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ENGINEERING DIVISION
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INITIAL DESIGN CONCEPT REPORT

PROJECT NO. I-17-3-912

PHOENIX-CORDES JUNCTION HIGHWAY

STRUCTURES OVER
ARIZONA CANAL DIVERSION CHANNEL

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DITZLER
Date Signed 5-28-85
ARIZONA, U.S.A.

rga
engineering corporation

RGA #85003

MAY, 1985

1102 W. Indian School Road • Phoenix, Arizona 85013 • (602) 266-6278

930.000

rga engineering corporation

May 21, 1985

Arizona Department of Transportation
Highways Division
206 South 17th Avenue
Phoenix, AZ 85007

Attn: Mr. Jim Oxley
Assistant State Engineer

Re: Contract No. 84-12
Phoenix-Cordes Junction Highway
(Structures Over
Arizona Canal Diversion Channel)
Project No. I-17-3-912
RGA #85003-L-066

Gentlemen:

In accordance with our agreement for engineering services and the scope of work dated October, 1984, RGA Engineering Corporation is pleased to present their Initial Design Concept Report.

The report consist of a discussion on the description of the project, characteristics, related reports, previously studied alternatives, traffic control concepts, phase construction concepts, major design features, an updated cost estimate for Alternate No. 5. roadway detour plan and profiles, and structure typical sections. Four copies of this report are hereby transmitted.

Also transmitted, under separate cover, are five copies of the Structure Selection Report, four copies of an Interim report on the Geotechnical Investigations by Western Technologies, Inc., and two copies of our Civil and Structural Calculations to date.

We understand that we are to stop work on this project, pending ADOT's review, approval with comments and notice to proceed on the Preliminary Design Phase. We do, however, request your immediate approval to proceed with development of separate design and bidding documents for the substructure elements of the "in-fill" bridges over the Arizona Canal to permit timely construction of this phase during this year's 30-day dry up period.

1102 W. Indian School Road • Phoenix, Arizona 85013 • (602) 266-6278

We wish to express our appreciation for the cooperation and assistance of Mr. John Lohr, Mr. Ron Breckler, Mr. Robert Conklin and the others on your staff in the preparation of this report.

Very truly yours,

RGA ENGINEERING CORPORATION

Harold E. Ditzler, P.E.
Vice President/
Manager of Phoenix Division

HED/ma

INITIAL DESIGN CONCEPT REPORT

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PHOENIX-CORDES JUNCTION HIGHWAY

STRUCTURES OVER

ARIZONA CANAL DIVERSION CHANNEL

May 1985

RGA Engineering Corporation
Phoenix, Arizona

Traffic Engineering Consultants
JHK & Associates
Phoenix, Arizona

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HAROLD E. BITZLER
Date Signed 5-28-85
ARIZONA, U.S.A.

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EXECUTIVE SUMMARY

I. INTRODUCTION

Project I-17-3-912 is a project to provide for construction of bridge structures to carry Interstate Highway 17 and frontage roads over the future Arizona Canal Diversion Channel. RGA Engineering Corporation is providing the Arizona Department of Transportation the design for this project. This report represents the Initial Design Concept submittal.

On April 22, 1985 RGA Engineering Corpoartion and JHK & Associates, it's Traffic Engineering Consultants presented seven alternative traffic detour plans to members of Arizona Department of Transportation, Maricopa County Flood Control District, and Salt River Project staffs. A recommendation was made by RGA to construct Alternate No. 5 and it was the unanimous concensus of those attending this presentation to accept that recommendation.

The project requires the maintenance of three lanes of traffic in each direction for the mainline and one lane of traffic for the north and southbound frontage roads, construction of the project in stages, and a traffic control plan.

II. ALTERNATIVES CONSIDERED

The seven Alternatives for construction staging are included herein to enable the reader to become acquainted with the various solutions, the construction cost impacts and the associated highway user costs. Alternate No. 5 represented a plan which was low in construction cost, low in user costs and low in accident potential.

III. TRAFFIC CONTROL CONCEPTS

The traffic detour staging will require constructing bridge closure structures at the existing Arizona Canal between the mainline bridge and the northbound and southbound frontage roads to enable these areas to be used for detour traffic in a restricted right-of-way; the construction of a temporary bridge spaning the existing Arizona Canal to carry the northbound single lane frontage road detour; the construction of the mainline detours around the existing mainline alignments; and a three stage construction of the bridge spaning the Arizona Canal Diversion Channel.

IV. PHASE CONSTRUCTION CONCEPT

It is planned to maximize the utilization of existing pavements for the detours and to restrict the building of temporary detour pavements to that portion between existing pavements. The temporary detour pavements will be constructed from asphaltic concrete materials.

A portion of the existing mainline concrete pavements will have an overlay of thin asphaltic concrete to obtain the correct grades and superelevation required. It is also planned to have a length of the existing concrete pavement overlayed with a thin asphalt material prior to beginning the detour curves. This transitional "color change" is used to lessen driver impact to a sudden color change at the point of curvature.

The proposed construction of the infill structures over the Arizona Canal is the critical phase of construction. The cast in place concrete for the substructure (walls and foundations) must be constructed during the 30 day canal dry up period, October to November, 1985. In order to accomplish this, it is recommended that the substructure for these infill bridges be let as a separate construction project and that RGA be authorized to begin this portion of the design no later than June 5, 1985. This project could then be ready for bidding no later than August 1, 1985.

Since the restrictions on the operation of the freeway and frontage roads serving Metro Center are from Thanksgiving through the Christmas holiday, it is recommended that the balance of the phased construction not begin until after January 1, 1986. Total construction period is estimated at 12½ months for the recommended type of construction.

V. MAJOR DESIGN FEATURES

The present I-17 is a six lane urban freeway carrying approximately 110,000 vehicles per day. Detour design speeds will be 50 mph on I-17 mainline and 40 mph on the frontage roads. The design hourly volume is 5,000 vph on the mainline. Three lanes of traffic in each direction on the mainline will be maintained during construction and a minimum of one lane in each direction for both frontage roads.

In order to minimize the rebuilding of existing pavements, it is planned to use superelevation rates to match the existing pavement slopes wherever possible. Horizontal curves have been designed with e = 0.02 ft/ft in the equation.

No additional right-of-way will be required for this project.

The existing 36" storm sewer entering the existing Arizona Canal will be reconstructed around the new ACDC bridge and outleted into the future diversion channel as a permanent solution.

Landscaping, irrigation systems and area safety lighting will be removed as required and replaced to match the existing conditions.

VI. ESTIMATE OF COST

The conceptual construction cost estimate for this project is estimated to be $2,500,000.

I. INTRODUCTION

A. FORWARD

This report presents the design concept for the construction of bridge structures over the Arizona Canal Diversion Channel at Interstate Highway 17. See Location and Vicinity Maps, Figures I-1 and I-2.

This project when completed will provide a bridge structure across the entire right-of-way including service roads to permit the future connection of the Arizona Canal Diversion Channel and permit the interception of storm water flows which now reach the Arizona Canal.

This report considers construction phasing to permit the present traffic continuous use of this highway without interruption.

B. CONSTRUCTION HISTORY OF PROJECT AREA

The existing interstate highway (I-17) was constructed in 1962. The freeway between the Dunlap Avenue Underpass and Bell Road, known as Project No. I-17-01 (39), was opened for traffic in the mid 1960's. The general contractor was Benson Contracting. Cast-in-place concrete slab bridges were constructed by James Brown Bridge Contractors over the Arizona Canal carrying northbound and southbound I-17 traffic. The construction also consisted of constructing the southbound frontage road bridge of similar construction over the Arizona Canal. As a part of the construction change order, the abutments for a future slab bridge over the Arizona Canal between the north and southbound I-17 were extended. The southbound frontage road was also widened as a part of this change order.

In 1965, the median was infilled with a new concrete slab bridge with curb and gutter. Jersey type barriers in the median were also installed.

The entire 6½ mile segment of I-17 was constructed for about 5 million dollars.

This concrete surfaced roadway was the first slip form paving project in Arizona.

Location Map

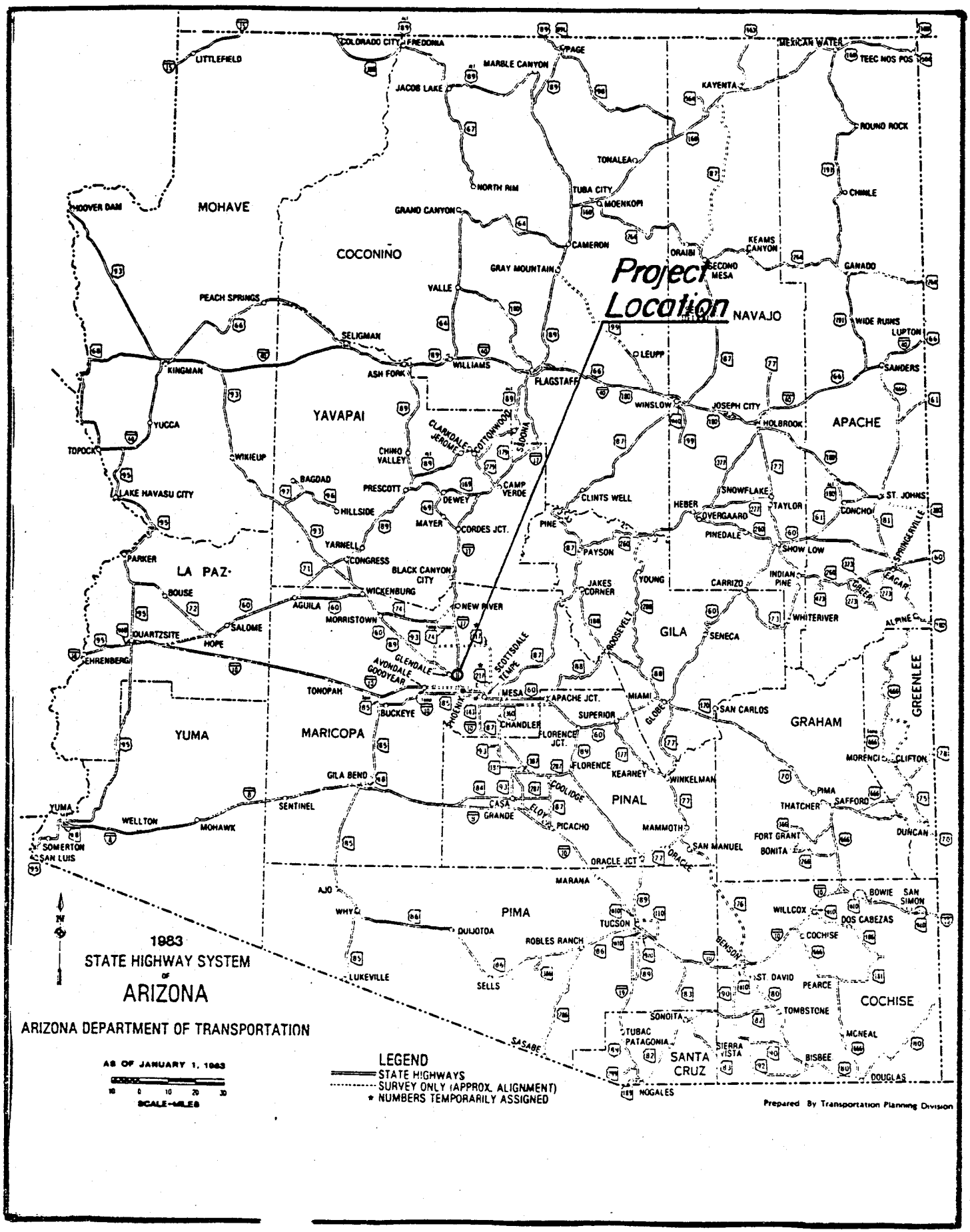


Figure 1

PROJECT LOCATION
Cave Creek
(Not to Scale)
PHOENIX AND VICINITY
Scale of Miles
0 1 2 3 4 5
© 1985 COLOR-ART, INC., ST. LOUIS, MO.
VICINITY MAP
Luke Aux. Field No. 2
Beardsley Canal
McMicken Dam Outlet Canal
Mc Micken Dam
Trilby Wash Detention Basin
Beardsley
Surprise
El Mirage
Sun City
Youngstown
Peoria
Glendale
LUKE AIR FORCE BASE
Litchfield Park
Goodyear
Avondale
Cashion
Tolleson
Phoenix Litchfield Airfield
Casey Abbott Semi-Regional Park
ESTRELLA MOUNTAIN REGIONAL PARK
Gila River
GILA RIVER INDIAN RESERVATION
MARICOPA CO.
PINAL CO.
Salt River
Arizona Canal
Western Canal
PHOENIX
Adobe
Deer Valley Airport
Thunderbird Regional Park
Paradise City
Paradise Valley Park
Turf Paradise Race Track
Moon Valley C. C.
Scottsdale Mun. Airport
Century C. C.
North Mountain Park
Scottsdale C. C.
Squaw Peak Park
Paradise Valley
Paradise Valley C. C.
Glendale Com. Col.
Grand Canyon Col.
Arizona Biltmore
Mun. G. C.
Enchanto Park
Phoenix C. C.
Heard Mus.
State Fair Grounds
Arizona St. Hosp.
Arizona C. C.
Military Res.
Papago Park
Zoological Park
Temple Park
State Capitol
Mun. Bldg.
Pueblo Grande
Mun. Sta.
SKY HARBOR MUN. AIRPORT
Ariz. State Univ.
Marzanita Speedway
Thunderbird C. C.
Guadalupe
Laveen
Kyrene
PHOENIX SOUTH MOUNTAIN PARK
International Harvester Proving Ground
West/Chandler
PINNACLE PEAK RD.
DEER VALLEY RD.
BEARDSLEY RD.
UNION HILLS RD.
BELL RD.
GREENWAY RD.
THUNDERBIRD RD.
CACTUS AVE.
PEORIA AVE.
DUNLAP AVE.
NORTHERN AVE.
GLENDALE AVE.
BETHANY HOME RD.
CAMELBACK RD.
INDIAN SCHOOL RD.
THOMAS RD.
MC DOWELL RD.
VAN BUREN ST.
BUCKEYE RD.
LOWER BUCKEYE RD.
BROADWAY RD.
SOUTHERN AVE.
BASE LINE RD.
DOBBINS RD.
ELLIOT RD.
ESTRELLA DR.
SHEA BLVD.
LINCOLN DR.
MC DONALD DR.
CAVE CREEK RD.
NORTHERN AVE.
SCOTTSDALE RD.
CANYON RD.
SAN JUAN RD.
STEPHEN MATHER RD.
TELEGRAPH PASS RD.
BUENA VISTA RD.
PIMA FREEWAY

C. CHARACTERISTICS OF PROJECT CORRIDOR

Interstate 17 (Black Canyon Freeway) is currently the only north-south freeway in the Phoenix metropolitan area. It serves the Phoenix central district (CBD) at its southern boundary and traverses basically within the western portion of the Metropolitan area providing services to the commercial, residential and industrial developments situated in the northwest Phoenix area.

Within the project corridor, Interstate 17 is a six-lane (three lanes per direction), urban freeway carrying approximately 110,000 vehicles per day (commercial vehicles comprise approximately ten percent of the daily volume.) Eight to ten-foot shoulders exist along both sides of the roadway. A 16-foot median area also exists with a Jersey-type concrete barrier used to provide positive separation of the north- and southbound directional flow of traffic.

Available freeway interchanges near the project corridor include the Dunlap Avenue (situated south of the project area) interchanges and Peoria Avenue (situated north of the project area). Both interchanges are four-legged, full-diamond, signalized interchanges and provide major access to the primary traffic generators in the area.

A frontage road exists along each side of the freeway within the project corridor. The northbound frontage road is primarily a one-way, three-lane roadway handling approximately 8,000 vehicles per day. A single-lane on-ramp to the freeway is provided approximately 150 feet north of the north bank of the existing Arizona Canal. From this point north, the northbound frontage road is comprised of two lanes (one-way operation).

The southbound frontage road operates primarily as a one-way, two-lane facility handling approximately 7,000 vehicles per day. Primary access to and from the Metro Center regional shopping center is provided approximately midway between the Peoria Avenue and Dunlap Avenue interchanges. A southbound freeway off-ramp situated just north of the existing Arizona Canal feeds additional traffic volumes (approximately 7,000 vehicles per day) onto the frontage road. South of the Arizona Canal, the frontage road widens to four-lane widths at connection with Dunlap Avenue.

The primary traffic generator in the area is the regional shopping center, Metro Center, situated along the west side of the southbound frontage road. Its property and that of accompanying businesses roughly occupy the area encompassing the freeway on the east, 31st Avenue on the west, Peoria Avenue on the north, and the Arizona Canal on the south.

Other major traffic generators in the area include the industrial park corporate center area along the eastside of the freeway (partially completed and bounded by the freeway on the west, 23rd Avenue on the east, Peoria Avenue on the north, and Dunlap Avenue on the south) and the major single-family residential areas abutting these properties.

D. DESCRIPTION OF THE PROJECT

Project I-17-3-912 proposes the construction of a bridge structure over the future Arizona Canal Diversion Channel (ACDC) for mainline and frontage roads to allow the future diversion channel to pass beneath the Interstate Highway system. Maintenance of traffic for both I-17 mainline and both frontage roads is a requirement during construction.

The overall plan of development will include:

1. Developing stage construction plans for traffic detours.
2. Traffic control plans.
3. Stage construction plans to construct bridge structures between the existing bridges over the Salt River Project's Arizona Canal.
4. Stage construction plans to construct a bridge structure over the future Maricopa County Flood Control District Arizona Canal Diversion Channel.
5. Construction of a temporary bridge over the existing Arizona Canal to carry the northbound frontage road.
6. Development of demolition and restoration of existing landscaping and irrigation systems.
7. Rerouting of existing storm drain system.
8. Conduct a soil and foundation investigation for pavement design and structure foundations.
9. Perform a field survey of the entire project area.

The project is located between Dunlap Avenue and Peoria Avenue along Interstate 17.

E. AVAILABILITY OF EXISTING DRAWINGS AND DATA

Existing drawings and data made available by the Arizona Department of Transportation (ADOT) are being utilized when available. This data includes:

1. "As-built" roadway plans for the section of I-17 (Black Canyon Freeway) from Butler Drive to Peoria Avenue used to define roadway geometrics, profiles, structures within the ADOT right-of-way (e.g., utility poles, catch basins, etc.), and underground structures (e.g., storm sewer lines).

2. Traffic signing plans used to identify existing signing in the area. These plans would be further used to plan signing requirements during each stage and/or phase of construction and to plan for future signing needs following construction.

3. Roadway lighting plans used to define existing roadway lighting in the area. As in the previous item, the plans would be used to define lighting requirements for each phase and/or stage of construction and to plan for providing the maintenance of similar lighting standards as existed prior to construction.

4. Traffic volume data used to identify roadway capacity and design needs during each stage and/or phase of construction. Based on the volume data (obtained in May 1983), design volumes selected for portions of the freeway system are:

    - NB freeway mainline - 5100 vehicles per hour (PM peak hour)

    - SB freeway mainline - 4800 vehicles per hour (AM peak hour)

    - NB frontage road south of on-ramp - 960 vehicles per hour (PM peak hour)

    - NB frontage road north of on-ramp - 700 vehicles per hour (PM peak hour)

    - SB frontage road north of off-ramp - 770 vehicles per hour (AM peak hour)

    - SB frontage road south of off-ramp - 1450 vehicles per hour (AM peak hour)

The volume data was also used in the calculation of the various evaluation measures, e.g., costs of delay, cost of accidents, air quality impacts, etc., used to evaluate the alternative traffic control strategies.

F. RELATED REPORTS

1. A "Structure Selection Report" by RGA is issued to ADOT as a separate Report and was issued at the same time as this report. A very limited discussion on structures is contained herein, however, the reader is encouraged to also read The Structure Selection Report for an indepth analysis of the types of structures proposed for this project.

2. A preliminary soils and foundation report by Western Technologies Inc. is issued as a separate report to enable the reader to become acquainted with soil conditions on this project and to make recommendations on types of foundation systems identified in the Structure Selection Report.

II. ALTERNATIVES CONSIDERED

The purpose of this section is to state the feasible construction traffic control strategies considered useful for this type project, define the alternative traffic control plans selected for evaluation and to describe and detail the evaluation process for the alternative traffic control plans.

A. DESCRIPTION OF TRAFFIC CONTROL STRATEGIES

All construction zone traffic control planning centers around an analysis of the construction activity and relating it to the provision of adequate safety and capacity. In planning for construction zones, one should strive for the greatest payoff in terms of safety and convenience at a cost commensurate with the hazards and problems involved. A properly planned and installed traffic control zone will allow traffic to pass through or around a work zone safely. The goals common to all traffic control strategies are:

- o to minimize accidents and accident severity; and
- o to minimize inconvenience and conflicts as a result of the work.

In addition to the use of design criteria aimed at these two goals, the traffic control strategy selected for this project shall maintain, as a minimum, the following ADOT-supplied criteria:

1. Three lanes of traffic shall be maintained for each direction on I-17 during peak hours (6:30 AM to 8:30 AM and 3:30 PM to 5:30 PM).

2. The northbound and southbound frontage road can be narrowed to one lane for each direction as required during construction.

3. The northbound on-ramp from Dunlap Avenue and the southbound off-ramp to Dunlap Avenue may be closed as required during construction.

4. A desirable design speed of 45 mph and absolute minimum design speed of 35 mph shall be maintained through any detour section on I-17. (Note: These design speeds have been changed to 50 mph and 40 mph, respective, during the course of this study.)

5. Consideration shall be given to moving the frontage road traffic to the outside next to the right-of-way line as required to improve the geometrics of the construction phase for the construction detour.

6. Due to the high traffic generation by the Metrocenter during the Christmas season, both the northbound and southbound frontage roads must have two lanes in each direction and the on-/off-ramps from Dunlap Avenue must be open to traffic from Thanksgiving Day to New Years Day.

7. Due to the close proximity of the existing Arizona Canal bridge to the proposed ACDC structure, it will be necessary to modify and widen the Arizona Canal bridge between I-17 and the frontage road in order to provide sufficient room for the I-17 detour roadway. Major construction work on the Arizona Canal bridge may be restricted to the dry up season by Salt River Project. Any design modification or necessary widening of the Arizona Canal bridge will be considered as part of this plan development and shall be submitted as part of each design phase.

Using these guidelines, the following traffic control strategies were reviewed.

LANE CLOSURES

In this type of strategy, a lane or lanes of traffic would be temporarily closed during construction of the diversion channel in the respective lanes. Traffic during construction would be required to use the available lanes open to traffic. For example, construction of the ACDC structure within, as a minimum, a single lane of traffic on the mainline would reduce the number of available mainline freeway lanes in a direction from three to two lanes. A major reduction in capacity would result. In addition, the constructibility of the bridge a single lane at a time is a major question mark. Due to the impact of this strategy on the available capacity of the freeway mainline during each construction phase and its questionable constructibility a single lane at a time, this strategy was not determined to be feasible.

CROSSOVERS

In this strategy, freeway mainline traffic in one direction of travel is crossed over to utilize available traffic lanes in the opposing direciton. The construction area typically covers several traffic lanes. This strategy typically results, however, in a major reduction in roadway capacity for both directions of freeway mainline traffic since all traffic must use the available travel lanes open to traffic. Due to the impact of this strategy on available freeway capacity, this strategy was not determined to be feasible.

USE OF MEDIAN AND/OR SHOULDER

This strategy utilizes the available widths of the shoulder and/or median to provide the needed operational roadway width to compensate for the lost width of the construction area. Due to the available width of the median and shoulder through the current project area, a major reduction in mainline freeway capacity would result during several stages of construction (in particular, those stages involving the middle travel lane in each travel direction). For this reason, this strategy was not determined to be feasible.

USE OF MEDIAN AND/OR SHOULDER SPLITTING TRAFFIC

This strategy is similar to the previous strategy except that traffic in the same direction can be maintained on both sides of the work area. This strategy minimizes the reduction in freeway mainline capacity since during all stages of construction, three mainline freeway lanes per direction and at least one frontage road lane can be maintained. However, the constructibility of this strategy during several stages (in particular where a single lane is closed off) is a question mark. Further, the potential safety impacts in maintaining a "gore-type area" within the construction zone was not determined by ADOT to offset the benefits associated with this type of control. Due to these reasons, this strategy was not determined to be feasible.

TEMPORARY BYPASS (WITHIN RIGHT-OF-WAY)

This strategy utilizes a temporary roadway to bypass the construction area. The roadway would be designed outside the existing travel lanes but within the existing ROW. This strategy is determined to be feasible. Available ROW exists to permit the operation of three mainline Freeway lanes per direction and, as a minimum, a single frontage road lane. This strategy would also allow for construction of larger portions of the bridge, thereby minimizing the total construction period.

