX
```

THIS RUN EXECUTED 30AUG95 16:09:09

```
************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
************************************


T1      93080.04
T2      Alma School Box Culvert
T3      Red Mountain Alma School Drain
T4      Filename = 2-8X8SC2.DAT
T4      DESIGN FLOWS CONSIST OF IGA FLOW OF 847 CFS AND IGA + HURLEY FLOW
T4      OF 995 CFS
T4      Tailwater = No flow in Salt River
T4      Box culvert modeled using special culvert methodology.  Normal
T4      depth methodology may not be appropriate due to the submerged inlet.


J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

       0         2         0         0        -1         0       0.0     845.0       0.0

J2   NROF     IPLOT     PRFVS     XSECV     XSECH     FN       ALLDC     IBW       CHNIM     ITRACE

      1         0        -1       0.0       0.0       0.0       0.0      -6.0       0.0


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

     38         1         43         26         42         51         4         8         10         53
     54         68

J5  LPRNT    NUMSEC                    ********REQUESTED SECTION NUMBERS********

    -10       -10
  Outfall into Salt River


NC    0.013      0.013      0.013        0.3         0.5

        Outfall into Salt River
X1     0.00          8   19993.66   20006.35         0.0         0.0         0.0         1.0         0.0           0
GR   1188.0    19935.0     1188.0   19991.66     1177.90    19991.67     1177.90     20000.0     1177.90    20008.34
GR   1188.0   20008.35     1188.0    20040.0      1188.0     20060.0

  Downstream end of 2-8'x 8'x 483' CBC
```

```
        Downstream end of 2-8'x 8'x 483' CBC
X1     0.07          8   19993.66   20006.35        7.0        7.0        7.0        1.0        0.0          0
X3       10
GR   1188.0    19935.0     1188.0   19991.66    1177.94   19991.67    1177.94   20000.00    1177.94   20008.34
GR   1188.0   20008.35     1188.0    20040.0     1188.0    20060.0


SC    2.013        0.2       2.67        0.0          8          8        483        9.2    1180.91    1177.94

  Upstream end of 2-8'x 8'x 483' CBC

        Upstream end of 2-8'x 8'x 483' CBC - Begin transition
X1     4.90          8   19993.66   20006.35      483.0      483.0      483.0        1.0        0.0          0
X2      0.0        0.0          2        0.0     1207.5
X3       10
GR   1191.8    19953.0     1191.6    19968.0    1191.40   19991.66    1180.91   19991.67    1180.91   20000.00
GR   1180.9   20008.34     1194.0   20008.35     1194.5    20060.0


        Transition Section
X1     5.00          9    19986.8    20013.2       10.0       10.0       10.0
GR   1191.8    19953.0    1191.80   19985.80    1183.40   19985.81    1180.99    19988.0    1180.99    20000.0
GR   1181.0    20012.0   1183.40   20014.19     1194.0   20014.20     1194.0    20050.0


NC    0.025      0.025      0.020        0.0        0.0

        Transition Section
X1     5.10          9   19978.79   20021.21       10.0       10.0       10.0
GR   1191.8    19953.0     1191.8   19978.79    1186.30    19978.8    1181.07    19987.6    1181.07    20000.0
GR   1181.1    20012.4     1186.3    20021.2     1194.0   20021.21     1194.0    20050.0


NC    0.025      0.025      0.035        0.0        0.0

        End Transition - Begin natural channel
X1     5.30          8    19968.0    20040.0       20.0       20.0       20.0        1.0        0.0          0
GR   1191.8    19953.0     1191.8    19968.0    1181.12    19989.0    1181.22    19995.0    1181.22    20000.0
GR   1181.2    20014.0     1194.0    20040.0     1194.5    20060.0

  Return to natural channel section


NC    0.025      0.025      0.050        0.1        0.3

X1     6.00          8    19971.0    20036.0       70.0       70.0       70.0        1.0        0.0          0
GR   1192.0    19968.0     1191.0    19971.0    1183.0    19987.0    1181.91    19990.0    1181.91    20000.0
GR   1181.9    20011.0     1194.0    20036.0    1194.7    20045.0
```

```
X1     7.00         9    19971.0    20034.0       100.0       100.0       100.0         1.0         0.0           0
GR   1192.7   19955.0     1192.0    19971.0      1183.0     19988.0     1182.71     19990.0     1182.71     20000.0
GR   1182.7   20010.0     1183.0    20012.0      1193.0     20034.0      1194.0     20058.0

X1     8.00         9    19970.0    20034.0       100.0       100.0       100.0         1.0         0.0           0
GR   1194.0   19964.0     1193.0    19970.0      1184.0     19988.0     1183.51     19991.0     1183.51     20000.0
GR   1183.5   20011.0     1184.0    20016.0      1194.0     20034.0      1194.0     20051.0

X1     9.00         8    19974.0    20022.0        94.0       104.0       100.0         1.0         0.0           0
GR   1194.0   19969.0     1193.0    19974.0     1184.30     19991.0     1184.30     20000.0     1184.30     20011.0
GR   1192.0   20022.0     1193.0    20026.0      1194.0     20032.0

X1    10.00         9    19978.0    20022.0        86.0       123.0       100.0         1.0         0.0           0
GR   1195.0   19962.0     1194.0    19972.0      1193.0     19978.0      1186.0     19988.0     1185.10     19990.0
GR   1185.1   20000.0     1185.1    20010.0      1192.0     20022.0      1194.0     20032.0

X1    11.00         9    19975.0    20013.0        98.0       102.0       100.0         1.0         0.0           0
GR   1199.0   19961.0     1194.0    19975.0      1187.0     19988.0     1185.89     20000.0     1185.89     20004.0
GR   1185.9   20007.0     1193.0    20013.0      1198.0     20029.0      1198.0     20043.0

NC    0.030     0.030      0.018        0.0         0.0

  Downstream of Drop Structure 3

        Downstream of Drop Structure 3
X1    11.26         8    19965.0    20029.0        21.0        21.0        21.0         1.0         0.0           0
GR   1200.0   19948.0     1199.0    19965.0      1186.3     19983.0      1186.3     20000.0      1186.1     20008.0
GR   1193.0   20012.0     1199.0    20029.0      1199.0     20045.0

  Upstream of Drop Structure 3


        Upstream of Drop Structure 3
X1    11.27         8    19965.0    20029.0         1.0         1.0         1.0         1.0         0.0           0
GR   1200.0   19948.0     1199.0    19965.0      1187.5     19981.0      1187.5     20000.0      1187.5     20010.0
GR   1193.0   20012.0     1199.0    20029.0      1199.0     20045.0

  Downstream of Drop Structure 2


        Downstream of Drop Structure 2
X1    11.50         7    19969.0    20018.0        23.0        23.0        23.0         1.0         0.0           0
GR   1200.0   19948.0     1199.0    19969.0      1187.5     19983.0      1187.5     20000.0      1187.5     20010.0
GR   1198.0   20018.0     1199.0    20028.0

      ream of Drop Structure 2
```

Upstream of Drop Structure 2

X1	11.51	7	19969.0	20018.0	1.0	1.0	1.0	1.0	0.0	0
GR	1200.0	19948.0	1199.0	19969.0	1191.4	19981.0	1191.4	20000.0	1191.4	20013.0
GR	1198.0	20018.0	1199.0	20028.0						
X1	12.00	10	19970.0	20031.0	54.0	54.0	54.0	1.0	0.0	0
GR	1200.0	19941.0	1199.0	19963.0	1198.0	19970.0	1192.0	19983.0	1191.5	19985.0
GR	1191.5	20000.0	1191.5	20017.0	1192.0	20019.0	1199.0	20031.0	1199.0	20060.0
X1	13.00	9	19971.0	20028.0	104.0	97.0	100.0	1.0	0.0	0
GR	1199.0	19947.0	1198.0	19971.0	1192.0	19984.0	1191.6	19986.0	1191.6	20000.0
GR	1191.6	20013.0	1192.0	20015.0	1199.0	20028.0	1199.5	20053.0		
X1	14.00	9	19968.0	20029.0	124.0	86.0	100.0	1.0	0.0	0
GR	1199.0	19963.0	1198.0	19968.0	1192.0	19983.0	1191.7	19985.0	1191.7	20000.0
GR	1191.7	20011.0	1192.0	20013.0	1200.0	20029.0	1200.0	20044.0		

```
T1      93080.04
T2      Alma School Box Culvert
T3      Red Mountain Alma School Drain
T4      Filename = 2-8x8SC2.DAT
T4      DESIGN FLOW CONSISTS OF IGA FLOW OF 847 CFS
T4      Tailwater = Pre-Roosevelt 10-yr flow in Salt River

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2        0        0       0.0        0      0.0     845.0   1178.91

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      2        0       -1       0.0      0.0      0.0      0.0     -6.0      0.0
```

```
T1      93080.04
T2      Alma School Box Culvert
T3      Red Mountain Alma School Drain
T4      Filename = 2-8x8SC2.DAT
T4      DESIGN FLOW CONSISTS OF IGA FLOW OF 847 CFS
T4      Tailwater = Post-Roosevelt 100-yr flow in Salt River

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2        0        0       0.0        0      0.0     845.0   1180.39

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      2        0       -1       0.0      0.0      0.0      0.0     -6.0      0.0
```

```
T1      93080.04
T2      Alma School Box Culvert
T3      Red Mountain Alma School Drain
T4      Filename = 2-8x8SC2.DAT
T4      DESIGN FLOW CONSISTS OF IGA FLOW OF 847 CFS
T4      Tailwater = Pre-Roosevelt 100-yr flow in Salt River

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2        0        0       0.0        0      0.0     845.0   1184.53

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      2        0       -1       0.0      0.0      0.0      0.0     -6.0      0.0
```

```
T1      93080.04
T2      Alma School Box Culvert
T3      Red Mountain Alma School Drain
T4      Filename = 2-8X8SC2.DAT
T4      DESIGN FLOW CONSISTS OF IGA FLOW OF 847 CFS PLUS HURLEY FLOW
T4      OF 150 CFS FOR A TOTAL OF 995 CFS
T4      Tailwater = no flow in Salt River

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2        0        0       -1        0       0.0     995.0     0.0

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      3        0       -1       0.0      0.0      0.0      0.0     -6.0      0.0
```

```
T1      93080.04
T2      Alma School Box Culvert
T3      Red Mountain Alma School Drain
T4      Filename = 2-8X8SC2.DAT
T4      DESIGN FLOW CONSISTS OF IGA FLOW OF 847 CFS PLUS HURLEY FLOW
T4      OF 150 CFS FOR A TOTAL OF 995 CFS
T4      Tailwater = Pre-Roosevelt 10-yr flow in Salt River
```

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	0.0	0	0.0	995.0	1178.91	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	2	0	-1	0.0	0.0	0.0	0.0	-6.0	0.0	

```
T1      93080.04
T2      Alma School Box Culvert
T3      Red Mountain Alma School Drain
T4      Filename = 2-8X8SC2.DAT
T4      DESIGN FLOW CONSISTS OF IGA FLOW OF 847 CFS PLUS HURLEY FLOW
T4      OF 150 CFS FOR A TOTAL OF 1145 CFS
T4      Tailwater = Post-Roosevelt 100-yr flow in Salt River

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2        0        0       0.0        0      0.0     995.0   1180.39

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      2        0       -1       0.0      0.0      0.0      0.0     -6.0      0.0
```

```
T1      93080.04
T2      Alma School Box Culvert
T3      Red Mountain Alma School Drain
T4      Filename = 2-8X8SC2.DAT
T4      DESIGN FLOW CONSISTS OF IGA FLOW OF 847 CFS PLUS HURLEY FLOW
T4      OF 150 CFS FOR A TOTAL OF 995 CFS
T4      Tailwater = Pre-Roosevelt 100-yr flow in Salt River
```

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	0.0	0	0.0	995.0	1184.53	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	2	0	-1	0.0	0.0	0.0	0.0	-6.0	0.0	

THIS RUN EXECUTED 30AUG95 16:09:21

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

Red Mountain Alma School

SUMMARY PRINTOUT

	SECNO	CWSEL	Q	VCH	ELMIN	DIFWSX	TOPWID	DEPTH	HV	SSTA	ENDST	FRCH
*	.000	1182.21	845.00	13.38	1177.90	.00	16.68	4.31	2.27	19991.67	20008.34	1.14
*	.000	1182.20	845.00	13.40	1177.90	.00	16.68	4.30	2.28	19991.67	20008.34	1.14
*	.000	1182.21	845.00	13.40	1177.90	.00	16.68	4.31	2.27	19991.67	20008.34	1.14
	.000	1184.53	845.00	9.12	1177.90	.00	16.68	6.63	1.01	19991.66	20008.35	.62
*	.000	1182.72	995.00	14.25	1177.90	.00	16.68	4.82	2.54	19991.67	20008.34	1.14
*	.000	1182.71	995.00	14.28	1177.90	.00	16.68	4.81	2.55	19991.67	20008.34	1.15
*	.000	1182.72	995.00	14.26	1177.90	.00	16.68	4.82	2.55	19991.67	20008.34	1.15
	.000	1184.53	995.00	10.74	1177.90	.00	16.68	6.63	1.40	19991.66	20008.35	.73
*	.070	1182.25	845.00	13.39	1177.94	.04	16.68	4.31	2.27	19991.67	20008.34	1.14
*	.070	1182.25	845.00	13.39	1177.94	.04	16.68	4.31	2.27	19991.67	20008.34	1.14
*	.070	1182.25	845.00	13.38	1177.94	.04	16.68	4.31	2.27	19991.67	20008.34	1.14
	.070	1184.53	845.00	9.16	1177.94	.00	16.68	6.59	1.02	19991.66	20008.35	.63
*	.070	1182.75	995.00	14.28	1177.94	.03	16.68	4.81	2.56	19991.67	20008.34	1.15
*	.070	1182.75	995.00	14.27	1177.94	.04	16.68	4.81	2.55	19991.67	20008.34	1.15
*	.070	1182.75	995.00	14.28	1177.94	.03	16.68	4.81	2.55	19991.67	20008.34	1.15
	.070	1184.53	995.00	10.79	1177.94	.00	16.68	6.59	1.41	19991.66	20008.35	.74
*	4.900	1186.69	845.00	10.28	1180.90	4.44	16.68	5.79	1.30	19991.66	20008.34	.75
*	4.900	1186.69	845.00	10.28	1180.90	4.44	16.68	5.79	1.30	19991.66	20008.34	.75
*	4.900	1186.69	845.00	10.28	1180.90	4.44	16.68	5.79	1.30	19991.66	20008.34	.75
	4.900	1186.92	845.00	9.93	1180.90	2.40	16.68	6.02	1.21	19991.66	20008.34	.71
*	4.900	1187.32	995.00	11.04	1180.90	4.57	16.68	6.42	1.48	19991.66	20008.34	.77
*	4.900	1187.32	995.00	11.04	1180.90	4.57	16.68	6.42	1.48	19991.66	20008.34	.77
*	4.900	1187.32	995.00	11.04	1180.90	4.57	16.68	6.42	1.48	19991.66	20008.34	.77
	4.900	1187.39	995.00	10.95	1180.90	2.86	16.68	6.49	1.46	19991.66	20008.34	.76

	SECNO	CWSEL	Q	VCH	ELMIN	DIFWSX	TOPWID	DEPTH	HV	SSTA	ENDST	FRCH
*	5.000	1187.97	845.00	4.57	1180.99	1.28	28.39	6.98	.32	19985.80	20014.19	.31
*	5.000	1187.97	845.00	4.57	1180.99	1.28	28.39	6.98	.32	19985.80	20014.19	.31
*	5.000	1187.97	845.00	4.57	1180.99	1.28	28.39	6.98	.32	19985.80	20014.19	.31
*	5.000	1188.10	845.00	4.48	1180.99	1.17	28.39	7.11	.31	19985.80	20014.19	.30
*	5.000	1188.80	995.00	4.81	1180.99	1.48	28.39	7.81	.35	19985.80	20014.20	.31
*	5.000	1188.80	995.00	4.81	1180.99	1.48	28.39	7.81	.35	19985.80	20014.20	.31
*	5.000	1188.80	995.00	4.81	1180.99	1.48	28.39	7.81	.35	19985.80	20014.20	.31
*	5.000	1188.83	995.00	4.78	1180.99	1.44	28.39	7.84	.35	19985.80	20014.20	.30
	5.100	1188.16	845.00	3.32	1181.07	.19	42.40	7.09	.17	19978.80	20021.20	.24
	5.100	1188.16	845.00	3.32	1181.07	.19	42.40	7.09	.17	19978.80	20021.20	.24
	5.100	1188.16	845.00	3.32	1181.07	.19	42.40	7.09	.17	19978.80	20021.20	.24
	5.100	1188.28	845.00	3.26	1181.07	.18	42.41	7.21	.16	19978.80	20021.20	.23
	5.100	1189.02	995.00	3.42	1181.07	.22	42.41	7.95	.18	19978.79	20021.20	.23
	5.100	1189.02	995.00	3.42	1181.07	.22	42.41	7.95	.18	19978.79	20021.20	.23
	5.100	1189.02	995.00	3.42	1181.07	.22	42.41	7.95	.18	19978.79	20021.20	.23
	5.100	1189.05	995.00	3.41	1181.07	.22	42.41	7.98	.18	19978.79	20021.20	.23
*	5.300	1188.20	845.00	3.09	1181.12	.04	53.13	7.08	.15	19975.08	20028.21	.24
*	5.300	1188.20	845.00	3.09	1181.12	.04	53.13	7.08	.15	19975.08	20028.21	.24
*	5.300	1188.20	845.00	3.09	1181.12	.04	53.13	7.08	.15	19975.08	20028.21	.24
*	5.300	1188.32	845.00	3.01	1181.12	.04	53.62	7.20	.14	19974.84	20028.46	.23
*	5.300	1189.07	995.00	3.09	1181.12	.05	56.60	7.95	.15	19973.38	20029.98	.23
*	5.300	1189.07	995.00	3.09	1181.12	.05	56.60	7.95	.15	19973.38	20029.98	.23
*	5.300	1189.07	995.00	3.09	1181.12	.05	56.60	7.95	.15	19973.38	20029.98	.23
*	5.300	1189.10	995.00	3.08	1181.12	.05	56.73	7.98	.15	19973.31	20030.04	.23
*	6.000	1188.22	845.00	3.87	1181.90	.02	47.51	6.32	.23	19976.55	20024.06	.32
*	6.000	1188.22	845.00	3.87	1181.90	.02	47.51	6.32	.23	19976.55	20024.06	.32
*	6.000	1188.22	845.00	3.87	1181.90	.02	47.51	6.32	.23	19976.55	20024.06	.32
*	6.000	1188.34	845.00	3.77	1181.90	.02	48.00	6.44	.22	19976.31	20024.31	.31
*	6.000	1189.08	995.00	3.81	1181.90	.01	51.03	7.18	.23	19974.82	20025.85	.30
*	6.000	1189.08	995.00	3.81	1181.90	.01	51.03	7.18	.23	19974.82	20025.85	.30
*	6.000	1189.08	995.00	3.81	1181.90	.01	51.03	7.18	.23	19974.82	20025.85	.30
*	6.000	1189.11	995.00	3.79	1181.90	.01	51.15	7.21	.22	19974.76	20025.92	.29
	7.000	1188.46	845.00	4.26	1182.70	.24	46.31	5.76	.28	19977.69	20024.00	.36
	7.000	1188.46	845.00	4.26	1182.70	.24	46.31	5.76	.28	19977.69	20024.00	.36
	7.000	1188.46	845.00	4.26	1182.70	.24	46.31	5.76	.28	19977.69	20024.00	.36
	7.000	1188.56	845.00	4.16	1182.70	.22	46.73	5.86	.27	19977.50	20024.23	.35
	7.000	1189.28	995.00	4.18	1182.70	.20	49.68	6.58	.27	19976.14	20025.81	.34
	7.000	1189.28	995.00	4.18	1182.70	.20	49.68	6.58	.27	19976.14	20025.81	.34
	7.000	1189.28	995.00	4.18	1182.70	.20	49.68	6.58	.27	19976.14	20025.81	.34
	7.000	1189.31	995.00	4.16	1182.70	.19	49.79	6.61	.27	19976.09	20025.88	.33

	SECNO	CWSEL	Q	VCH	ELMIN	DIFWSX	TOPWID	DEPTH	HV	SSTA	ENDST	FRCH
	8.000	1188.78	845.00	4.47	1183.50	.32	46.16	5.28	.31	19978.44	20024.60	.39
	8.000	1188.78	845.00	4.47	1183.50	.32	46.16	5.28	.31	19978.44	20024.60	.39
	8.000	1188.78	845.00	4.47	1183.50	.32	46.16	5.28	.31	19978.44	20024.60	.39
	8.000	1188.86	845.00	4.38	1183.50	.30	46.47	5.36	.30	19978.28	20024.75	.38
	8.000	1189.54	995.00	4.41	1183.50	.27	49.07	6.04	.30	19976.91	20025.98	.36
	8.000	1189.54	995.00	4.41	1183.50	.27	49.07	6.04	.30	19976.91	20025.98	.36
	8.000	1189.54	995.00	4.41	1183.50	.27	49.07	6.04	.30	19976.91	20025.98	.36
	8.000	1189.57	995.00	4.39	1183.50	.26	49.16	6.07	.30	19976.86	20026.02	.36
*	9.000	1189.11	845.00	6.24	1184.30	.33	36.28	4.81	.60	19981.59	20017.88	.57
*	9.000	1189.11	845.00	6.24	1184.30	.33	36.28	4.81	.60	19981.59	20017.88	.57
*	9.000	1189.11	845.00	6.24	1184.30	.33	36.28	4.81	.60	19981.59	20017.88	.57
*	9.000	1189.17	845.00	6.14	1184.30	.31	36.49	4.87	.58	19981.47	20017.96	.56
*	9.000	1189.79	995.00	6.19	1184.30	.25	38.58	5.49	.59	19980.27	20018.85	.53
*	9.000	1189.79	995.00	6.19	1184.30	.25	38.58	5.49	.59	19980.27	20018.85	.53
*	9.000	1189.79	995.00	6.19	1184.30	.25	38.58	5.49	.59	19980.27	20018.85	.53
*	9.000	1189.81	995.00	6.16	1184.30	.24	38.64	5.51	.59	19980.23	20018.87	.53
	10.000	1189.94	845.00	6.17	1185.10	.83	36.03	4.84	.59	19982.38	20018.41	.56
	10.000	1189.94	845.00	6.17	1185.10	.83	36.03	4.84	.59	19982.38	20018.41	.56
	10.000	1189.94	845.00	6.17	1185.10	.83	36.03	4.84	.59	19982.38	20018.41	.56
	10.000	1189.96	845.00	6.13	1185.10	.79	36.11	4.86	.58	19982.34	20018.45	.55
	10.000	1190.50	995.00	6.30	1185.10	.71	37.84	5.40	.62	19981.56	20019.40	.54
	10.000	1190.50	995.00	6.30	1185.10	.71	37.84	5.40	.62	19981.56	20019.40	.54
	10.000	1190.50	995.00	6.30	1185.10	.71	37.84	5.40	.62	19981.56	20019.40	.54
	10.000	1190.51	995.00	6.29	1185.10	.70	37.87	5.41	.61	19981.55	20019.42	.54
	11.000	1190.74	845.00	7.78	1185.89	.80	30.06	4.85	.94	19981.04	20011.10	.72
	11.000	1190.74	845.00	7.78	1185.89	.80	30.06	4.85	.94	19981.04	20011.10	.72
	11.000	1190.74	845.00	7.78	1185.89	.80	30.06	4.85	.94	19981.04	20011.10	.72
	11.000	1190.75	845.00	7.77	1185.89	.78	30.07	4.86	.94	19981.03	20011.10	.72
	11.000	1191.21	995.00	8.08	1185.89	.71	31.34	5.32	1.01	19980.16	20011.50	.72
	11.000	1191.21	995.00	8.08	1185.89	.71	31.34	5.32	1.01	19980.16	20011.50	.72
	11.000	1191.21	995.00	8.08	1185.89	.71	31.34	5.32	1.01	19980.16	20011.50	.72
	11.000	1191.22	995.00	8.07	1185.89	.70	31.35	5.33	1.01	19980.15	20011.50	.72
*	11.260	1191.28	845.00	5.60	1186.10	.54	35.07	5.18	.49	19975.93	20011.01	.48
*	11.260	1191.28	845.00	5.60	1186.10	.54	35.07	5.18	.49	19975.93	20011.01	.48
*	11.260	1191.28	845.00	5.60	1186.10	.54	35.07	5.18	.49	19975.93	20011.01	.48
*	11.260	1191.28	845.00	5.60	1186.10	.54	35.08	5.18	.49	19975.93	20011.01	.48
*	11.260	1191.77	995.00	5.91	1186.10	.56	36.06	5.67	.54	19975.23	20011.29	.48
*	11.260	1191.77	995.00	5.91	1186.10	.56	36.06	5.67	.54	19975.23	20011.29	.48
*	11.260	1191.77	995.00	5.91	1186.10	.56	36.06	5.67	.54	19975.23	20011.29	.48
*	11.260	1191.78	995.00	5.90	1186.10	.56	36.07	5.68	.54	19975.23	20011.29	.48

	SECNO	CWSEL	Q	VCH	ELMIN	DIFWSX	TOPWID	DEPTH	HV	SSTA	ENDST	FRCH
*	11.270	1191.02	845.00	7.48	1187.50	-.27	35.18	3.52	.87	19976.10	20011.28	.73
*	11.270	1191.02	845.00	7.48	1187.50	-.27	35.18	3.52	.87	19976.10	20011.28	.73
*	11.270	1191.02	845.00	7.48	1187.50	-.27	35.18	3.52	.87	19976.10	20011.28	.73
*	11.270	1191.02	845.00	7.47	1187.50	-.26	35.19	3.52	.87	19976.10	20011.28	.73
*	11.270	1191.53	995.00	7.58	1187.50	-.24	36.08	4.03	.89	19975.38	20011.47	.70
*	11.270	1191.53	995.00	7.58	1187.50	-.24	36.08	4.03	.89	19975.38	20011.47	.70
*	11.270	1191.53	995.00	7.58	1187.50	-.24	36.08	4.03	.89	19975.38	20011.47	.70
*	11.270	1191.53	995.00	7.57	1187.50	-.24	36.09	4.03	.89	19975.38	20011.47	.70
	11.500	1190.98	845.00	7.97	1187.50	-.03	33.89	3.48	.99	19978.76	20012.65	.79
	11.500	1190.98	845.00	7.97	1187.50	-.03	33.89	3.48	.99	19978.76	20012.65	.79
	11.500	1190.98	845.00	7.97	1187.50	-.03	33.89	3.48	.99	19978.76	20012.65	.79
	11.500	1190.98	845.00	7.96	1187.50	-.03	33.90	3.48	.98	19978.76	20012.66	.79
	11.500	1191.49	995.00	8.05	1187.50	-.04	34.90	3.99	1.01	19978.14	20013.04	.75
	11.500	1191.49	995.00	8.05	1187.50	-.04	34.90	3.99	1.01	19978.14	20013.04	.75
	11.500	1191.49	995.00	8.05	1187.50	-.04	34.90	3.99	1.01	19978.14	20013.04	.75
	11.500	1191.50	995.00	8.04	1187.50	-.04	34.91	4.00	1.00	19978.13	20013.05	.75
*	11.510	1194.08	845.00	8.96	1191.40	3.10	38.27	2.68	1.25	19976.76	20015.03	1.01
*	11.510	1194.08	845.00	8.96	1191.40	3.10	38.27	2.68	1.25	19976.76	20015.03	1.01
*	11.510	1194.08	845.00	8.96	1191.40	3.10	38.27	2.68	1.25	19976.76	20015.03	1.01
*	11.510	1194.08	845.00	8.96	1191.40	3.10	38.27	2.68	1.25	19976.76	20015.03	1.01
*	11.510	1194.38	995.00	9.39	1191.40	2.89	38.97	2.98	1.37	19976.29	20015.26	1.00
*	11.510	1194.38	995.00	9.39	1191.40	2.89	38.97	2.98	1.37	19976.29	20015.26	1.00
*	11.510	1194.38	995.00	9.39	1191.40	2.89	38.97	2.98	1.37	19976.29	20015.26	1.00
*	11.510	1194.38	995.00	9.40	1191.40	2.89	38.97	2.98	1.37	19976.29	20015.26	1.01
*	12.000	1194.94	845.00	6.05	1191.50	.86	47.42	3.44	.57	19976.63	20024.04	.62
*	12.000	1194.94	845.00	6.05	1191.50	.86	47.42	3.44	.57	19976.63	20024.04	.62
*	12.000	1194.94	845.00	6.05	1191.50	.86	47.42	3.44	.57	19976.63	20024.04	.62
*	12.000	1194.94	845.00	6.05	1191.50	.86	47.42	3.44	.57	19976.63	20024.04	.62
*	12.000	1195.32	995.00	6.30	1191.50	.94	48.89	3.82	.62	19975.80	20024.69	.62
*	12.000	1195.32	995.00	6.30	1191.50	.94	48.89	3.82	.62	19975.80	20024.69	.62
*	12.000	1195.32	995.00	6.30	1191.50	.94	48.89	3.82	.62	19975.80	20024.69	.62
*	12.000	1195.32	995.00	6.30	1191.50	.94	48.89	3.82	.62	19975.80	20024.69	.62
	13.000	1194.97	845.00	6.94	1191.60	.03	42.98	3.37	.75	19977.55	20020.53	.73
	13.000	1194.97	845.00	6.94	1191.60	.03	42.98	3.37	.75	19977.55	20020.53	.73
	13.000	1194.97	845.00	6.94	1191.60	.03	42.98	3.37	.75	19977.55	20020.53	.73
	13.000	1194.97	845.00	6.94	1191.60	.03	42.98	3.37	.75	19977.55	20020.53	.73
	13.000	1195.34	995.00	7.23	1191.60	.01	44.44	3.74	.81	19976.76	20021.21	.72
	13.000	1195.34	995.00	7.23	1191.60	.01	44.44	3.74	.81	19976.76	20021.21	.72
	13.000	1195.34	995.00	7.23	1191.60	.01	44.44	3.74	.81	19976.76	20021.21	.72
	13.000	1195.34	995.00	7.23	1191.60	.01	44.44	3.74	.81	19976.76	20021.21	.72

SECNO	CWSEL	Q	VCH	ELMIN	DIFWSX	TOPWID	DEPTH	HV	SSTA	ENDST	FRCH
14.000	1195.24	845.00	6.55	1191.70	.26	44.57	3.54	.67	19974.91	20019.47	.68
14.000	1195.24	845.00	6.55	1191.70	.26	44.57	3.54	.67	19974.91	20019.47	.68
14.000	1195.24	845.00	6.55	1191.70	.26	44.57	3.54	.67	19974.91	20019.47	.68
14.000	1195.23	845.00	6.55	1191.70	.26	44.56	3.53	.67	19974.91	20019.47	.68
14.000	1195.60	995.00	6.84	1191.70	.26	46.19	3.90	.73	19974.00	20020.20	.68
14.000	1195.60	995.00	6.84	1191.70	.26	46.19	3.90	.73	19974.00	20020.20	.68
14.000	1195.60	995.00	6.84	1191.70	.26	46.19	3.90	.73	19974.00	20020.20	.68
14.000	1195.60	995.00	6.84	1191.70	.26	46.20	3.90	.73	19974.00	20020.20	.68

SUMMARY OF ERRORS AND SPECIAL NOTES

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CAUTION SECNO=      .000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      .000  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      .000  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      .000  PROFILE=  5  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      .000  PROFILE=  6  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      .000  PROFILE=  7  CRITICAL DEPTH ASSUMED

CAUTION SECNO=      .070  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      .070  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      .070  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      .070  PROFILE=  2  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      .070  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      .070  PROFILE=  3  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      .070  PROFILE=  5  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      .070  PROFILE=  5  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      .070  PROFILE=  6  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      .070  PROFILE=  6  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      .070  PROFILE=  7  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      .070  PROFILE=  7  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     4.900  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     4.900  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     4.900  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     4.900  PROFILE=  5  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     4.900  PROFILE=  6  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     4.900  PROFILE=  7  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     5.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.000  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.000  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.000  PROFILE=  5  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.000  PROFILE=  6  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.000  PROFILE=  7  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.000  PROFILE=  8  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     5.300  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.300  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.300  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.300  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.300  PROFILE=  5  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.300  PROFILE=  6  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.300  PROFILE=  7  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     5.300  PROFILE=  8  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     6.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     6.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     6.000  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     6.000  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     6.000  PROFILE=  5  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     6.000  PROFILE=  6  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