DETOUR

In this strategy, the project area would be completely closed and all traffic would be detoured onto the available surface street system. In this case, the northbound freeway and frontage road traffic would be detoured from the freeway area onto Dunlap Avenue. The detour would continue onto 25th Avenue to Peoria Avenue and back onto the northbound freeway area. The southbound freeway and frontage road traffic would be detoured from the freeway area into the Metro Center area by way of Peoria Avenue or a specially-designed ramp constructed south of the Peoria Avenue interchange. The detour would continue along 29th Avenue to Dunlap Avenue and back onto the southbound freeway area. This strategy was not determined to be feasible due to the excessive delays anticipated to be experienced during peak hours at intersection points proposed. The detour routes are in the "D-E" level. The large increase in traffic volumes that would result with the detour would be expected to congest these areas. The anticipated safety impacts of excessive delays at these points would be significant.

INTERMITTENT CLOSURE

In this strategy, major portions of the construction area would be closed and construction activity performed only during certain periods of the day. Typical periods for construction activity would be either the off-peak hours (10:00 AM - 3:00 PM) or the nighttime hours (6:30 PM - 5:30 AM). All construction would be performed only during these periods. Time would be allowed prior to the end of the work period for cleanup and restoration of the highway facility to pre-construction conditions. Extended construction periods result with the use of this strategy. However, this strategy was not determined to be feasible due primarily to the type of construction to be performed. Excavation and construction requirements would not permit restoration of the construction area each working day to a usable form. In addition, the significant extension of the construction period would not be favorable.

INSTANT FREEWAY

This strategy utilizes bridge overpasses through the construction area. Bridge structures consist of pre-fabricated materials and are erected on-site in roughly a two-week period. This period, however, does not include the construction period for building the overpass foundations. This strategy was not determined to be feasible due primarily to initial cost (approximately $2 million for a two-lane bridge spanning 150 feet), constructability of ACDC (although the overpass could span 150 feet, additional space is required under actual working conditions), and total disruption time (while overpasses are under construction, all traffic through the area would need to be detoured).

CROSSOVERS WITH USE OF MEDIAN AND SHOULDER

In this strategy, full use of the median and shoulders along both sides of the freeway are utilized to maintain the existing freeway capacity. Construction is achieved on a piece by piece basis. As construction of the diversion channel proceeds across the project area, traffic is relocated along the available roadway width. At all times, six travel lanes for the mainline freeway and at least one frontage road lane would be maintained. This strategy was not determined to be feasible, however, due primarily to physical restrictions. During several phases of construction, freeway traffic in the same direction would need to be split. The disadvantages of the split traffic operation were described earlier.

CROSSOVERS WITH TEMPORARY BYPASS

This strategy utilizes crossovers and temporary bypass routes to construct major portions of the diversion channel. All lanes of a direction of traffic are crossed over to the opposing freeway lanes. The opposing lanes are diverted outside the existing freeway using a temporary bypass route. This operation can be used to construct across one direction of freeway traffic and, when completed the operation can be reversed and the remaining freeway area constructed. The frontage road areas can be constructed in several ways: temporary bypass routes outside the existing frontage road but within the existing ROW, relocation of frontage road traffic onto the shoulder area of the mainline freeway, or a detour of the frontage

road onto other surface streets. This strategy is detemined to be feasible. It shoud be noted, however, that detour of the frontage roads onto the surface street system would be expected to result in additional congestion on an already overloaded street system during peak hours.

B. DESCRIPTION OF ALTERNATIVE STRATEGIES

From the review of available construction traffic control strategies, a list of seven alternative traffic control strategies were derived. The strategies typically entail combinations of the feasible strategies. Following is a description of the alternative strategies. Sketches depicting each alternative strategy are provided in the Appendix.

Alternative 1

In the first phases of this alternative, a temporary 3-lane bypass roadway is constructed for northbound freeway traffic utilizing the area between the existing freeway and the northbound frontage road. At the same time, construction of a temporary one-lane bypass route for the southbound frontage road is constructed outside the existing frontage road. Finally, the median barrier and concrete in the median area is removed and replaced with an asphaltic concrete surface. Traffic is maintained as prior to construction. Phase I will last approximately two months.

In Phase 2, the northbound freeway traffic is diverted onto the temporary bypass route constructed in the previous phase. Northbound frontage road traffic is maintained on the frontage road (under one-lane operation). However, the southbound freeway traffic will be crossed over to the southbound freeway lanes. Northbound frontage road traffic is diverted onto the temporary bypass route constructed in Phase 2.

Once all traffic is diverted, construction of the east half of the diversion channel will be underway. This period will last approximately 3½ months at which time traffic will be relocated to its pre-construction condition. The total construction period for this alternative is estimated at nine months.

A major advantage of this alternative is the construction of the diversion channel in two portions. This type construction would typically result in lower

construction costs and a shorter overall construction time than if constructed in three or more pieces. A primary disadvantage is the crossover of freeway traffic onto opposing traffic lanes. Although design alternatives (for instance, overlays) are able to offset some of the existing design features (such as crossing a negative cross slope), driver expectancy characteristics typically favor the movement of traffic to the right side of a roadway. Further characteristics of this alternative are detailed in the next section.

Alternative 2

The first phase of this alternative involves the construction of 3-lane temporary bypass routes for the freeway mainline traffic. These bypass routes utilize the area along each side of the freeway between the freeway lanes and the frontage road area. Traffic is maintained as prior to construction. Approximately, a 2½ month construction period is estimated.

In Phase 2, the freeway traffic is diverted onto the temporary bypass routes. Frontage road traffic along both sides of the freeway is limited to single-lane operation. Construciton of the middle portion of the diversion channel (encompassing a width slightly greater than the freeway lanes) commences. Simultaneous with this construction, temporary bypass routes for both frontage roads are constructed. These routes are situated outside the existing frontage road but within the ROW. This construction phase would last approximately 3½ months.

Phase III relocates the freeway traffic back onto its existing freeway lanes. The frontage road traffic is detoured onto its temporary bypass routes constructed in the previous phases. After traffic is diverted, construction of the east and west portions of the diversion channel commences. The area covered in this construction extends from near the edge of the freeway to the ouside of the frontage road on both sides of the freeway. This phase encompasses approximately a 3½ month construction period at which time, all traffic is relocated to its preconstruction condition. The total construction period for this alternative is estimated at 9½ months.

A primary advantage of this alternative is its maintenance of driver expectancy characteristics. When diverted, the freeway traffic is diverted to its

right. Due to its construction plan (constructing the diversion channel in three portions), a longer construction period and slightly higher construction costs can be expected over the preious alternative. Further characteristics of this alternative are provided in the following section.

Alternative 3

In Phase 1 of the alternative, a temporary, one-lane bypass roadway for the northbound frontage road would be constructed. The bypass roadway would extend from the frontage road and run along the existing right shoulder of the northbound freeway lanes. To allow sufficient width for the frontage road bypass route, the lanes of the northbound freeway traffic would need to be moved towards the centerline of the median area. At the same time that the frontage road bypass route is being constructed, the median barrier and concrete in the median area is removed and replaced with an asphaltic concrete surface. Traffic is maintained as prior to construction. The construction period for this phase is approximately two months.

In Phase 2, the northbound frontage road traffic is diverted onto it's bypass roadway constructed in the previous phase. The lanes of the northbound freeway are moved over towards the centerline of the median. At this time, the eastern quarter of the diversion channel is constructed along with a 3-lane, temporary detour roadway for northbound traffic. This roadway is situated between the existing freeway and the northbound frontage road area. The construction period for this phase will be approximately 2 months.

Phase 3 diverts the northbound frontage road traffic back onto the frontage road (single-lane operation) and detours the northbound freeway traffic onto its temporary bypass route constructed in the previous phase. A second portion of the diversion channel is constructed. This portion extends through the area previously occupied by the northbound freeway traffic. A two-month construction period is projected.

In Phase 4, the northbound traffic remains as at the end of the previous phase. The southbound freeway traffic, however, is crossed over to the northbound freeway lanes (section of diversion channel completed in previous phase). Southbound

frontage road traffic is maintained on the existing frontage road. Construction of a third portion of the diversion channel is then made. This portion extends from the median area to near the southbound frontage road. At this time, construction of a one-lane southbound frontage road bypass roadway is also made. The bypass roadway runs between the freeway and the southbound frontage road. Overall, this phase lasts approximately 2½ months.

In the final phase, traffic is relocated back to preconstruction conditions with the exception of the southbound frontage road traffic. This traffic is relocated to the temporary bypass route to allow for construction of the final portion of the diversion channel (extending across the southbound frontage road). The Phase 5 construction period is approximately 2 months. At his time, the southbound frontage road traffic is relocated to the frontage road. The total construction period for this alternative is 10½ months. A primary advantage of this alternative is its tendency to minimize traffic disruption by breaking the area under construction into shorter pieces and maintaining existing traffic conditions for specific movements as long as possible. However, this type of construction results in a longer construction period and greater construction costs. Further characteristics of this alternative are listed in the next section.

Alternative 4

In Phase 1, construction of a 3-lane, temporary bypass roadway occurs. These roadways utilize the existing frontage roads in the project area. For the displaced frontage road traffic, one-lane, temporary bypass routes are constructed outside the existing frontage road but within the existing ROW. Traffic is maintained as prior to construction. The construction period is 2½ months.

Phase 2 diverts all traffic onto the temporary bypass routes constructed in the previous phase. Construction of the middle portion of the diversion channel extending roughly between the two frontage roads occurs. The construction period for this phase lasts approximately 3½ months.

In Phase 3, the freeway traffic is relocated back onto the freeway while the frontage road traffic is maintained on its temporary bypass routes. At this time, the two outside portions of the diversion channel are constructed. This period lasts

approximately 3½ months. At the end of that time, the frontage road traffic is relocated back onto the frontage road. The total construction period for this alternative is 9½ months.

A primary advantage of this alternative is its use of the existing frontage roads as temporary bypass routes for freeway traffic. This utilization results in lower overall construction costs. However, since the width of the frontage road over existing bridges is limited to 36 feet (curb-to-curb), actual widths of travel lanes would be limited to 10' or 10.5' lanes. The impact of the reduced lane widths on traffic safety and operations could be significant. Further discussion of this alternative is provided in the next section.

Alternative 5

In Phase 1, a temporary, one-lane bypass roadway for the southbound frontage road would be constructed. The bypass roadway would extend from the frontage road and run along the existing right shoulder of the southbound freeway lanes. To allow sufficient width for the frontage road bypass route, the lanes of the southbound freeway traffic would need to be moved towards the centerline of the median area. Traffic is maintained as prior to construction. The construction period for this phase is approximately 2½ months.

In Phase 2, the southbound frontage road traffic is diverted onto its bypass roadway constructed in the previous phase. The lanes of the southbound freeway are moved towards the centerline of the median. At this time, the western quarter of the diversion channel is constructed. This portion extends roughly between the existing freeway and the southbound frontage road area. The construction period is estimated at 3 months.

In Phase 3, the southbound frontage road traffic is relocated onto the frontage road. In addition, 3-lane, temporary bypass routes are constructed for both the north- and southbound freeway traffic. These roadways are situated between the existing freeway and the respective frontage roads. After completion of this construction, the freeway traffic is diverted to the temporary bypass routes. Frontage road traffic is maintained under single-lane operation. At this time, the middle portion of the diversion channel is constructed extending across the existing

freeway travel lanes. Simultaneous with this construction, a one-lane temporary bypass route for northbound frontage road traffic will be constructed. The total length of construction period for this phase is approximatley 4 months.

As a final phase, the freeway traffic is relocated back onto the freeway lanes. However, the northbound frontage road traffic is relocated onto the temporary bypass route situated outside the existing frontage road. Construction of the eastern portion of the diversion channel will be made. This construction period will last approximately 3 months. After this phase is completed, the northbound frontage road traffic will be relocated to the existing frontage road. The total construction period for this alternative will be 10 months.

A primary advantage of this alternative is its tendency to favor driver expectancy requirements. Detour traffic is primarily relocated to the right side of the roadway. An exception is the southbound frontage road traffic. Further details of this alternative are provided in the next seciton.

Alternative 6

In Phase 1, a temporary, one-lane bypass roadway for the northbound frontage road would be constructed. The bypass roadway would extend from the frontage road and run along the exisitng right shoulder of the northbound freeway lanes. To allow sufficient width for the frontage road bypass route, the lanes of the northbound freeway traffic would need to be moved towards the ceterline of the median area. Traffic is maintained as prior to construction. The construction period is approximately 1½ months.

In Phase 2, the northbound frontage road traffic is relocated onto the temporary bypass route constructed in the previous phase and construction of the eastern quarter of the diversion channel is performed. A two-month construction period is estimated.

In Phase 3 the northbound frontage road traffic is relocated to its existing frontage road. Also, a 3-lane temporary bypass route is constructed in the area between the existing freeway and the northbound frontage road. A one-month construction period is estimated.

Phase 4 results in the diversion of the northbound freeway traffic onto its temporary route constructed in the previous phase. Northbound frontage road traffic is restricted to single lane operation. during this time, construction of a second portion of the diverion channel will be underway. This portion will extend basically from the median east to the portion previously completed at the northbound frontage road. Simultaneous with this construction, a temporary southbound frontage road will be constructed in the median area of the freeway. Prior to this construction, the median barrier and concrete will be removed and replaced with an asphaltic concrete surface. Overall, this phase will last approximately two months.

In the final phase of this alternative, all northbound traffic will be maintained as in the previous phase. All southbound traffic (including the frontage road) will be crossed over to the northbound lanes. Construction of the western half of the diversion channel will be completed. This phase will last approximately 3½ months. After completion, all traffic will be relocated to preconstruction conditions. The total construction period for this alternative is 10 months.

A primary disadvantage of this alternative is the effect of driver expectancy related to the crossover of freeway traffic. Further details of this alternative is provided in the next section.

Alternative 7

Phase 1 of this alternative allows for the construction of all paved areas required for temporary bypass routes with this alternative. Traffic is maintained as prior to construction. A 2½ month construction period is estimated.

In Phase 2, the freeway traffic is detoured onto temporary bypass routes situated between the existing freeway and the respective frontage roads. Frontage road traffic is restricted to single-lane operation. Construction of the middle portion of the diversion channel will be underway. This section extends basically through the freeway portion of the project area. A 3½ month construction period is estimated.

In the final phase of this alternative, all traffic (including the frontage roads) is relocated to the previously completed area in the middle portion of the project area. The two outside portions of the diversion channel are then constructed. A 2½ month construction period is estimated. After completion, all traffic will be relocated to preconstruction conditions. The total construction period for this alternative is 8½ months.

A major advantage of this alternative is the minimum disruption to traffic due to construction. All detour construction (aside from traffic control) is completed in Phase 1. The remaining phases serve to move traffic onto available roadway space. However, the geometrics available under this plan limits freeway lane widths to 10' to 10.5'. Further details of this alternative is provided in the next section.

C. EVALUATION OF ALTERNATIVES

The selection of one type of traffic control strategy over another should be based on a systematic evaluation of what the likely impacts of the strategies will be. Project cost, safety, and traffic delay are the three most commonly considered factors in selecting work zone strategies. With the increasing emphasis on energy conservation and environmental protection, additional factors such as fuel consumption (or a related factor) and air pollution may also need to be evaluated. Other considerations such as length of construction period, impacts on businesses in the area, and right-of-way availability may also be key factors.

To aid in evaluating each of the seven alternatives described in the previous section, a number of measures were defined. The measures include the factors stated above plus other key items relevant for the particular project area. Figure II-1 displays a completed evaluation matrix for the alternative work zone strategies. This table was used to identify the project teams recommendation. Following is the description of each measure and the procedure used for quantification of each measure selected for evaluation.

ALTERNATIVE EVALUATION MATRIX

MEASURES OF COMPARISON / ALTERNATIVES	ALTERNATIVE NUMBER						
	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5	ALT. 6	ALT. 7
COST-RELATED FACTORS ($1000)							
ACDC Construction	1950.0	2100.0	1950.0	2100.0	1950.0	1800.0	1800.0
Bridge(s) over Arizona Canal	211.8	211.8	211.8	-0-	211.8	90.8	211.8
Temporary Bridges	76.0	76.0	-0-	76.0	38.0	-0-	-0-
Roadway Detours	488.4	372.4	400.8	222.1	179.1	288.8	427.4
Traffic Control	247.2	180.5	260.3	251.6	220.4	285.7	331.5
SUB-TOTAL	2973.4	2940.7	2822.9	2649.7	2599.3	2465.3	2770.7
USER-COSTS ($1000)							
Accidents	16.8	10.2	6.2	13.9	8.6	14.8	9.2
Delay	631.5	337.8	378.1	348.8	324.8	253.6	337.8
Time Value	7.4	7.4	4.2	7.4	4.2	7.4	5.3
SUB-TOTAL	655.7	355.4	388.5	370.1	337.6	275.8	352.3
TOTAL COSTS	3629.1	3296.1	3211.4	3019.8	2936.9	2741.1	3123.0
NON COST-RELATED FACTORS							
Total Construction Period (mos.)	9.0	9.5	10.5	9.5	10.0	10.0	8.5
Structures to be Relocated							
- NB cantilever sign	X	X	X	X	X	X	X
- SB bridge sign	X	X	X			X	X
- Other breakaway design signs	X(4)	X(4)	X(4)	X(4)	X(4)	X(4)	X(4)
- Lighting poles	X(3)	X(2)	X(2)	X(3)	X(4)	X(1)	X(3)
Air Quality (1000#)							
- Hydrocarbons	23.4	11.8	11.8	12.0	11.7	15.1	11.8
- Carbon monoxide	536.7	257.6	258.9	261.3	256.8	331.4	258.9
- Nitrogen oxides	33.5	16.8	16.9	17.0	16.8	21.7	16.9
Special Considerations							
- Fill-in canal bridge structures	X(2)	X(2)	X(2)		X(2)	X(1)	X(2)
- Temporary bridges over canal	X(2)	X(2)		X(2)	X(1)		
- Ramp closures	NB-7 mos. SB-3½ mos	NB-7 mos. SB-3½ mos	NB-6½ mos SB-4½ mos	NB-7 mos SB-3½ mos	NB-5½ mos SB-2 mos	NB-6½ mos SB-3½ mos	NB-6 mos SB-2½ mos
- Use of SRP ROW	X	X		X			
- Use of private RWO	X	X		X			
- Gunite wall removal (partial)	X	X	X	X	X	X	X
- Bike path (SE side) relocation	X	X		X	X		

Figure II-1. Evaluation Matrix for Alternative Traffic Control Strategies

COST-RELATED FACTORS

Project Costs

ACDC Construction - This cost represents the estimated construction costs of the Arizona Canal Diversion Channel. It includes the installation of sheet piling (where necessary), mobilization requirements, area excavation, approach slab, and pavement section over the channel area.

Bridge(s) over Arizona Canal - This cost represents the estimated construction costs of a fill-in bridge over the existing Arizona Canal. A fill-in bridge is required for alternatives where a temporary bypass route utilizes the space between the freeway and the frontage road. The cost includes the demolition of existing curbs, barriers, etc., mobilization requirements, excavation and backfill, the physical construction of the bridge structure, and the paving of the pavement section over the bridge, and channel paving.

Temporary Bridges - This cost represents the estimated construction costs of a temporary bridge on a bypass route for the frontage road. A temporary bridge is required for alternatives where a temporary bypass route utilizes the space between the frontage road and the right-of-way line. The cost includes the physical construction of foundations, the shipping and rental of bridge sections, bridge erection, and the disassembly and demolition of the bridge following relocation of frontage road traffic and the frontage road area.

Roadway Detours - This cost represents the estimated costs of the temporary bypass routes (excluding bridge construction and structure costs) for each alternative. Cost items include (where appropriate) clearing and grubbing, construction surveying and layout, mobilization requirements, roadway excavation, median barrier removal, concrete pavement removal, guardrail removal and salvage, fence removal, roadway grading for pavement, base and subbase preparation, base and pavement installation, and other construction-related items pertinent to the roadway construction.

Traffic Control - This cost represents the cost of traffic control devices used to mark and manage the work zone. Cost items include (where appropriate): the

installation, maintenance, and removal of temporary concrete barrier; the use of flashing arrow panels; flagging services; installation and removal of temporary pavement markings (tape); obliteration of permanent pavement markings; installation and removal of temporary, raised, reflectorized pavement markers; installation, maintenance, and removal of necessary barricading and channelization devices; and other traffic-control related items. It should be noted that these costs vary significantly depending on the number of devices used time period of use, and length of time DPS officers are on duty. These factors were accounted for in the cost estimate of each alternative.

User Costs

Accidents - This cost represents the cost of additional traffic accidents resulting with the construction activity. Statistics on construction zone accidents generally show that accident rates in work zones are greater than the period before the work zone. Highway work zones have a greater portential of accidents not only because the roadway is temporarily degraded, but also because there are more potentially hazardous devices in the work area. As a result of these findings and other recent research, projections for the increased accident activity were made using relationships as outlined in the technical report, Planning and Scheduling Work Zone Traffic Control. The accident activity was further quantified with dollar costs using the lastest available National Safety Council figures on accident costs.

Delay - This cost represents the difference between travel costs under pre-construction conditions and the travel costs under various phases of construction, as measured by vehicle operating costs. The difference in travel costs for these work zone strategies are primarily due to increased travel distance (associated with a change in geometrics) reduced travel speeds, and, where ramp traffic is prohibited, temporary stoppage associated with traffic being rerouted through a signalized intersection. While the costs on a "per vehicle" bases do not appear significant, the aggregation of costs for all vehicles during the various construction phases does become considerable.

The basic cost data was obtained using graphical procedures detailed in the AASHTO document, A Manual on User Benefit Analysis of Highway and Bus Transit Improvements - 1977. It was updated based on Economic Index factors and aggregated for the total construction period.

Traveltime - This cost represents the time value to motorists and is based on projected travel time differences with and without construction activity. Based on data obtained from the FHWA report, Planning and Scheduling Work Zone Traffic Control, there is no travel time costs to motorists associated with increased travel times of two minutes or less. Under the alternative work zone strategies, travel time increases for most traffic flows are typically less than two minutes. An exception is the period when the southbound freeway off ramp is closed. This traffic is diverted off at the Peoria Avenue interchange and rerouted. Based on sample travel time runs, the increased travel time associated with this movement ranges from two to three minutes. The cost estimate for this item reflects this increase in travel time.

NON-COST-RELATED FACTORS

Total Construction Period - This measure defined the estimated total construction period for each alternative. The estimate represents the anticipated period with a minimum of delays or disruptions due to weather or other unforeseen circumstances.

Structures to be Relocated - This item reflects the number of physical structures requiring relocation or removal during various phases of the construction period. These structures are noted since their relocation and/or removal can result in a significant cost. The costs for relocation/removal of these structures is included in the cost estimate for roadway detours.

Air Quality - This measure reflects the increased vehicle emissions estimated to be emitted with each alternative. The primary emissions are typically noted as three types of pollutants: hydrocarbons, carbon monoxide, and nitrous oxides. Hydrocarbons do not by themselves, represent a health hazard; rather it is their reaction with other pollutants and sunlight which produces smog. This condition

reduces visibility and can cause eye irritation and a worsening of respiratory problems. Carbon Monoxide is the most widely distributed and the most commonly occurring air pollutant. Its effect on human health is well documented. It tends to impair bodily funcitons of varying degrees dependent on concentration and duration of exposure. Nitrous oxides tend to produce nose and eye irritations and, with increasing concentrations, respiratory problems.

The change in vehicle emissions through the project area is primarily attributed to projected speed changes. For example, traffic on the freeway may reduce travel speeds through the construction zone from 55 mph to 45 mph and back again to 55 mph after passing through the construction zone. The amount of increased vehicle emissions were obtained using graphical procedures defined in the FHWA reference Procedure For Estimating Highway User Costs, Fuel Consumption and Air Pollution, (April 1981).

Special Considerations - These measures reflect specific information items determined to be pertinent to each alternative. For example, many of the alternatives require fill-in bridge structures over the Arizona Canal in order to provide a temporary bypass route for freeway traffic through the area. While the costs of the bridge structures are included in the cost factors, should a problem occur which would prohibit use of these fill-in structures, an alternative in which fill-in structures were not used would beocme highly favorable. As such, the information item under Special Considerations is particularly relevant.

Other items included in the seciton are: number of temporary bridges required for frontage road temporary bypass routes; period of time specific freeway on/off ramps in the construction area are closed due to construction; alternatives where specific approval for right-of-way use from Salt River Project or the private sector is required; alternatives where gunite wall (situated along sideslopes between freeway and frontage road) removal is required; and alternatives where the northbound frontage road temporary bypass route would interfere with an existing bike path.

III. TRAFFIC CONTROL CONCEPT

The purpose of this section is to describe the general traffic controls for each phase of the selected traffic control plan (Alternate 5).

DESCRIPTION BY PHASE

Sketches depicting the general traffic controls by phase are displayed in Figures III-1 to III-4. In Phase 1, a temporary one-lane bypass roadway will be constructed for the southbound frontage road. Also during Phase 1, bridge closure structures will be constructed over the Arizona Canal between the freeway and both frontage roads. During construction of the temporary bypass roadways and the closure structures, Jersey barrier will be used to provide positive protection of the work space. Where lane closures are required such as on the frontage roads approaching the work areas, Type II barricades will be used to channelize the traffic. This scheme is displayed in Figure III-1. Temporary tape will be utilized to mark lane and edgelines.

All Jersey barriers used in Phase I will be removed prior to the start of Phase 2. In Phase 2, the frontage road traffic will be diverted onto the temporary bypass roadway constructed in the previous phase and the western quarter of the diversion channel bridge will be constructed. Jersey barrier will delineate the frontage road temporary bypass along both sides. Type II barricades will be used for the lane closure designed for the southbound frontage road and for the transition area along the southbound freeway lanes approaching the work area. The northbound traffic is maintained as prior to construction. This scheme is shown in Figure III-2. Temporary tape will be used to mark lane and edgelines. Freeway lanes, where necessary, will be supplemented with temporary raised pavement markers.

Prior to Phase 3, all Jersey barrier used in Phase 2 will be removed. Phase III will be divided into two stages. In the first stage, the southbound frontage road traffic is relocated back to the original frontage road alignment. In addition, three-lane temporary bypass routes are constructed for both the north and southbound freeway traffic. During the construction of these detours, Jersey barrier will be placed along the outside shoulders of both directions of freeway traffic throughout

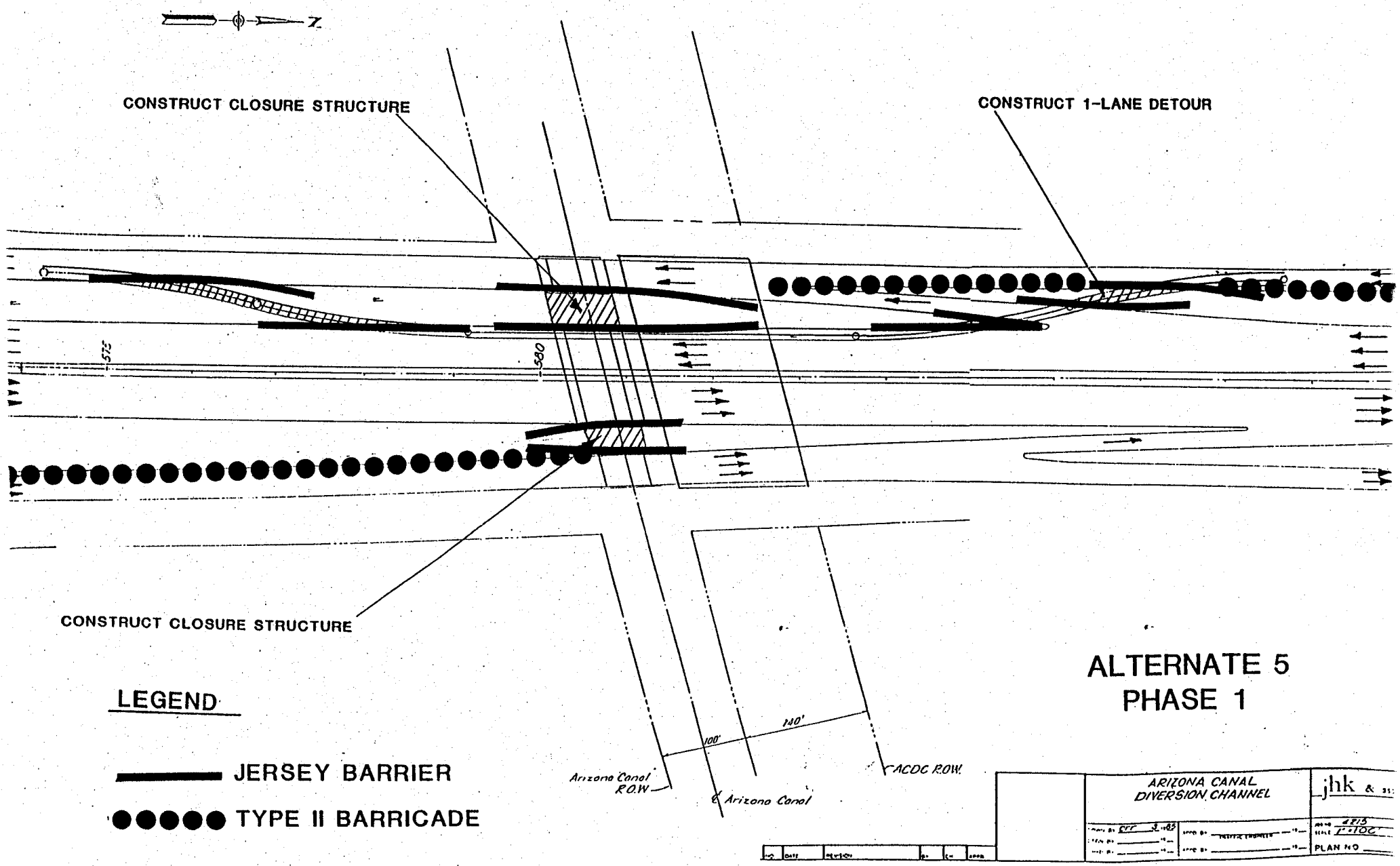


Figure III-1. Phase 1 Traffic Controls

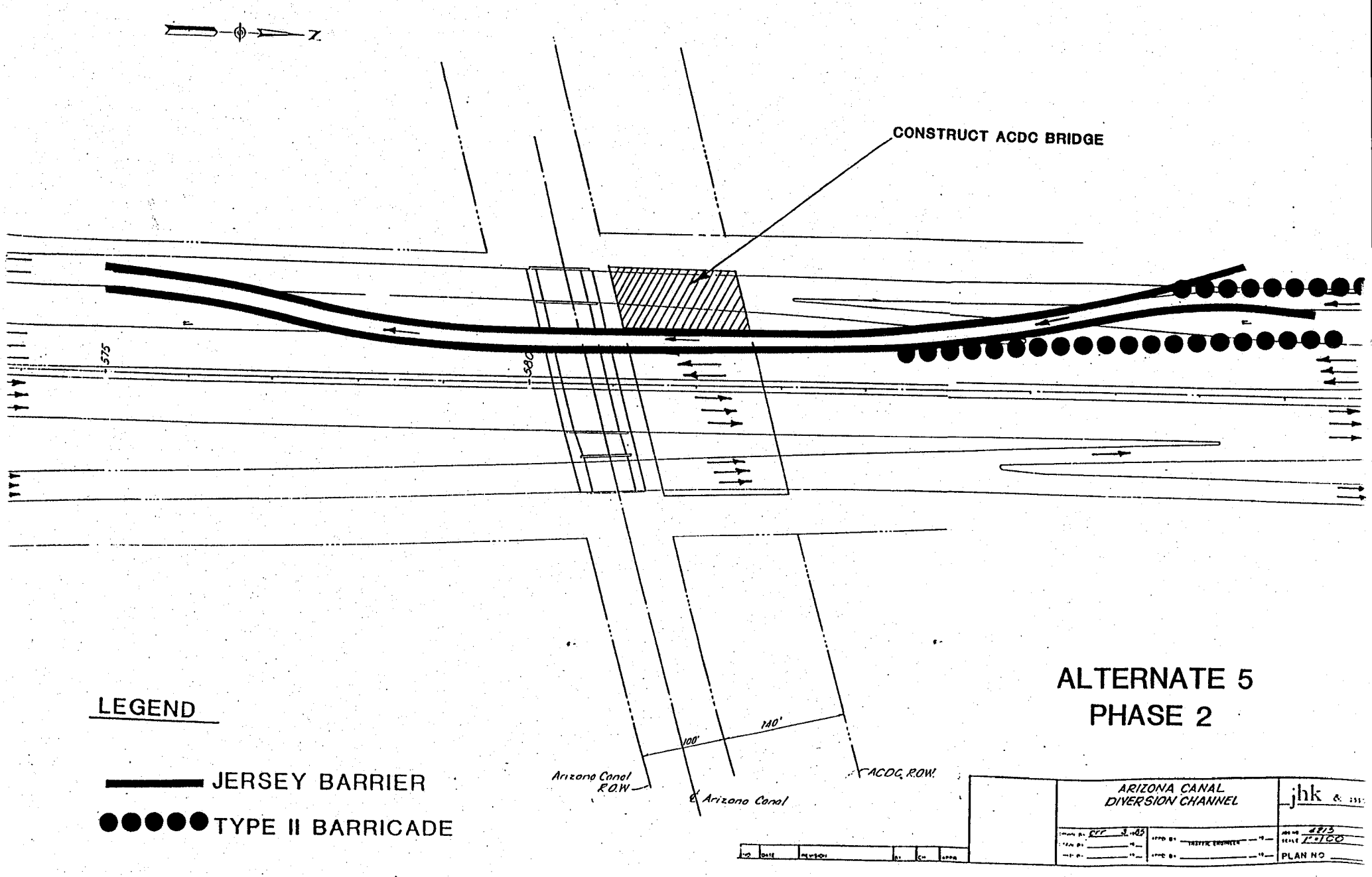


Figure III-2. Phase 2 Traffic Controls

the work area. Also, Jersey barrier will be placed along the inside lane of both frontage roads to protect the work area. Frontage road widths will be reduced. This scheme is as shown in Figure III-3A.

In the second stage of this phase, the freeway traffic is diverted to the temporary routes. Both frontage roads will be reduced to one lane. At this time the middle portion of the diversion channel extending across the existing freeway travel lanes will be constructed. To separate traffic and to protect the work area, Jersey barrier will be placed along both sides of the temporary bypass route. Type II barricades will also be used to channelize traffic. This scheme is displayed in Figure III-3B. Temporary pavement marking tape will be utilized for lane markings and edgelines. Temporary raised pavement markers will supplement markings on the freeway.

Simultaneous with this construction, a one-lane temporary bypass route for northbound frontage road traffic will be constructed. Jersey barrier and Type II barricades will be used to protect the work areas near the travelled portion of the frontage road (as shown in Figure III-3B).

Prior to Phase 4, all Jersey barriers used in Phase III will be removed. In Phase 4, the freeway traffic will be relocated onto the original freeway alignment and the northbound frontage road traffic will be relocated to the temporary bypass route constructed in the previous phase. A Jersey barrier alignment will be placed along both sides of the detoured northbound frontage road. In addition, Jersey barrier will be placed on the northbound freeway shoulder in the work area. Type II barricades will be used for channelization purposes, as shown in Figure III-4. Temporary tape will be used to mark lanes and edgelines.

Once Phase 4 is completed the northbound frontage road traffic will be relocated to the existing frontage road alignment, the temporary Jersey barrier removed, temporary bridge removed, and traffic alignment maintained as prior to construction.

OTHER TRAFFIC CONTROLS

In addition to the traffic controls at the work zone, advance construction warning signing will be required. The advance warning signing will be placed to allow traffic to detour or exit off the freeway at least two exits prior to the

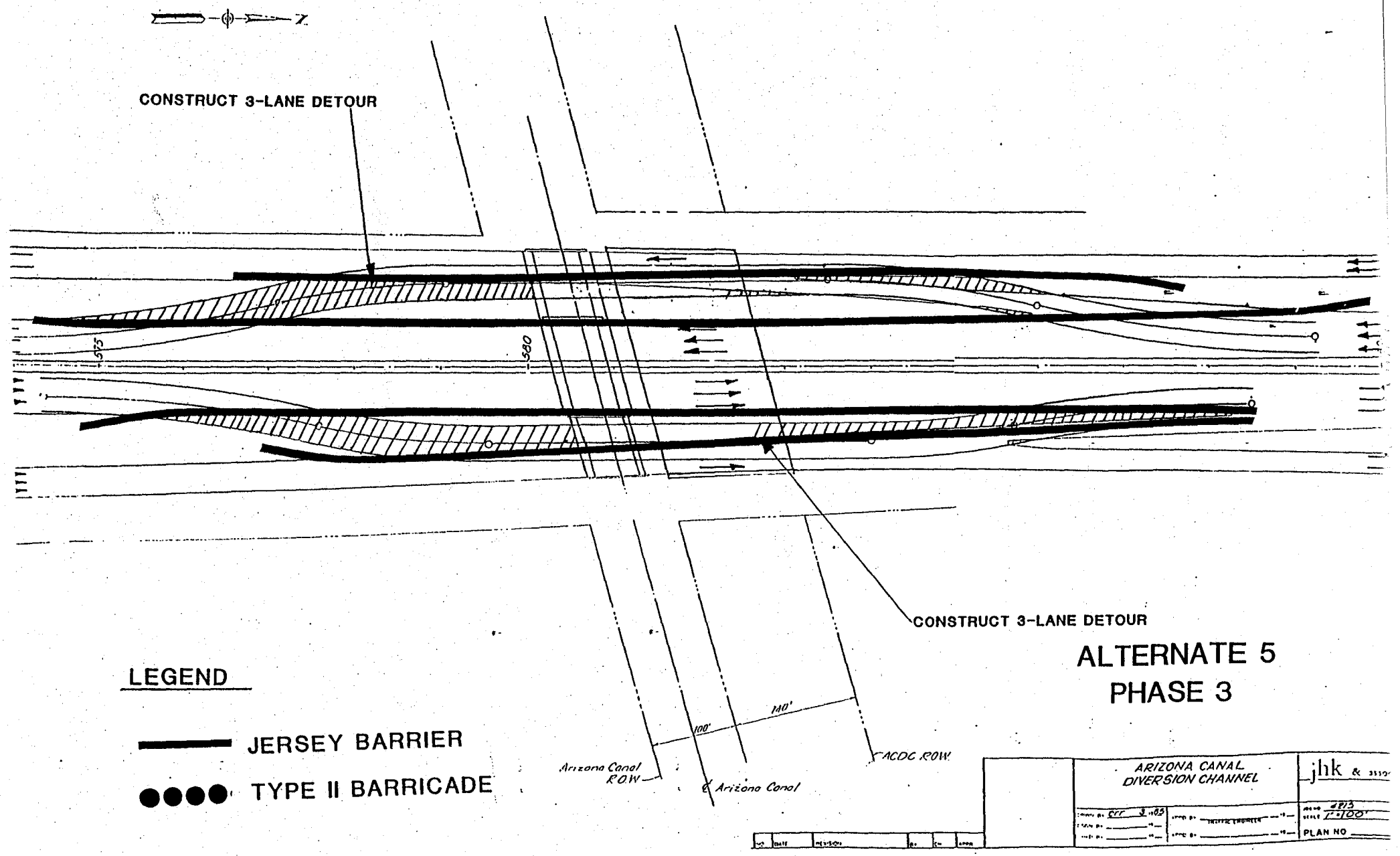


Figure III-3-A. Phase 3(Stage 1) Traffic Controls

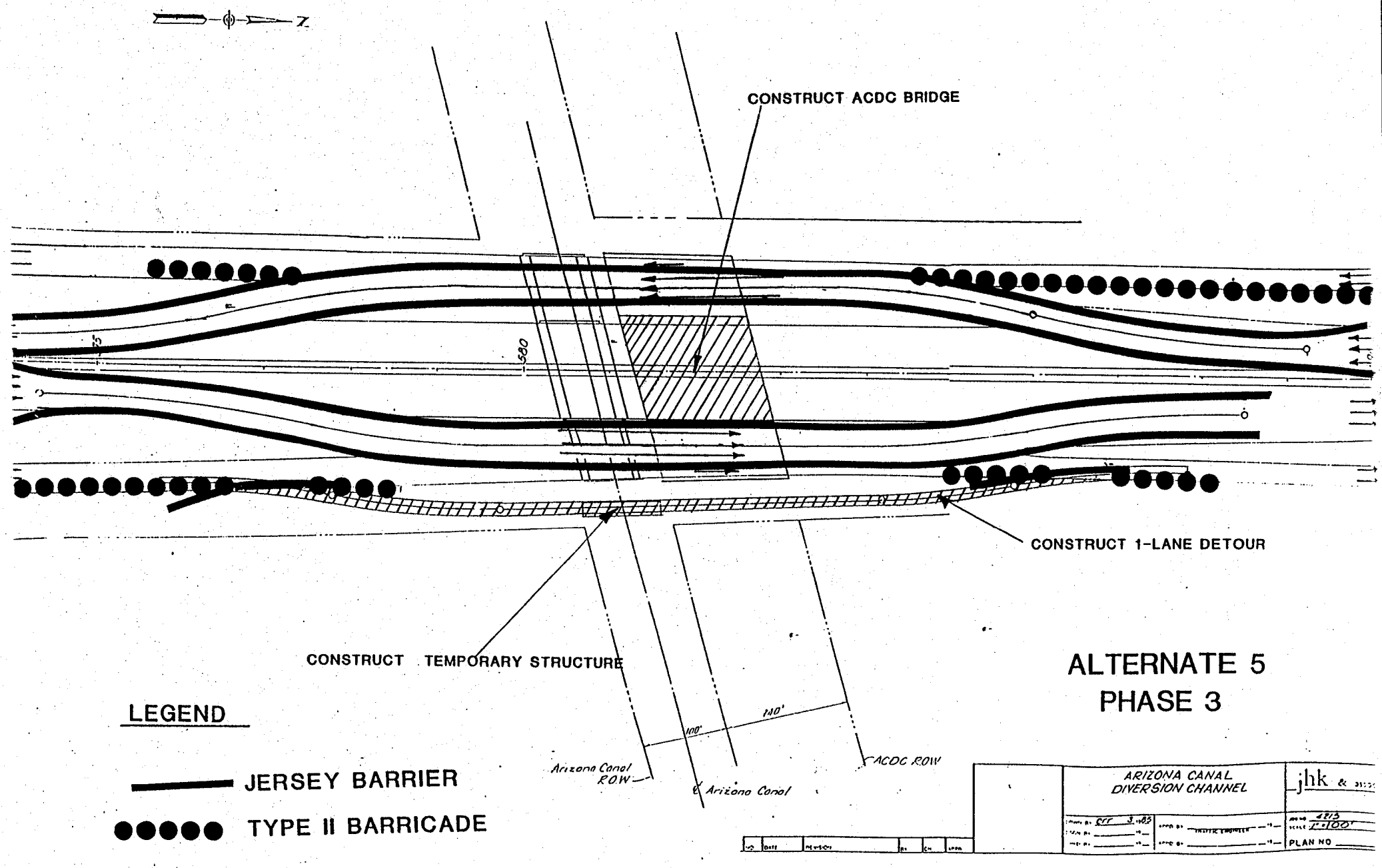


Figure III-3-B. Phase 3 (Stage 2) Traffic Controls

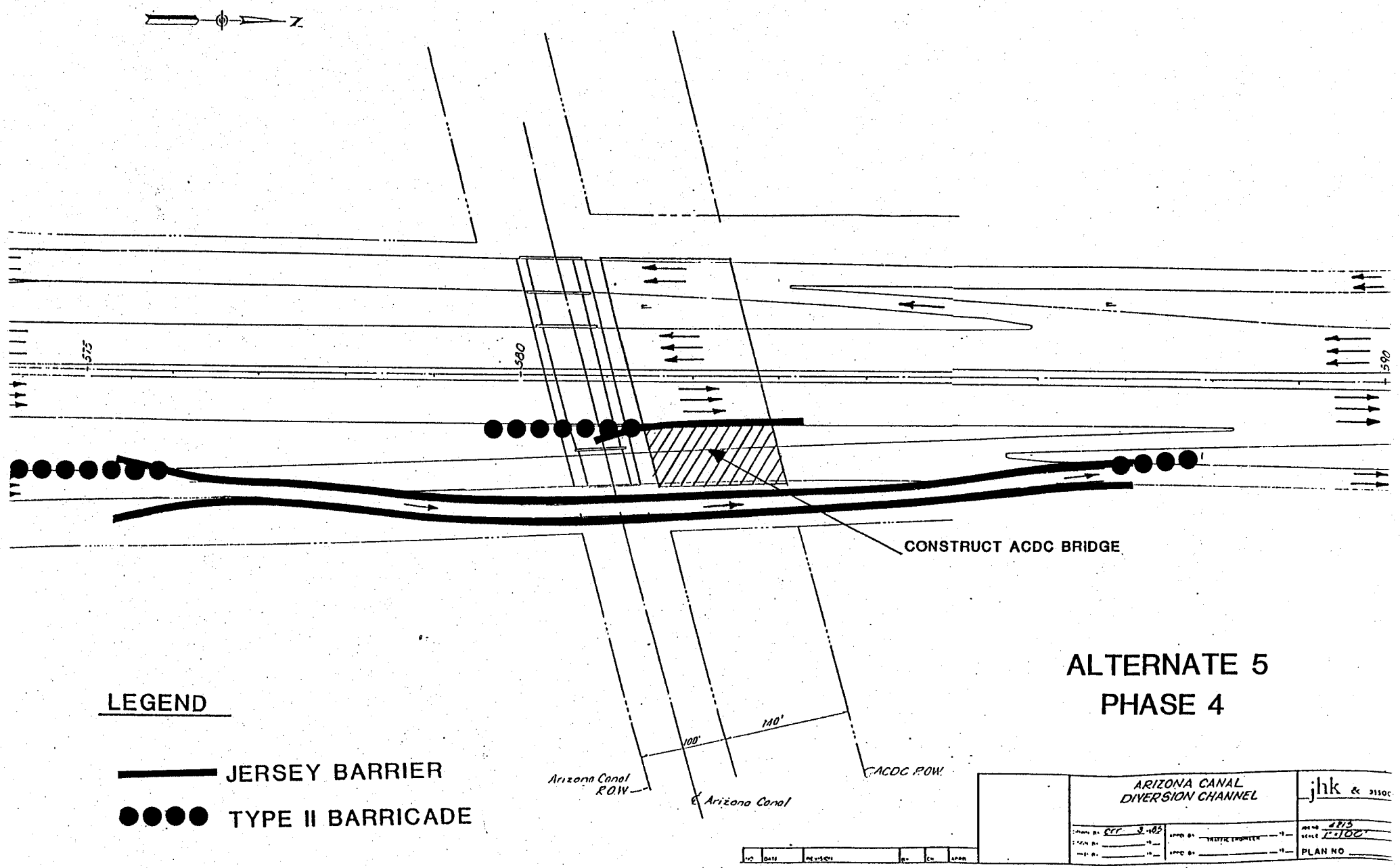


Figure III-4. Phase 4 Traffic Controls

construction area. For southbound freeway traffic, advance warning will be provided to permit traffic to exit at Cactus Road or Peoria Avenue. Northbound traffic will receive advance notice to permit exiting at either Glendale or Northern Avenues. Flashing lights will be placed on the advance warning signing to aid in alerting motorists of the upcoming construction area. Criteria for the advance warning construction signing will follow MUTCD guidelines.

Within the construction zone, one-direction target arrows (W 1-6) will be used to aid in guiding traffic through the curved portions of the temporary bypass routes. High-intensity sheeting may be used. For the lane closures along the frontage roads, flashing arrow boards may be utilized.

For nighttime control, steady burn lights will be used on Type II barricades used throughout the work zone length. Finally, delineators shall be placed on the walls of the Jersey barrier to aid in delineation.

The movement of construction vehicles within the work zone shall follow the guidelines set by the Arizona Department of Transportation. When crossing travelled portions of roadway, police officers and/or flaggers will be used to maintain the control of traffic through the work zone. It may be necessary to prohibit movement by construction vehicles into or out of the work zone (except for emergency purposes) during peak hours of typical weekdays. When possible, parking of construction vehicles within the work area during non-work hours will be planned. Finally, openings in the Jersey barrier (not depicted in Figure III-1 to III-4) will be typically designed on the downstream end of the work zone, i.e., where construction vehicles must cross southbound traffic lanes, openings in the Jersey barrier will be provided nearer the south end of the work zone. This design will permit the freeway and frontage road traffic to enter the work zone and be well into the work zone prior to passing through another major decision area, i.e., construction vehicle crossing area. Adequate sight distance will be provided to and from the crossing area.

IV. PHASE CONSTRUCTION CONCEPT

A detailed construction phasing concept has been devised to minimize the inpact of the construction of the Arizona Canal Diversion Channel bridge across I-17 and adjacent frontage roads. A detailed description of each phase following the appendix of this report contains plan and profile sheets of each of these phases.

PHASE 1A

Construct closure structures on the Arizona Canal, at the two open channel locations between the I-17 mainline and the two frontage roads. These bridge structures will be tied to, and match the existing three span structures over the Arizona Canal. During construction, the mainline shoulders and a twelve foot width on each frontage road may be barricaded for use by the contractor.