```
WA    .G SECNO=      6.000  PROFILE=  7  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=       6.000  PROFILE=  8  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=       9.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=       9.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=       9.000  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=       9.000  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=       9.000  PROFILE=  5  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=       9.000  PROFILE=  6  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=       9.000  PROFILE=  7  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=       9.000  PROFILE=  8  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      11.260  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      11.260  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      11.260  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      11.260  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      11.260  PROFILE=  5  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      11.260  PROFILE=  6  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      11.260  PROFILE=  7  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      11.260  PROFILE=  8  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      11.270  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      11.270  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      11.270  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      11.270  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WA    G SECNO=      11.270  PROFILE=  5  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WAR   NG SECNO=     11.270  PROFILE=  6  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      11.270  PROFILE=  7  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      11.270  PROFILE=  8  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      11.510  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      11.510  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      11.510  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      11.510  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      11.510  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      11.510  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      11.510  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      11.510  PROFILE=  3  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      11.510  PROFILE=  3  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      11.510  PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      11.510  PROFILE=  4  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      11.510  PROFILE=  4  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      11.510  PROFILE=  5  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      11.510  PROFILE=  5  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      11.510  PROFILE=  5  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      11.510  PROFILE=  6  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      11.510  PROFILE=  6  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      11.510  PROFILE=  6  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      11.510  PROFILE=  7  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      11.510  PROFILE=  7  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      11.510  PROFILE=  7  20 TRIALS ATTEMPTED TO BALANCE WSEL
CA    N SECNO=      11.510  PROFILE=  8  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      11.510  PROFILE=  8  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      11.510  PROFILE=  8  20 TRIALS ATTEMPTED TO BALANCE WSEL
```

```
WARNING SECNO=     12.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     12.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     12.000  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     12.000  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     12.000  PROFILE=  5  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     12.000  PROFILE=  6  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     12.000  PROFILE=  7  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     12.000  PROFILE=  8  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

DESIGNED BY JRM	DATE 12/12/95	SHEET NO. 1	PAGE NO.
CHECKED BY	DATE	OF 2	JOB NO.
REVIEWED BY	DATE	SUBJECT: McLELLAN OUTFALL BASIN	
APPROVED BY	DATE	CLARK UNIT HYDROGRAPH	

CONTRIBUTING PAVEMENT AREA = 8.239 Ac
CONTRIBUTING R/W AREA = 9.742 Ac

TOTAL = 17.981 Ac
A = 0.0281 sq. miles

LENGTH TO MOST HYDRAULICALLY DISTANT PT:

(482+41) − (−79+97)	=	744'
PIPE TO ES 120	=	150'
ALMA RAMP D R/W DITCH	=	920'
PIPE TO ES 106	=	360'
BASIN TO OUTFALL	=	800'
TOTAL	=	2974'
L	=	0.5633 miles

LENGTH ALONG FLOW PATH TO POINT OPPOSITE THE CENTROID OF DRAINAGE AREA:

L_{ca} = 400' = 0.0758 miles

AVERAGE SLOPE OF WATERSHED:

HIGH ELEV = 1227'
LOW ELEV = 1192'

Δ ELEV = 35'

S = 35'/0.5633 = 62.14 '/Mile

EFFECTIVE IMPERVIOUS AREA:

$$RTIMP = \frac{8.239}{17.981} = 45.82\%$$

SC 3020

DESIGNED BY JRM	DATE 12/18/95	SHEET NO. 1	PAGE NO.
CHECKED BY	DATE	OF 1	JOB NO.
REVIEWED BY	DATE	SUBJECT: MCKELLAR OUTFALL BASIN	
APPROVED BY	DATE	RAINFALL LOSSES	

RTIMP = 45.82% (HIGHWAY PAVEMENT)

SURFACE RETENTION LOSS:

AREA	IA	DESCRIPTION
8.239	0.05	PAVEMENT
9.742	0.10	R/W DESERT LANDSCAPE

IA = 0.46(0.05) + 0.54(0.10) = 0.077"

SOIL COMPOSITION:

Gf, Gm = GILMAN LOAM XKSAT = 0.25

FROM FIGURE 3-3 (ADOT MANUAL)

PSIF = 5"

DTHETA = 0.32 (DRY)

NO VEGETATION CORRECTION FOR XKSAT

HEC-1 LG RECORD:

	IA	DTHETA	PSIF	XKSAT	RTIMP
LG	0.077	0.32	5	0.25	46

SC 3020

DESIGNED BY JRM DATE 2/18/95 SHEET NO. 1 PAGE NO.
CHECKED BY DATE OF 1 JOB NO.
REVIEWED BY DATE SUBJECT: OUTFALL BASIN
APPROVED BY DATE

OUTFALL BASIN AREA/ELEV. RATING CURVE:

ELEV	AREA (Sq.Ft)	AREA (ac)
1192	335	0.008
1193	7830	0.180
1194	37273	0.856
1195	66832	1.534
1197	80826	1.856
1200	101782	2.337

① TOTAL FWY CONTRIBUTING AREA = 783,270 □'
= 17.981 Ac

② OUTFALL BASIN AREA = 220,490 □'
= 5.062 Ac

③ ALMA RAMP D R/W = 2.700 Ac

④ ALMA B INFIELD = 1.120 Ac

⑤ ALMA D INFIELD = 0.860 Ac

⑥ TOTAL NON-PVMT AREA = 9.742 Ac (② → ⑤)
⑦ TOTAL CONTRIBUTING = 17.981 Ac (①)

PVMT AREA = 8.239 Ac (⑦ − ⑥)

SC 3020

DESIGNED BY JPM	DATE 12/20/87	SHEET NO. 1	PAGE NO.
CHECKED BY	DATE	OF 1	JOB NO. 12168
REVIEWED BY	DATE	SUBJECT: McLELLAN OUTFALL BASIN	
APPROVED BY	DATE	OUTLET PIPE	

STA 58+50 CSA CST ℄ TOP OF LEVEE = 1193.4'
DESIGN INVERT = 1161.5'
Δ ELEV = 31.9'

INLET INV ELEV = 1192'
OUTLET INV ELEV = 1175'
Δ ELEV = 17'

LENGTH = 630'

$S = \frac{17}{630} = 0.0270'/\cancel{H}$

STA 58+50: SALT RIVER WSEL

10-YR TAILWATER ELEV = 1181.74
100-YR TAILWATER ELEV = 1190.40

McLELLAN RD 48" S.D. MH 105 INV. = 1198.53 ±
PIPE Ø = +4
MAX. BASIN WSE = 1202.53' N.G.

SC 3020

100-YR SALT TAILWATER
10-YR SALT TAILWATER
12168 VPM

CURRENT DATE: 12-19-1995
CURRENT TIME: 16:38:23

FILE DATE: 12-18-1995
FILE NAME: OUTFALL

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.0

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1192.00	1175.00	630.23	1 RCP	4.50	4.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: OUTFALL DATE: 12-18-1995

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1192.00	0	0	0	0	0	0	0	0	1
1193.56	20	20	0	0	0	0	0	0	1
1194.49	40	40	0	0	0	0	0	0	1
1195.18	60	60	0	0	0	0	0	0	1
1195.77	80	80	0	0	0	0	0	0	1
1196.35	100	100	0	0	0	0	0	0	1
1196.98	120	120	0	0	0	0	0	0	1
1197.71	140	140	0	0	0	0	0	0	1
1198.55	160	160	0	0	0	0	0	0	1
1199.50	180	180	0	0	0	0	0	0	1
1200.57	200	200	0	0	0	0	0	0	1
1218.00	361	361	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: OUTFALL DATE: 12-18-1995

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
1192.00	0.00	0	0	0.00
1193.56	0.00	20	0	0.00
1194.49	0.00	40	0	0.00
1195.18	0.00	60	0	0.00
1195.77	0.00	80	0	0.00
1196.35	0.00	100	0	0.00
1196.98	0.00	120	0	0.00
1197.71	0.00	140	0	0.00
1198.55	0.00	160	0	0.00
1199.50	0.00	180	0	0.00
1200.57	0.00	200	0	0.00

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 12-19-1995 FILE DATE: 12-18-1995
CURRENT TIME: 16:38:23 FILE NAME: OUTFALL

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (4.5 BY 4.5) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1192.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	15.40
20	1193.56	1.56	1.56	1-S1f	0.69	1.26	1.26	4.50	0.00	15.40
40	1194.49	2.49	2.49	1-S1f	1.01	1.82	2.52	4.50	0.00	15.40
60	1195.18	3.18	3.18	1-S1f	1.25	2.25	3.77	4.50	0.00	15.40
80	1195.77	3.77	3.77	1-S1f	1.45	2.61	5.03	4.50	0.00	15.40
100	1196.35	4.35	4.35	1-S1f	1.63	2.93	6.29	4.50	0.00	15.40
120	1196.98	4.98	4.98	1-S1f	1.81	3.22	7.55	4.50	0.00	15.40
140	1197.71	5.71	5.71	1-S1f	1.97	3.47	8.80	4.50	0.00	15.40
160	1198.55	6.55	6.55	1-S1f	2.13	3.68	10.06	4.50	0.00	15.40
180	1199.50	7.50	5.25	4-FFt	2.28	3.86	11.32	4.50	0.00	15.40
200	1200.57	8.57	6.86	4-FFt	2.43	4.03	12.58	4.50	0.00	15.40

El. inlet face invert 1192.00 ft El. outlet invert 1175.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	1192.00
OUTLET STATION (FT)	630.00
OUTLET ELEVATION (FT)	1175.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0270
CULVERT LENGTH ALONG SLOPE (FT)	630.23

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	4.50 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	BEVELED EDGE (1:1)
INLET DEPRESSION	NONE

CURRENT DATE: 12-19-1995 FILE DATE: 12-18-1995
CURRENT TIME: 16:38:23 FILE NAME: OUTFALL

TAILWATER

CONSTANT WATER SURFACE ELEVATION
1190.40

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	200.00
CREST LENGTH (FT)	1000.00
OVERTOPPING CREST ELEVATION (FT)	1218.00

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
            VERSION 4.0.1E             *
                                       *
*  RUN DATE  01/22/96  TIME  11:32:37  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 551-1748              *
*                                      *
****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID   Red Mountain Freeway - Phase II
  2           ID   Detention Basin Sta 490+00
  3           ID   100-Year, 24-Hour Storm
  4           ID   HEC-1 HYPOTHETHICAL RAINFALL DISTRIBUTION
  5           ID   RAINFALL DEPTHS IN PH RECORD BASED ON PREFRE OUTPUT
  6           ID   CLARK UNIT HYDROGRAPH
  7           ID   GREEN-AMPT SOIL LOSS PARAMETERS
  8           ID   DETENTION BASIN DISCHARGE ELEVATION BASED ON HY8 ANALYSIS
  9           ID   OUTLET CULVERT: 24"x 236', 1203 INLET ELEV., ~~1200~~ OUTLET ELEV.
 10           ID   FILENAME: BASIN490.DAT                          1201
 11           IT       5                    220
 12           IO       3
              *DIAGRAM

 13           KK  SUB490
 14           KM   RUNOFF FROM SUBBASIN 490 CONTRIBUTING TO DETENTION BASIN
 15           BA   .0223
 16           PH                     .71    1.41    2.38    2.59    2.73    3.00    3.30    3.60
 17           LG    .064     .32     5.0     .25      73
 18           UC    .123    .151
 19           UA       0       5      16      30      65      77      84      90      94      97
 20           UA     100