PHASE 1B

Construct a one lane detour roadway for southbound frontage road traffic; detour roadway to run parallel and adjacent to southbound mainline I-17 traffic, with a median barrier between. During this phases the southbound off-ramp will be closed.

PHASE 2

Construct first segment of ACDC bridge structure; this segment is the westerly portion that will eventually carry the full three lanes of the southbound frontage road. After completion, southbound frontage road traffic can be restored to normal, until Phase 3B is started.

PHASE 3A

Construct one lane detour roadway and temporary bridge across the Arizona Canal for northbound frontage road traffic, east of the existing frontage road location.

PHASE 3B

Construct both I-17 mainline 3-lane detours. The northbound mainline detour uses the existing northbound frontage road alignment at the Arizona Canal and Arizona Canal Diversion Channel locations. The southbound mainline detour traverses the new ACDC structure built in PHASE 2. The northbound off-ramp is closed at the start of the northbound detour construction.

PHASE 3C

Construct center segment of ACDC bridge structure. Prior to starting construction, all traffic detours are placed into service. The southbound frontage road traffic is reduced to one lane of travel, and occupies the extreme west lane of the southbound frontage road alignment. A median barrier separates the frontage road traffic from the three lanes of mainline southbound traffic.

The northbound frontage road traffic is diverted to the one-lane temporary bridge across the Arizona Canal; the northbound mainline traffic occupies the new detour along the northbound frontage road alignment.

After the construction of the center segment of the ACDC bridge structure is complete, mainline traffic is relocated to its normal position across the new structure, and the southbound frontage road and off-ramp reconstructed for permanent use. At this time, only the northbound frontage road traffic remains on its detour.

PHASE 4

Construct final, easterly, segment of ACDC bridge structure. Upon completion, northbound frontage road and on-ramp are reconstructed for permanent use, and the temporary bridge and detour pavement removed, restoring full normal service.

V. MAJOR DESIGN FEATURES

A. DESIGN CONTROLS

1. Design speeds

   a. I-17 mainline detours - 50 mph; to be posted at 45 mph
   b. Frontage road detours - 40 mph; to be posted at 35 mph

2. Number of lanes

   a. I-17 mainline detours - 3 lanes in each direction
   b. Frontage road detours - a minimum of one lane in each direction

3. Design hourly volumes

   a. freeway - 5000 vph
   b. frontage road (NB) - 950 vph (700 after on-ramp)
   c. frontage road (SB) - 800 vph (1500 after off-ramp)
   d. NB on-ramp - 550 vph
   e. SB off-ramp - 700 vph

4. Level of Service - consistent w/existing conditions

5. lane widths - Attempt to maintain 12-foot lanes (11 foot minimum); outside lanes may need to be greater (14 foot)

6. Shoulder - For short length of construction area, shoulder area may be eliminated.

7. Superelevation - Max. - 0.06 ft/ft; 0.02 ft/ft to match existing pavement slopes as minimum.

8. Grades - 4 to 5 percent maximum

9. Vertical clearance (if used) - 15 feet

10. Median width (where separation of directional traffic flow may occur) -2 ft. median barrier w/2ft. shoulder.

11. Stopping sight distance - per 35 mph absolute minimum design speed.

12. Horizontal curvature - determined as a function of design speed, superelevation, and friction factor.

13. Geometric design guidelines

    a. A Policy on Geometric Design of Highways and Streets, AASHTO, 1984.

b. Roadway Guides for Use in Office and Field, ADOT, 1982.

B. Horizontal Alignment

The preliminary horizontal alignment for each required detour is shown on the half size plan sheets included in the appendix of this report.

C. Vertical Alignment

The preliminary profile grades for each detour is shown on the half size profile sheets included in the appendix of this report.

D. Access Control

Both the I-17 southbound off-ramp and the northbound on-ramp north of Dunlap Avenue will be closed during portions of construction.

E. Right of Way

No additional right-of-way will be required for this project.

F. Drainage

An existing 36" reinforced concrete pipe storm drain, conveying storm runoff from I-17 north of the project site, empties into the Arizona Canal beneath the I-17 median. This storm drain will be rerouted during the phased construction to empty into the Arizona Canal Diversion Channel right-of-way west of I-17.

A number of storm drain catch basins along I-17 will be impacted to some degree by temporary detour roadways required in this project. Relocation and reconstruction will be required.

The Arizona Canal Diversion Channel right-of-way west of I-17 receives a substantial amount of storm runoff during periods of heavy rainfall. The existing swale drains to the west for approximately a half mile to a pump station that directs storm runoff into the Arizona Canal. The deep swale in the Arizona Canal Diversion Channel right-of-way east of I-17 also receives storm runoff, but does not drain off under existing conditions. The swale acts as a detention basin during storm periods; storm water is retained until it is lost through natural percolation into the ground and evaporation into the atmosphere. An unusually wet period may affect construction operations for the Arizona Canal Diversion Channel bridge structure and would require local pumping to maintain a dry excavation.

G. Floodplain Considerations

The Arizona Canal Diversion Channel project has been undertaken to mitigate the floodplain problem in the central Phoenix area. The I-17

ACDC bridge structure, upon completion, will allow over 26,000 cubic feet per second of storm water to pass beneath I-17, to the benefit of residents and businesses to the northeast and to prevent present storm water flows from entering Salt River Project's Arizona Canal.

H. Section 404 of the Clean Water Act

There are no streams near this project which come under the jurisdiction of Section 404 of the Clean Water Act.

I. Earthwork

Earthwork will be a minor aspect of the ACDC bridge project. A small amount of embankment fill will be required to develop approach ramps for the northbound frontage road detour to the temporary bridge. A small amount of roadway excavation will be required on the southbound frontage road detour, as well as both mainline detours south of the bridge site. Some roadway excavation and fill will be required when the detours are removed and the site is restored to the existing conditions. During the construction staging, excess excavation will be moved off highway right-of-way. Fill required will be moved from stockpiles off the highway right-of-way.

J. Utilities

Construction of the various detours will require removal and restoration of several overhead light standards and associated wiring and conduit in the vicinity of the existing on and off ramps. No other known existing utilities or facilities will be affected.

K. Landscaping and Irrigation System

Detour construction will require the removal and replacement in kind for existing roadway planting and associated irrigation systems.

L. Structures

The selection of structure type was indicated by several factors. Some of them include traffic routing during various phases, horizontal and vertical roadway geometry, hydraulic clearances, construction of existing bridges and the available technology to construct new structures over the proposed ACDC Canal.

The infill structures between the I-17 Mainline and the frontage roads over the Arizona Canal will consist of new three span cast-in-place concrete slab bridges with wall type piers constructed on spread footings. This construction will be similar to the existing bridges over the Arizona Canal. Although several alternatives were considered, it was concluded that the available time of the dry-up period is sufficient to construct a cast-in-place concrete substructures. Precast superstructure are not favored since camber growth could lead to changes in the deck elevation between

the existing and the new decks. Recent ADOT experience indicates that cast-in-place structures have been constructed without unusual delays and their performance has been satisfactory.

The recommended structure over the new ACDC consist of single span cast-in-place post-tensioned box girders constructed in several phases. Other structure types considered were:

1. Single span CIP concrete deck over Type VI AASHTO girders.

2. Two span CIP concrete deck over Type III AASHTO girders with one pier at the center.

3. Two span precast concrete boxes with one pier at the center.

The post-tensioned box girder will be constructed on grade over drilled piers. The ACDC can then be excavated after the structure is complete. This type of construction procedure has been utilized successfully at other crossings in Maricopa County.

The box girder constructed in each phase will experience different degrees of elastic shortening. A continuous joint will be provided in the post-tensioned box girder separating construction in each phase.

A temporary one-lane bridge over the Arizona Canal will be constructed at the northbound frontage road. A prefabricated steel bridge such as the ones manufactured by Acrow Corporation of America commonly known as "Bailey Bridge" was considered. This type of reusable structure can be easily installed and dismantled after it has served its purpose.

Recommended is the utilization of existing prestressed-precast concrete box girders currently being built for a crossing of the Arizona Canal at 25th Avenue.

A detailed analysis of the selection of structure is included in the Structure Selection Report issued as a separate report.

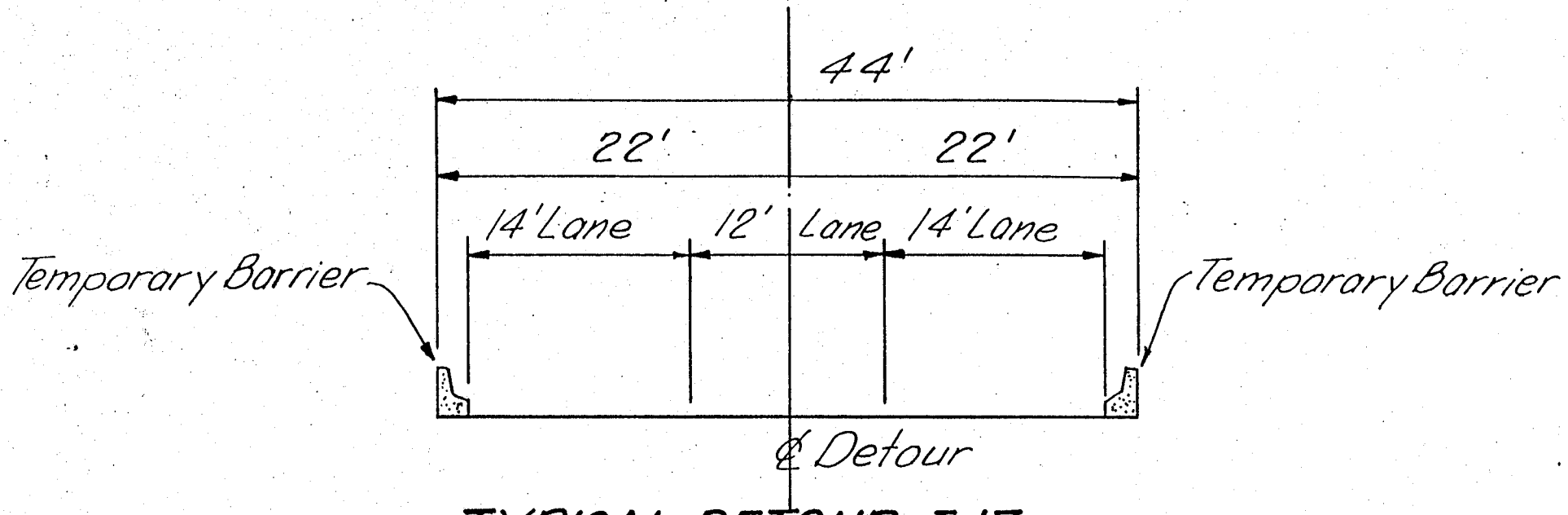
VI. ESTIMATE OF COST

The following cost estimate for Alternative No. 5 is based on the recommended structure types and a detailed take-off of the quantities as represented by the field survey and may vary from the estimate included in Section II Cost Matrix.

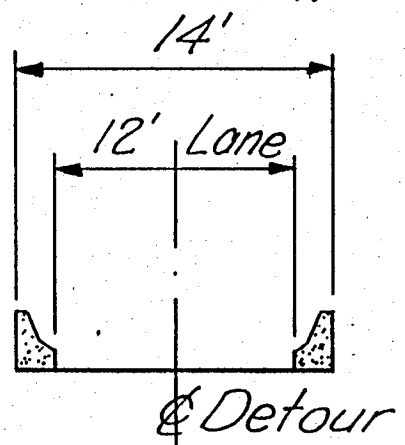
Arizona Diversion Canal Bridge	$1,090,000.00
Bridges Over The Arizona Canal	211,800.00
Temporary Bridge Over The Arizona Canal	50,000.00
Roadway Detours including	
Anchor Slab Construction	859,600.00
Traffic Control	220,400.00
Landscape and Irrigation Systems	35,000.00
Safety Lighting System	25,000.00
TOTAL ESTIMATED CONSTRUCTION COST	**$2,491,800.00**

APPENDIX

APPENDIX ALTERNATIVE TRAFFIC CONTROL STRATEGIES

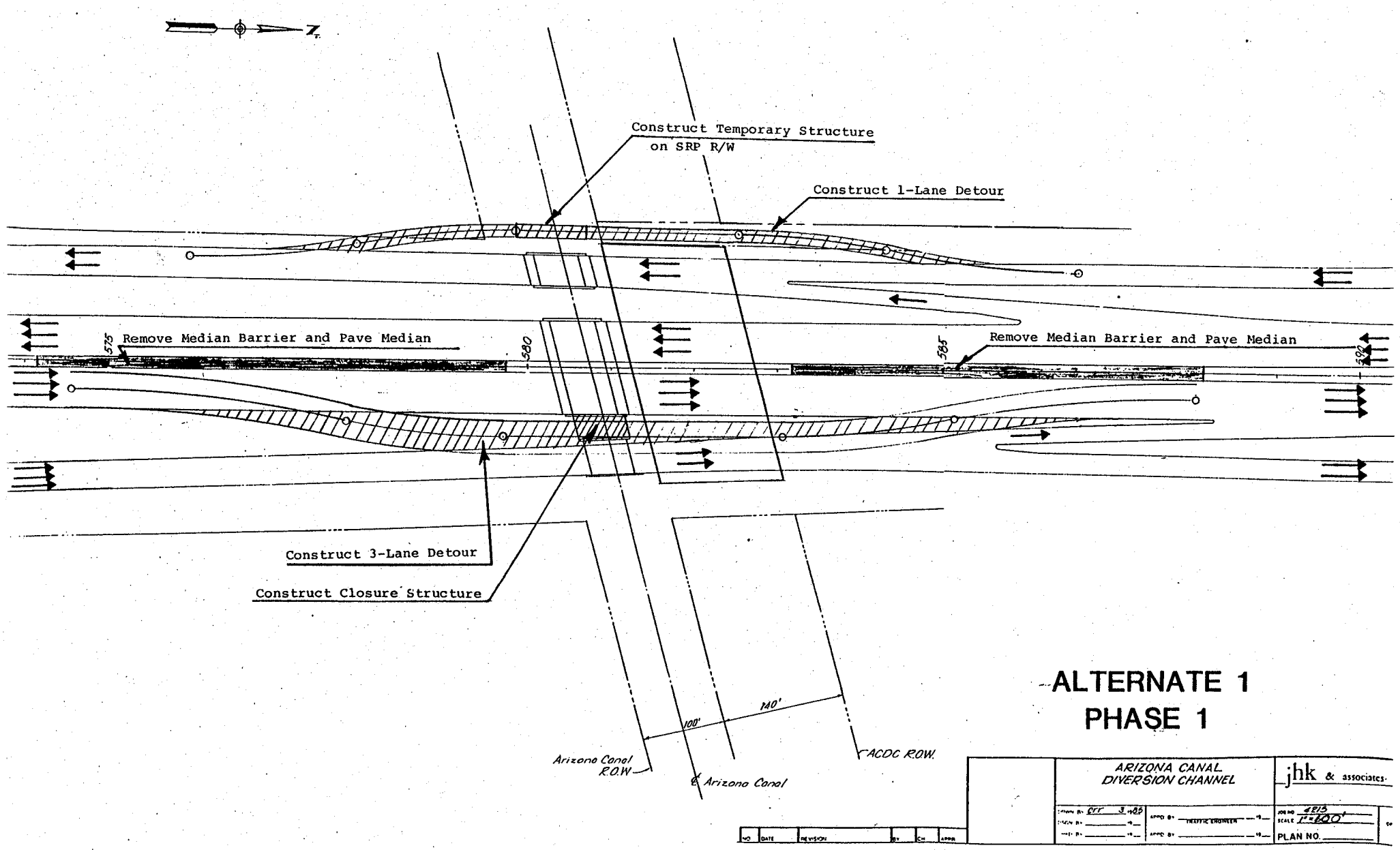


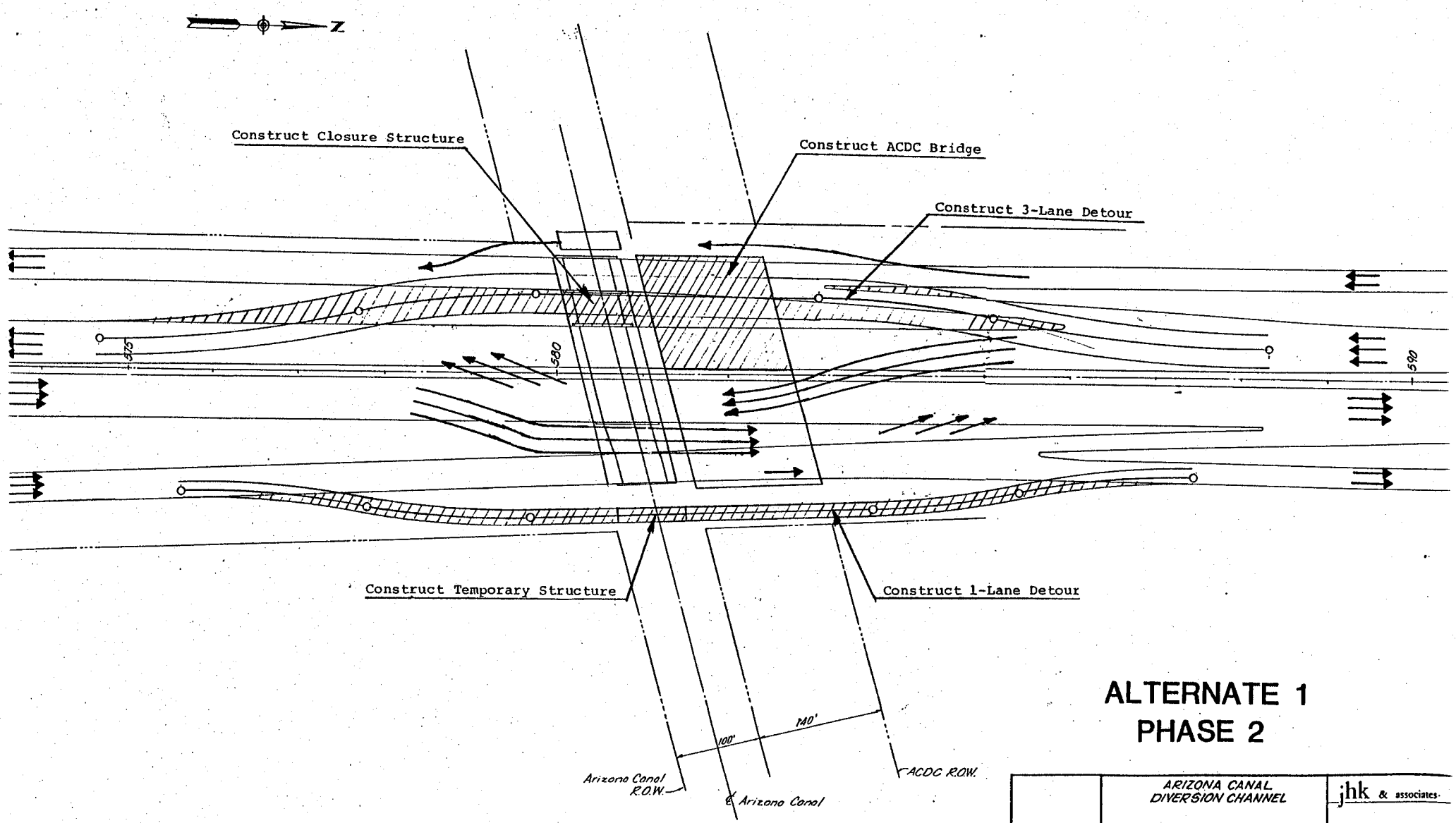
TYPICAL DETOUR I-17
(Northbound or Southbound)



TYPICAL DETOUR
(Frontage Rd.)

TYPICAL SECTIONS
ACDC


Construct Temporary Structure on SRP R/W
Construct 1-Lane Detour
Remove Median Barrier and Pave Median
575
580
585
590
Remove Median Barrier and Pave Median
Construct 3-Lane Detour
Construct Closure Structure
100'
140'
Arizona Canal R.O.W.
℄ Arizona Canal
ACDC R.O.W.
ALTERNATE 1
PHASE 1
ARIZONA CANAL DIVERSION CHANNEL
jhk & associates
DRAWN BY Orr 3-1-85
DESIGN BY
CHECK BY
APPD BY TRAFFIC ENGINEER
APPD BY
JOB NO 4815
SCALE 1"=100'
PLAN NO.
NO DATE REVISION BY CH APPR



ALTERNATE 1
PHASE 2

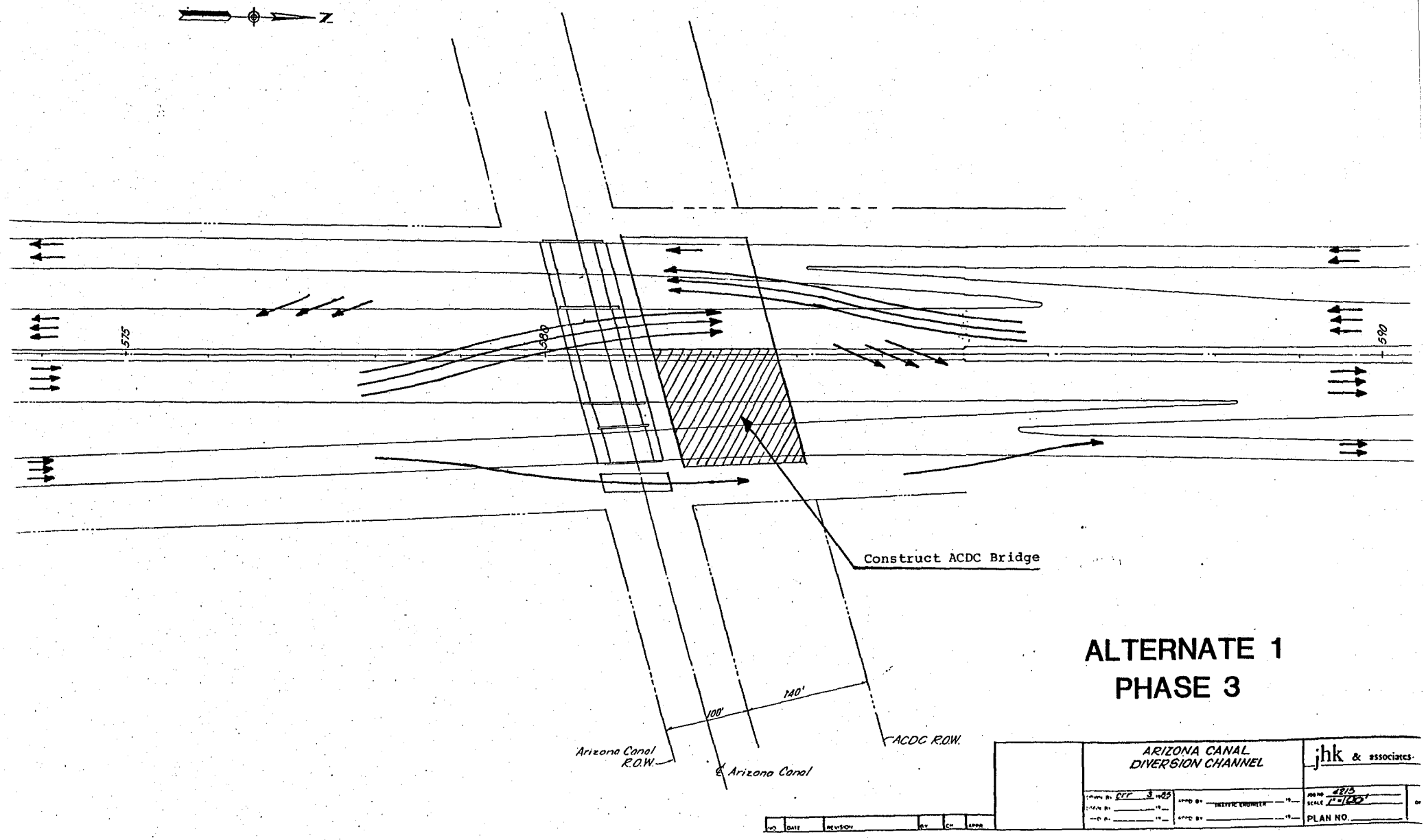
NO	DATE	REVISION	BY	CH	APPR

ARIZONA CANAL DIVERSION CHANNEL

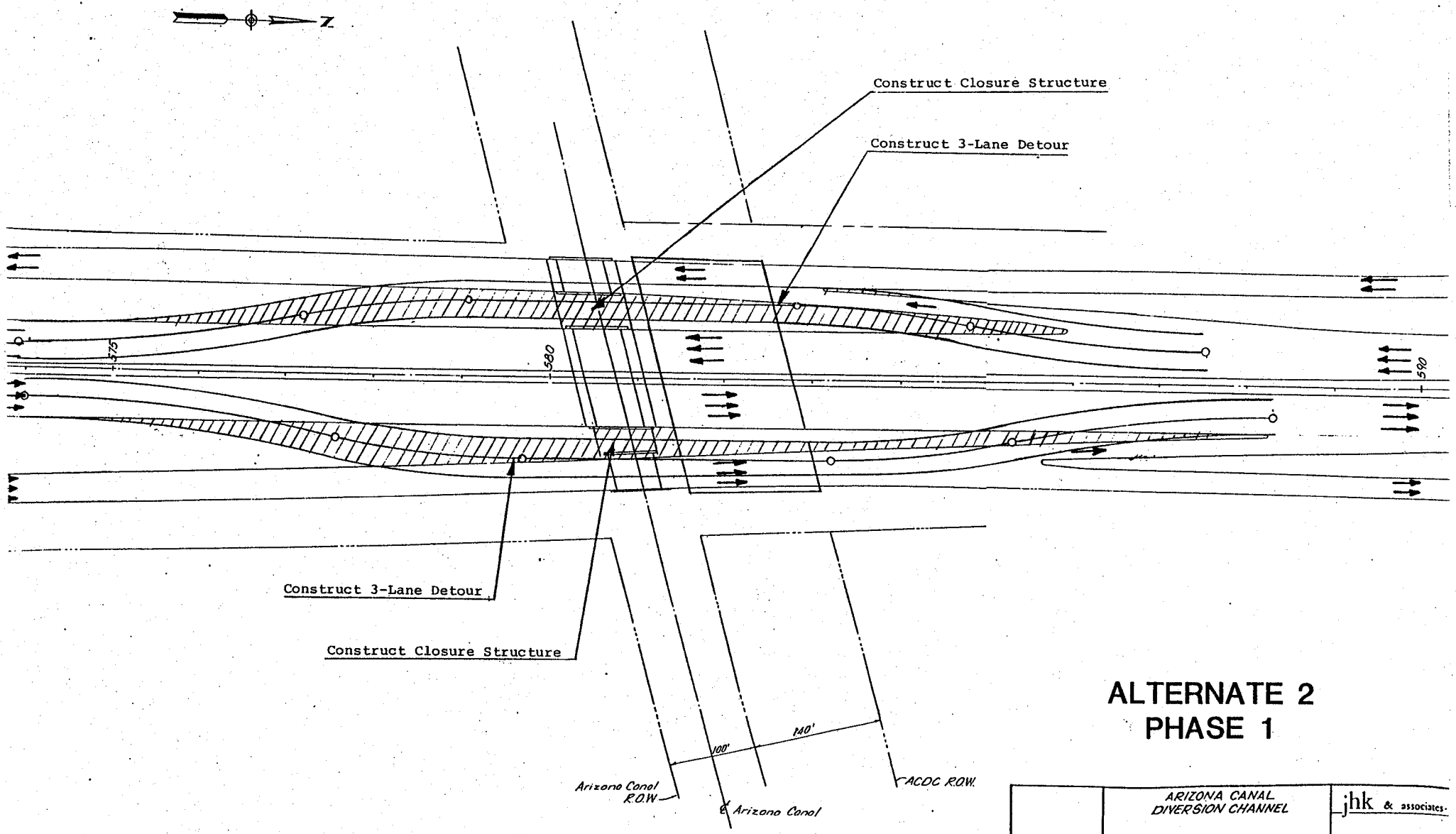
jhk & associates

DRAWN BY Crr 3-1985 | DESIGN BY ____ 19__ | CHKD BY ____ 19__ | APPD BY ____ TRAFFIC ENGINEER ____ 19__ | APPD BY ____ 19__

JOB NO 4213 | SCALE 1"=100' | PLAN NO. ____ | OF



ALTERNATE 1
PHASE 3



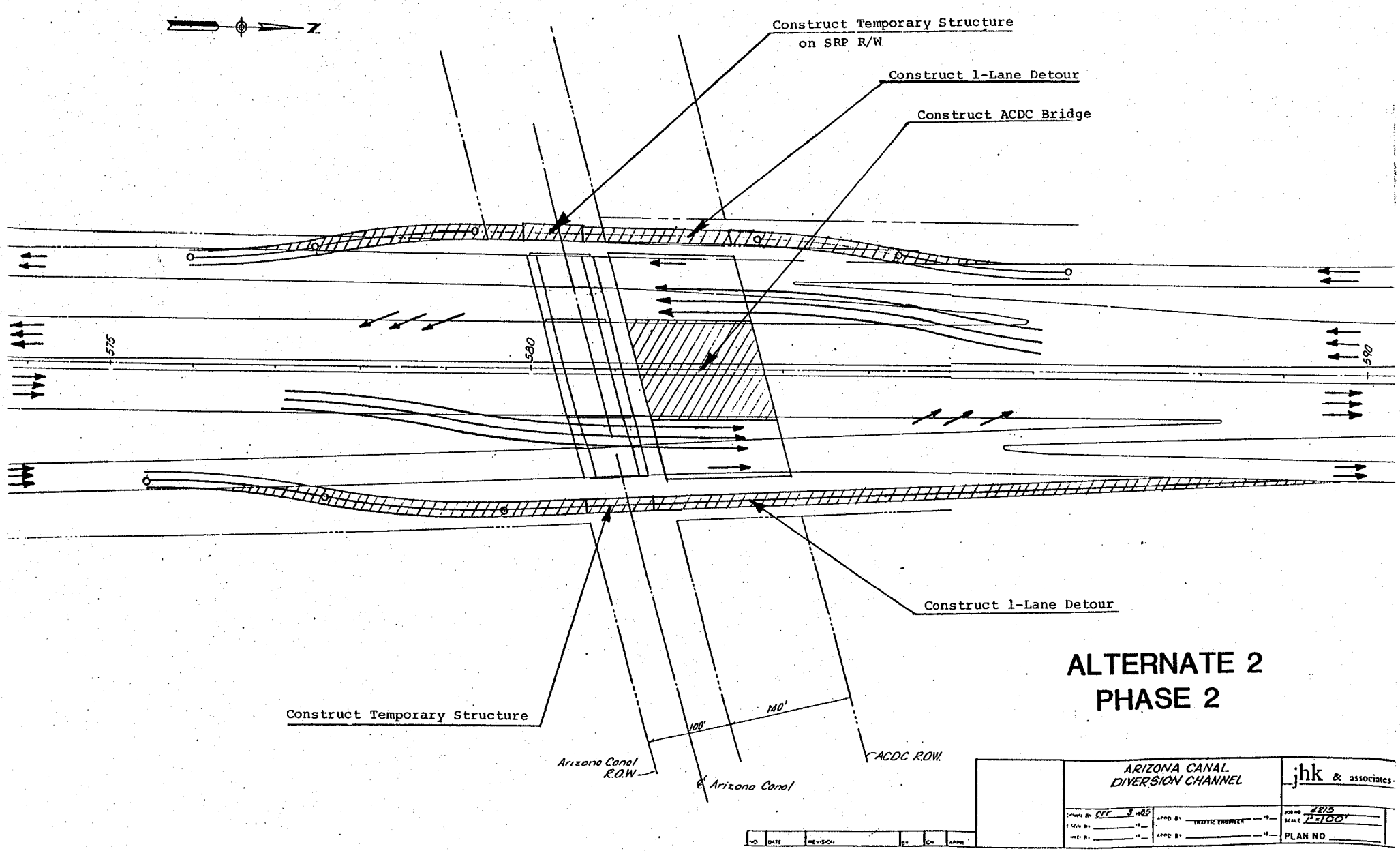
ALTERNATE 2
PHASE 1

NO.	DATE	REVISION	BY	CH.	APPR.

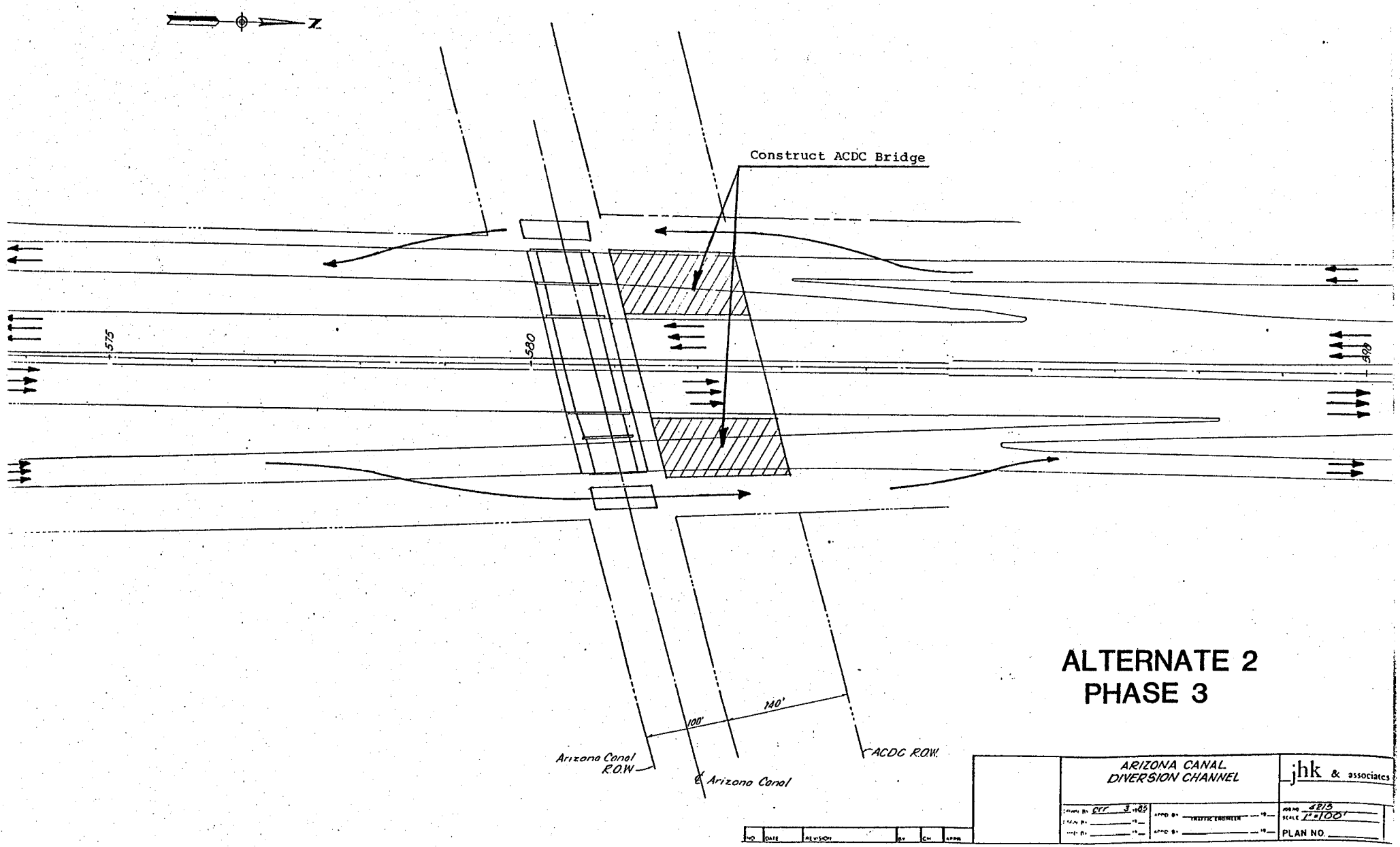
ARIZONA CANAL DIVERSION CHANNEL

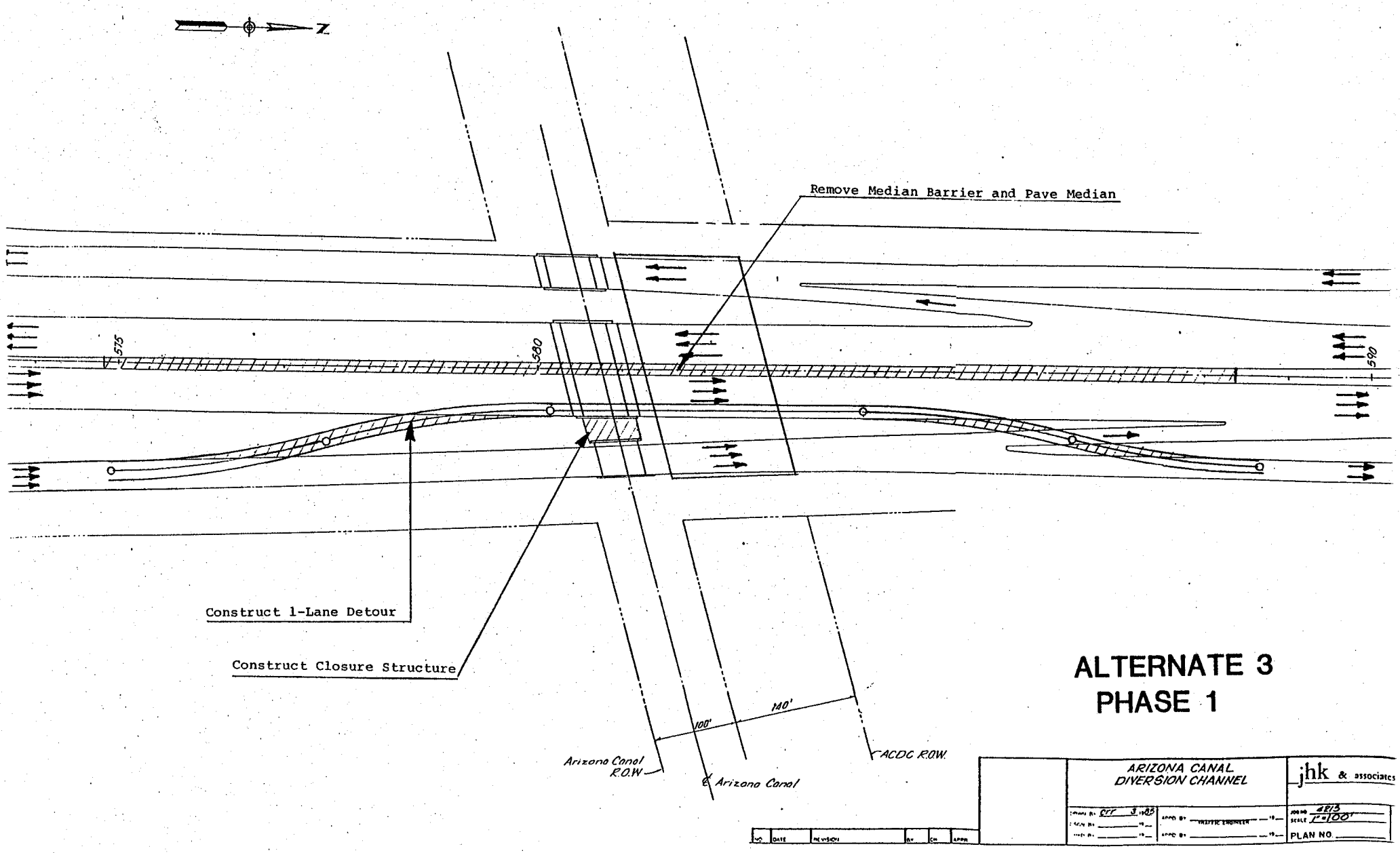
jhk & associates

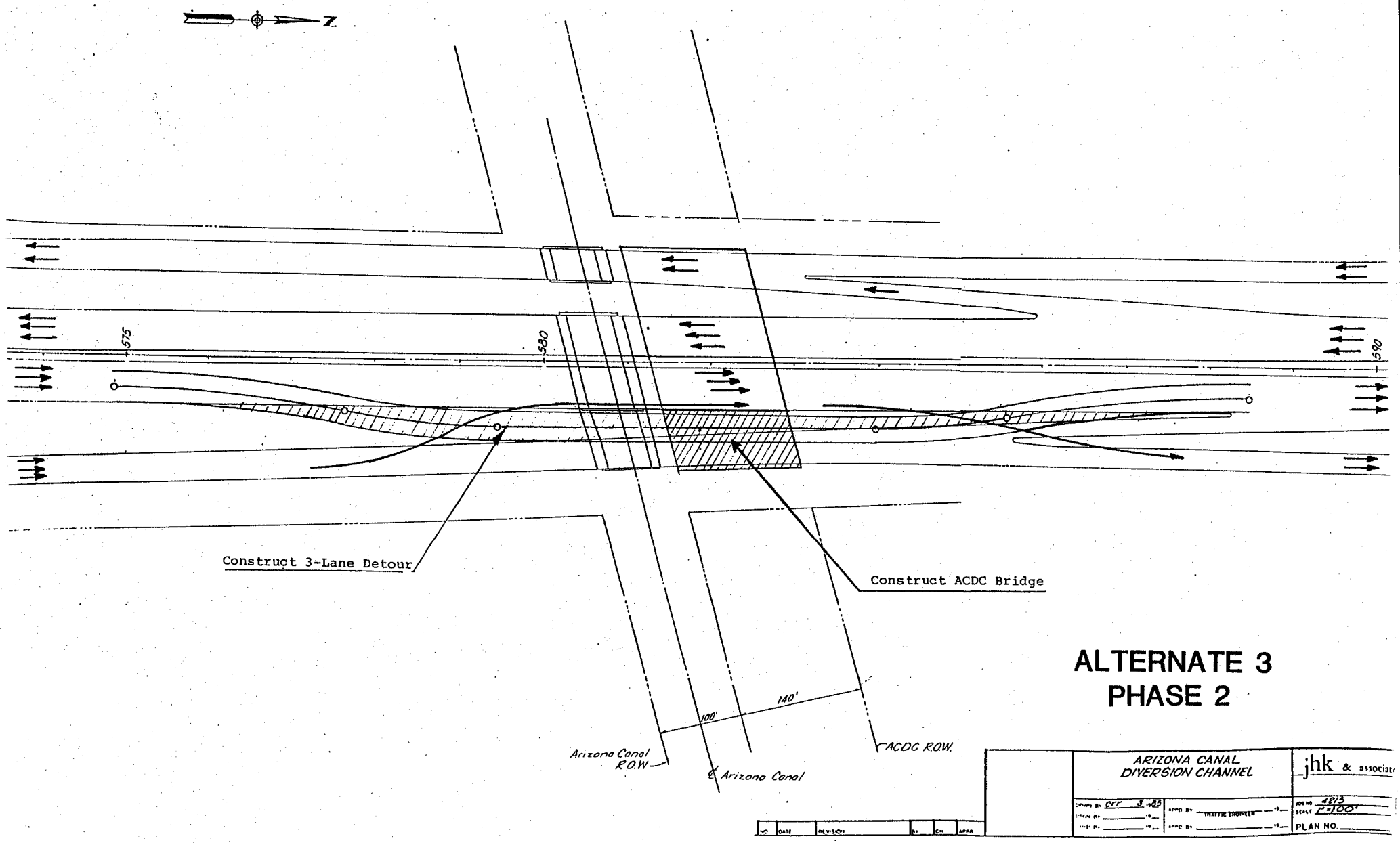
DRAWN BY Orr 3-1-85
CHECKED BY
TRACED BY
APPD BY
APPD BY
CHIEF ENGINEER
JOB NO. 4818
SCALE 1"=100'
PLAN NO.



ALTERNATE 2
PHASE 2


N
Construct ACDC Bridge
575
580
585
100'
140'
Arizona Canal R.O.W.
℄ Arizona Canal
ACDC R.O.W.
ALTERNATE 2
PHASE 3
ARIZONA CANAL
DIVERSION CHANNEL
jhk & associates
TRAFFIC ENGINEER
PLAN NO.
NO
DATE
REVISION
BY
CK
APPR


N
Remove Median Barrier and Pave Median
575
580
590
Construct 1-Lane Detour
Construct Closure Structure
100'
140'
Arizona Canal R.O.W.
℄ Arizona Canal
ACDC R.O.W.
ALTERNATE 3
PHASE 1
ARIZONA CANAL DIVERSION CHANNEL
jhk & associates
DRAWN BY CFF 3-1985
TRAFFIC ENGINEER
JOB NO 4813
SCALE 1"=100'
PLAN NO.
NO. DATE REVISION BY CK APPR



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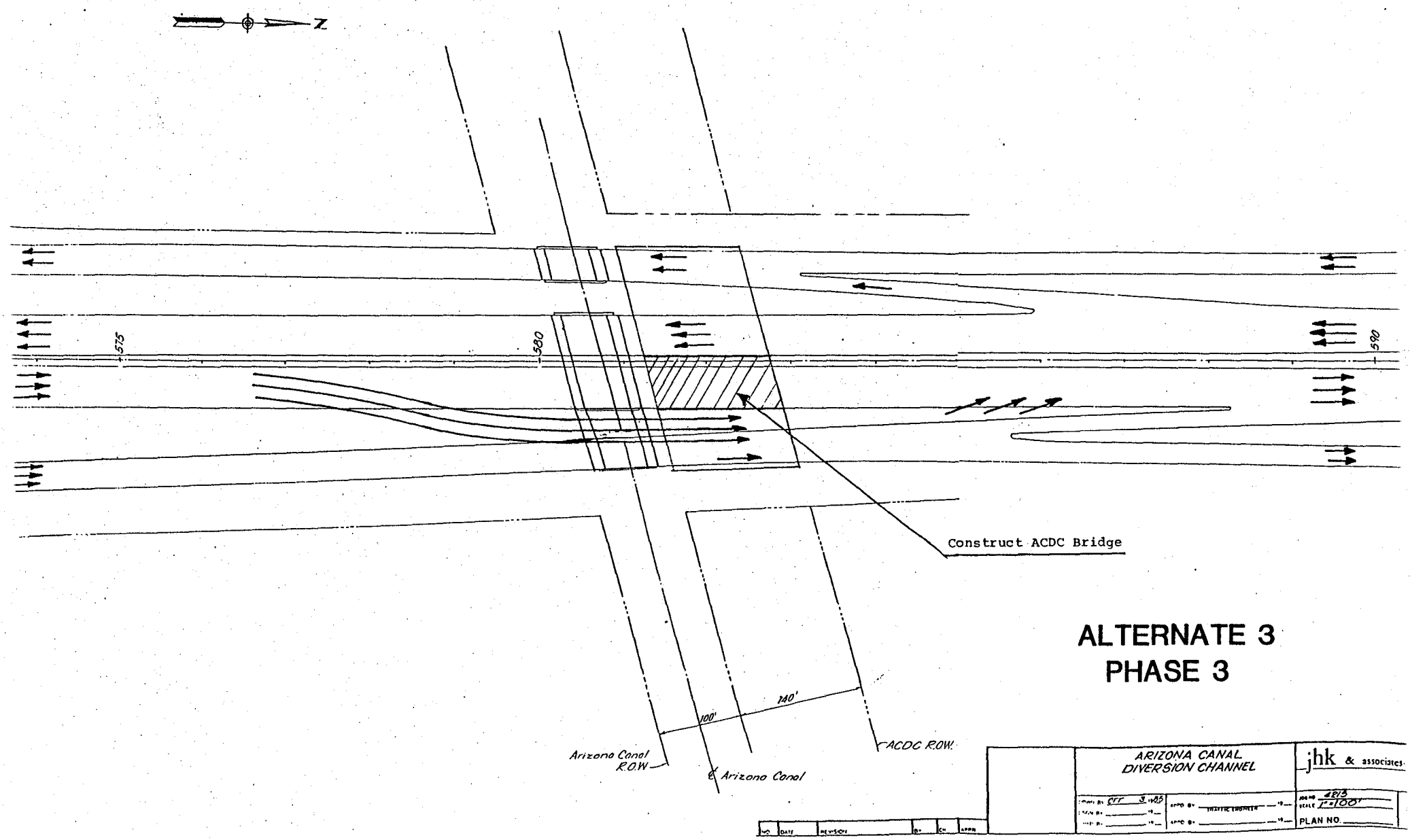
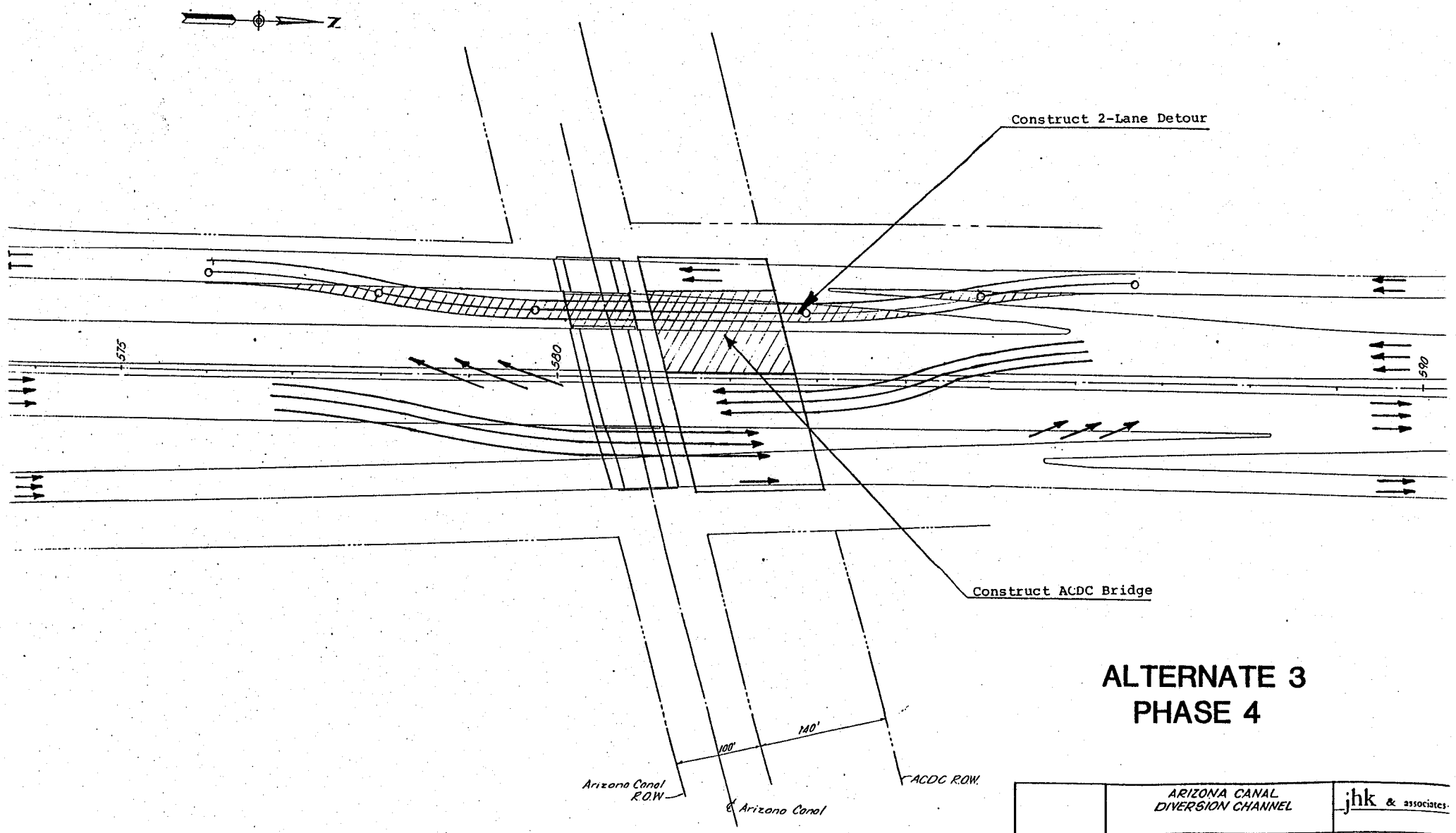
PHASE 2