 21           KK    B490
 22           KM       RESERVOIR ROUTE OF DETENTION BASIN AT STA 490+00
 23           RS       1    STOR      -1       0
 24           SA       0    .853   1.439   1.954   2.207
 25           SE    1203    1204    1205    1206  1206.5
 26           SQ       0       5      10      15      20      25      30
 27           SE    1203  1204.1  1204.6  1205.1  1205.8  1206.6  1208.1
 28           ZZ
```

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
            VERSION 4.0.1E             *
                                       *
*  RUN DATE  01/22/96  TIME  11:32:37  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 551-1748             *
*                                      *
****************************************
```

```
                    Red Mountain Freeway - Phase II
                    Detention Basin Sta 490+00
                    100-Year, 24-Hour Storm
                    HEC-1 HYPOTHETHICAL RAINFALL DISTRIBUTION
                    RAINFALL DEPTHS IN PH RECORD BASED ON PREFRE OUTPUT
                    CLARK UNIT HYDROGRAPH
                    GREEN-AMPT SOIL LOSS PARAMETERS
                    DETENTION BASIN DISCHARGE ELEVATION BASED ON HY8 ANALYSIS
                    OUTLET CULVERT: 24"x 236', 1203 INLET ELEV., 1200 OUTLET ELEV.
                    FILENAME: BASIN490.DAT

 12 IO        OUTPUT CONTROL VARIABLES
                    IPRNT          3  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT        HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1   0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        220  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      1   0  ENDING DATE
                   NDTIME       1815  ENDING TIME
                    ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL    0.08 HOURS
                     TOTAL TIME BASE   18.25 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 13 KK      *    SUB490  *
            *            *
            **************
                    RUNOFF FROM SUBBASIN 490 CONTRIBUTING TO DETENTION BASIN

               SUBBASIN RUNOFF DATA

 15 BA         SUBBASIN CHARACTERISTICS
```

```
                TAREA        0.02  SUBBASIN AREA

            PRECIPITATION DATA

16 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
            ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
            5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
             0.71    1.41    2.38    2.59    2.73    3.00    3.30    3.60    0.00    0.00    0.00    0.00

                                                STORM AREA =    0.02

17 LG       GREEN AND AMPT LOSS RATE
                STRTL        0.06  STARTING LOSS
                  DTH        0.32  MOISTURE DEFICIT
                 PSIF        5.00  WETTING FRONT SUCTION
                XKSAT        0.25  HYDRAULIC CONDUCTIVITY
                RTIMP       73.00  PERCENT IMPERVIOUS AREA

18 UC       CLARK UNITGRAPH
                   TC        0.12  TIME OF CONCENTRATION
                    R        0.15  STORAGE COEFFICIENT

19 UA       ACCUMULATED-AREA VS. TIME,  11 ORDINATES
                 0.0      5.0     16.0     30.0     65.0     77.0     84.0     90.0     94.0     97.0
               100.0

                                                  ***

                                          UNIT HYDROGRAPH PARAMETERS
                                     CLARK   TC=  0.12 HR,       R=  0.15 HR
                                    SNYDER   TP=  0.11 HR,      CP=  0.51

                                              UNIT HYDROGRAPH
                                          11 END-OF-PERIOD ORDINATES
             33.      56.      36.      20.      12.       7.       4.       2.       1.       1.
              0.

    ***            ***            ***            ***            ***

                     HYDROGRAPH AT STATION   SUB490

   TOTAL RAINFALL =    3.48, TOTAL LOSS =    0.49, TOTAL EXCESS =    2.99

 PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
   (CFS)       (HR)                 6-HR       24-HR       72-HR     18.25-HR
     68.       9.25       (CFS)       6.          2.          2.          2.
                         (INCHES)    2.629       2.974       2.974       2.974
                         (AC-FT)       3.          4.          4.          4.

                         CUMULATIVE AREA =    0.02 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
21 KK       *      B490  *
            *            *
            **************
                                RESERVOIR ROUTE OF DETENTION BASIN AT STA 490+00

               HYDROGRAPH ROUTING DATA
```

```
23 RS          STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                     ITYP       STOR  TYPE OF INITIAL CONDITION
                   RSVRIC      -1.00  INITIAL CONDITION
                        X       0.00 WORKING R AND D COEFFICIENT

24 SA             AREA        0.0       0.9       1.4       2.0       2.2

25 SE          ELEVATION    1203.00   1204.00   1205.00   1206.00   1206.50

26 SQ          DISCHARGE        0.        5.       10.       15.       20.       25.       30.

27 SE          ELEVATION    1203.00   1204.10   1204.60   1205.10   1205.80   1206.60   1208.10
```

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	0.28	1.42	3.11	4.15
ELEVATION	1203.00	1204.00	1205.00	1206.00	1206.50

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.28	0.37	0.89	1.42	1.56	2.73	3.11	4.15	4.37
OUTFLOW	0.00	4.55	5.00	10.00	14.00	15.00	20.00	21.25	24.38	25.00
ELEVATION	1203.00	1204.00	1204.10	1204.60	1205.00	1205.10	1205.80	1206.00	1206.50	1206.60

STORAGE	8.39
OUTFLOW	30.00
ELEVATION	1208.10

*** *** *** *** ***

HYDROGRAPH AT STATION B490

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	18.25-HR
16.	9.67	(CFS)	6.	2.	2.	2.
		(INCHES)	2.593	2.959	2.959	2.959
		(AC-FT)	3.	4.	4.	4.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	18.25-HR
2.	9.67	1.	0.	0.	0.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	18.25-HR
1205.25	9.67	1204.05	1203.41	1203.41	1203.41

CUMULATIVE AREA = 0.02 SQ MI

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB490	68.	9.25	6.	2.	2.	0.02		
ROUTED TO	B490	16.	9.67	6.	2.	2.	0.02	1205.25	9.67

*** NORMAL END OF HEC-1 ***

CURRENT DATE: 01-10-1996
CURRENT TIME: 11:16:33

FILE DATE: 12-13-1995
FILE NAME: BASIN490

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.0

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1203.00	1201.00	232.76	1 RCP	2.00	2.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

FILE: BASIN490 CULVERT HEADWATER ELEVATION (FT) DATE: 12-13-1995

DISCHARGE	1	2	3	4	5	6	ROADWAY
0	1203.00	0.00	0.00	0.00	0.00	0.00	1211.30
5	1204.09	0.00	0.00	0.00	0.00	0.00	1211.31
10	1204.64	0.00	0.00	0.00	0.00	0.00	1211.32
15	1205.14	0.00	0.00	0.00	0.00	0.00	1211.33
20	1205.77	0.00	0.00	0.00	0.00	0.00	1211.34
25	1206.58	0.00	0.00	0.00	0.00	0.00	1211.34
30	1208.12	0.00	0.00	0.00	0.00	0.00	1211.35
35	1210.03	0.00	0.00	0.00	0.00	0.00	1211.35
40	1212.19	0.00	0.00	0.00	0.00	0.00	1211.36
45	1214.63	0.00	0.00	0.00	0.00	0.00	1211.36
50	1217.35	0.00	0.00	0.00	0.00	0.00	1211.37
50	1217.35	0.00	0.00	0.00	0.00	0.00	0.00

The above Q and HW are for a point above the roadway.

CURRENT DATE: 01-10-1996
CURRENT TIME: 11:16:33

FILE DATE: 12-13-1995
FILE NAME: BASIN490

TAILWATER

CONSTANT WATER SURFACE ELEVATION
1198.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	200.00
CREST LENGTH (FT)	1000.00
OVERTOPPING CREST ELEVATION (FT)	1211.30

DESIGNED BY JRM	DATE 12/12/95	SHEET NO. 1	PAGE NO.
CHECKED BY	DATE	OF 2	JOB NO. 12168
REVIEWED BY	DATE	SUBJECT: STA 490+00 BASIN	
APPROVED BY	DATE	CLARK UNIT HYDROGRAPH	

CONTRIBUTING PAVEMENT AREA = 10.47 Ac
CONTRIBUTING R/W AREA = 3.79 Ac

TOTAL = 14.26 Ac
A = 0.0223 sq. miles

LENGTH OF FLOW PATH TO HYDRAULICALLY MOST DISTANT POINT IN WATERSHED:

(507+80) − (487+50) = 2030'
+ PUMP WIDTH = 70'

TOTAL = 2100'
L = 0.3977 miles

LENGTH ALONG FLOW PATH TO A POINT OPPOSITE THE CENTROID OF THE D.A.:

[(483+00) + (507+80)]/2 = 495+40 (CENTROID)
− 487+50 (OUTFALL)
L_{ca} = 790' = 0.1496 miles

AVERAGE SLOPE OF WATERSHED:

HIGH ELEV = 1237'
LOW ELEV = 1203
Δ ELEV = 34'

S = 34'/0.3977 = 85.49'/mile

EFFECTIVE IMPERVIOUS AREA:

$$RTIMP = \frac{10.47}{14.26} = 73.42\%$$

SC 3020

DESIGNED BY JKM	DATE 12/13/95	SHEET NO. 1	PAGE NO.
CHECKED BY	DATE	OF 1	JOB NO.
REVIEWED BY	DATE	SUBJECT: STA 490+00 BASIN	
APPROVED BY	DATE	RAINFALL LOSSES	

RTIMP = 73.42% (HIGHWAY PAVEMENT)

SURFACE RETENTION LOSS:

AREA	IA	DESCRIPTION
10.47	0.05	PAVEMENT
3.79	0.10	R/W DESERT LANDSCAPE

IA = 0.73(0.05) + 0.27(0.10) = 0.064"

SOIL COMPOSITION:

GM = GILMAN LOAM XKSAT = 0.25 IN/HR

FROM FIGURE 3-3 (ADOT MANUAL)

PSIF = 5"
DTHETA = 0.32 (DRY)

NO VEGETATION CORRECTION USED FOR XKSAT

HEC-1 LG RECORD:

	IA	DTHETA	PSIF	XKSAT	RTIMP
LG	0.064	0.32	5	0.25	73

Roadway Drainage Area

Rainfall Intensity = 4.20 in/hr
Runoff Coefficient = 0.95

	Basin No.	Basin Station	Area (Ac)	Discharge (cfs)
Eastbound				
	150	486+00	0.30	1.22
	156	486+90	0.18	0.73
	159	487+50	0.24	0.94
	158	488+10	0.18	0.70
	157	489+00	0.19	0.74
	160	489+95	0.37	1.49
	161	491+85	2.10	8.38
	Phase 3	500+69	0.19	0.74
	Phase 3	501+65	1.17	4.66
Westbound				
	151	486+55	1.05	4.19
	154	487+50	0.34	1.37
	153	488+30	0.20	0.78
	152	489+30	1.98	7.90
	Phase 3	498+10	0.23	0.82
	Phase 3	499+20	0.60	2.16
	Phase 3	502+10	1.17	4.23
		Totals	10.47	41.06

DESIGNED BY JKM	DATE 12/12/95	SHEET NO. 1	PAGE NO.
CHECKED BY	DATE	OF 1	JOB NO.
REVIEWED BY	DATE	SUBJECT: STA 490+00 BASIN	
APPROVED BY	DATE	SE/SE RATING	

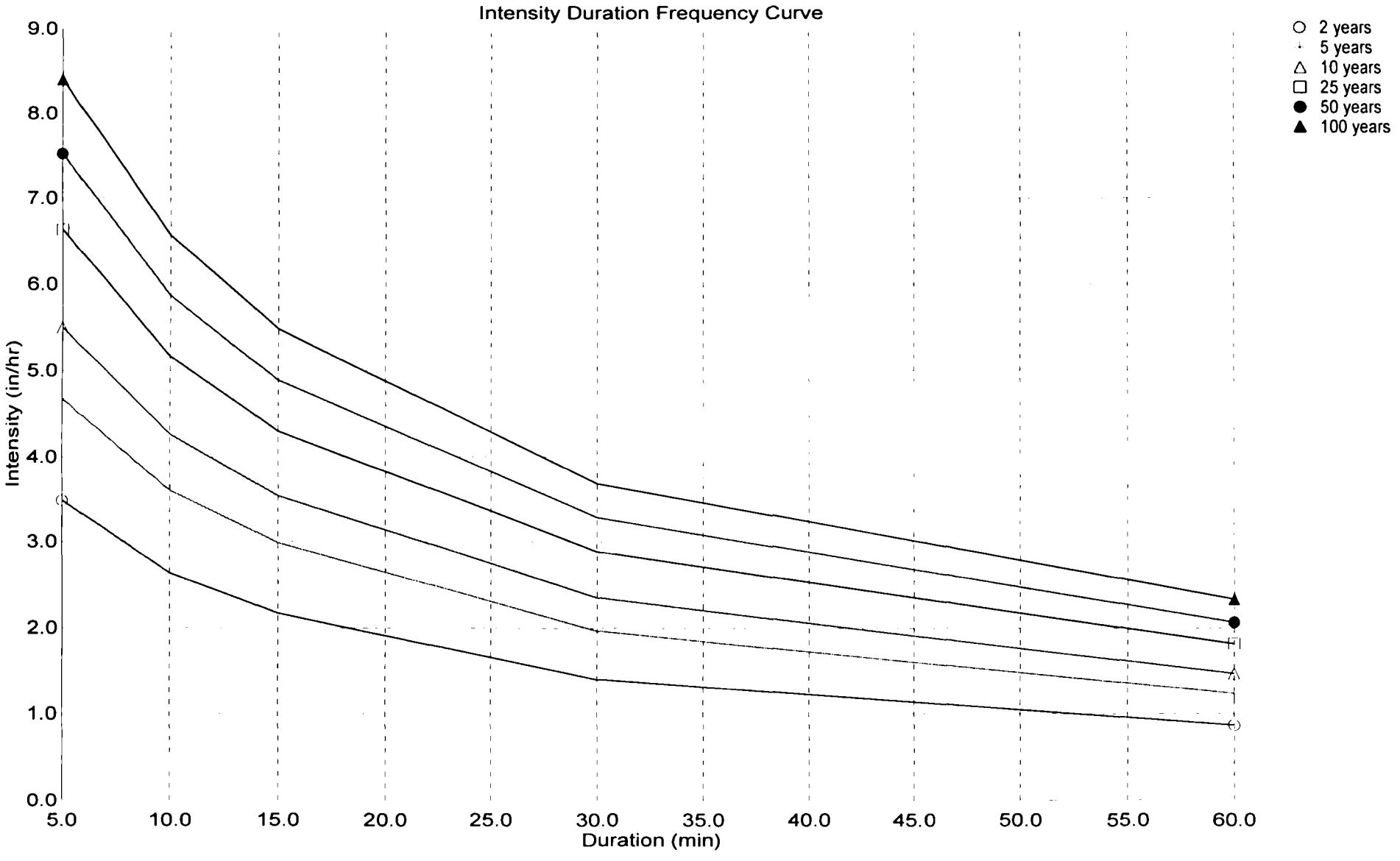
STATION	INVERT ELEV.	BOTTOM WIDTH
485	1206.5	136
486	1205.8	90'
487	1205.1	78'
488	1204.4	49
489	1203.7	83
490	1203.0	167
491	1204.0	190
492	1205.0	98
493	1206.0	8
494	1206.4	↓
495	1206.8	↓
496	1207.2	↓
497	1207.6	↓
498	1207.97	8

ELEVATION	(Ai) AREA ①	(Ac) AREA
1204	37159	0.853
1205	62668	1.439
1206	85115	1.954
1206.5	96147	2.207

① FROM DIGITIZED CONTOUR FILE

APPENDIX D

Storm Drain Hydraulic Grade Line Calculations



Project Title: Red Mountain Freeway
c:\haestad\stmc\k25_29.stm
12/01/95 10:58:53 AM

Stanley Consultants
© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Project Engineer: Jeffrey R. Minch
StormCAD v1.0
Page 1 of 1

STANLEY CONSULTANTS

Computed by: VRM Date: 10/20/95
Checked by: ____ Date: ____
Reviewed by: ____ Date: ____
Approved by: ____ Date: ____

Job No. 12168 Page No. ____
Subject: PRICE OUTFALL BOX CULVERT HGL STARTING USE
Sheet No. 1 of 1

CB NO.	Q_{MAX}	DESIGN CONDITION	
10	4.8	ULTIMATE	
11	1.5	ULTIMATE	TOP OF PRICE RD.
12	2.6	ULTIMATE	OUTFALL BOX
13	6.1	ULTIMATE	CULVERT ELEV = 1169.6'±
14	8.0	ULTIMATE	
15	8.3	INTERIM	
16	3.5	EXISTING	
17	3.0	EXISTING	

$\Sigma Q = 38.1$ cfs

ASSUME: OUTLET OPERATES AS ORIFICE

$$Q = CA(2gd)^{0.5} \quad \text{(HEC-12)}$$

$$d = \frac{1}{2g}\left[\frac{Q}{CA}\right]^2$$

ASSUME: $C = 0.67$

$$A = \pi\frac{D^2}{4} = \pi\frac{(2)^2}{4} = \pi$$

$Q = 38.5$ cfs (MAXIMUM)

$$d = \frac{1}{2(32.2)}\left[\frac{38.1}{0.67(\pi)}\right]^2$$

$$d = 5.10'$$

STARTING HGL = 1169.6 + 5. = 1174.7' USE

SC 3004R2 592

```
        Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12168)
$       Storm Sewer Hydraulic Grade Line Analysis for Red Mtn. Freeway
$       10-Year Hydrology using ADOT Methodology
$       SYSTEM "A" - Price Road Outfall Box Culvert
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          M            MANHOLE
$          L            ELBOW
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels.
$       Outfall to the Price Road Tunnel assumed orifice flow through
$       the top of the box for all the contributing drainage area.
$
SEWER                ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --   ---- ---- ---- ---- ---- ---- ----- ---- ----    --        - -----
DA C 10                                                   24       6   4.8
DA C 11                                                                   1.5
DA C 12                                                                   2.6
DA C 13                                                                   6.1
DA C 14                                                                   8.0
DA C 15                                                                   8.3
DA C 16                                                                   3.8
DA C 17                                                                   3.0
        Starting water-surface elevation based upon orifice flow into the
        Price Road Tunnel outfall for the ultimate contributing discharge.
OUTLET    STATIONING       0  T.W. ELEV  1174.70   M 15
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
$*   ---  - -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN  A8  C 15 M 12 US1183.46 DS1181.70  186           .012        24 CIRC
DSGN  6A  M 12 J 12 US1181.70 DS1180.27  120           .012        24 CIRC
DSGN  A7  C 14 J 12 US1180.52 DS1180.27   14           .012        24 CIRC
DSGN  6B  J 12 M 11 US1180.27 DS1177.90  199           .012        24 CIRC
DSGN  A5  C 13 M 11 US1179.67 DS1177.90   94           .012        24 CIRC
DSGN  2A  M 11 J 11 US1177.90 DS1176.85  130           .012        30 CIRC
DSGN  A4  C 12 J 11 US1179.96 DS1176.60    6           .012        24 CIRC
DSGN  2B  J 11 J 10 US1176.85 DS1176.01  105           .012        30 CIRC
DSGN  A3  C 11 J 10 US1179.86 DS1175.76    3           .012        24 CIRC
DSGN  2C  J 10 M 10 US1176.01 DS1175.90   14           .012        30 CIRC
DSGN  A1  C 10 M 10 US1179.96 DS1178.20   92           .012        24 CIRC
DSGN  A9  C 16 M 13 US1180.07 DS1180.00    8           .012        24 CIRC
DSGN 11A  M 13 J 13 US1180.00 DS1179.21  100           .012        24 CIRC
DSGN A10  C 17 J 13 US1180.33 DS1179.21    8           .012        24 CIRC
DSGN 11B  J 13 M 14 US1179.21 DS1179.05   20           .012        24 CIRC
DSGN A12  M 14 M 10 US1179.00 DS1176.70  168           .012        24 CIRC
DSGN A13  M 10 M 15 US1183.03 DS1183.02    1           .012       168 CIRC
$
$       Run A13 included because program will not allow
$       outfall to also be a junction.
$
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.               LOSS
$*   ---  - -- - --  ---- ---- ----     -----
    _ A8  C 15 M 12         24
ANAL  6A  M 12 J 12         24
ANAL  A7  C 14 J 12         24
```

```
ANAL  6B  J 12 M 11        24
ANAL  A5  C 13 M 11        24
ANAL  2A  M 11 J 11        30
ANAL  A4  C 12 J 11        24
   L  2B  J 11 J 10        30
   L  A3  C 11 J 10        24
ANAL  2C  J 10 M 10        30
ANAL  A1  C 10 M 10        24
ANAL  A9  C 16 M 13        24
ANAL 11A  M 13 J 13        24
ANAL A10  C 17 J 13        24
ANAL 11B  J 13 M 14        24
ANAL A12  M 14 M 10        24
ANAL A13  M 10 M 15       168
ENDATA
```

SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
A8	C15	M12	.00	.00	.00	.00	.00	.00	.00	8.30
6A	M12	J12	.00	.00	.00	.00	.00	.00	.00	8.30
A7	C14	J12	.00	.00	.00	.00	.00	.00	.00	8.00
6B	J12	M11	.00	.00	.00	.00	.00	.00	.00	16.30
A5	C13	M11	.00	.00	.00	.00	.00	.00	.00	6.10
2A	M11	J11	.00	.00	.00	.00	.00	.00	.00	22.40
A4	C12	J11	.00	.00	.00	.00	.00	.00	.00	2.60
2B	J11	J10	.00	.00	.00	.00	.00	.00	.00	25.00
A3	C11	J10	.00	.00	.00	.00	.00	.00	.00	1.50
2C	J10	M10	.00	.00	.00	.00	.00	.00	.00	26.50
A1	C10	M10	.00	.00	.00	.00	.00	.00	.00	4.80
A9	C16	M13	.00	.00	.00	.00	.00	.00	.00	3.80
11A	M13	J13	.00	.00	.00	.00	.00	.00	.00	3.80
A10	C17	J13	.00	.00	.00	.00	.00	.00	.00	3.00
11B	J13	M14	.00	.00	.00	.00	.00	.00	.00	6.80
A12	M14	M10	.00	.00	.00	.00	.00	.00	.00	6.80
A13	M10	M15	.00	.00	.00	.00	.00	.00	.00	38.10

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
A8	C15	M12	1181.46	1179.70	186	.00946	1	24	24	CIRC
6A	M12	J12	1179.70	1178.27	120	.01192	1	24	24	CIRC
A7	C14	J12	1178.52	1178.27	14	.01786	1	24	24	CIRC
6B	J12	M11	1178.27	1175.90	199	.01191	1	24	24	CIRC
A5	C13	M11	1177.67	1175.90	94	.01883	1	24	24	CIRC
2A	M11	J11	1175.40	1174.35	130	.00808	1	30	30	CIRC
A4	C12	J11	1177.96	1174.60	6	.56000	1	24	24	CIRC
2B	J11	J10	1174.35	1173.51	105	.00800	1	30	30	CIRC
A3	C11	J10	1177.86	1173.76	3	1.36666	1	24	24	CIRC
2C	J10	M10	1173.51	1173.40	14	.00786	1	30	30	CIRC
A1	C10	M10	1177.96	1176.20	92	.01913	1	24	24	CIRC
A9	C16	M13	1178.07	1178.00	8	.00874	1	24	24	CIRC
11A	M13	J13	1178.00	1177.21	100	.00790	1	24	24	CIRC
A10	C17	J13	1178.33	1177.21	8	.14000	1	24	24	CIRC
11B	J13	M14	1177.21	1177.05	20	.00800	1	24	24	CIRC
A12	M14	M10	1177.00	1174.70	168	.01369	1	24	24	CIRC
A13	M10	M15	1169.03	1169.02	1	.01001	1	168	168	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. A8 IS 1.52											
A8	C15	M12	.012	.00	8.30	1182.98	1180.52	.00115	.41	6.8	23.8
6A	M12	J12	.012	.00	8.30	1180.46	1179.39	.00115	.38	4.6*	26.8
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. A7 IS 1.49											
A7	C14	J12	.012	.00	8.00	1180.01	1179.39	.00107	.34	4.4*	32.7
6B	J12	M11	.012	.00	16.30	1179.39	1177.02	.00442	.56	9.0	26.7
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. A5 IS 1.26											
A5	C13	M11	.012	.00	6.10	1178.93	1176.75	.00062	.29	4.8*	33.6
2A	M11	J11	.012	.00	22.40	1176.75	1175.80	.00254	.54	7.6*	39.9
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. A4 IS .79											
A4	C12	J11	.012	.00	2.60	1178.75	1175.80	.00011	.08	1.3*	183.4
2B	J11	J10	.012	.00	25.00	1175.80	1175.01	.00317	.58	8.1*	39.7
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. A3 IS .61											
A3	C11	J10	.012	.00	1.50	1178.47	1175.01	.00004	.05	.7*	286.5
2C	J10	M10	.012	.00	26.50	1175.01	1174.90	.00356	.60	8.6*	39.4
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. A1 IS 1.10											
A1	C10	M10	.012	.00	4.80	1179.06	1176.70	.00038	.25	7.8*	33.9
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. A9 IS .97											
A9	C16	M13	.012	.00	3.80	1179.04	1178.56	.00024	.28	5.3*	22.9
11A	M13	J13	.012	.00	3.80	1178.56	1177.97	.00024	.28	3.5*	21.8
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. A10 IS .85											
A10	C17	J13	.012	.00	3.00	1179.18	1177.97	.00015	.12	2.7*	91.7
11B	J13	M14	.012	.00	6.80	1177.97	1177.81	.00077	.38	6.2*	21.9
A12	M14	M10	.012	.00	6.80	1177.66	1175.36	.00077	.33	7.5*	28.7
A13	M10	M15	.012	.00	38.10	1174.70	1174.70	.00000	.07	.7*	4396.4

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
A8	C15	755
6A	M12	569
A7	C14	463
6B	J12	449
A5	C13	344
2A	M11	250
A4	C12	126
2B	J11	120
A3	C11	18
2C	J10	15
A1	C10	93
A9	C16	297
11A	M13	289
A10	C17	197
11B	J13	189
A12	M14	169
A13	M10	1

```
        Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12168)
$       Storm Sewer Hydraulic Grade Line Analysis for Red Mtn. Freeway
$       10-Year Hydrology using ADOT Methodology
$       SYSTEM "B" - Outfall to Lined Channel
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          M            MANHOLE
$          L            ELBOW
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels.
$
SEWER                ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --    ---- ---- ---- ---- ---- ---- ----- ---- ----    --        - -----
DA C 20                                                     24        6   2.9
DA C 21                                                                     1.0
DA C 22                                                                     0.9
$       Assumed starting water-surface elevation at the top of the
$       pipe which approximates the 100-year event off-site peak flow.
OUTLET    STATIONING       0  T.W. ELEV  1182.27   E 20
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
$*   ---  - -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN  B1  C 20 C 21 US1187.28 DS1186.17  150           .012        24 CIRC
      B2  C 21 C 22 US1186.17 DS1185.18   98           .012        24 CIRC
      B3  C 22 E 20 US1185.18 DS1182.27  256           .012        24 CIRC
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.                LOSS
$*   ---  - -- - --  ---- ---- ----     -----
ANAL  B1  C 20 C 21         24
ANAL  B2  C 21 C 22         24
ANAL  B3  C 22 E 20         24
ENDATA
```

SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
B1	C20	C21	.00	.00	.00	.00	.00	.00	.00	2.90
B2	C21	C22	.00	.00	.00	.00	.00	.00	.00	3.90
B3	C22	E20	.00	.00	.00	.00	.00	.00	.00	4.80

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
B1	C20	C21	1185.28	1184.17	150	.00740	1	24	24	CIRC
B2	C21	C22	1184.17	1183.18	98	.01010	1	24	24	CIRC
B3	C22	E20	1183.18	1180.27	256	.01137	1	24	24	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. B1 IS .83											
B1	C20	C21	.012	.00	2.90	1186.11	1184.71	.00014	.25	4.2*	21.1
B2	C21	C22	.012	.00	3.90	1184.71	1183.76	.00025	.27	5.2*	24.6
B3	C22	E20	.012	.00	4.80	1183.76	1182.27	.00038	.29	1.5**	26.1

SEW0069--**PIPE FLOWING FULL DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON FULL FLOW.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
B1	C20	504
B2	C21	354
B3	C22	256

```
        Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12168)
$       Storm Sewer Hydraulic Grade Line Analysis for Red Mtn. Freeway
$       10-Year Hydrology using ADOT Methodology
$       SYSTEM "C"
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          M            MANHOLE
$          L            ELBOW
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels.
$       This system collects the westbound mainline runoff and outfalls
$       to the off-site drainage channel.
$
$       Junction head losses calculated using ASCE No. 77 (1992).
$               hj = hv(outlet) - 0.25(hv(inlet))
$               hj = minor junction losses (ft)
$               hv = velocity head (ft)
$
$       Discharge added at MH 30 (8.2 cfs) to intercept estimated additional
$       roadway runoff from W-S and W-N Ramp.
$
SEWER                ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --   ---- ---- ---- ---- ---- ---- ----- ---- ----    --       - -----
   C 31                                                   24       6   4.0
   C 32                                                                1.4
DA M 30                                                                8.2
DA C 33                                                                6.2
$       Assumed starting water-surface elevation at the top of the pipe.
OUTLET    STATIONING       0  T.W. ELEV  1180.15   E 30
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
$*   ---  - -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN  1A  C 33 J 30 US1182.31 DS1181.41  165           .012        24 CIRC
DSGN  C3  C 32 J 30 US1181.67 DS1181.41    8           .012        24 CIRC
DSGN  2A  J 30 M 30 US1181.41 DS1180.95   85           .012        24 CIRC
DSGN  C2  M 30 C 31 US1180.95 DS1180.54   93           .012        24 CIRC
DSGN  C6  C 31 E 30 US1180.54 DS1180.15  128           .012        24 CIRC
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.               LOSS
$*   ---  - -- - --  ---- ---- ----     -----
ANAL  1A  C 33 J 30         24
ANAL  C3  C 32 J 30         24
ANAL  2A  J 30 M 30         24
ANAL  C2  M 30 C 31         24
ANAL  C6  C 31 E 30         24            .52
ENDATA
```

SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
1A	C33	J30	.00	.00	.00	.00	.00	.00	.00	6.20
C3	C32	J30	.00	.00	.00	.00	.00	.00	.00	1.40
2A	J30	M30	.00	.00	.00	.00	.00	.00	.00	7.60
C2	M30	C31	.00	.00	.00	.00	.00	.00	.00	15.80
C6	C31	E30	.00	.00	.00	.00	.00	.00	.00	19.80

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
1A	C33	J30	1180.31	1179.41	165	.00545	1	24	24	CIRC
C3	C32	J30	1179.67	1179.41	8	.03250	1	24	24	CIRC
2A	J30	M30	1179.41	1178.95	85	.00541	1	24	24	CIRC
C2	M30	C31	1178.95	1178.54	93	.00441	1	24	24	CIRC
C6	C31	E30	1178.54	1178.15	128	.00305	1	24	24	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
1A	C33	J30	.012	.00	6.20	1182.08	1181.97	.00064	.40	2.0**	18.1
C3	C32	J30	.012	.00	1.40	1181.97	1181.97	.00003	.12	.4**	44.2
2A	J30	M30	.012	.00	7.60	1181.97	1181.89	.00096	.45	2.4**	18.0
C2	M30	C31	.012	.00	15.80	1181.89	1181.51	.00416	.79	5.0**	16.3
C6	C31	E30	.012	.52	19.80	1181.51	1180.15	.00653	1.00	6.3	13.5***

SEW0069--**PIPE FLOWING FULL DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON FULL FLOW.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

0008--CAPACITY OF RUN C6 IS EXCEEDED.

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
1A	C33	471
C3	C32	314
2A	J30	306
C2	M30	221
C6	C31	128

```
        Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12168)
$       Storm Sewer Hydraulic Grade Line Analysis for Red Mtn. Freeway
$       10-Year Hydrology using ADOT Methodology
$       SYSTEM "D" Sta 400+50
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          M            MANHOLE
$          L            ELBOW
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels.
$
$       Through manhole losses calculated as (Pima Co.)
$               hm = 0.1(hv(outlet))
$               hm = minor manhole losses (ft)
$               hv = velocity head (ft)
$
$       Entrance losses calculated as (HY8)
$               hm = 0.5(hv(outlet))
$               hm = minor manhole losses (ft)
$               hv = velocity head (ft)
$
SEWER               ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --   ---- ---- ---- ---- ---- ---- ----- ---- ----    --       - -----
   E 39                                                   24       6  23.0
   C 42                                                                  6.0
$       Assumed starting water-surface elevation is the Salt River
$       Design Conditon 100-year WSE
OUTLET    STATIONING       0  T.W. ELEV  1183.00   E 40
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
$*   ---  - -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN  D1  E 39 M 39 US1178.50 DS1175.94  160           .012        24 CIRC
DSGN  D2  M 39 M 40 US1175.94 DS1175.06   68           .024        30 CIRC
DSGN  D3  C 42 M 40 US1196.54 DS1196.30    6           .024        24 CIRC
DSGN  D4  M 40 E 40 US1175.06 DS1173.80   97           .024        30 CIRC
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.                LOSS
$*   ---  - -- - --  ---- ---- ----     -----
ANAL  D1  E 39 M 39         24            .41
ANAL  D2  M 39 M 40         30            .03
ANAL  D3  C 42 M 40         24
ANAL  D4  M 40 E 40         30            .05
ENDATA
```

SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
D1	E39	M39	.00	.00	.00	.00	.00	.00	.00	23.00
D2	M39	M40	.00	.00	.00	.00	.00	.00	.00	23.00
D3	C42	M40	.00	.00	.00	.00	.00	.00	.00	6.00
D4	M40	E40	.00	.00	.00	.00	.00	.00	.00	29.00

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
D1	E39	M39	1176.50	1173.94	160	.01600	1	24	24	CIRC
D2	M39	M40	1173.44	1172.56	68	.01294	1	30	30	CIRC
D3	C42	M40	1194.54	1194.30	6	.04000	1	24	24	CIRC
D4	M40	E40	1172.56	1171.30	97	.01299	1	30	30	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
D1	E39	M39	.012	.41	23.00	1187.28	1185.46	.00881	.64	7.3**	31.0
D2	M39	M40	.024	.03	23.00	1185.46	1184.70	.01072	.75	4.7**	25.3
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. D3 IS 1.25											
D3	C42	M40	.024	.00	6.00	1195.79	1194.98	.00240	.34	6.4*	24.5
D4	M40	E40	.024	.05	29.00	1184.70	1183.00	.01704	1.00	5.9	25.3***

SEW0069--**PIPE FLOWING FULL DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON FULL FLOW.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

J0008--CAPACITY OF RUN D4 IS EXCEEDED.

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
D1	E39	325
D2	M39	165
D3	C42	103
D4	M40	97

```
        Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12168)
$       Storm Sewer Hydraulic Grade Line Analysis for Red Mtn. Freeway
$       10-Year Hydrology using ADOT Methodology
$       SYSTEM "E" Hurley Outfall
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          M            MANHOLE
$          L            ELBOW
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels.
$       Node labels less than 10 and pipe runs starting with A were
$       constructed with the Dobson Road Connection project.
$
$       Junction head losses calculated using ASCE No. 77 (1992).
$               hj = hv(outlet) - 0.25(hv(inlet))
$               hj = minor junction losses (ft)
$               hv = velocity head (ft)
$
$       Through manhole losses calculated as (Pima Co.)
$               hm = 0.1(hv(outlet))
$               hm = minor manhole losses (ft)
$               hv = velocity head (ft)
$
$       Entrance losses calculated as (HY8)
$               hm = 0.5(hv(outlet))
$               hm = minor manhole losses (ft)
                hv = velocity head (ft)
$
SEWER                ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --   ---- ---- ---- ---- ---- ---- ----- ---- ----    --       - -----
DA C 56                                                   24       6   2.2
DA C 55                                                                   0.5
DA C 54                                                                   5.3
DA C  2                                                                   4.3
DA C  3                                                                   1.4
DA E 50                                                                  66.0
DA C 43                                                                   4.7
$       Assumed starting water-surface elevation is the Salt River
$       Design Conditon 100-year WSE
OUTLET    STATIONING       0  T.W. ELEV  1183.60   E 53
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
$*   ---  - -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN  E6  C 56 M 53 US1215.86 DS1214.85    8           .012        24 CIRC
DSGN  E5  C 55 J 50 US1215.37 DS1214.13    8           .012        24 CIRC
DSGN  4A  M 53 J 50 US1214.85 DS1214.13   80           .012        24 CIRC
DSGN  4B  J 50 M 52 US1214.13 DS1213.00  125           .012        24 CIRC
DSGN  E3  M 52 M 51 US1213.00 DS1210.00  258           .012        24 CIRC
DSGN  E2  C 54 M 51 US1210.82 DS1210.00   80           .012        24 CIRC
DSGN  E1  M 51 M 50 US1210.00 DS1206.80  165           .012        24 CIRC
DSGN A4A  M 50 J  1 US1206.80 DS1206.29   45           .012        24 CIRC
DSGN  A5  C  2 J  1 US1207.17 DS1206.29    8           .012        24 CIRC
DSGN A4B  J  1 M  2 US1206.29 DS1204.34  174           .012        24 CIRC
DSGN  A6  C  3 M  2 US1205.51 DS1204.34    8           .012        24 CIRC
DSGN  A7  M  2 J  0 US1204.34 DS1183.74  136           .012        24 CIRC
DSGN  6A  E 50 M 64 US1185.26 DS1185.25   64           .012        48 CIRC
```

```
DSGN  6B  M 64 J  0 US1185.25 DS1184.74   68          .024        48 CIRC
DSGN  6C  J  0 M 41 US1184.74 DS1183.98  100          .024        48 CIRC
DSGN  D6  M 41 M 42 US1183.98 DS1179.00   68          .024        48 CIRC
DSGN  D7  C 43 M 42 US1205.27 DS1205.00   25          .024        24 CIRC
DSGN  D8  M 42 E 53 US1179.00 DS1172.44   64          .024        48 CIRC
  RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.               LOSS
$*   ---  - -- - --  ---- ---- ----     -----
ANAL  E6  C 56 M 53         24
ANAL  E5  C 55 J 50         24
ANAL  4A  M 53 J 50         24
ANAL  4B  J 50 M 52         24
ANAL  E3  M 52 M 51         24
ANAL  E2  C 54 M 51         24
ANAL  E1  M 51 M 50         24
ANAL A4A  M 50 J  1         24
ANAL  A5  C  2 J  1         24
ANAL A4B  J  1 M  2         24
ANAL  A6  C  3 M  2         24
ANAL  A7  M  2 J  0         24
ANAL  6A  E 50 M 64         48            .22
ANAL  6B  M 64 J 50         48            .04
ANAL  6C  J 50 M 41         48            .51
ANAL  D6  M 41 M 42         48            .06
ANAL  D7  C 43 M 42         24
ANAL  D8  M 42 E 53         48            .07
ENDATA
```

SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
E6	C56	M53	.00	.00	.00	.00	.00	.00	.00	2.20
E5	C55	J50	.00	.00	.00	.00	.00	.00	.00	.50
4A	M53	J50	.00	.00	.00	.00	.00	.00	.00	2.20
4B	J50	M52	.00	.00	.00	.00	.00	.00	.00	2.70
E3	M52	M51	.00	.00	.00	.00	.00	.00	.00	2.70
E2	C54	M51	.00	.00	.00	.00	.00	.00	.00	5.30
E1	M51	M50	.00	.00	.00	.00	.00	.00	.00	8.00
A4A	M50	J 1	.00	.00	.00	.00	.00	.00	.00	8.00
A5	C 2	J 1	.00	.00	.00	.00	.00	.00	.00	4.30
A4B	J 1	M 2	.00	.00	.00	.00	.00	.00	.00	12.30
A6	C 3	M 2	.00	.00	.00	.00	.00	.00	.00	1.40
A7	M 2	J 0	.00	.00	.00	.00	.00	.00	.00	13.70
6A	E50	M64	.00	.00	.00	.00	.00	.00	.00	66.00
6B	M64	J 0	.00	.00	.00	.00	.00	.00	.00	66.00
6C	J 0	M41	.00	.00	.00	.00	.00	.00	.00	79.70
D6	M41	M42	.00	.00	.00	.00	.00	.00	.00	79.70
D7	C43	M42	.00	.00	.00	.00	.00	.00	.00	4.70
D8	M42	E53	.00	.00	.00	.00	.00	.00	.00	84.40

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
E6	C56	M53	1213.86	1212.85	8	.12625	1	24	24	CIRC
E5	C55	J50	1213.37	1212.13	8	.15500	1	24	24	CIRC
4A	M53	J50	1212.85	1212.13	80	.00900	1	24	24	CIRC
4B	J50	M52	1212.13	1211.00	125	.00904	1	24	24	CIRC
E3	M52	M51	1211.00	1208.00	258	.01163	1	24	24	CIRC
E2	C54	M51	1208.82	1208.00	80	.01025	1	24	24	CIRC
E1	M51	M50	1208.00	1204.80	165	.01939	1	24	24	CIRC
A4A	M50	J 1	1204.80	1204.29	45	.01133	1	24	24	CIRC
A5	C 2	J 1	1205.17	1204.29	8	.11000	1	24	24	CIRC
A4B	J 1	M 2	1204.29	1202.34	174	.01121	1	24	24	CIRC
A6	C 3	M 2	1203.51	1202.34	8	.14626	1	24	24	CIRC
A7	M 2	J 0	1202.34	1181.74	136	.15147	1	24	24	CIRC
6A	E50	M64	1181.26	1181.25	64	.00016	1	48	48	CIRC
6B	M64	J 0	1181.25	1180.74	68	.00750	1	48	48	CIRC
6C	J 0	M41	1180.74	1179.98	100	.00760	1	48	48	CIRC
D6	M41	M42	1179.98	1175.00	68	.07324	1	48	48	CIRC
D7	C43	M42	1203.27	1203.00	25	.01080	1	24	24	CIRC
D8	M42	E53	1175.00	1168.44	64	.10250	1	48	48	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. E6 IS .73											
E6	C56	M53	.012	.00	2.20	1214.59	1213.27	.00008	.11	4.6*	87.1
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. E5 IS .43											
E5	C55	J50	.012	.00	.50	1213.80	1212.59	.00000	.05	.9*	96.5
4A	M53	J50	.012	.00	2.20	1213.27	1212.59	.00008	.21	4.0*	23.2
4B	J50	M52	.012	.00	2.70	1212.59	1211.46	.00012	.23	4.9	23.3
E3	M52	M51	.012	.00	2.70	1211.44	1208.66	.00012	.22	3.0*	26.4
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. E2 IS 1.16											
E2	C54	M51	.012	.00	5.30	1209.98	1208.66	.00047	.31	5.9*	24.8
E1	M51	M50	.012	.00	8.00	1208.66	1205.56	.00107	.33	7.3*	34.1
A4A	M50	J 1	.012	.00	8.00	1205.56	1205.25	.00107	.38	5.4*	26.1
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. A5 IS 1.03											
A5	C 2	J 1	.012	.00	4.30	1206.20	1205.25	.00031	.16	2.9*	81.3
A4B	J 1	M 2	.012	.00	12.30	1205.25	1203.30	.00252	.48	8.3	25.9
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. A6 IS .59											
A6	C 3	M 2	.012	.00	1.40	1204.10	1202.86	.00003	.09	2.2*	93.7
A7	M 2	J 0	.012	.00	13.70	1202.86	1186.76	.00313	.26	4.4**	95.4
6A	E50	M64	.012	.22	66.00	1187.62	1187.29	.00180	1.00	5.3	19.5***
6B	M64	J 0	.024	.04	66.00	1187.29	1186.76	.00720	.80	5.3**	67.4
6C	J 0	M41	.024	.51	79.70	1186.76	1185.20	.01049	1.00	6.3	67.8***
D6	M41	M42	.024	.06	79.70	1185.20	1184.42	.01049	.43	6.3**	210.6
D7	C43	M42	.024	.00	4.70	1204.11	1203.84	.00147	.42	3.8	12.7
D8	M42	E53	.024	.07	84.40	1184.42	1183.60	.01177	.40	6.7**	249.1

SEW0069--**PIPE FLOWING FULL DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON FULL FLOW.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS
BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

,0008--CAPACITY OF RUN 6A IS EXCEEDED.
SEW0008--CAPACITY OF RUN 6C IS EXCEEDED.