N
575
580
590
Construct ACDC Bridge
ALTERNATE 3
PHASE 3
100'
180'
Arizona Canal
R.O.W.
℄ Arizona Canal
ACDC R.O.W.
ARIZONA CANAL
DIVERSION CHANNEL
jhk & associates
DRAWN BY CFF 3 1985
APPD BY TRAFFIC ENGINEER 19
APPD BY 19
JOB NO 4213
SCALE 1"=100'
PLAN NO.
NO DATE REVISION BY CK APPR



ALTERNATE 3
PHASE 4

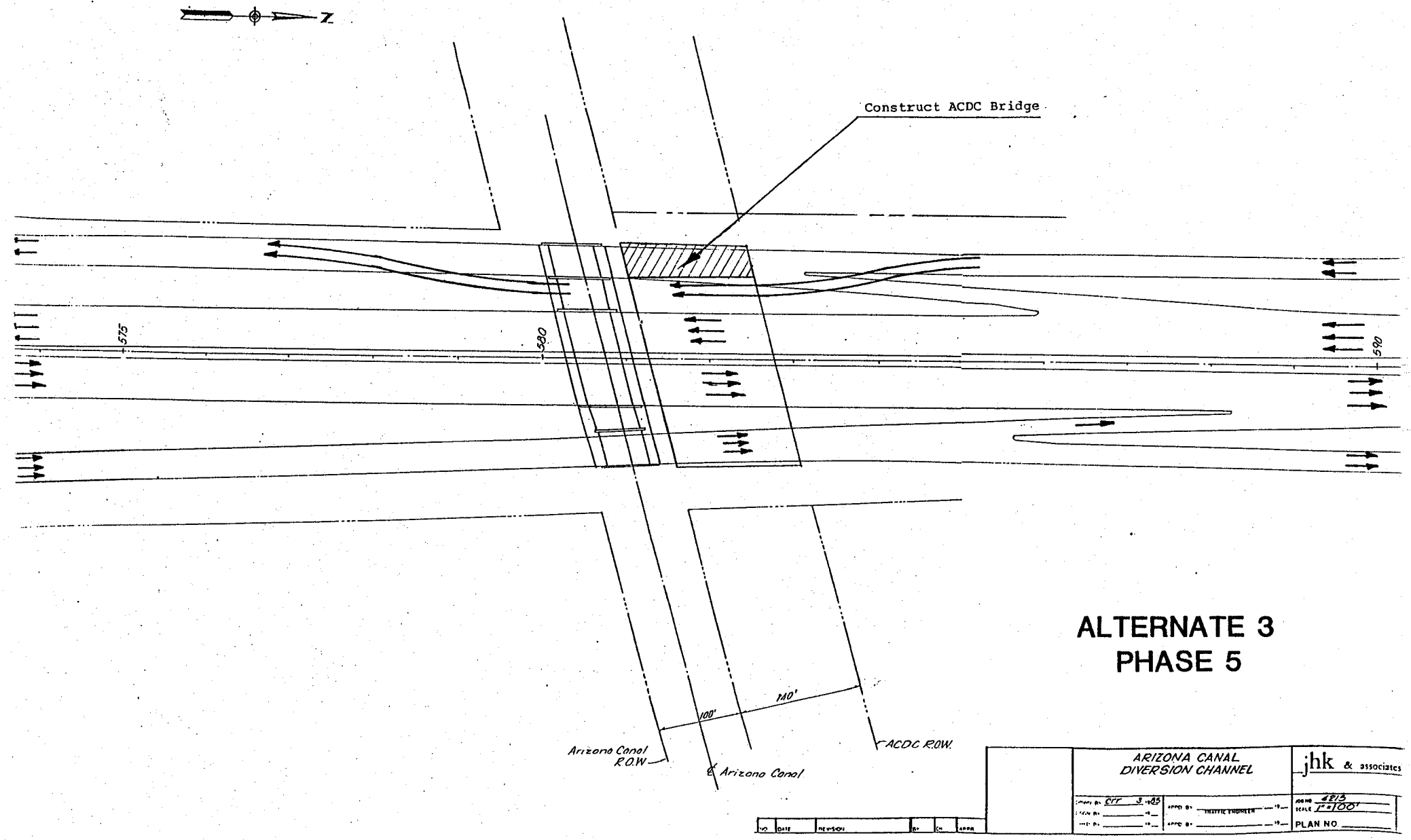
NO	DATE	REVISION	BY	CK	APPR

ARIZONA CANAL DIVERSION CHANNEL

jhk & associates

DRAWN BY CFF 3 1985 — APPD BY TRAFFIC ENGINEER — 19__
CHKD BY — 19__ — APPD BY — 19__
DWN BY — 19__

JOB NO 4213
SCALE 1" = 100'
PLAN NO



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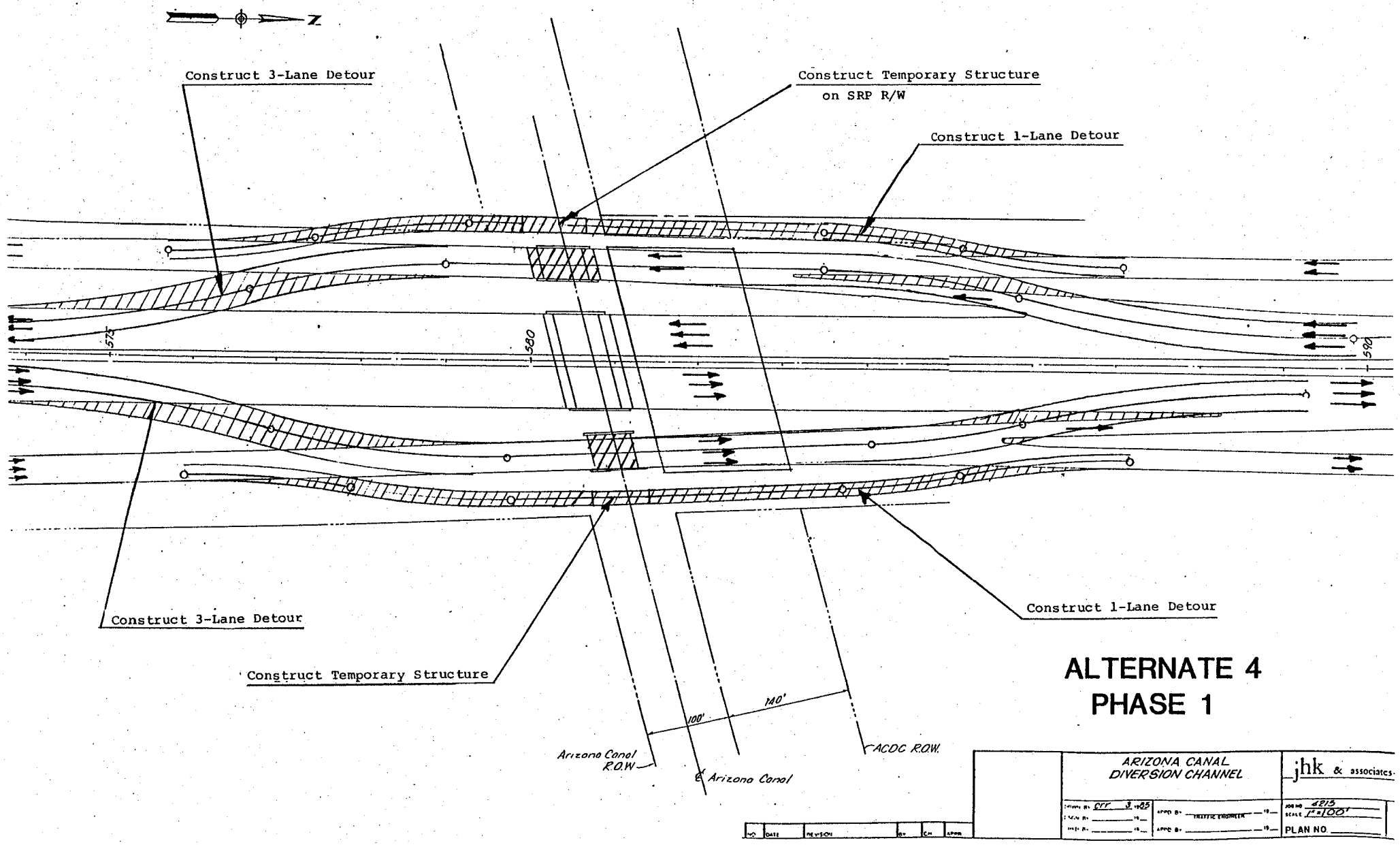
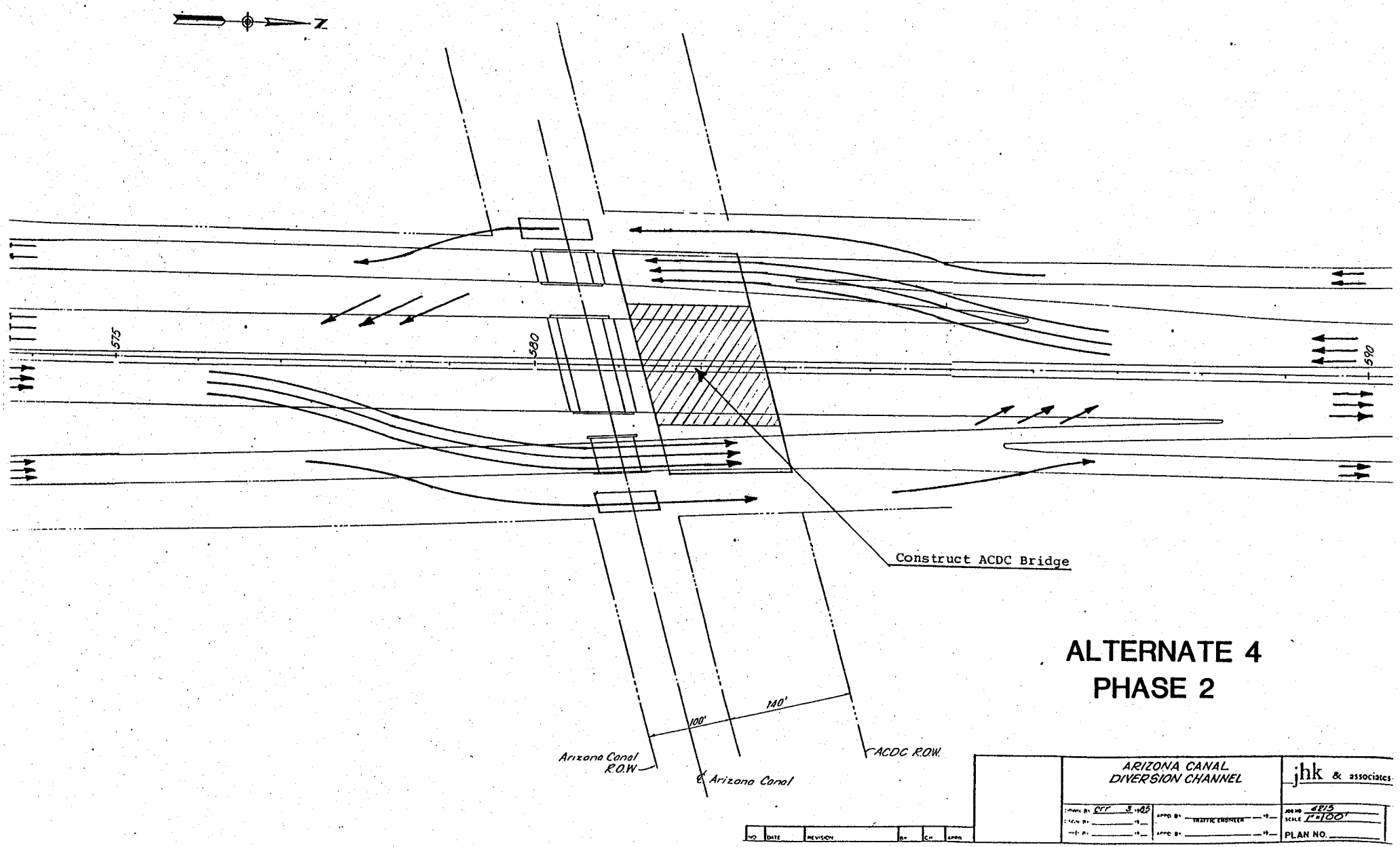
PHASE 5


N
Construct 3-Lane Detour
Construct Temporary Structure
on SRP R/W
Construct 1-Lane Detour
572
580
590
Construct 3-Lane Detour
Construct Temporary Structure
Construct 1-Lane Detour
100'
140'
Arizona Canal
R.O.W.
℄ Arizona Canal
ACDC R.O.W.
ALTERNATE 4
PHASE 1
ARIZONA CANAL
DIVERSION CHANNEL
jhk & associates
DRAWN BY: CFF 3 1985
CHECKED BY: 19
DESIGN BY: 19
APPD BY: TRAFFIC ENGINEER 19
APPD BY: 19
JOB NO 4215
SCALE 1"=100'
PLAN NO.
NO DATE REVISION BY CK APPR



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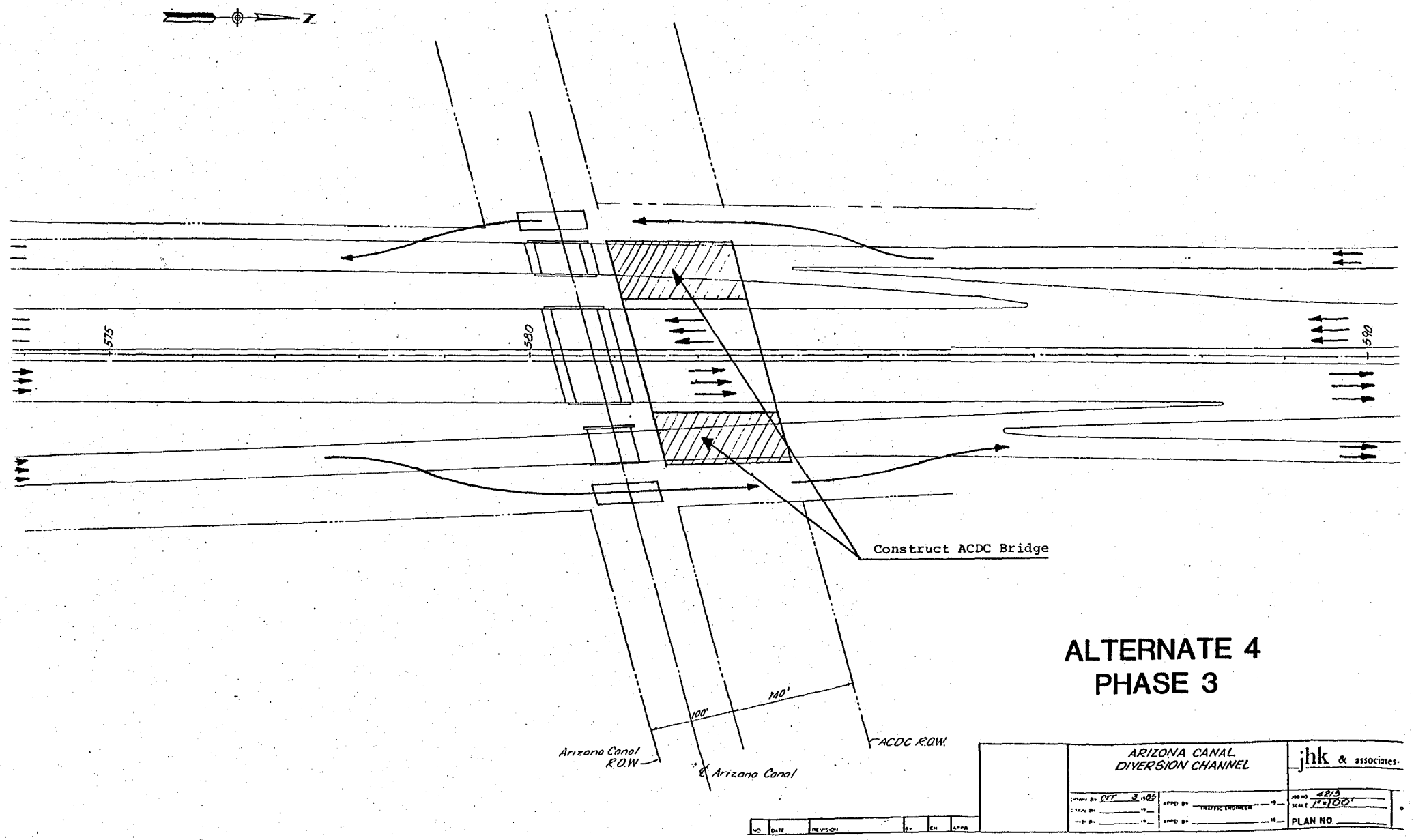

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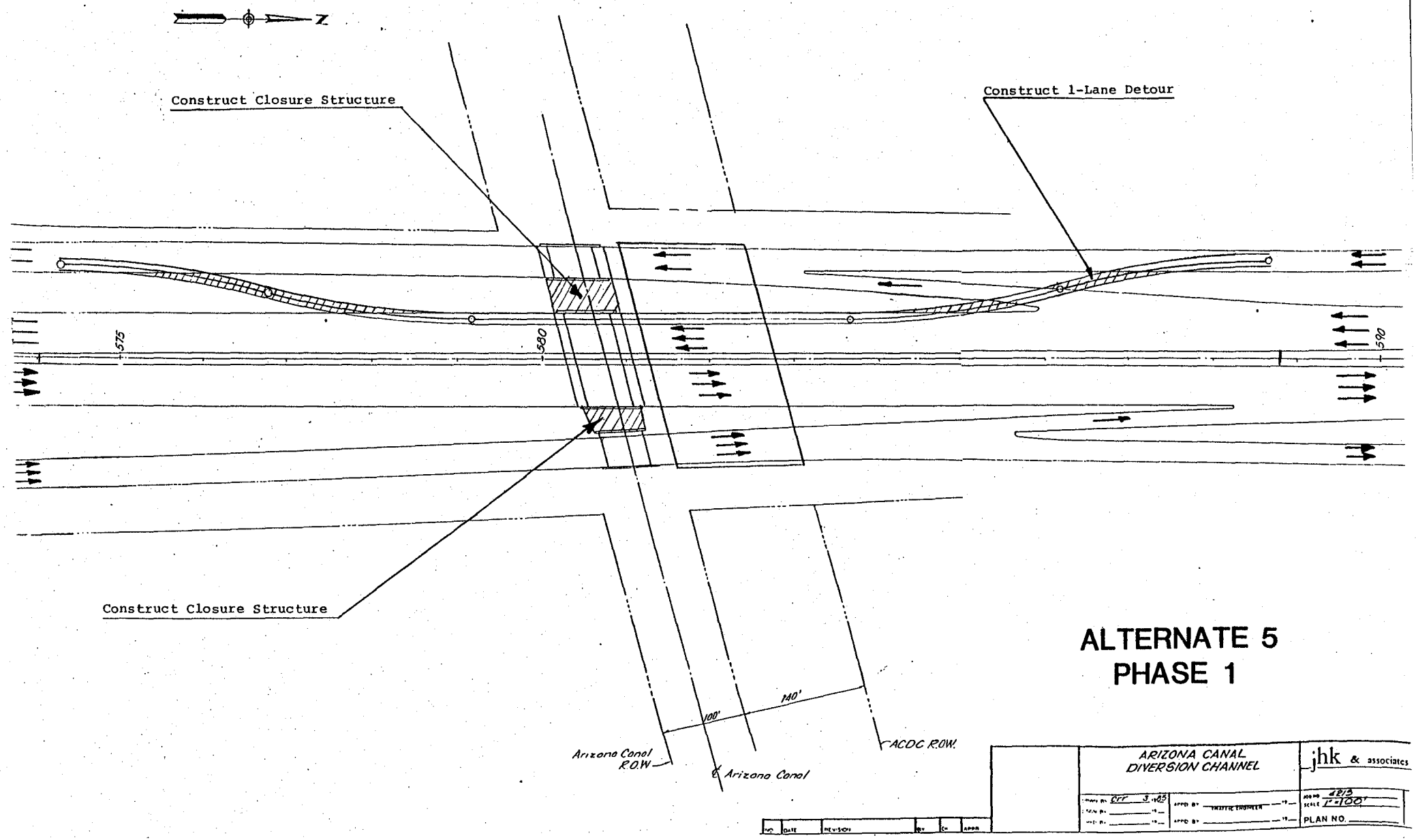
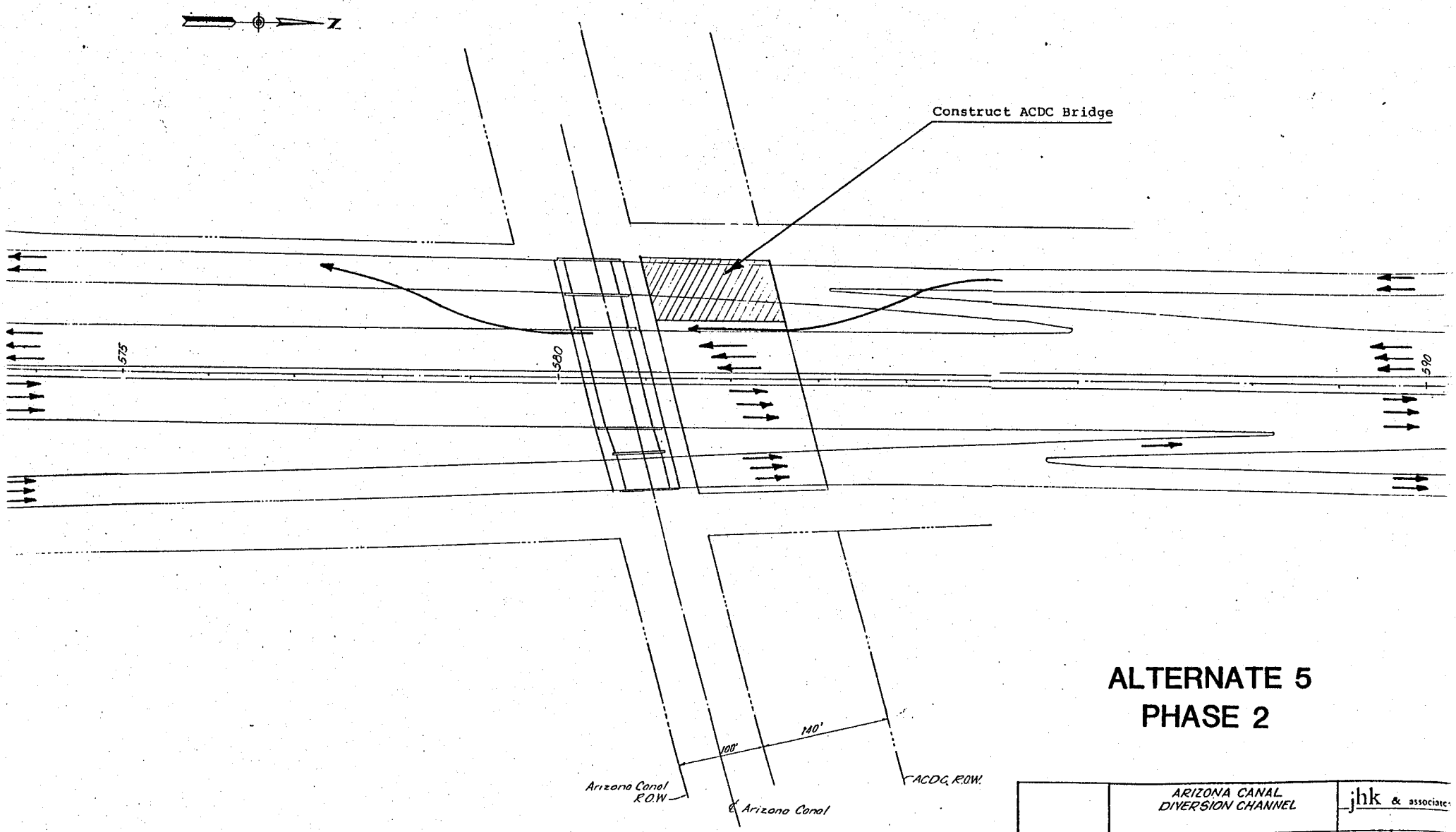