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
E6	C56	1223
E5	C55	1143
4A	M53	1215
4B	J50	1135
E3	M52	1010
E2	C54	832
E1	M51	752
A4A	M50	587
A5	C 2	550
A4B	J 1	542
A6	C 3	376
A7	M 2	368
6A	E50	364
6B	M64	300
6C	J 0	232
D6	M41	132
D7	C43	89
D8	M42	64

```
        Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12168)
$       Storm Sewer Hydraulic Grade Line Analysis for Red Mtn. Freeway
$       10-Year Hydrology using ADOT Methodology
$       SYSTEM "G" - Dobson Road
$
$       Analysis revised to avoid conflict with the C.O.M. utilities
$       parallel to run F2 (4-10-95).  F2 changed to FA and FB pipe runs.
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          M            MANHOLE
$          L            ELBOW
$          J            JUNCTION
$
$       Run ID's correspond to the construction plan pipe run labels.
$       The main trunkline "G" is subdivided from upstream to downstream
$       between tees and structures using an alpha character.
$
$       Junction head losses calculated using ASCE No. 77 (1992).
$               hj = hv(outlet) - 0.25(hv(inlet))
$               hj = minor junction losses (ft)
$               hv = velocity head (ft)
$
$       Bend head losses calculated using ASCE No. 77 (1992).
$               hb = 0.20(hv(outlet))
$               hb = minor bend losses (ft)
$               hv = velocity head (ft)

        Through manhole losses calculated as (Pima Co.)
$               hm = 0.1(hv(outlet))
$               hm = minor manhole losses (ft)
$               hv = velocity head (ft)
$
SEWER               ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --   ---- ---- ---- ---- ---- ---- ----- ---- ----    --        - -----
DA M 63                                                   24        6  25.0
DA C 60                                                                  0.9
DA C 61                                                                  2.0
DA C 62                                                                  2.7
DA C 63                                                                  5.8
DA C 64                                                                  2.0
DA C 65                                                                  1.8
DA C 66                                                                  2.0
DA C 67                                                                  1.3
DA C 68                                                                  5.6
DA C 69                                                                  3.0
DA C 70                                                                  3.5
DA C 71                                                                  2.6
DA C 72                                                                  3.6
DA C 73                                                                  4.9
$       Assumed starting water-surface elevation is the Salt River
$       Design Conditon 100-year WSE at XSEC 225.38
OUTLET    STATIONING       0  T.W. ELEV  1185.10   E 60
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
          L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
     ---  - -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN G1A  M 63 J 60 US1183.86 DS1183.64  109           .012        36 CIRC
DSGN  F1  C 60 J 60 US1195.74 DS1183.14   40           .012        24 CIRC
```

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DSGN G1B  J 60 J 61 US1183.64 DS1183.57   36          .012        36 CIRC
DSGN  FA  C 65 L 61 US1194.40 DS1188.55   43          .012        24 CIRC
DSGN  FB  L 61 J 61 US1188.55 DS1183.07   41          .012        24 CIRC
DSGN G1C  J 61 M 62 US1183.57 DS1183.45   61          .012        36 CIRC
  GN  F3  C 61 M 60 US1197.34 DS1193.00  295          .012        24 CIRC
  GN  F4  C 62 M 60 US1193.50 DS1193.00    8          .012        24 CIRC
DSGN  F5  M 60 M 62 US1193.00 DS1183.45  136          .012        24 CIRC
DSGN  F6  C 64 M 62 US1190.25 DS1183.45  129          .012        24 CIRC
DSGN G2A  M 62 J 62 US1183.45 DS1183.31   85          .012        48 CIRC
DSGN F7A  C 63 P 63 US1190.10 DS1190.00    7          .012        24 CIRC
DSGN F7B  P 63 J 62 US1190.00 DS1182.31   58          .012        24 CIRC
DSGN G2B  J 62 M 61 US1183.31 DS1183.22   54          .012        48 CIRC
DSGN  F8  C 66 C 67 US1193.30 DS1192.48   50          .012        24 CIRC
DSGN  F9  C 67 C 68 US1192.48 DS1189.00   34          .012        24 CIRC
DSGN F10  C 68 M 61 US1189.00 DS1183.22  110          .012        24 CIRC
DSGN G2C  M 61 J 64 US1183.22 DS1182.76  271          .012        48 CIRC
DSGN F11  C 69 C 70 US1190.99 DS1187.00   54          .012        24 CIRC
DSGN F12  C 70 J 64 US1187.00 DS1181.76   66          .012        24 CIRC
DSGN G2D  J 64 M 64 US1182.76 DS1182.64   73          .012        48 CIRC
DSGN F13  C 71 C 73 US1214.16 DS1188.00  161          .012        24 CIRC
DSGN F14  C 72 C 73 US1189.31 DS1188.00  183          .012        24 CIRC
DSGN F15  C 73 M 64 US1188.00 DS1182.64  100          .012        24 CIRC
DSGN G2E  M 64 L 60 US1182.64 DS1182.59   27          .012        48 CIRC
DSGN G2F  L 60 J 65 US1182.59 DS1182.50   54          .012        48 CIRC
DSGN  G3  J 65 E 60 US1182.50 DS1182.45   30          .012        48 CIRC
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.                LOSS
$*   ---  - -- - --  ---- ---- ----     -----
ANAL G1A  M 63 J 60         36
ANAL  F1  C 60 J 60         24
ANAL G1B  J 60 J 61         36            .17
ANAL  FA  C 65 L 61         24
ANAL  FB  L 61 J 61         24
   L G1C  J 61 M 62         36            .18
 . AL  F3  C 61 M 60         24
ANAL  F4  C 62 M 60         24
ANAL  F5  M 60 M 62         24
ANAL  F6  C 64 M 62         24
ANAL G2A  M 62 J 62         48            .05
ANAL F7A  C 63 P 63         24
ANAL F7B  P 63 J 62         24
ANAL G2B  J 62 M 61         48            .13
ANAL  F8  C 66 C 67         24
ANAL  F9  C 67 C 68         24
ANAL F10  C 68 M 61         24
ANAL G2C  M 61 J 64         48            .20
ANAL F11  C 69 C 70         24
ANAL F12  C 70 J 64         24
ANAL G2D  J 64 M 64         48            .24
ANAL F13  C 71 C 73         24
ANAL F14  C 72 C 73         24
ANAL F15  C 73 M 64         24
ANAL G2E  M 64 L 60         48            .36
ANAL G2F  L 60 J 65         48            .09
ANAL  G3  J 65 E 60         48
ENDATA
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SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
G1A	M63	J60	.00	.00	.00	.00	.00	.00	.00	25.00
F1	C60	J60	.00	.00	.00	.00	.00	.00	.00	.90
G1B	J60	J61	.00	.00	.00	.00	.00	.00	.00	25.90
FA	C65	L61	.00	.00	.00	.00	.00	.00	.00	1.80
FB	L61	J61	.00	.00	.00	.00	.00	.00	.00	1.80
G1C	J61	M62	.00	.00	.00	.00	.00	.00	.00	27.70
F3	C61	M60	.00	.00	.00	.00	.00	.00	.00	2.00
F4	C62	M60	.00	.00	.00	.00	.00	.00	.00	2.70
F5	M60	M62	.00	.00	.00	.00	.00	.00	.00	4.70
F6	C64	M62	.00	.00	.00	.00	.00	.00	.00	2.00
G2A	M62	J62	.00	.00	.00	.00	.00	.00	.00	34.40
F7A	C63	P63	.00	.00	.00	.00	.00	.00	.00	5.80
F7B	P63	J62	.00	.00	.00	.00	.00	.00	.00	5.80
G2B	J62	M61	.00	.00	.00	.00	.00	.00	.00	40.20
F8	C66	C67	.00	.00	.00	.00	.00	.00	.00	2.00
F9	C67	C68	.00	.00	.00	.00	.00	.00	.00	3.30
F10	C68	M61	.00	.00	.00	.00	.00	.00	.00	8.90
G2C	M61	J64	.00	.00	.00	.00	.00	.00	.00	49.10
F11	C69	C70	.00	.00	.00	.00	.00	.00	.00	3.00
F12	C70	J64	.00	.00	.00	.00	.00	.00	.00	6.50
G2D	J64	M64	.00	.00	.00	.00	.00	.00	.00	55.60
F13	C71	C73	.00	.00	.00	.00	.00	.00	.00	2.60
F14	C72	C73	.00	.00	.00	.00	.00	.00	.00	3.60
F15	C73	M64	.00	.00	.00	.00	.00	.00	.00	11.10
G2E	M64	L60	.00	.00	.00	.00	.00	.00	.00	66.70
G2F	L60	J65	.00	.00	.00	.00	.00	.00	.00	66.70
G3	J65	E60	.00	.00	.00	.00	.00	.00	.00	66.70

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
G1A	M63	J60	1180.86	1180.64	109	.00202	1	36	36	CIRC
F1	C60	J60	1193.74	1181.14	40	.31500	1	24	24	CIRC
G1B	J60	J61	1180.64	1180.57	36	.00195	1	36	36	CIRC
FA	C65	L61	1192.40	1186.55	43	.13605	1	24	24	CIRC
FB	L61	J61	1186.55	1181.07	41	.13366	1	24	24	CIRC
G1C	J61	M62	1180.57	1180.45	61	.00197	1	36	36	CIRC
F3	C61	M60	1195.34	1191.00	295	.01471	1	24	24	CIRC
F4	C62	M60	1191.50	1191.00	8	.06250	1	24	24	CIRC
F5	M60	M62	1191.00	1181.45	136	.07022	1	24	24	CIRC
F6	C64	M62	1188.25	1181.45	129	.05271	1	24	24	CIRC
G2A	M62	J62	1179.45	1179.31	85	.00165	1	48	48	CIRC
F7A	C63	P63	1188.10	1188.00	7	.01428	1	24	24	CIRC
F7B	P63	J62	1188.00	1180.31	58	.13259	1	24	24	CIRC
G2B	J62	M61	1179.31	1179.22	54	.00167	1	48	48	CIRC
F8	C66	C67	1191.30	1190.48	50	.01640	1	24	24	CIRC
F9	C67	C68	1190.48	1187.00	34	.10235	1	24	24	CIRC
F10	C68	M61	1187.00	1181.22	110	.05255	1	24	24	CIRC
G2C	M61	J64	1179.22	1178.76	271	.00170	1	48	48	CIRC
F11	C69	C70	1188.99	1185.00	54	.07389	1	24	24	CIRC
F12	C70	J64	1185.00	1179.76	66	.07939	1	24	24	CIRC
G2D	J64	M64	1178.76	1178.64	73	.00164	1	48	48	CIRC
F13	C71	C73	1212.16	1186.00	161	.16248	1	24	24	CIRC
F14	C72	C73	1187.31	1186.00	183	.00716	1	24	24	CIRC
F15	C73	M64	1186.00	1180.64	100	.05360	1	24	24	CIRC
G2E	M64	L60	1178.64	1178.59	27	.00185	1	48	48	CIRC
G2F	L60	J65	1178.59	1178.50	54	.00167	1	48	48	CIRC
G3	J65	E60	1178.50	1178.45	30	.00167	1	48	48	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
G1A	M63	J60	.012	.00	25.00	1187.43	1187.30	.00120	.66	3.5**	32.5
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. F1 IS .50											
F1	C60	J60	.012	.00	.90	1194.24	1187.30	.00001	.06	.3**	137.5
G1B	J60	J61	.012	.17	25.90	1187.30	1187.08	.00128	.68	3.7**	31.9
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. FA IS .66											
FA	C65	L61	.012	.00	1.80	1193.06	1187.09	.00005	.10	2.7*	90.4
FB	L61	J61	.012	.00	1.80	1187.09	1187.08	.00005	.10	.6**	89.6
G1C	J61	M62	.012	.18	27.70	1187.08	1186.81	.00147	.72	3.9**	32.0
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. F3 IS .69											
F3	C61	M60	.012	.00	2.00	1196.03	1191.36	.00007	.18	5.2	29.7
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. F4 IS .80											
F4	C62	M60	.012	.00	2.70	1192.30	1191.36	.00012	.14	7.0*	61.3
F5	M60	M62	.012	.00	4.70	1191.36	1186.81	.00037	.18	1.5**	64.9
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. F6 IS .69											
F6	C64	M62	.012	.00	2.00	1188.94	1186.81	.00007	.13	.6**	56.3
G2A	M62	J62	.012	.05	34.40	1186.81	1186.72	.00049	.53	2.7**	63.1
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. F7A IS 1.23											
F7A	C63	P63	.012	.00	5.80	1189.33	1188.60	.00056	.30	7.3	29.3
F7B	P63	J62	.012	.00	5.80	1188.34	1186.72	.00056	.17	1.8**	89.2
G2B	J62	M61	.012	.13	40.20	1186.72	1186.56	.00067	.58	3.2**	63.6
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. F8 IS .69											
F8	C66	C67	.012	.00	2.00	1191.99	1190.82	.00007	.17	5.6	31.4
F9	C67	C68	.012	.00	3.30	1190.76	1187.54	.00018	.14	4.8*	78.4
F10	C68	M61	.012	.00	8.90	1187.54	1186.56	.00132	.27	2.8**	56.2
G2C	M61	J64	.012	.20	49.10	1186.56	1186.09	.00100	.66	3.9**	64.1
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. F11 IS .85											
F11	C69	C70	.012	.00	3.00	1189.84	1186.13	.00015	.14	1.6*	66.6
F12	C70	J64	.012	.00	6.50	1186.13	1186.09	.00070	.21	2.1**	69.1
G2D	J64	M64	.012	.24	55.60	1186.09	1185.75	.00128	.73	4.4**	63.1
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. F13 IS .79											
F13	C71	C73	.012	.00	2.60	1212.95	1186.60	.00011	.11	3.3*	98.8
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. F14 IS .94											
F14	C72	C73	.012	.00	3.60	1188.25	1186.60	.00022	.28	4.5*	20.7
F15	C73	M64	.012	.00	11.10	1186.60	1185.75	.00205	.30	3.5**	56.7
G2E	M64	L60	.012	.36	66.70	1185.75	1185.34	.00184	.82	5.3**	67.0
G2F	L60	J65	.012	.09	66.70	1185.34	1185.16	.00184	1.00	5.3	63.5***
G3	J65	E60	.012	.00	66.70	1185.16	1185.10	.00184	1.00	5.3	63.6***

SEW0069--**PIPE FLOWING FULL DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON FULL FLOW.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS
BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

```
  W0008--CAPACITY OF RUN G2F IS EXCEEDED.
SEW0008--CAPACITY OF RUN  G3 IS EXCEEDED.
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STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
G1A	M63	800
F1	C60	731
G1B	J60	691
FA	C65	739
FB	L61	696
G1C	J61	655
F3	C61	1025
F4	C62	738
F5	M60	730
F6	C64	723
G2A	M62	594
F7A	C63	574
F7B	P63	567
G2B	J62	509
F8	C66	649
F9	C67	599
F10	C68	565
G2C	M61	455
F11	C69	304
F12	C70	250
G2D	J64	184
F13	C71	372
F14	C72	394
F15	C73	211
G2E	M64	111
G2F	L60	84
G3	J65	30

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        Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12168)
$       Storm Sewer Hydraulic Grade Line Analysis for Red Mtn. Freeway
$       10-Year Hydrology using ADOT Methodology
$       SYSTEM "H"
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          M            MANHOLE
$          L            ELBOW
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels.
$       This system collects the eastbound and westbound mainline runoff
$       and outfalls to the off-site channel using a modified downdrain.
$
SEWER                ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --   ---- ---- ---- ---- ---- ---- ----- ---- ----    --       - -----
DA C 80                                                   24       6   5.4
DA C 81                                                                   1.3
DA C 82                                                                   0.7
DA C 83                                                                   1.4
DA C 84                                                                   8.8
DA C 85                                                                   0.9
$       Assumed starting water-surface elevation is the Salt River
$       Design Conditon 100-year WSE
  TLET    STATIONING       0  T.W. ELEV  1187.30   E 81
  RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
$*   ---  - -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN  H1  C 80 M 80 US1204.33 DS1203.20    8           .012        24 CIRC
DSGN  H2  M 80 M 81 US1203.20 DS1200.60  185           .012        24 CIRC
DSGN  H3  C 81 C 82 US1202.92 DS1202.78    7           .012        24 CIRC
DSGN  H4  C 82 C 83 US1202.78 DS1201.43   73           .012        24 CIRC
DSGN  H5  C 83 M 81 US1201.43 DS1200.60    8           .012        24 CIRC
DSGN  H6  M 81 C 84 US1200.60 DS1199.65  107           .012        24 CIRC
DSGN  H7  C 84 C 85 US1199.65 DS1197.47  117           .012        24 CIRC
DSGN  H8  C 85 E 81 US1197.47 DS1183.23   93           .012        24 CIRC
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.               LOSS
$*   ---  - -- - --  ---- ---- ----     -----
ANAL  H1  C 80 M 80         24
ANAL  H2  M 80 M 81         24
ANAL  H3  C 81 C 82         24
ANAL  H4  C 82 C 83         24
ANAL  H5  C 83 M 81         24
ANAL  H6  M 81 C 84         24
ANAL  H7  C 84 C 85         24
ANAL  H8  C 85 E 81         24
ENDATA
```

SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
H1	C80	M80	.00	.00	.00	.00	.00	.00	.00	5.40
H2	M80	M81	.00	.00	.00	.00	.00	.00	.00	5.40
H3	C81	C82	.00	.00	.00	.00	.00	.00	.00	1.30
H4	C82	C83	.00	.00	.00	.00	.00	.00	.00	2.00
H5	C83	M81	.00	.00	.00	.00	.00	.00	.00	3.40
H6	M81	C84	.00	.00	.00	.00	.00	.00	.00	8.80
H7	C84	C85	.00	.00	.00	.00	.00	.00	.00	17.60
H8	C85	E81	.00	.00	.00	.00	.00	.00	.00	18.50

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
H1	C80	M80	1202.33	1201.20	8	.14125	1	24	24	CIRC
H2	M80	M81	1201.20	1198.60	185	.01405	1	24	24	CIRC
H3	C81	C82	1200.92	1200.78	7	.02000	1	24	24	CIRC
H4	C82	C83	1200.78	1199.43	73	.01849	1	24	24	CIRC
H5	C83	M81	1199.43	1198.60	8	.10376	1	24	24	CIRC
H6	M81	C84	1198.60	1197.65	107	.00888	1	24	24	CIRC
H7	C84	C85	1197.65	1195.47	117	.01863	1	24	24	CIRC
H8	C85	E81	1195.47	1181.23	93	.15312	1	24	24	CIRC

HYDRAULIC DATA

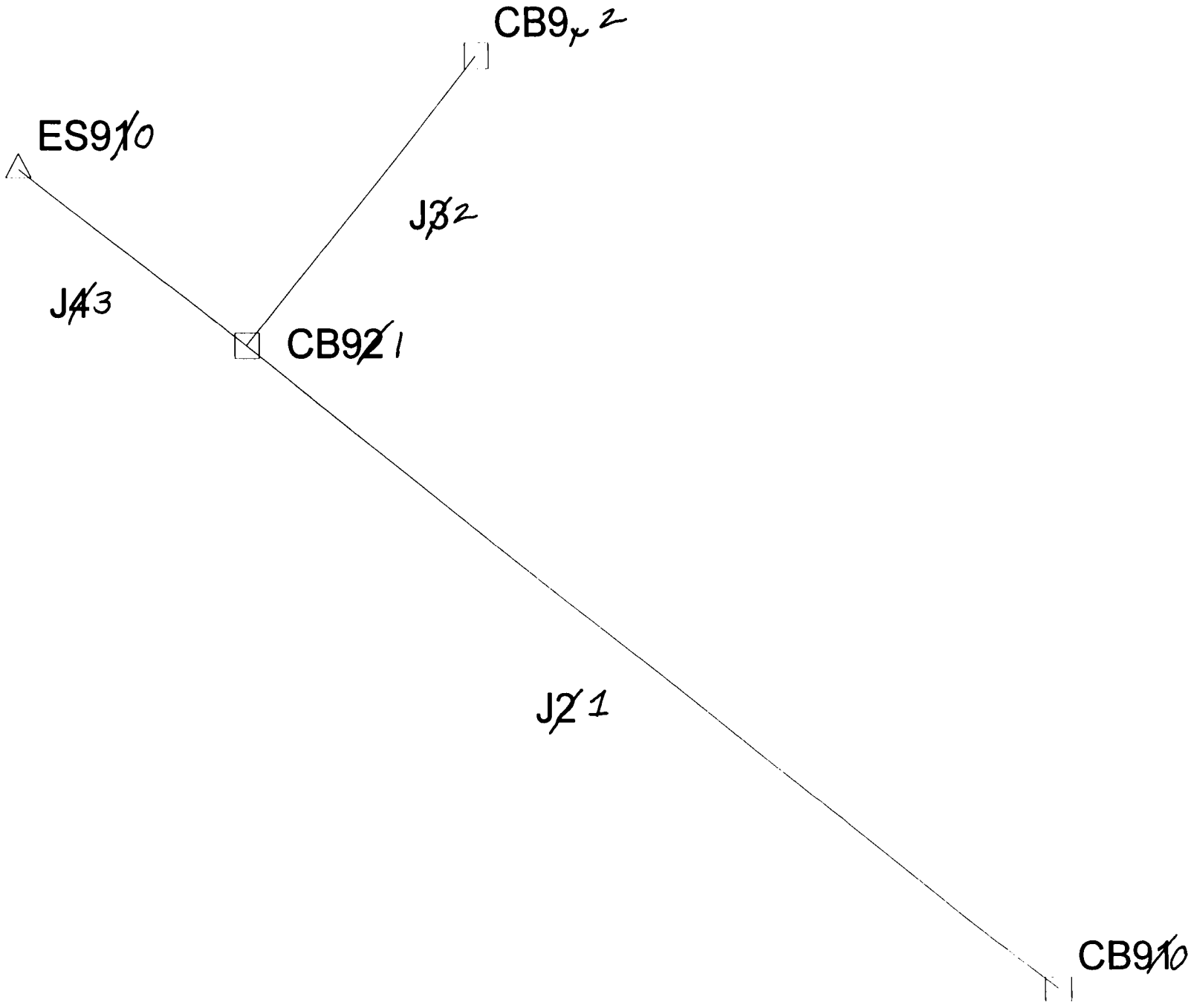
RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. H1 IS 1.18											
H1	C80	M80	.012	.00	5.40	1203.51	1201.78	.00049	.16	7.1*	92.1
H2	M80	M81	.012	.00	5.40	1201.78	1199.46	.00049	.29	4.2*	29.1
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. H3 IS .58											
H3	C81	C82	.012	.00	1.30	1201.50	1201.12	.00003	.13	3.7*	34.7
H4	C82	C83	.012	.00	2.00	1201.12	1199.77	.00007	.17	5.6	33.3
H5	C83	M81	.012	.00	3.40	1199.71	1199.46	.00019	.14	2.6*	78.9
H6	M81	C84	.012	.00	8.80	1199.46	1198.69	.00129	.43	5.3*	23.1
H7	C84	C85	.012	.00	17.60	1198.69	1196.51	.00516	.52	10.7*	33.5
H8	C85	E81	.012	.00	18.50	1196.07	1187.30	.00570	.30	5.9**	95.9

SEW0069--**PIPE FLOWING FULL DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON FULL FLOW.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
H1	C80	510
H2	M80	502
H3	C81	405
H4	C82	398
H5	C83	325
H6	M81	317
H7	C84	210
H8	C85	93



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Project Engineer: JRM
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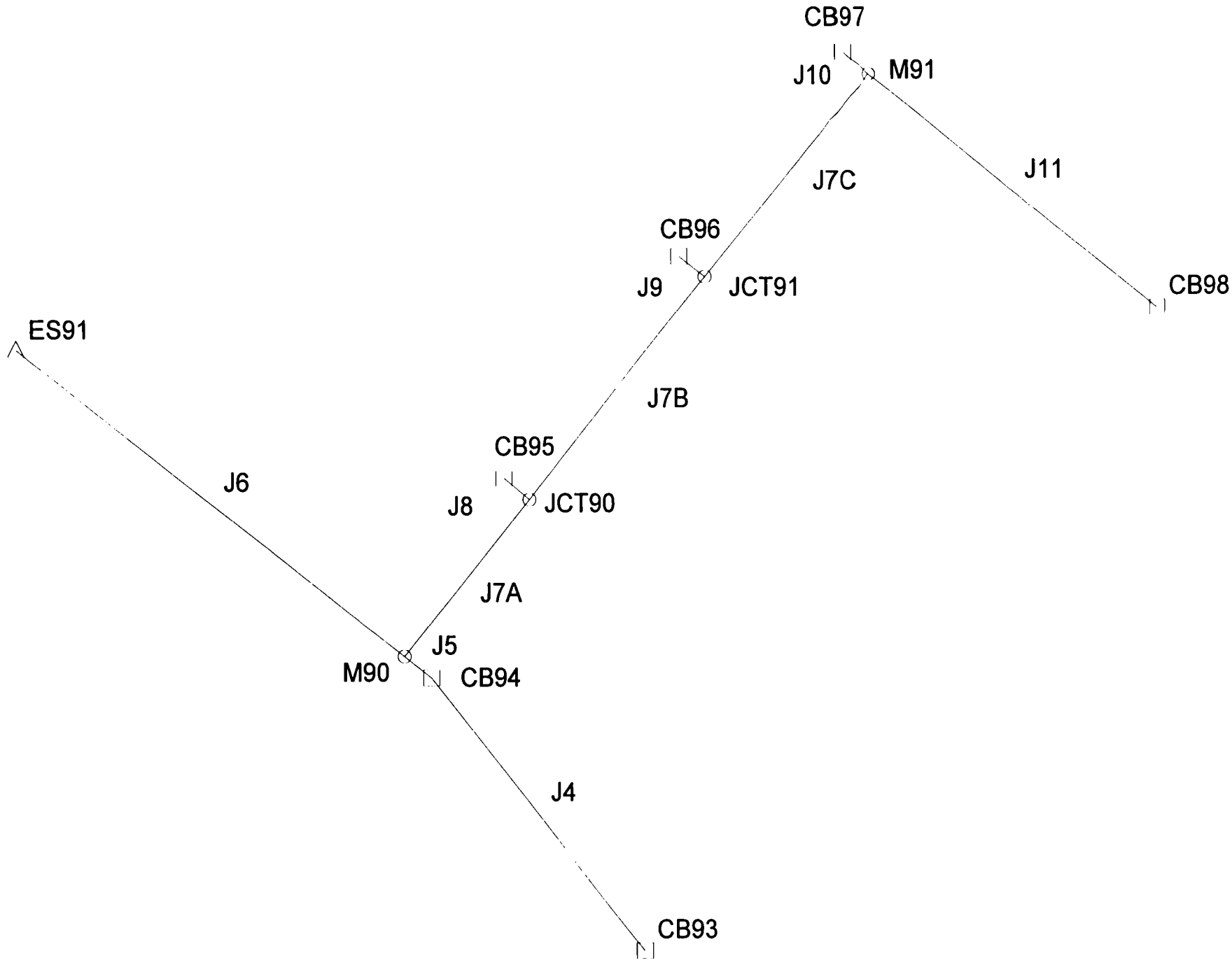
Page 1 of 1

A' T

Pipe	-Node- Up Dn	C	Inlet A (acres)	TC (min)	Inlet Q (cfs)	Tot CA (acres)	Sys Flow Time (min)	Q (cfs)	-Ground- Up Dn (ft)	-Crown- Up Dn (ft)	-Invert- Up Dn (ft)	-Cover- Up Dn (ft)	-HGL- Up Dn (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	V avg (ft/s)
J12	CB912	0.95	0.40	10.00	1.63	0.38	10.00	1.63	1,193.15	1,190.15	1,188.15	3.00	1,188.84	0.000145	1.63	Circular	59.97	1.11
	CB911								1,192.89	1,188.89	1,186.89	4.00	1,188.87	0.021009	35.52	24 inch		
J11	CB910	0.95	2.12	10.00	8.63	2.01	10.00	9.08	1,192.89	1,189.89	1,187.89	3.00	1,188.97	0.002369	9.08	Circular	167.01	4.08
	CB911								1,192.89	1,188.89	1,186.89	4.00	1,188.87	0.005988	18.96	24 inch		
J13	CB911	0.95	1.92	10.00	7.82	4.22	10.90	17.98	1,192.89	1,188.89	1,186.89	4.00	1,188.42	0.020781	17.98	Circular	46.50	6.35
	ES910								1,186.00	1,186.00	1,184.00	0.00	1,187.70	0.062148	61.09	24 inch		



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Pipe	-Node- Up Dn	C	Inlet A (acres)	TC (min)	Inlet Q (cfs)	Tot CA (acres)	Sys Flow Time (min)	Q (cfs)	-Ground- Up Dn (ft)	-Crown- Up Dn (ft)	-Invert- Up Dn (ft)	-Cover- Up Dn (ft)	-HGL- Up Dn (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	V avg (ft/s)
J4	CB93	0.00	0.00	0.00	0.00	0.30	10.00	2.57	1,193.15	1,190.15	1,188.15	3.00	1,188.71	0.006986	2.57	Circular	85.86	2.50
	CB94								1,193.15	1,189.15	1,187.15	4.00	1,188.28	0.011647	26.45	24 inch		
J5	CB94	0.00	0.00	0.00	0.00	0.80	10.57	5.47	1,193.15	1,189.15	1,187.15	4.00	1,188.28	0.000603	5.47	Circular	8.50	2.37
	M90								1,193.99	1,188.00	1,186.00	5.99	1,188.36	0.135294	90.14	24 inch		
J8	CB95	0.88	0.16	10.00	0.61	0.14	10.00	0.61	1,194.26	1,191.26	1,189.26	3.00	1,189.53	0.083251	0.61	Circular	8.00	1.31
	JCT90								1,194.40	1,188.81	1,186.81	5.59	1,188.95	0.306250	135.62	24 inch		
J9	CB96	0.88	0.15	10.00	0.56	0.13	10.00	0.61	1,194.60	1,191.60	1,189.60	3.00	1,189.88	0.000299	0.61	Circular	8.00	1.22
	JCT91								1,194.80	1,189.95	1,187.95	4.85	1,189.96	0.206250	111.29	24 inch		
J10	CB97	0.88	1.13	10.00	4.24	0.99	10.00	4.24	1,195.09	1,192.09	1,190.09	3.00	1,190.81	0.064147	4.24	Circular	8.00	2.90
	M91								1,195.68	1,191.00	1,189.00	4.68	1,190.52	0.136250	90.46	24 inch		
J11	CB98	0.95	3.39	10.00	13.81	3.22	10.00	13.81	1,194.46	1,191.46	1,189.46	3.00	1,190.81	0.004555	13.81	Circular	92.00	5.75
	M91								1,195.68	1,191.00	1,189.00	4.68	1,190.52	0.005000	17.33	24 inch		
J7C	M91	N/A	N/A	N/A	N/A	4.21	10.27	17.88	1,195.68	1,191.00	1,189.00	4.68	1,190.52	0.012512	17.88	Circular	65.09	6.33
	JCT91								1,194.80	1,189.95	1,187.95	4.85	1,189.96	0.016131	31.13	24 inch		
J7B	JCT91	N/A	N/A	N/A	N/A	4.34	10.44	18.38	1,194.80	1,189.95	1,187.95	4.85	1,189.49	0.011186	18.38	Circular	70.05	6.46
	JCT90								1,194.40	1,188.81	1,186.81	5.59	1,188.95	0.016274	31.26	24 inch		
J7A	JCT90	N/A	N/A	N/A	N/A	4.48	10.62	18.87	1,194.40	1,188.81	1,186.81	5.59	1,188.56	0.005761	18.87	Circular	50.01	6.23
	M90								1,193.99	1,188.00	1,186.00	5.99	1,188.36	0.016198	31.19	24 inch		
J6	M90	N/A	N/A	N/A	N/A	5.28	10.75	24.23	1,193.99	1,188.00	1,185.50	5.99	1,188.06	0.002975	24.23	Circular	121.50	4.94
	ES91								1,185.50	1,185.50	1,183.00	0.00	1,187.70	0.020576	63.74	30 inch		

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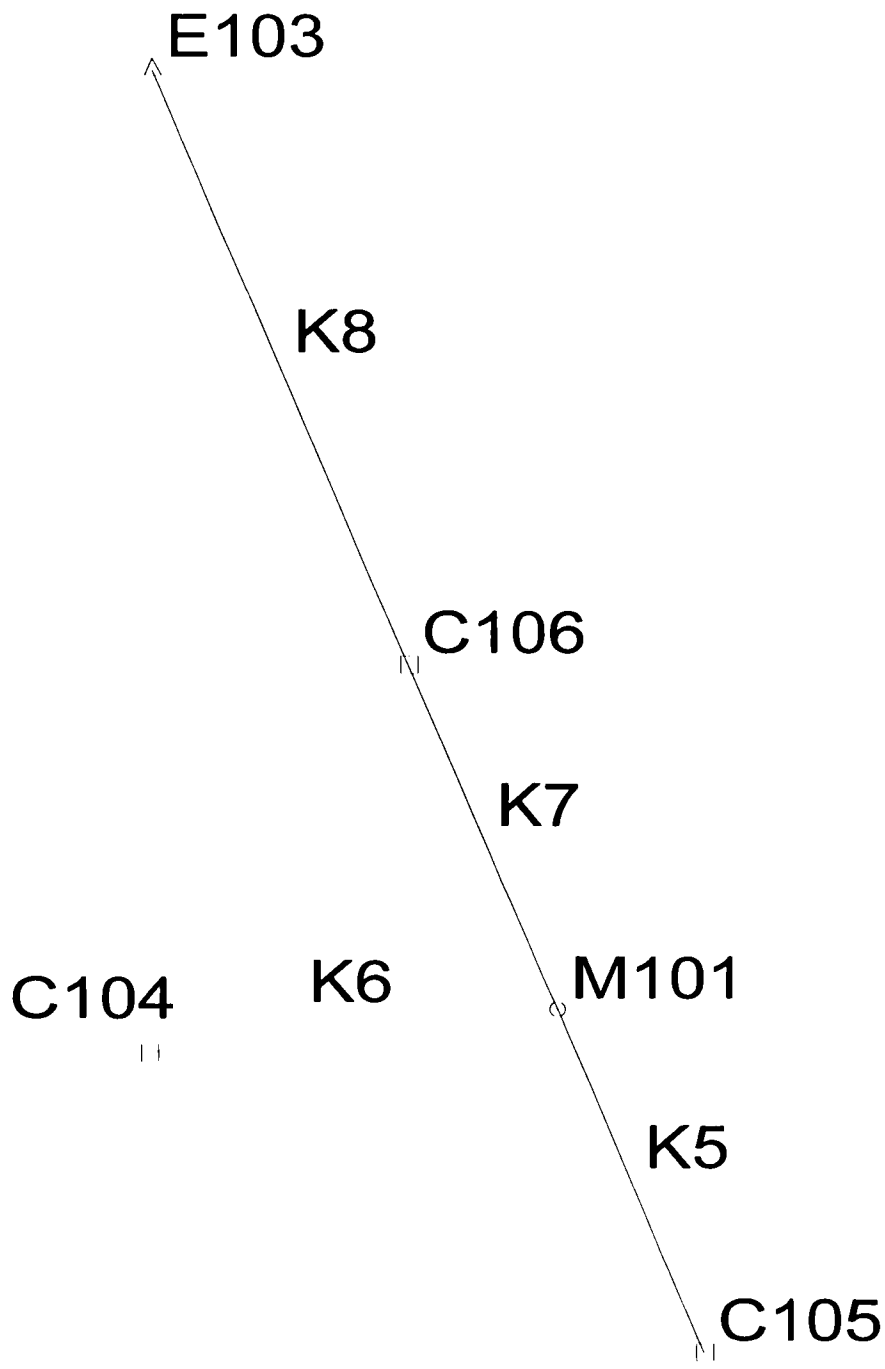
A' Γ

Pipe	-Node- Up Dn	C	Inlet A (acres)	TC (min)	Inlet Q (cfs)	Tot CA (acres)	Sys Flow Time (min)	Q (cfs)	-Ground- Up Dn (ft)	-Crown- Up Dn (ft)	-Invert- Up Dn (ft)	-Cover- Up Dn (ft)	-HGL- Up Dn (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	V avg (ft/s)
J12	CB99	0.88	2.04	10.00	7.65	1.78	10.00	7.65	1,203.08	1,200.08	1,198.08	3.00	1,199.06	0.098289	7.65	Circular	113.50	3.70
	ES92								1,188.00	1,188.00	1,186.00	0.00	1,188.20	0.106432	79.95	24 inch		

Pipe	-Node- Up Dn	C	Inlet A (acres)	TC (min)	Inlet Q (cfs)	Tot CA (acres)	Sys Flow Time (min)	Q (cfs)	-Ground- Up Dn (ft)	-Crown- Up Dn (ft)	-Invert- Up Dn (ft)	-Cover- Up Dn (ft)	-HGL- Up Dn (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	V avg (ft/s)
J13	CB100	0.88	2.12	10.00	8.04	1.88	10.00	8.04	1,218.76	1,215.76	1,213.76	3.00	1,214.77	0.134960	8.04	Circular	183.50	3.81
	ES93								1,189.00	1,189.00	1,187.00	0.00	1,190.30	0.145831	93.58	24 inch		



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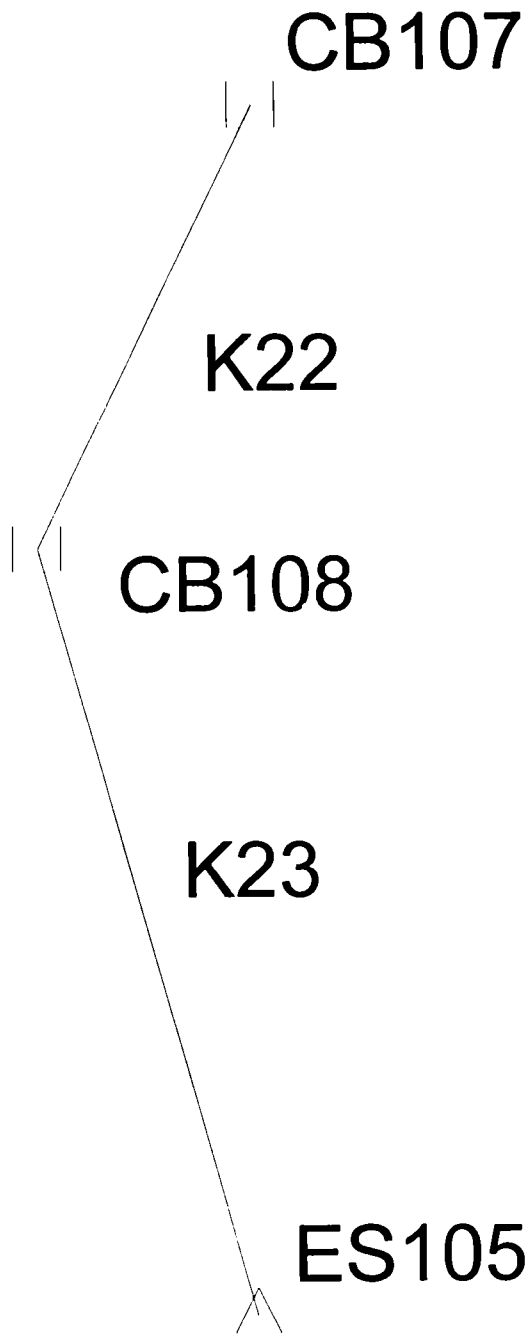
Pipe	-Node- Up Dn	C	Inlet A (acres)	TC (min)	Inlet Q (cfs)	Tot CA (acres)	Sys Flow Time (min)	Q (cfs)	-Ground- Up Dn (ft)	-Crown- Up Dn (ft)	-Invert- Up Dn (ft)	-Cover- Up Dn (ft)	-HGL- Up Dn (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	V avg (ft/s)
K6	C104	0.00	0.00	0.00	0.00	0.00	10.00	1.99	1,230.60	1,226.60	1,224.60	4.00	1,225.09	0.006338	1.99	Circular	91.69	3.69
	M101								1,230.92	1,226.00	1,224.00	4.92	1,224.43	0.006544	19.82	24 inch		
K5	C105	0.00	0.00	0.00	0.00	0.00	10.00	0.19	1,231.18	1,228.18	1,226.18	3.00	1,226.33	0.008124	0.19	Circular	83.09	1.98
	M101								1,230.92	1,227.50	1,225.50	3.42	1,225.63	0.008184	22.17	24 inch		
K7	M101	N/A	N/A	N/A	N/A	0.00	10.70	2.18	1,230.92	1,214.00	1,212.00	16.92	1,212.58	0.002009	2.18	Circular	83.32	2.68
	C106								1,220.99	1,213.80	1,211.80	7.19	1,212.45	0.002400	12.01	24 inch		
K8	C106	0.00	0.00	0.00	0.00	0.00	11.22	3.42	1,220.99	1,213.80	1,211.80	7.19	1,212.45	0.145255	3.42	Circular	145.01	2.49
	E103								1,172.40	1,171.40	1,169.40	1.00	1,191.60	0.292394	132.51	24 inch		



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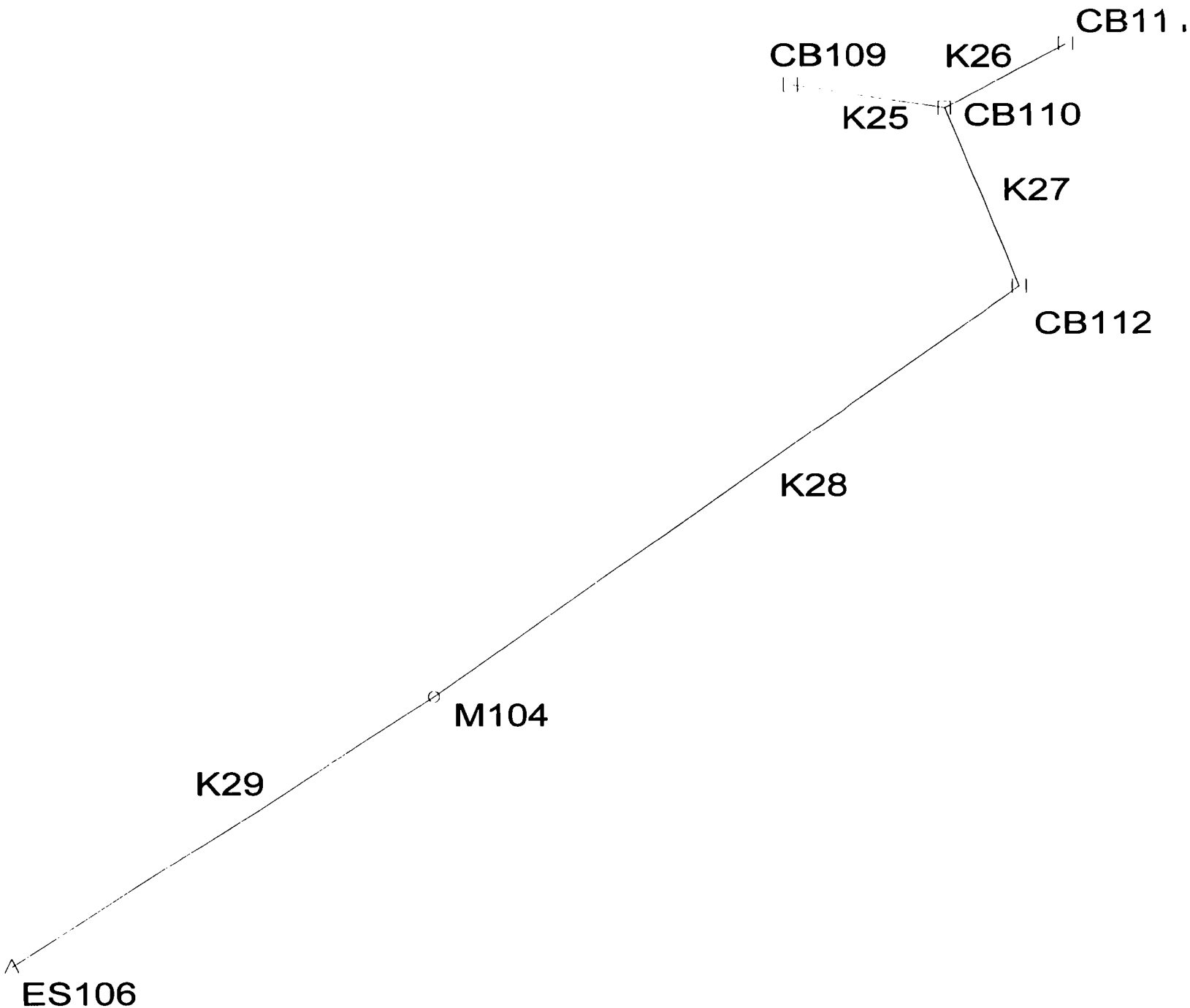