N
Construct Closure Structure
Construct 1-Lane Detour
575
580
590
Construct Closure Structure
140'
100'
Arizona Canal R.O.W.
℄ Arizona Canal
ACDC R.O.W.
ALTERNATE 5
PHASE 1
ARIZONA CANAL DIVERSION CHANNEL
jhk & associates
DRAWN BY
SCALE 1" = 100'
PLAN NO.
NO. DATE REVISION BY CK APPR



ALTERNATE 5
PHASE 2

NO	DATE	REVISION	BY	CK	APPR

ARIZONA CANAL DIVERSION CHANNEL

jhk & associates

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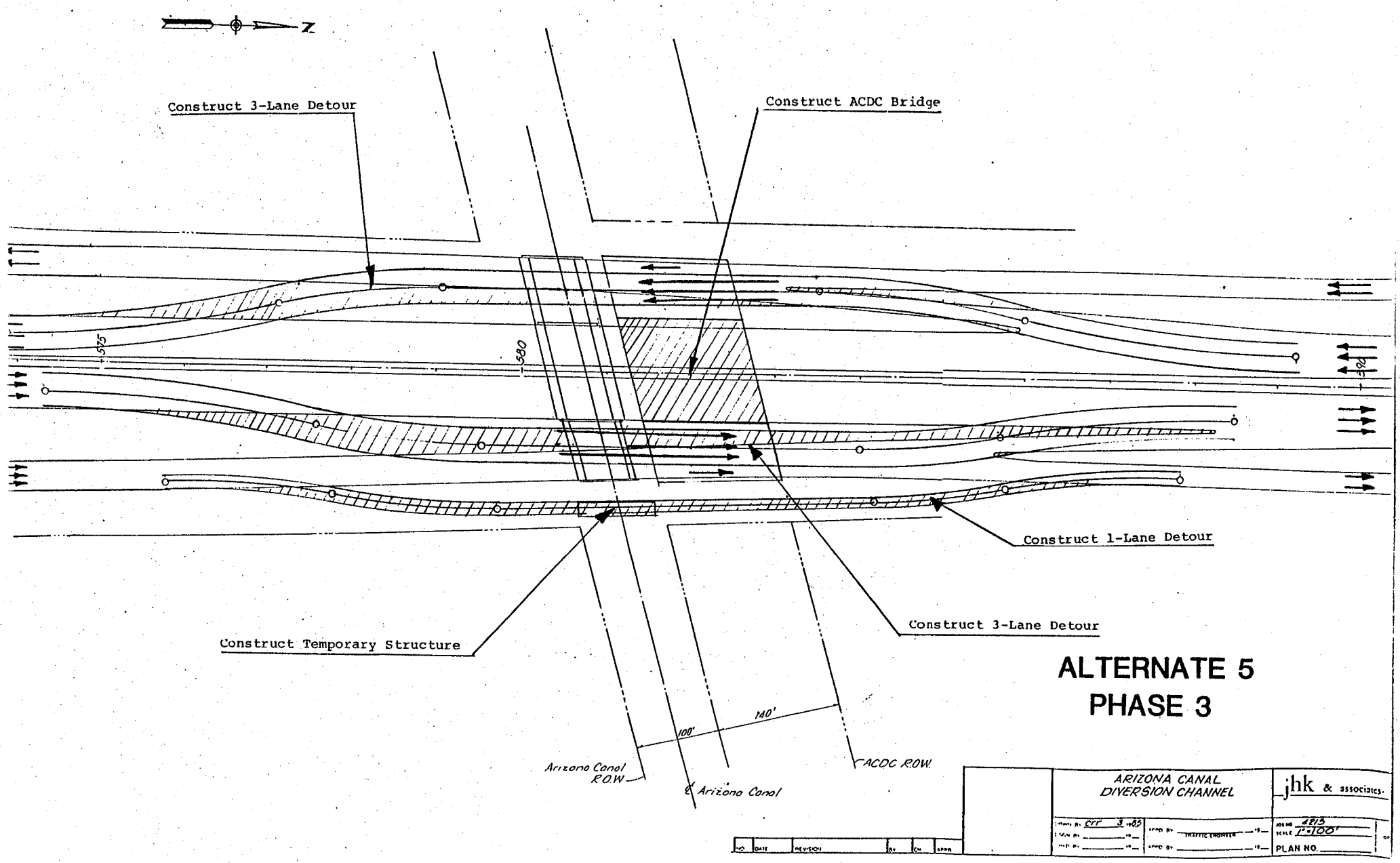
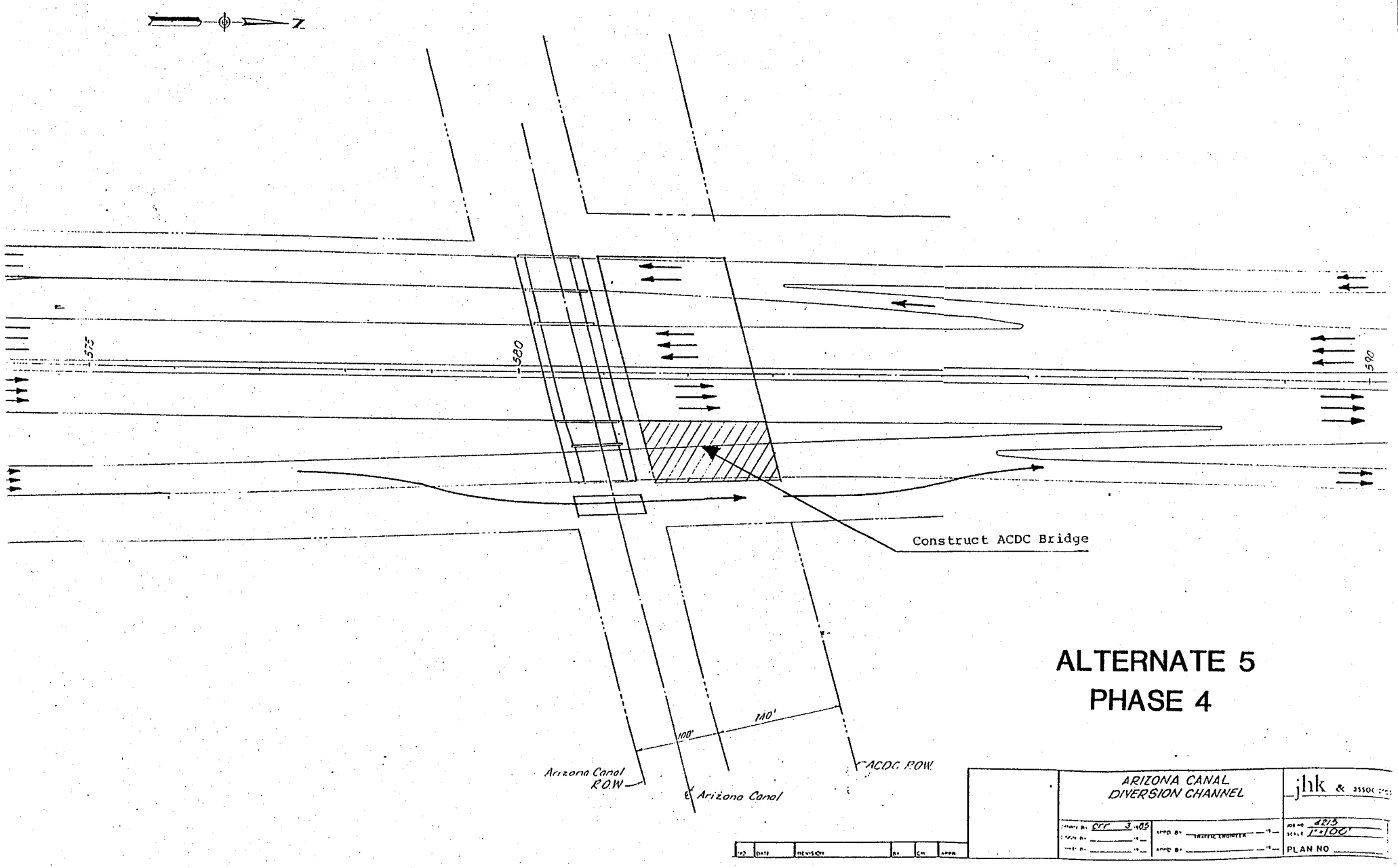
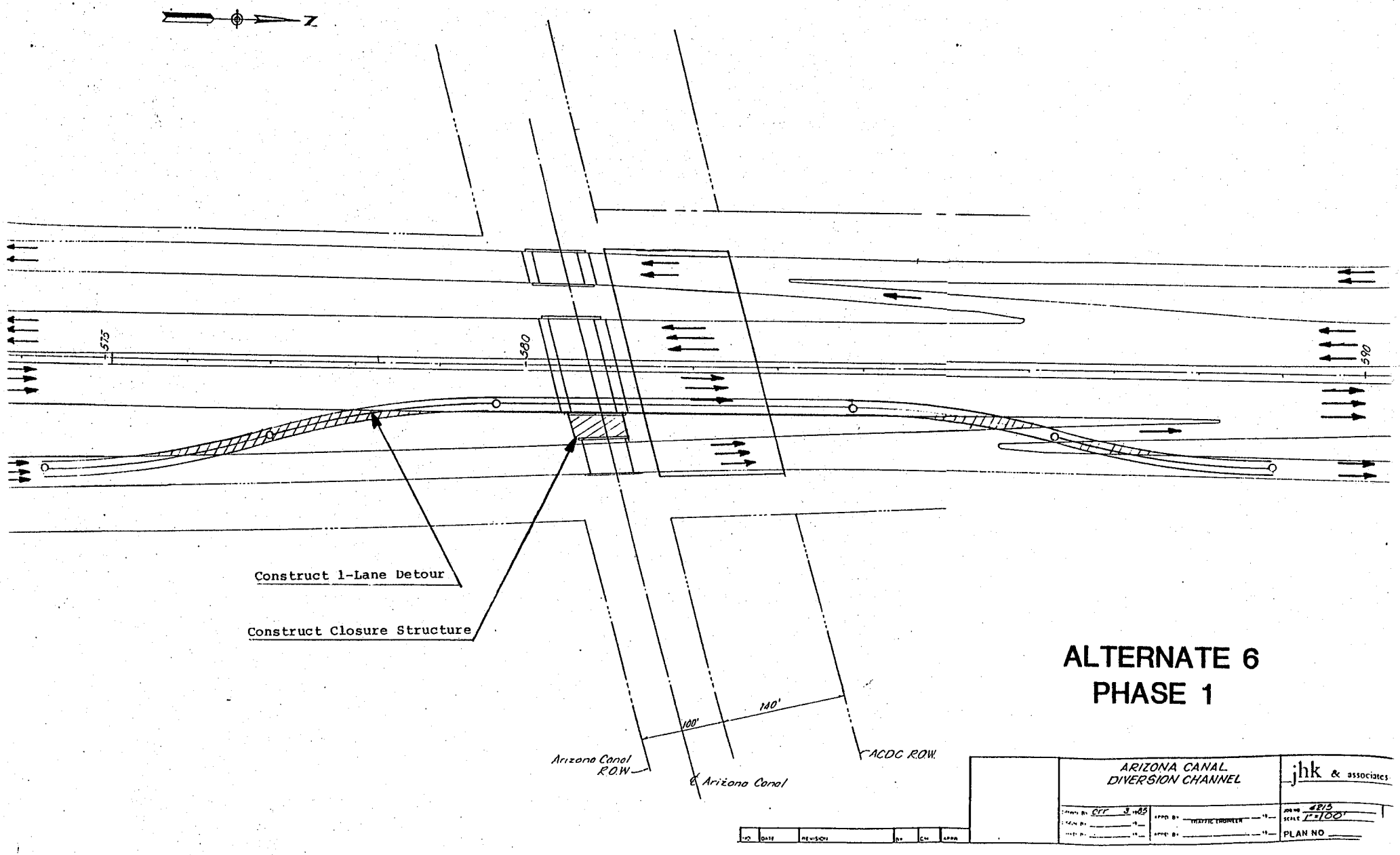
CHECKED BY: 19
APPROVED BY: TRAFFIC ENGINEER 19
APPROVED BY: 19

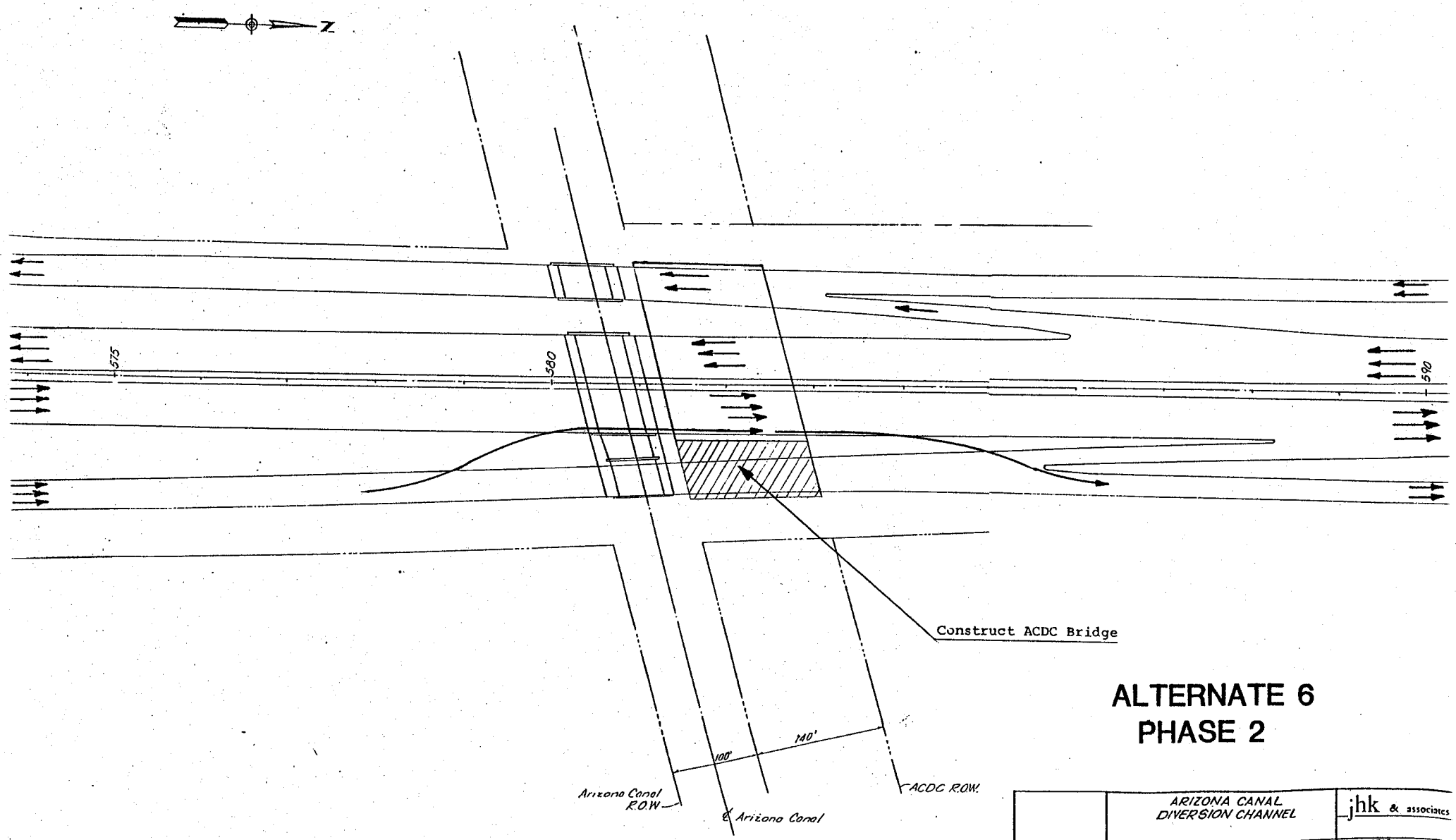
JOB NO 4813
SCALE 1" = 100'
PLAN NO


N
Construct 3-Lane Detour
Construct ACDC Bridge
575
580
584
Construct 1-Lane Detour
Construct 3-Lane Detour
Construct Temporary Structure
ALTERNATE 5
PHASE 3
140'
100'
Arizona Canal R.O.W.
℄ Arizona Canal
ACDC R.O.W.
NO
DATE
REVISION
BY
CK
APPR
ARIZONA CANAL DIVERSION CHANNEL
jhk & associates
DRAWN BY CFF 3-85
APPD BY TRAFFIC ENGINEER
JOB NO 4813
SCALE 1"=100'
PLAN NO.



ALTERNATE 5
PHASE 4


N
575
580
590
Construct 1-Lane Detour
Construct Closure Structure
100'
140'
Arizona Canal R.O.W.
℄ Arizona Canal
ACDC R.O.W.
ALTERNATE 6
PHASE 1
ARIZONA CANAL
DIVERSION CHANNEL
jhk & associates
PLAN NO