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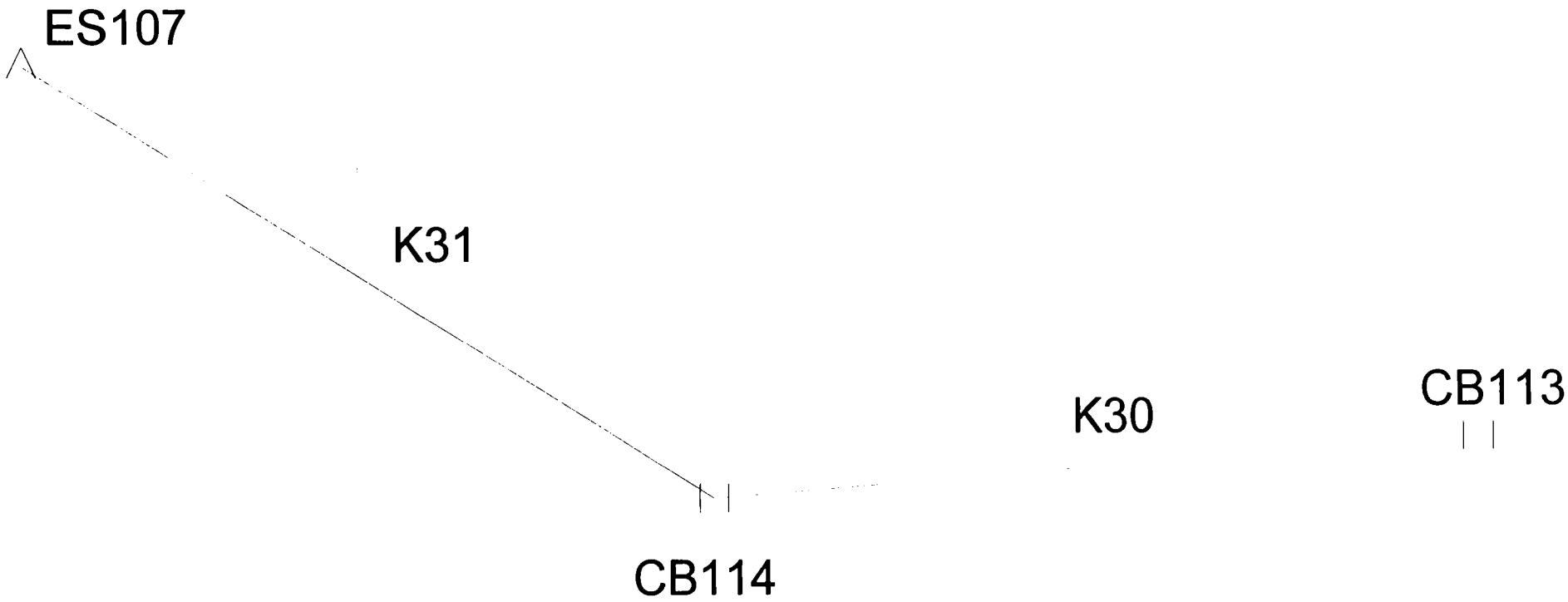
Pipe	-Node- Up Dn	C	Inlet A (acres)	TC (min)	Inlet Q (cfs)	Tot CA (acres)	Sys Flow Time (min)	Q (cfs)	-Ground- Up Dn (ft)	-Crown- Up Dn (ft)	-Invert- Up Dn (ft)	-Cover- Up Dn (ft)	-HGL- Up Dn (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	V avg (ft/s)
K26	CB111	0.95	0.24	10.00	0.98	0.23	10.00	1.06	1,203.46	1,200.43	1,198.43	3.03	1,200.88	0.000019	1.06	Circular	40.000	0.34
	CB110								1,203.43	1,198.50	1,196.50	4.93	1,200.88	0.048250	53.83	24 inch		
K25	CB109	0.76	1.11	10.00	3.60	0.84	10.00	3.60	1,199.10	1,198.60	1,196.60	0.50	1,200.89	0.000216	3.60	Circular	45.303	1.15
	CB110								1,203.43	1,198.50	1,196.50	4.93	1,200.88	0.002207	11.51	24 inch		
K27	CB110	0.95	0.23	10.00	0.94	1.29	11.98	5.22	1,203.43	1,198.50	1,196.50	4.93	1,200.84	0.000454	5.22	Circular	56.721	1.66
	CB112								1,201.10	1,198.30	1,196.30	2.80	1,200.82	0.003526	14.55	24 inch		
K28	CB112	0.85	7.33	14.00	22.98	7.49	14.00	27.82	1,201.10	1,198.30	1,195.30	2.80	1,200.62	0.001483	27.82	Circular	209.415	3.94
	M104								1,206.57	1,197.60	1,194.60	8.97	1,200.31	0.003343	41.77	36 inch		
K29	M104	N/A	N/A	N/A	N/A	7.49	14.89	26.86	1,206.57	1,197.60	1,194.60	8.97	1,200.20	0.001382	26.86	Circular	145.499	3.80
	ES106								1,197.10	1,197.10	1,194.10	0.00	1,200.00	0.003436	42.36	36 inch		



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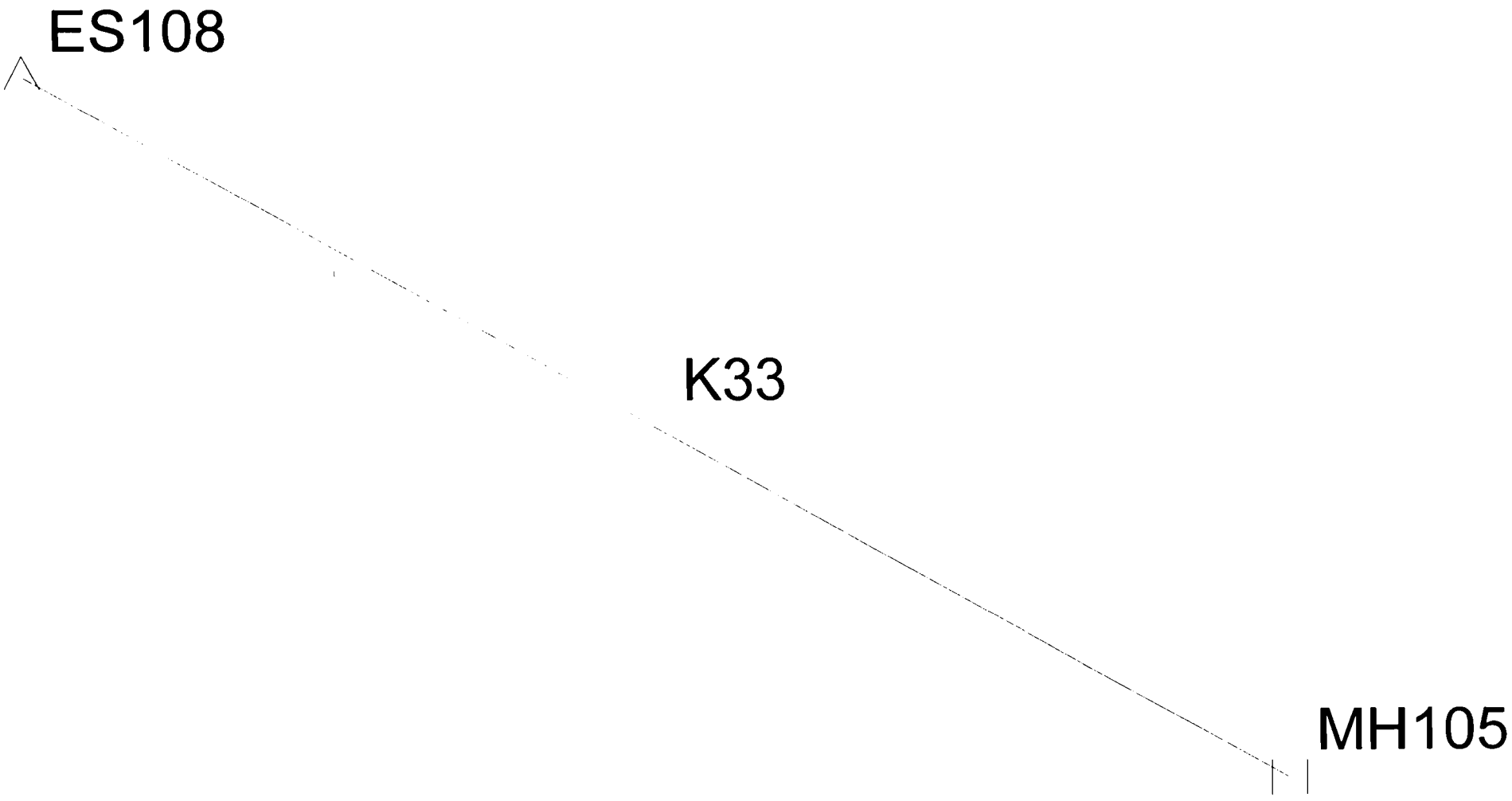
Pipe	-Node- Up Dn	C	Inlet A (acres)	TC (min)	Inlet Q (cfs)	Tot CA (acres)	Sys Flow Time (min)	Q (cfs)	-Ground- Up Dn (ft)	-Crown- Up Dn (ft)	-Invert- Up Dn (ft)	-Cover- Up Dn (ft)	-HGL- Up Dn (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	V avg (ft/s)
K30	CB113	0.95	0.28	10.00	1.14	0.27	10.00	1.14	1,204.45	1,202.45	1,200.45	2.00	1,200.82	0.002798	1.14	Circular	103.690	2.11
	CB114								1,204.50	1,202.00	1,200.00	2.50	1,200.63	0.004340	16.14	24 inch		
K31	CB114	0.95	0.28	10.00	1.14	0.53	10.82	2.22	1,204.50	1,202.00	1,200.00	2.50	1,200.52	0.006323	2.22	Circular	109.688	2.07
	ES107								1,197.10	1,196.10	1,194.10	1.00	1,200.00	0.053789	56.84	24 inch		



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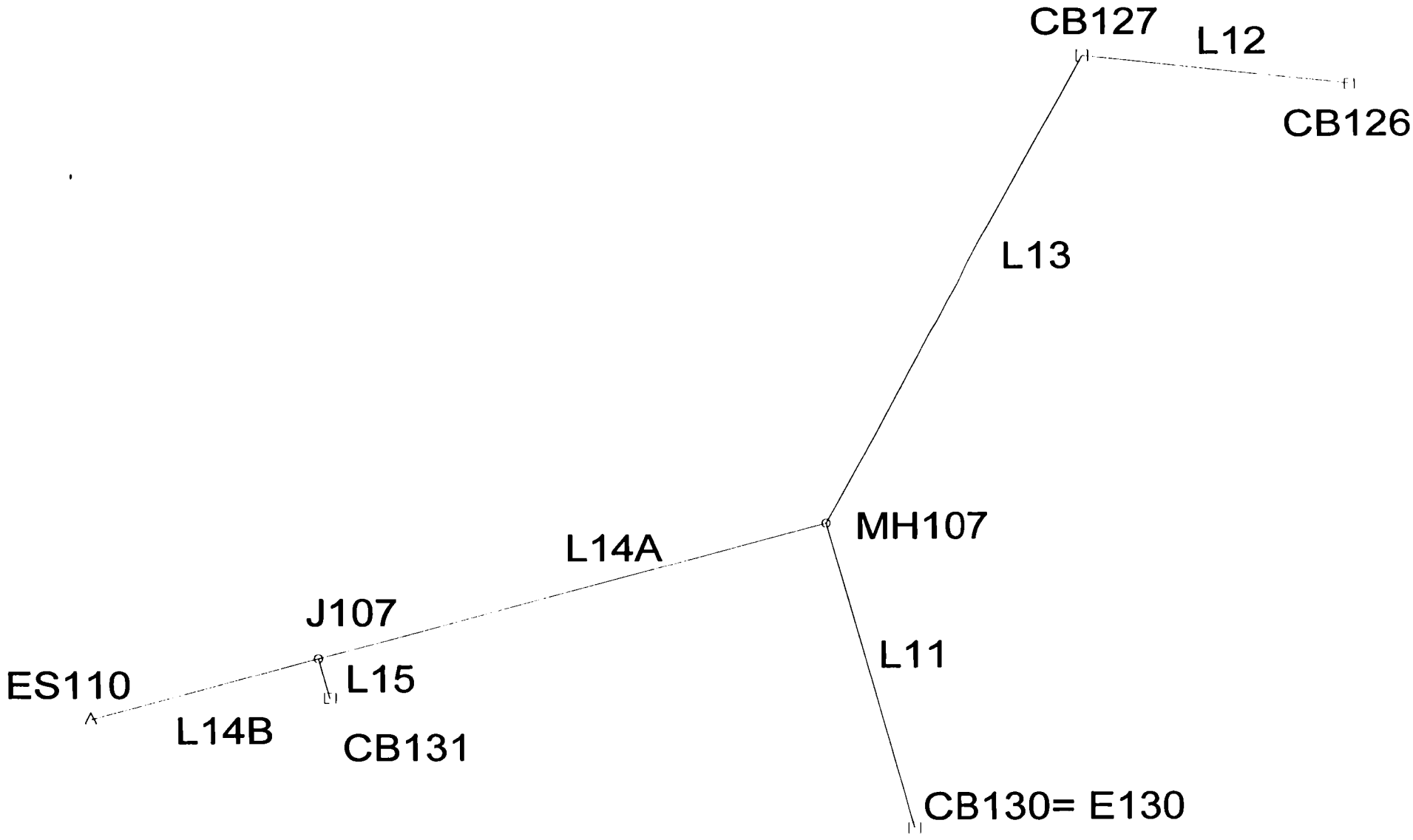
A' T

Pipe	-Node- Up Dn	C	Inlet A (acres)	TC (min)	Inlet Q (cfs)	Tot CA (acres)	Sys Flow Time (min)	Q (cfs)	-Ground- Up Dn (ft)	-Crown- Up Dn (ft)	-Invert- Up Dn (ft)	-Cover- Up Dn (ft)	-HGL- Up Dn (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	V avg (ft/s)
K33	MH105	0.00	0.00	0.00	0.00	0.00	0.00	98.00	1,205.40	1,202.53	1,198.53	2.87	1,201.53	0.012476	98.00	Circular	163.93	8.75
	ES108								1,199.00	1,198.50	1,194.50	0.50	1,200.00	0.024583	243.97	48 inch		



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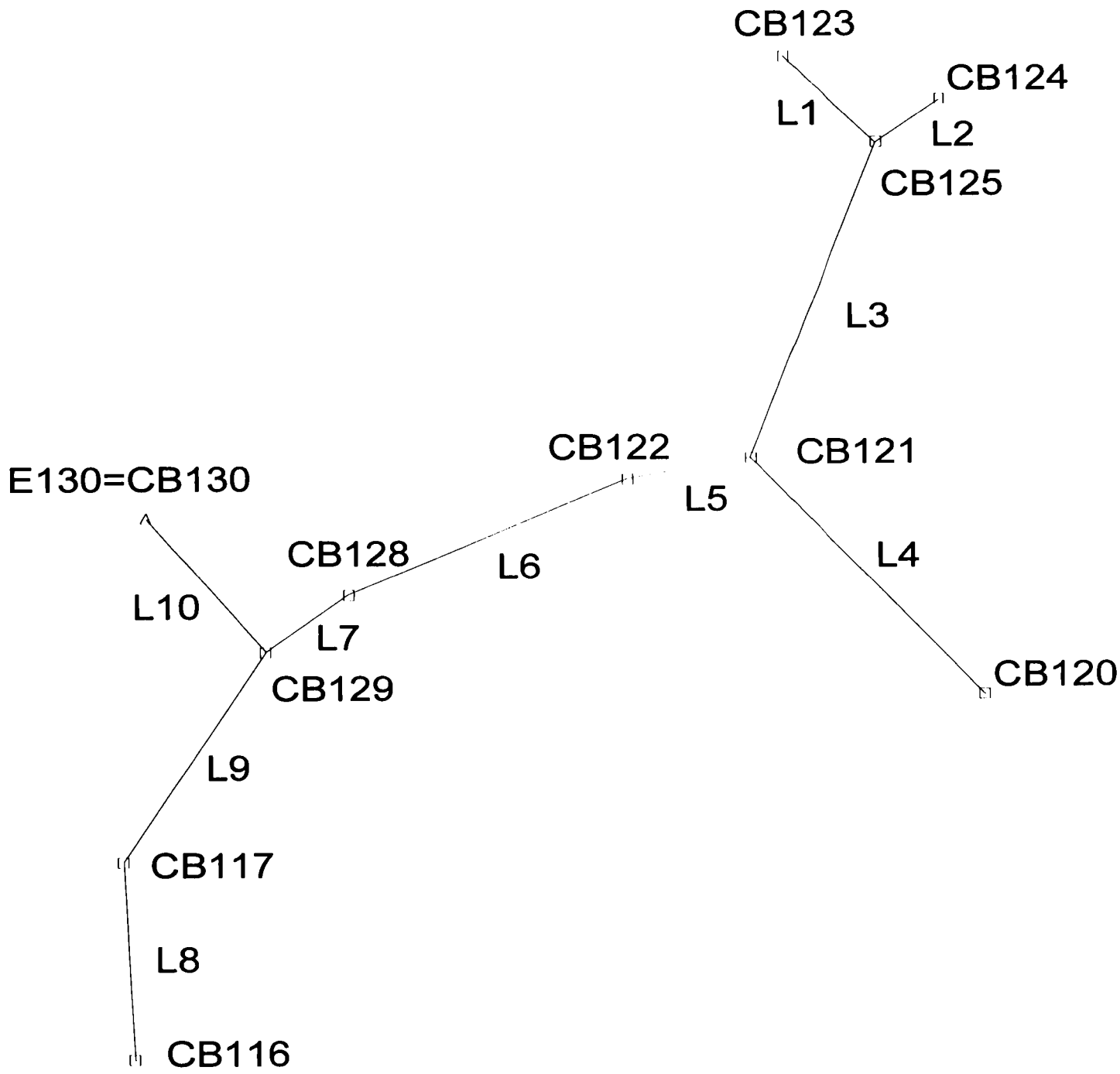
Page 1 of 1

Pipe	-Node- Up Dn	C	Inlet A (acres)	TC (min)	Inlet Q (cfs)	Tot CA (acres)	Sys Flow Time (min)	Q (cfs)	-Ground- Up Dn (ft)	-Crown- Up Dn (ft)	-Invert- Up Dn (ft)	-Cover- Up Dn (ft)	-HGL- Up Dn (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	V avg (ft/s)
L15	CB131	0.70	1.90	10.00	5.70	1.33	10.00	5.70	1,193.00	1,191.00	1,189.00	2.00	1,192.03	0.000541	5.70	Circular	14.583	1.81
	J107								1,202.00	1,173.85	1,171.85	28.15	1,192.03	1.176027	265.76	24 inch		
L11	CB130= E130	0.95	0.46	10.00	1.85	6.48	12.68	25.26	1,203.45	1,197.27	1,194.77	6.18	1,196.74	0.003783	25.26	Circular	114.099	6.57
	MH107								1,202.00	1,196.90	1,194.40	5.10	1,196.11	0.003243	25.30	30 inch		
L12	CB126	0.95	0.08	10.00	0.31	0.07	10.00	0.31	1,203.47	1,201.97	1,199.97	1.50	1,200.16	0.002152	0.31	Circular	96.258	1.26
	CB127								1,203.22	1,201.50	1,199.50	1.72	1,200.01	0.004883	17.12	24 inch		
L13	CB127	0.95	0.27	10.00	1.10	0.33	11.27	1.35	1,203.22	1,201.50	1,199.50	1.72	1,199.90	0.022785	1.35	Circular	192.294	4.34
	MH107								1,202.00	1,196.90	1,194.90	5.10	1,195.16	0.023922	37.90	24 inch		
L14A	MH107	N/A	N/A	N/A	N/A	6.81	12.97	26.26	1,202.00	1,176.00	1,173.00	26.00	1,192.28	0.001321	26.26	Circular	189.725	3.72
	J107								1,202.00	1,174.35	1,171.35	27.65	1,192.03	0.008697	67.38	36 inch		
L14B	J107	N/A	N/A	N/A	N/A	8.14	13.82	30.38	1,202.00	1,174.35	1,171.35	27.65	1,191.85	0.001768	30.38	Circular	86.397	4.30
	ES110								1,175.00	1,173.60	1,170.60	1.40	1,191.70	0.008681	67.32	36 inch		



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Project Engineer: JRM
StormCAD v1.0
Page 1 of 1

Pipe	-Node- Up Dn	C	Inlet A (acres)	TC (min)	Inlet Q (cfs)	Tot CA (acres)	Sys Flow Time (min)	Q (cfs)	-Ground- Up Dn (ft)	-Crown- Up Dn (ft)	-Invert- Up Dn (ft)	-Cover- Up Dn (ft)	-HGL- Up Dn (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	V avg (ft/s)
L8	CB116	0.95	0.72	10.00	2.93	0.68	10.00	2.93	1,230.19	1,227.19	1,225.19	3.00	1,225.79	0.010320	2.93	Circular	76.561	4.65
	CB117								1,229.28	1,226.28	1,224.28	3.00	1,224.73	0.011886	26.72	24 inch		
L9	CB117	0.95	0.54	10.00	2.20	1.20	10.27	5.08	1,229.28	1,221.00	1,219.00	8.28	1,219.79	0.230634	5.08	Circular	97.496	2.99
	CB129								1,199.50	1,196.95	1,194.95	2.55	1,197.56	0.246677	121.71	24 inch		
L4	CB120	0.95	0.61	10.00	2.47	0.58	10.00	2.47	1,226.87	1,219.70	1,217.70	7.17	1,218.25	0.159509	2.47	Circular	127.833	2.17
	CB121								1,199.00	1,197.25	1,195.25	1.75	1,198.04	0.175619	102.70	24 inch		
L2	CB124	0.95	0.46	10.00	1.89	0.44	10.00	1.89	1,203.35	1,200.41	1,198.41	2.94	1,198.89	0.003706	1.89	Circular	29.700	3.27
	CB125								1,203.06	1,200.30	1,198.30	2.76	1,198.78	0.003704	14.91	24 inch		
L1	CB123	0.70	1.65	10.00	4.95	1.15	10.00	4.95	1,199.00	1,198.00	1,196.00	1.00	1,198.33	0.000408	4.95	Circular	48.604	1.58
	CB125								1,203.06	1,197.93	1,195.93	5.13	1,198.31	0.001440	9.30	24 inch		
L3	CB125	0.95	0.47	10.00	1.91	2.04	10.51	8.60	1,203.06	1,197.93	1,195.93	5.13	1,198.20	0.001231	8.60	Circular	130.998	2.74
	CB121								1,199.00	1,197.75	1,195.75	1.25	1,198.04	0.001374	9.08	24 inch		
L5	CB121	0.70	1.22	10.00	3.66	3.47	11.31	14.22	1,199.00	1,197.75	1,195.25	1.25	1,197.92	0.001024	14.22	Circular	48.451	2.90
	CB122								1,204.49	1,197.68	1,195.18	6.81	1,197.88	0.001445	16.89	30 inch		
L6	CB122	0.95	0.13	10.00	0.53	3.60	11.59	14.58	1,204.49	1,197.68	1,195.18	6.81	1,197.81	0.001077	14.58	Circular	116.976	2.97
	CB128								1,204.51	1,197.51	1,195.01	7.00	1,197.68	0.001453	16.94	30 inch		
L7	CB128	0.95	0.19	10.00	0.79	3.78	12.25	14.97	1,204.51	1,197.51	1,195.01	7.00	1,197.61	0.001135	14.97	Circular	38.735	3.05
	CB129								1,199.50	1,197.45	1,194.95	2.05	1,197.56	0.001549	17.49	30 inch		
L10	CB129	0.70	1.53	10.00	4.59	6.05	12.46	23.76	1,199.50	1,197.45	1,194.95	2.05	1,197.20	0.002514	23.76	Circular	68.610	5.10
	E130=CB130								1,203.45	1,197.27	1,194.77	6.18	1,197.03	0.002624	22.76	30 inch		

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        Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12168)
$       Storm Sewer Hydraulic Grade Line Analysis for Red Mtn. Freeway
$       10-Year Hydrology using ADOT Methodology
$       SYSTEM L
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          M            MANHOLE
$          L            ELBOW
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels
$       minus 100 for node input into THYSYS.
$
$       Junction head losses calculated using ASCE No. 77 (1992).
$               hj = hv(outlet) - 0.25(hv(inlet))
$               hj = minor junction losses (ft)
$               hv = velocity head (ft)
$
$       Junction head losses with inlet calculated using ASCE No. 77 (1992).
$               hj = hv(outlet) - 0.50(hv(inlet))
$               hj = minor junction losses (ft)
$               hv = velocity head (ft)
$
SEWER                ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
SLINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
   - --   ---- ---- ---- ---- ---- ---- ----- ---- ----    --       - -----
   C 23                                                   24       6   5.0
DA C 24                                                                   1.9
DA C 25                                                                   1.9
DA C 20                                                                   3.2
DA C 21                                                                   3.6
DA C 22                                                                   0.5
DA C 28                                                                   0.8
DA C 29                                                                   4.5
DA C 30                                                                   1.7
DA C 26                                                                   1.6
DA C 27                                                                   2.7
DA C 31                                                                   1.2
$       Assumed starting water-surface elevation is the Salt River
$       Design Conditon 100-year WSE
OUTLET    STATIONING       0  T.W. ELEV  1191.64   E 10
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
$*   --- -- -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN  L1  C 23 C 25 US1198.00 DS1197.93   49           .012        24 CIRC
DSGN  L2  C 24 C 25 US1200.41 DS1200.30   30           .012        24 CIRC
DSGN  L3  C 25 C 21 US1197.93 DS1197.75  131           .012        24 CIRC
DSGN  L4  C 20 C 21 US1219.70 DS1197.25  128           .012        24 CIRC
DSGN  L5  C 21 C 22 US1197.75 DS1197.68   49           .012        30 CIRC
DSGN  L6  C 22 C 28 US1197.68 DS1197.51  117           .012        30 CIRC
DSGN  L7  C 28 C 29 US1197.51 DS1197.45   39           .012        30 CIRC
DSGN  L8  C 29 C 30 US1197.45 DS1197.27   69           .012        30 CIRC
DSGN  L9  C 30 M 07 US1197.27 DS1197.20   25           .012        30 CIRC
DSGN L10  C 26 C 27 US1201.93 DS1201.72   96           .012        24 CIRC
DSGN L11  C 27 M 06 US1201.72 DS1201.00  246           .012        24 CIRC
     L12  M 06 M 07 US1201.00 DS1200.00   67           .012        24 CIRC
DSGN L13  M 07 M 08 US1197.20 DS1195.90  330           .012        30 CIRC
DSGN L14  C 31 M 08 US1214.26 DS1201.00  128           .012        24 CIRC
```

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DSGN L15  M 08 E 10 US1195.90 DS1186.65   84          .012        30 CIRC
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.                LOSS
$*   ---  - -- - --  ---- ---- ----     -----
  'AL  L1  C 23 C 25         24
  AL   L2  C 24 C 25         24
ANAL   L3  C 25 C 21         24          0.11
ANAL   L4  C 20 C 21         24
ANAL   L5  C 21 C 22         30          0.13
ANAL   L6  C 22 C 28         30          0.09
ANAL   L7  C 28 C 29         30          0.09
ANAL   L8  C 29 C 30         30          0.26
ANAL   L9  C 30 M 07         30          0.19
ANAL  L10  C 26 C 27         24
ANAL  L11  C 27 M 06         24
ANAL  L12  M 06 M 07         24
ANAL  L13  M 07 M 08         30          0.57
ANAL  L14  C 31 M 08         24
ANAL  L15  M 08 E 10         30          0.36
ENDATA
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SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
L1	C23	C25	.00	.00	.00	.00	.00	.00	.00	5.00
L2	C24	C25	.00	.00	.00	.00	.00	.00	.00	1.90
L3	C25	C21	.00	.00	.00	.00	.00	.00	.00	8.80
L4	C20	C21	.00	.00	.00	.00	.00	.00	.00	3.20
L5	C21	C22	.00	.00	.00	.00	.00	.00	.00	15.60
L6	C22	C28	.00	.00	.00	.00	.00	.00	.00	16.10
L7	C28	C29	.00	.00	.00	.00	.00	.00	.00	16.90
L8	C29	C30	.00	.00	.00	.00	.00	.00	.00	21.40
L9	C30	M 7	.00	.00	.00	.00	.00	.00	.00	23.10
L10	C26	C27	.00	.00	.00	.00	.00	.00	.00	1.60
L11	C27	M 6	.00	.00	.00	.00	.00	.00	.00	4.30
L12	M 6	M 7	.00	.00	.00	.00	.00	.00	.00	4.30
L13	M 7	M 8	.00	.00	.00	.00	.00	.00	.00	27.40
L14	C31	M 8	.00	.00	.00	.00	.00	.00	.00	1.20
L15	M 8	E10	.00	.00	.00	.00	.00	.00	.00	28.60

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
L1	C23	C25	1196.00	1195.93	49	.00143	1	24	24	CIRC
L2	C24	C25	1198.41	1198.30	30	.00367	1	24	24	CIRC
L3	C25	C21	1195.93	1195.75	131	.00137	1	24	24	CIRC
L4	C20	C21	1217.70	1195.25	128	.17539	1	24	24	CIRC
L5	C21	C22	1195.25	1195.18	49	.00143	1	30	30	CIRC
L6	C22	C28	1195.18	1195.01	117	.00145	1	30	30	CIRC
L7	C28	C29	1195.01	1194.95	39	.00154	1	30	30	CIRC
L8	C29	C30	1194.95	1194.77	69	.00261	1	30	30	CIRC
L9	C30	M 7	1194.77	1194.70	25	.00280	1	30	30	CIRC
L10	C26	C27	1199.93	1199.72	96	.00219	1	24	24	CIRC
L11	C27	M 6	1199.72	1199.00	246	.00293	1	24	24	CIRC
L12	M 6	M 7	1199.00	1198.00	67	.01493	1	24	24	CIRC
L13	M 7	M 8	1194.70	1193.40	330	.00394	1	30	30	CIRC
L14	C31	M 8	1212.26	1199.00	128	.10359	1	24	24	CIRC
L15	M 8	E10	1193.40	1184.15	84	.11012	1	30	30	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.	
L1	C23	C25	.012	.00	5.00	1198.83	1198.81	.00042	.52	1.6**	9.3	K
L2	C24	C25	.012	.00	1.90	1198.89	1198.81	.00006	.24	3.0*	14.8	
L3	C25	C21	.012	.11	8.80	1198.81	1198.53	.00129	.79	2.8**	9.1	0.25
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. L4 IS .88												
L4	C20	C21	.012	.00	3.20	1218.58	1198.53	.00017	.12	1.0**	102.6	
L5	C21	C22	.012	.13	15.60	1198.53	1198.34	.00123	.76	3.2**	16.8	0.25
L6	C22	C28	.012	.09	16.10	1198.34	1198.09	.00131	.78	3.3**	16.9	0.50
L7	C28	C29	.012	.09	16.90	1198.09	1197.95	.00145	.79	3.4**	17.4	0.50
L8	C29	C30	.012	.26	21.40	1197.95	1197.53	.00232	.77	4.4**	22.7	0.25
L9	C30	M 7	.012	.19	23.10	1197.53	1197.27	.00270	.80	4.7**	23.5	0.50
L10	C26	C27	.012	.00	1.60	1200.50	1200.50	.00004	.25	1.4*	11.5	
L11	C27	M 6	.012	.00	4.30	1200.50	1199.78	.00031	.39	3.8*	13.3	
L12	M 6	M 7	.012	.00	4.30	1199.52	1198.52	.00031	.26	6.6*	29.9	
L13	M 7	M 8	.012	.57	27.40	1197.27	1195.40	.00380	.80	6.5*	27.9	0.25
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. L14 IS .56												
L14	C31	M 8	.012	.00	1.20	1212.82	1199.18	.00002	.09	8.6*	78.9	
L15	M 8	E10	.012	.36	28.60	1194.51	1191.64	.00414	.30	5.8**	147.5	0.25

SEW0069--**PIPE FLOWING FULL DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON FULL FLOW.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
L1	C23	893
L2	C24	874
L3	C25	844
L4	C20	841
L5	C21	713
L6	C22	664
L7	C28	547
L8	C29	508
L9	C30	439
L10	C26	823
L11	C27	727
L12	M 6	481
L13	M 7	414
L14	C31	212
L15	M 8	84

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        Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12168)
$       Storm Sewer Hydraulic Grade Line Analysis for Red Mtn. Freeway
$       10-Year Hydrology using ADOT Methodology
$       SYSTEM M
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          M            MANHOLE
$          L            ELBOW
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels
$       minus 100 for node input into THYSYS.
$
SEWER                ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --   ---- ---- ---- ---- ---- ---- ----- ---- ----    --        - -----
DA C 40                                                   24        6   3.6
DA C 41                                                                   7.3
DA C 42                                                                   1.3
DA C 43                                                                   0.8
DA C 44                                                                   0.5
DA C 45                                                                   0.9
$       Assumed starting water-surface elevation the top of pipe
OUTLET    STATIONING       0  T.W. ELEV  1206.42   E 20
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
          L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
     --- -- -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN  M1  C 40 M 10 US1217.70 DS1216.60    8           .012        24 CIRC
DSGN  M2  M 10 M 11 US1216.60 DS1213.92  155           .012        24 CIRC
DSGN  M3  C 41 M 11 US1214.14 DS1213.92   92           .012        24 CIRC
DSGN M4A  M 11 J 10 US1213.92 DS1213.44   25           .012        24 CIRC
DSGN  M5  C 42 J 10 US1214.27 DS1213.44    8           .012        24 CIRC
DSGN M4B  J 10 M 12 US1213.44 DS1211.97   76           .012        24 CIRC
DSGN  M6  C 43 M 12 US1212.86 DS1211.97   92           .012        24 CIRC
DSGN  M7  M 12 C 44 US1211.97 DS1211.45   63           .012        24 CIRC
DSGN M8A  C 44 J 11 US1211.45 DS1209.37   35           .012        24 CIRC
DSGN  M9  C 45 J 11 US1209.90 DS1209.37   49           .012        24 CIRC
DSGN M8B  J 11 E 20 US1209.37 DS1206.42   49           .012        24 CIRC
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.                LOSS
$*   ---  - -- - --  ---- ---- ----     -----
ANAL  M1  C 40 M 10         24
ANAL  M2  M 10 M 11         24
ANAL  M3  C 41 M 11         24
ANAL M4A  M 11 J 10         24
ANAL  M5  C 42 J 10         24
ANAL M4B  J 10 M 12         24
ANAL  M6  C 43 M 12         24
ANAL  M7  M 12 C 44         24
ANAL M8A  C 44 J 11         24
ANAL  M9  C 45 J 11         24
ANAL M8B  J 11 E 20         24
ENDATA
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SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
M1	C40	M10	.00	.00	.00	.00	.00	.00	.00	3.60
M2	M10	M11	.00	.00	.00	.00	.00	.00	.00	3.60
M3	C41	M11	.00	.00	.00	.00	.00	.00	.00	7.30
M4A	M11	J10	.00	.00	.00	.00	.00	.00	.00	10.90
M5	C42	J10	.00	.00	.00	.00	.00	.00	.00	1.30
M4B	J10	M12	.00	.00	.00	.00	.00	.00	.00	12.20
M6	C43	M12	.00	.00	.00	.00	.00	.00	.00	.80
M7	M12	C44	.00	.00	.00	.00	.00	.00	.00	13.00
M8A	C44	J11	.00	.00	.00	.00	.00	.00	.00	13.50
M9	C45	J11	.00	.00	.00	.00	.00	.00	.00	.90
M8B	J11	E20	.00	.00	.00	.00	.00	.00	.00	14.40

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
M1	C40	M10	1215.70	1214.60	8	.13750	1	24	24	CIRC
M2	M10	M11	1214.60	1211.92	155	.01729	1	24	24	CIRC
M3	C41	M11	1212.14	1211.92	92	.00239	1	24	24	CIRC
M4A	M11	J10	1211.92	1211.44	25	.01920	1	24	24	CIRC
M5	C42	J10	1212.27	1211.44	8	.10376	1	24	24	CIRC
M4B	J10	M12	1211.44	1209.97	76	.01934	1	24	24	CIRC
M6	C43	M12	1210.86	1209.97	92	.00967	1	24	24	CIRC
M7	M12	C44	1209.97	1209.45	63	.00825	1	24	24	CIRC
M8A	C44	J11	1209.45	1207.37	35	.05943	1	24	24	CIRC
M9	C45	J11	1207.90	1207.37	49	.01082	1	24	24	CIRC
M8B	J11	E20	1207.37	1204.42	49	.06020	1	24	24	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. M1 IS .94											
M1	C40	M10	.012	.00	3.60	1216.64	1215.06	.00022	.14	6.6*	90.9
M2	M10	M11	.012	.00	3.60	1215.06	1212.70	.00022	.23	3.2*	32.2
M3	C41	M11	.012	.00	7.30	1213.26	1213.04	.00089	.56	4.0	12.0
M4A	M11	J10	.012	.00	10.90	1212.70	1212.26	.00198	.39	9.0*	34.0
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. M5 IS .58											
M5	C42	J10	.012	.00	1.30	1212.85	1212.26	.00003	.09	1.1*	78.9
M4B	J10	M12	.012	.00	12.20	1212.26	1211.07	.00248	.41	6.9*	34.1
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. M6 IS .49											
M6	C43	M12	.012	.00	.80	1211.35	1211.07	.00001	.12	.5*	24.1
M7	M12	C44	.012	.00	13.00	1211.07	1210.55	.00281	.55	7.3	22.3
M8A	C44	J11	.012	.00	13.50	1210.09	1208.03	.00303	.32	14.9*	59.7
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. M9 IS .50											
M9	C45	J11	.012	.00	.90	1208.40	1208.03	.00001	.13	1.0*	25.5
M8B	J11	E20	.012	.00	14.40	1208.03	1206.42	.00345	.33	4.6**	60.1

SEW0069--**PIPE FLOWING FULL DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON FULL FLOW.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS
BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
M1	C40	411
M2	M10	403
M3	C41	340
M4A	M11	248
M5	C42	231
M4B	J10	223
M6	C43	239
M7	M12	147
M8A	C44	84
M9	C45	98
M8B	J11	49

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        Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12168)
$       Storm Sewer Hydraulic Grade Line Analysis for Red Mtn. Freeway
$       10-Year Hydrology using ADOT Methodology
$       SYSTEM M2
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          M            MANHOLE
$          L            ELBOW
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels
$       minus 100 for node input into THYSYS.
$
SEWER                ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --   ---- ---- ---- ---- ---- ---- ----- ---- ----    --       - -----
DA C 46                                                   24       6   0.6
DA C 47                                                                   1.6
$       Assumed starting water-surface elevation the bottom of pipe
OUTLET    STATIONING       0  T.W. ELEV  1205.31   E 21
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
$*   --- -- -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN M10  C 46 C 47 US1208.50 DS1207.37   96           .012        24 CIRC
DSGN M11  C 47 E 21 US1207.37 DS1207.31   22           .012        24 CIRC
  `UN ID  U.S. D.S. BARR RISE SPAN      HEAD
          L IN L IN  NO.                LOSS
$*   ---  - -- - --  ---- ---- ----     -----
ANAL M10  C 46 C 47         24
ANAL M11  C 47 E 21         24
ENDATA
```

SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
M10	C46	C47	.00	.00	.00	.00	.00	.00	.00	.60
M11	C47	E21	.00	.00	.00	.00	.00	.00	.00	2.20

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SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
M10	C46	C47	1206.50	1205.37	96	.01177	1	24	24	CIRC
M11	C47	E21	1205.37	1205.31	22	.00272	1	24	24	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. M10 IS .45											
M10	C46	C47	.012	.00	.60	1206.95	1205.93	.00001	.10	.8*	26.6
M11	C47	E21	.012	.00	2.20	1205.93	1205.87	.00008	.28	3.1*	12.8

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
M10	C46	118
M11	C47	22

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        Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12168)
$       Storm Sewer Hydraulic Grade Line Analysis for Red Mtn. Freeway
$       10-Year Hydrology using ADOT Methodology
$       SYSTEM N
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          M            MANHOLE
$          L            ELBOW
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels
$       minus 100 for node input into THYSYS.
$
SEWER                ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --    ---- ---- ---- ---- ---- ---- ----- ---- ----    --       - -----
DA C 51                                                     24       6   4.4
DA C 52                                                                     7.9
DA C 53                                                                     0.8
DA C 54                                                                     1.5
DA C 55                                                                     2.0
DA C 56                                                                     0.6
DA C 57                                                                     0.8
DA C 58                                                                     0.7
DA C 59                                                                     1.1
        Assumed starting water-surface elevation is the maximum
        detention basin elevation from HEC-1 model
OUTLET    STATIONING       0  T.W. ELEV  1205.25   E 31
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
$*   --- -- -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN  N2  C 51 C 54 US1207.61 DS1207.40   96           .012        24 CIRC
DSGN  N3  C 52 C 53 US1208.08 DS1207.52  100           .012        24 CIRC
DSGN  N4  C 53 C 54 US1207.52 DS1207.40   80           .012        24 CIRC
DSGN  N5  C 54 C 55 US1207.40 DS1207.18   84           .012        30 CIRC
DSGN  N6  C 55 C 59 US1207.18 DS1206.95   84           .012        30 CIRC
DSGN  N7  C 56 C 59 US1207.28 DS1206.95   75           .012        24 CIRC
DSGN  N8  C 57 C 58 US1207.79 DS1207.38   90           .012        24 CIRC
DSGN  N9  C 58 C 59 US1207.38 DS1206.95   60           .012        24 CIRC
DSGN N10  C 59 E 31 US1206.95 DS1206.79   22           .012        30 CIRC
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.               LOSS
$*   --- - -- - --  ---- ---- ----     -----
ANAL  N2  C 51 C 54         24
ANAL  N3  C 52 C 53         24
ANAL  N4  C 53 C 54         24
ANAL  N5  C 54 C 55         30
ANAL  N6  C 55 C 59         30
ANAL  N7  C 56 C 59         24
ANAL  N8  C 57 C 58         24
ANAL  N9  C 58 C 59         24
ANAL N10  C 59 E 31         30
ENDATA
```

SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
N2	C51	C54	.00	.00	.00	.00	.00	.00	.00	4.40
N3	C52	C53	.00	.00	.00	.00	.00	.00	.00	7.90
N4	C53	C54	.00	.00	.00	.00	.00	.00	.00	8.70
N5	C54	C55	.00	.00	.00	.00	.00	.00	.00	14.60
N6	C55	C59	.00	.00	.00	.00	.00	.00	.00	16.60
N7	C56	C59	.00	.00	.00	.00	.00	.00	.00	.60
N8	C57	C58	.00	.00	.00	.00	.00	.00	.00	.80
N9	C58	C59	.00	.00	.00	.00	.00	.00	.00	1.50
N10	C59	E31	.00	.00	.00	.00	.00	.00	.00	19.80

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SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
N2	C51	C54	1205.61	1205.40	96	.00219	1	24	24	CIRC
N3	C52	C53	1206.08	1205.52	100	.00560	1	24	24	CIRC
N4	C53	C54	1205.52	1205.40	80	.00150	1	24	24	CIRC
N5	C54	C55	1204.90	1204.68	84	.00262	1	30	30	CIRC
N6	C55	C59	1204.68	1204.45	84	.00274	1	30	30	CIRC
N7	C56	C59	1205.28	1204.95	75	.00440	1	24	24	CIRC
N8	C57	C58	1205.79	1205.38	90	.00456	1	24	24	CIRC
N9	C58	C59	1205.38	1204.95	60	.00717	1	24	24	CIRC
N10	C59	E31	1204.45	1204.29	22	.00727	1	30	30	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
N2	C51	C54	.012	.00	4.40	1206.47	1206.35	.00032	.43	3.0*	11.5
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. N3 IS 1.47											
N3	C52	C53	.012	.00	7.90	1207.55	1207.02	.00104	.46	3.1*	18.3
N4	C53	C54	.012	.00	8.70	1207.02	1206.90	.00126	.75	3.4*	9.5
N5	C54	C55	.012	.00	14.60	1206.35	1206.23	.00108	.58	4.6*	22.7
N6	C55	C59	.012	.00	16.60	1206.23	1206.00	.00140	.62	5.2*	23.3
N7	C56	C59	.012	.00	.60	1205.73	1205.72	.00001	.13	.5*	16.3
N8	C57	C58	.012	.00	.80	1206.09	1205.74	.00001	.15	2.1*	16.5
N9	C58	C59	.012	.00	1.50	1205.74	1205.72	.00004	.18	1.3*	20.7
N10	C59	E31	.012	.00	19.80	1205.72	1205.57	.00199	.51	7.9*	37.9

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
N2	C51	286
N3	C52	370
N4	C53	270
N5	C54	190
N6	C55	106
N7	C56	97
N8	C57	172
N9	C58	82
N10	C59	22

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        Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12168)
$       Storm Sewer Hydraulic Grade Line Analysis for Red Mtn. Freeway
$       10-Year Hydrology using ADOT Methodology
$       SYSTEM N2
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          M            MANHOLE
$          L            ELBOW
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels
$       minus 100 for node input into THYSYS.
$
SEWER                ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --   ---- ---- ---- ---- ---- ---- ----- ---- ----    --        - -----
DA J 38                                                   24        6  12.6
DA C 62                                                                 0.8
$       Assumed starting water-surface elevation is the maximum
$       detention basin elevation from HEC-1 model
OUTLET    STATIONING       0  T.W. ELEV  1206.69   E 37
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
$*   --- -- -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN N15  J 38 M 61 US1221.57 DS1218.04  160           .012        24 CIRC
  GN N16  M 61 M 60 US1218.04 DS1215.30  224           .012        24 CIRC
  GN N17  M 60 C 62 US1215.30 DS1214.85    9           .012        24 CIRC
DSGN N18  C 62 E 37 US1214.85 DS1208.69  118           .012        24 CIRC
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.               LOSS
$*   ---  - -- - --  ---- ---- ----     -----
ANAL N15  J 38 M 61         24
ANAL N16  M 61 M 60         24
ANAL N17  M 60 C 62         24
ANAL N18  C 62 E 37         24
ENDATA
```

SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
N15	J38	M61	.00	.00	.00	.00	.00	.00	.00	12.60
N16	M61	M60	.00	.00	.00	.00	.00	.00	.00	12.60
N17	M60	C62	.00	.00	.00	.00	.00	.00	.00	12.60
N18	C62	E37	.00	.00	.00	.00	.00	.00	.00	13.40

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SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
N15	J38	M61	1219.57	1216.04	160	.02206	1	24	24	CIRC
N16	M61	M60	1216.04	1213.30	224	.01223	1	24	24	CIRC
N17	M60	C62	1213.30	1212.85	9	.05001	1	24	24	CIRC
N18	C62	E37	1212.85	1206.69	118	.05220	1	24	24	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. N15 IS 2.00											
N15	J38	M61	.012	.00	12.60	1221.57	1217.00	.00264	.41	8.5*	36.4
N16	M61	M60	.012	.00	12.60	1217.00	1214.26	.00264	.48	8.5	27.1
N17	M60	C62	.012	.00	12.60	1213.96	1213.51	.00264	.33	13.9*	54.8
N18	C62	E37	.012	.00	13.40	1213.51	1207.35	.00299	.33	14.8*	56.0

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
N15	J38	511
N16	M61	351
N17	M60	127
N18	C62	118