ALTERNATE 6
PHASE 2

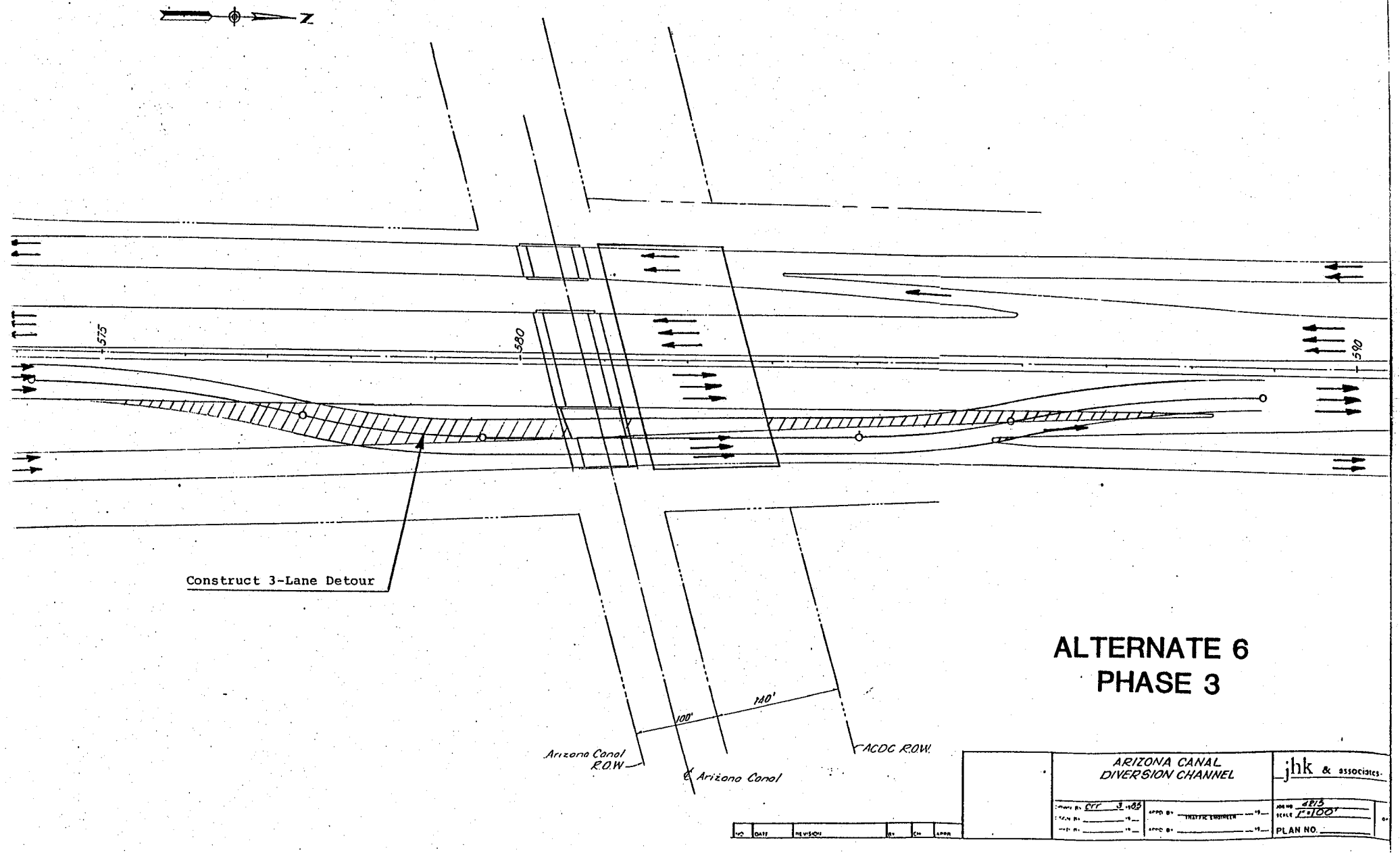
NO	DATE	REVISION	BY	CK	APPR

ARIZONA CANAL DIVERSION CHANNEL

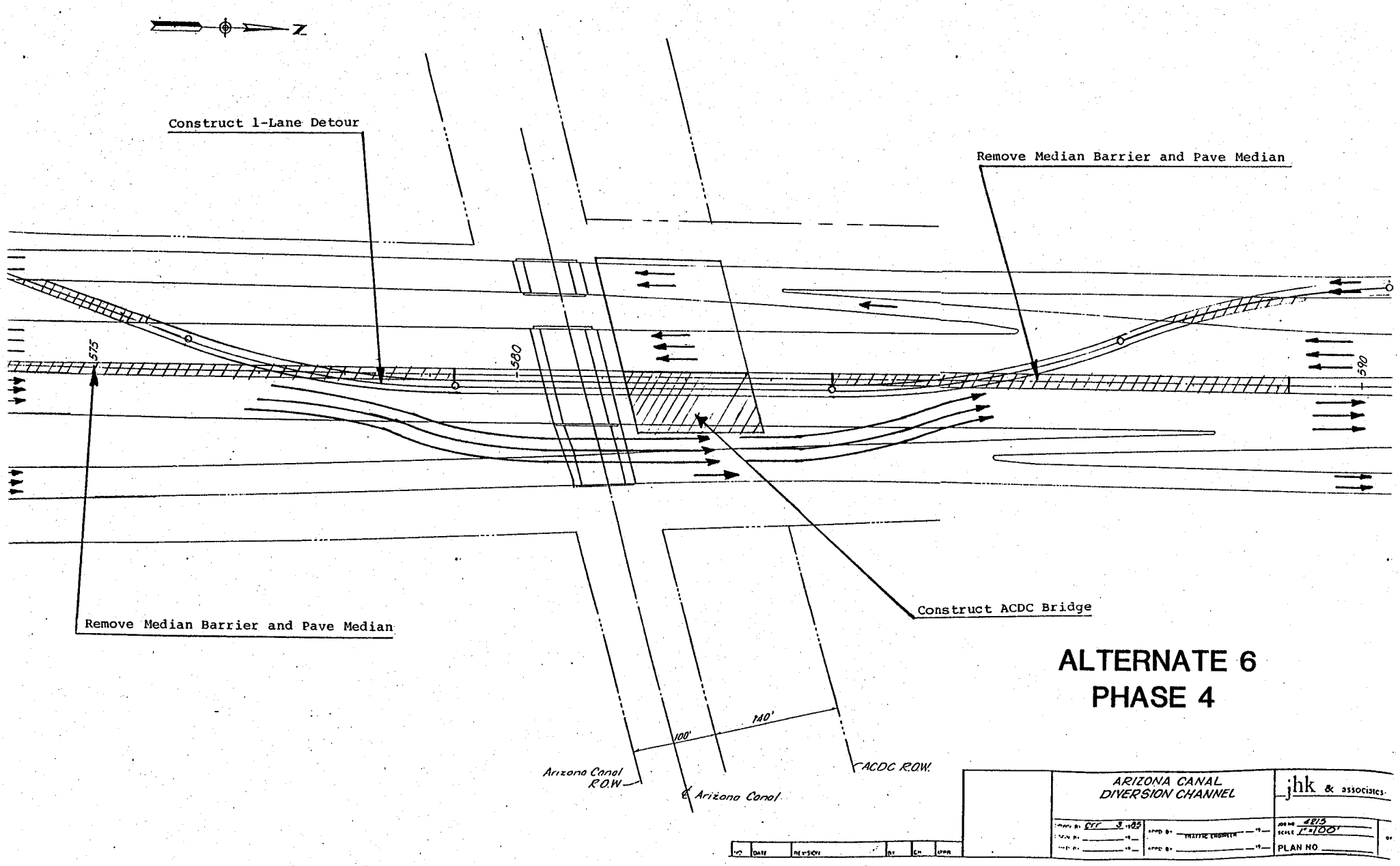
jhk & associates

DRAWN BY Crr 3 '85
CHECKED BY ____ '85
SUBMITTED BY ____ '85
APPRD BY: TRAFFIC ENGINEER ____ '85
APPRD BY: ____ '85

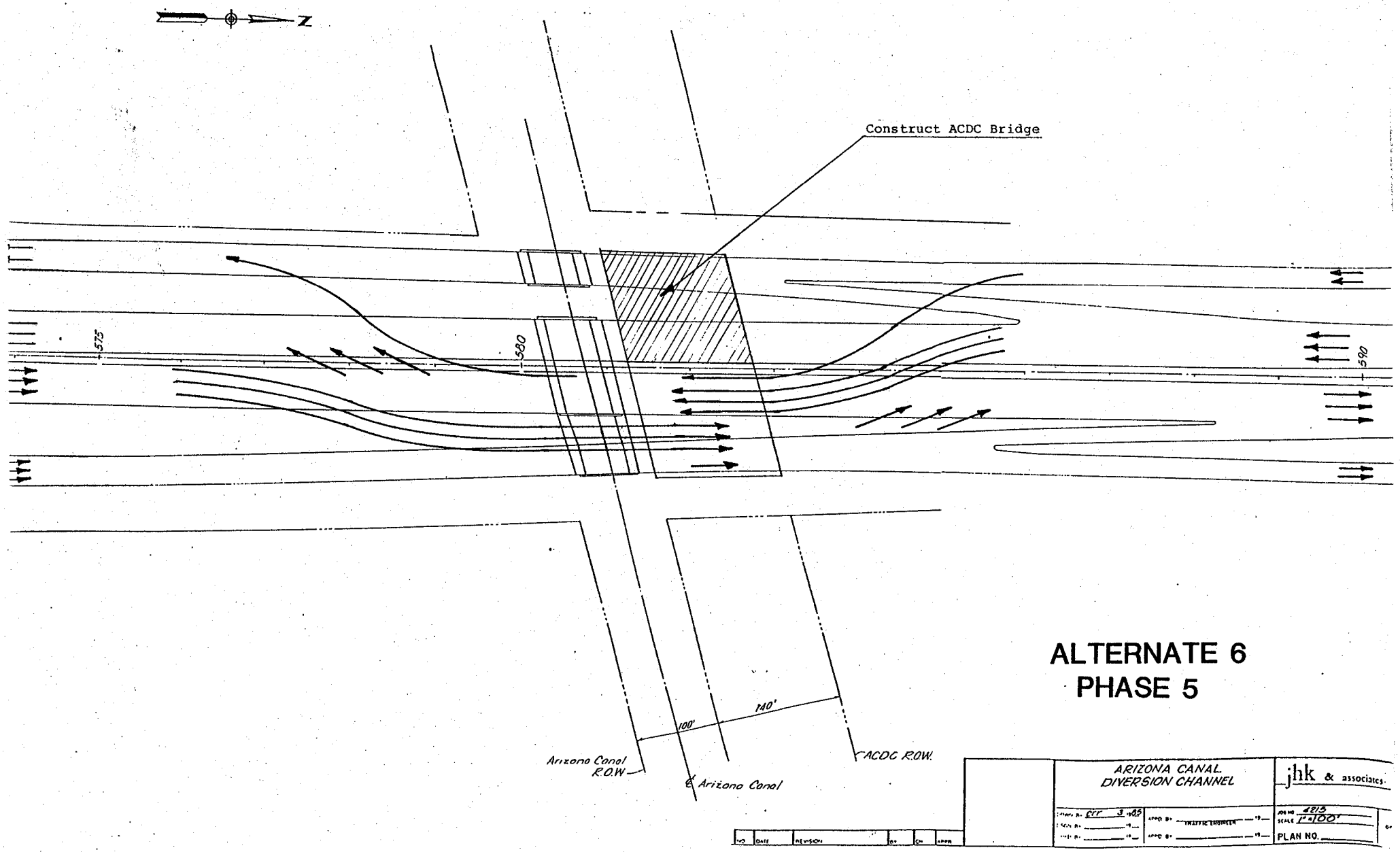
JOB NO 4215
SCALE 1" = 100'
PLAN NO. ____

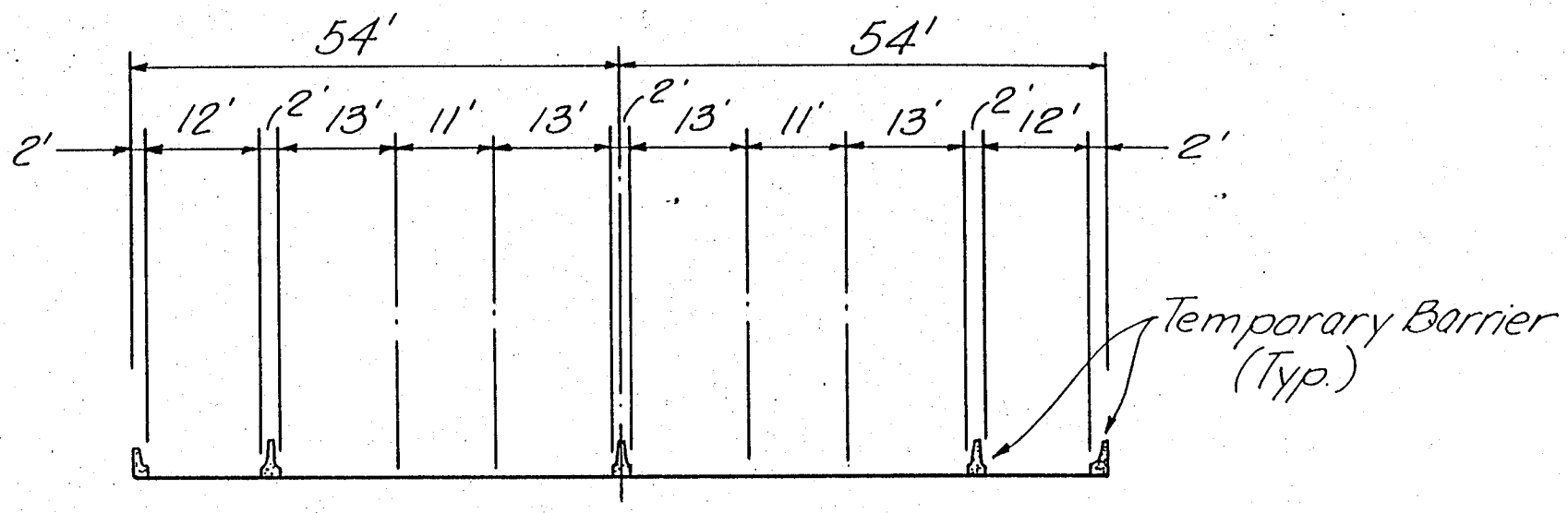


ALTERNATE 6
PHASE 3



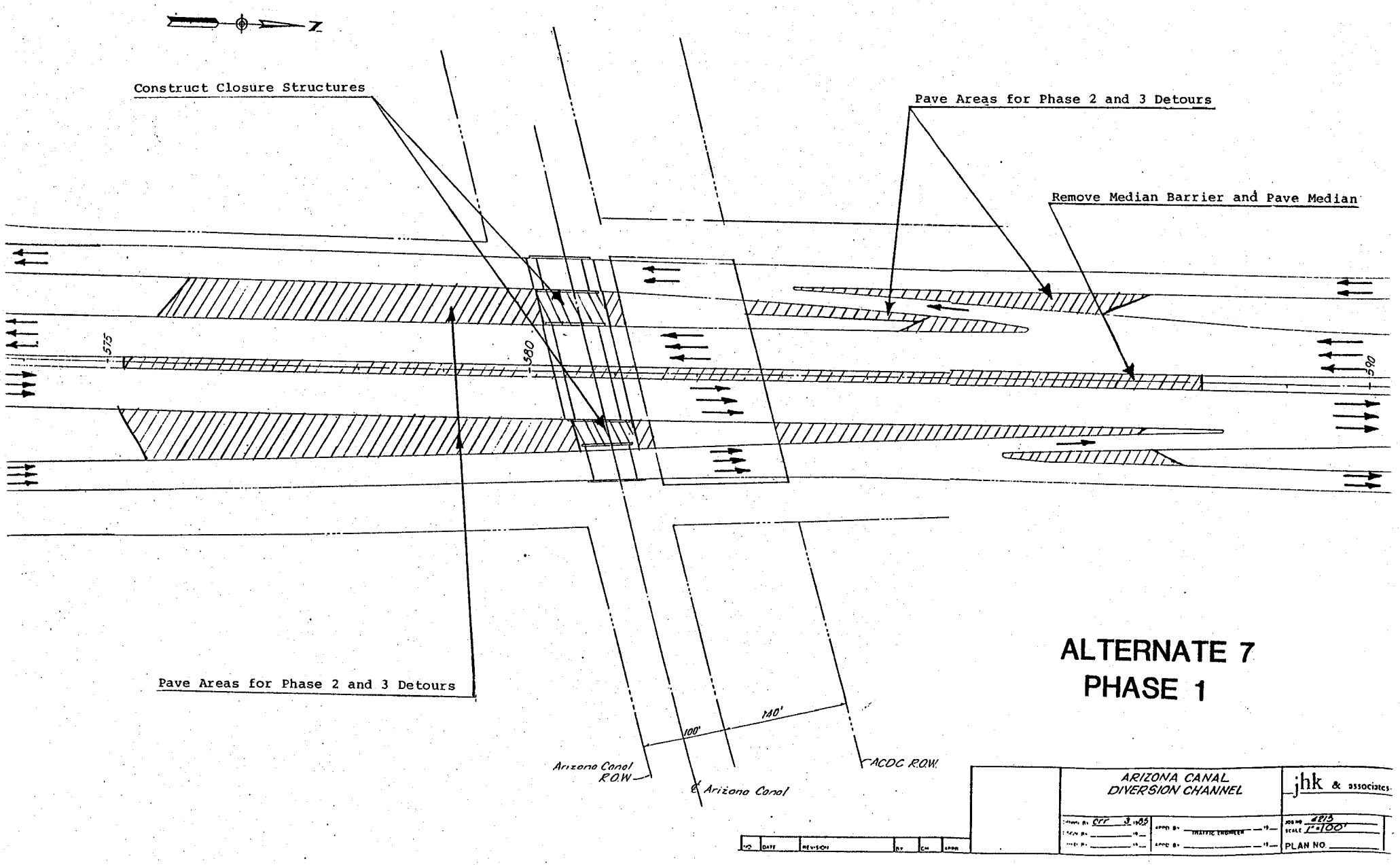
ALTERNATE 6
PHASE 4

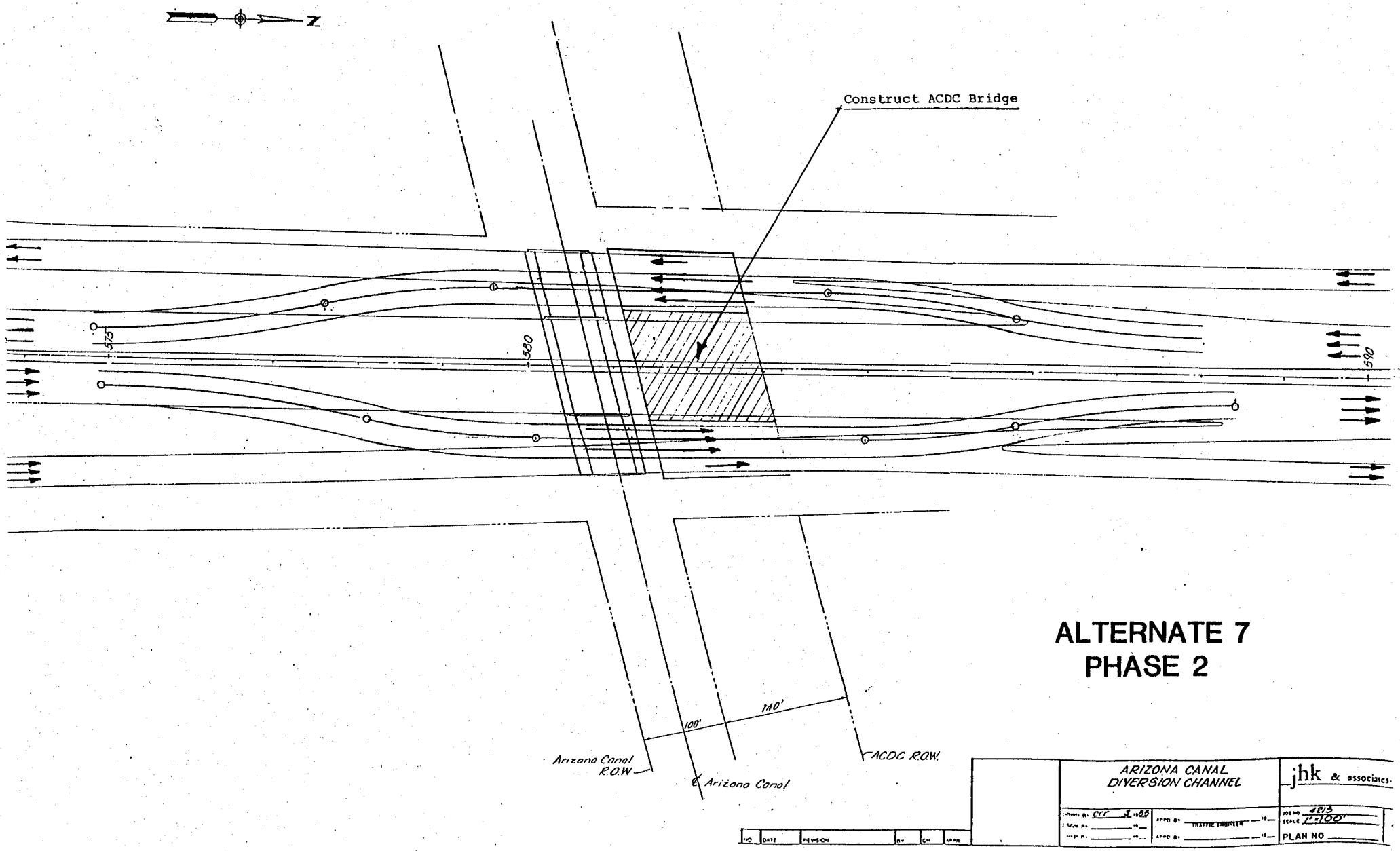

N
Construct ACDC Bridge
575
580
590
140'
100'
Arizona Canal R.O.W.
℄ Arizona Canal
ACDC R.O.W.
ALTERNATE 6
PHASE 5
ARIZONA CANAL DIVERSION CHANNEL
jhk & associates
PLAN NO.



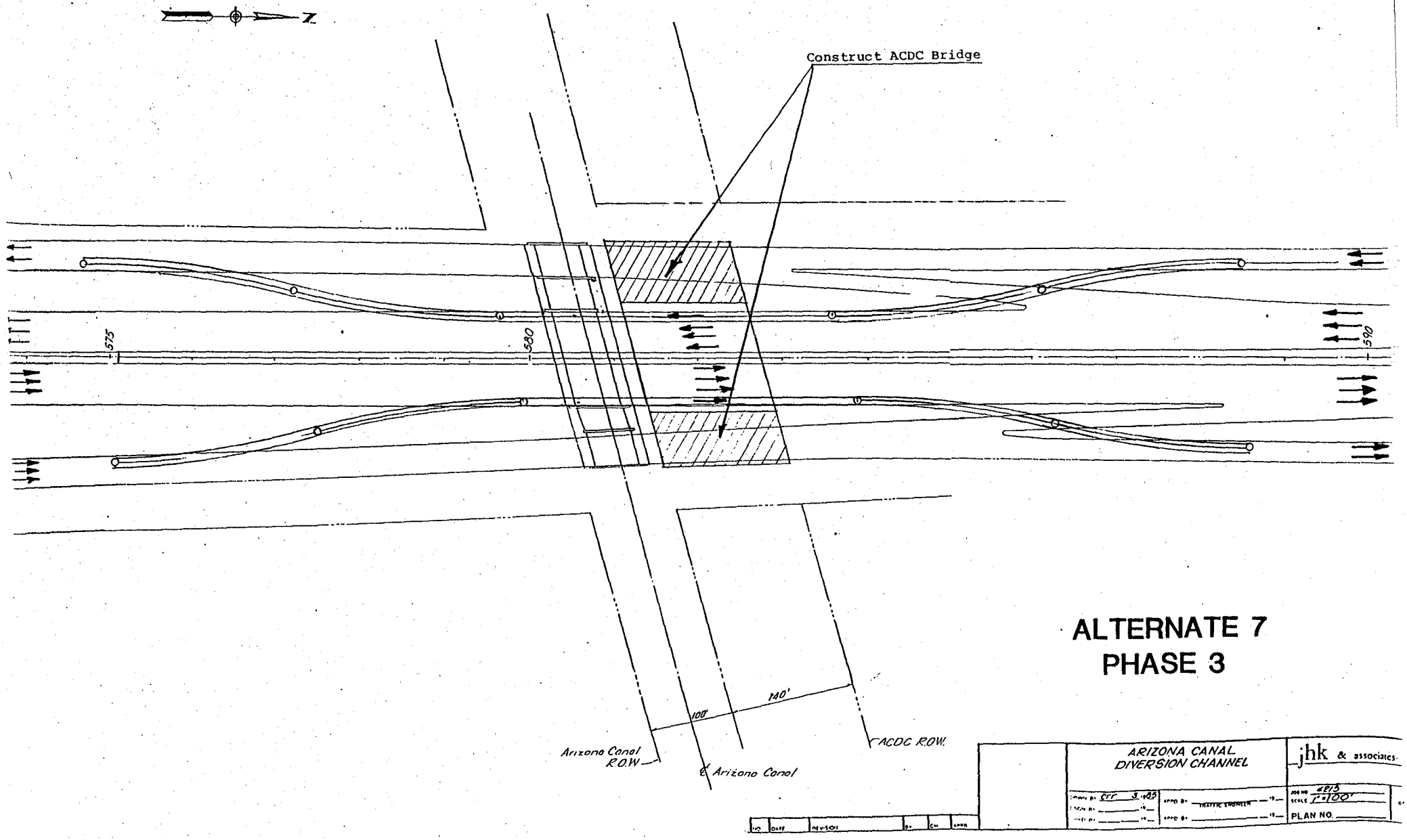
TYPICAL SECTION- ALT. #7
Phase III

TYPICAL SECTIONS
ACDC


N
Construct Closure Structures
Pave Areas for Phase 2 and 3 Detours
Remove Median Barrier and Pave Median
575
580
590
Pave Areas for Phase 2 and 3 Detours
100'
140'
Arizona Canal R.O.W.
℄ Arizona Canal
ACDC R.O.W.
ALTERNATE 7
PHASE 1
ARIZONA CANAL DIVERSION CHANNEL
jhk & associates
DRAWN BY Crr 3-1-85
APPD BY TRAFFIC ENGINEER
JOB NO 4215
SCALE 1" = 100'
PLAN NO.
NO. DATE REVISION BY CK APPR

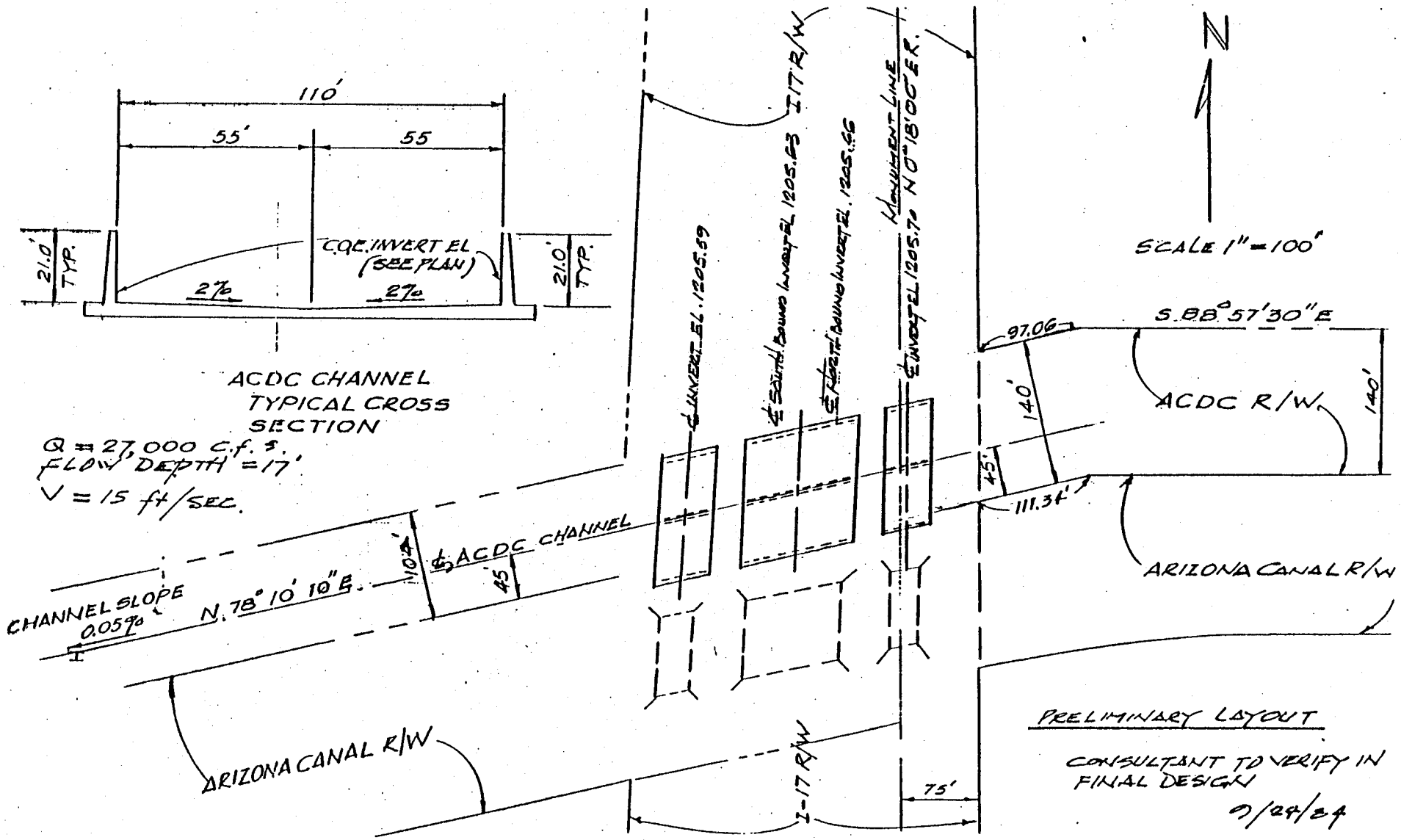


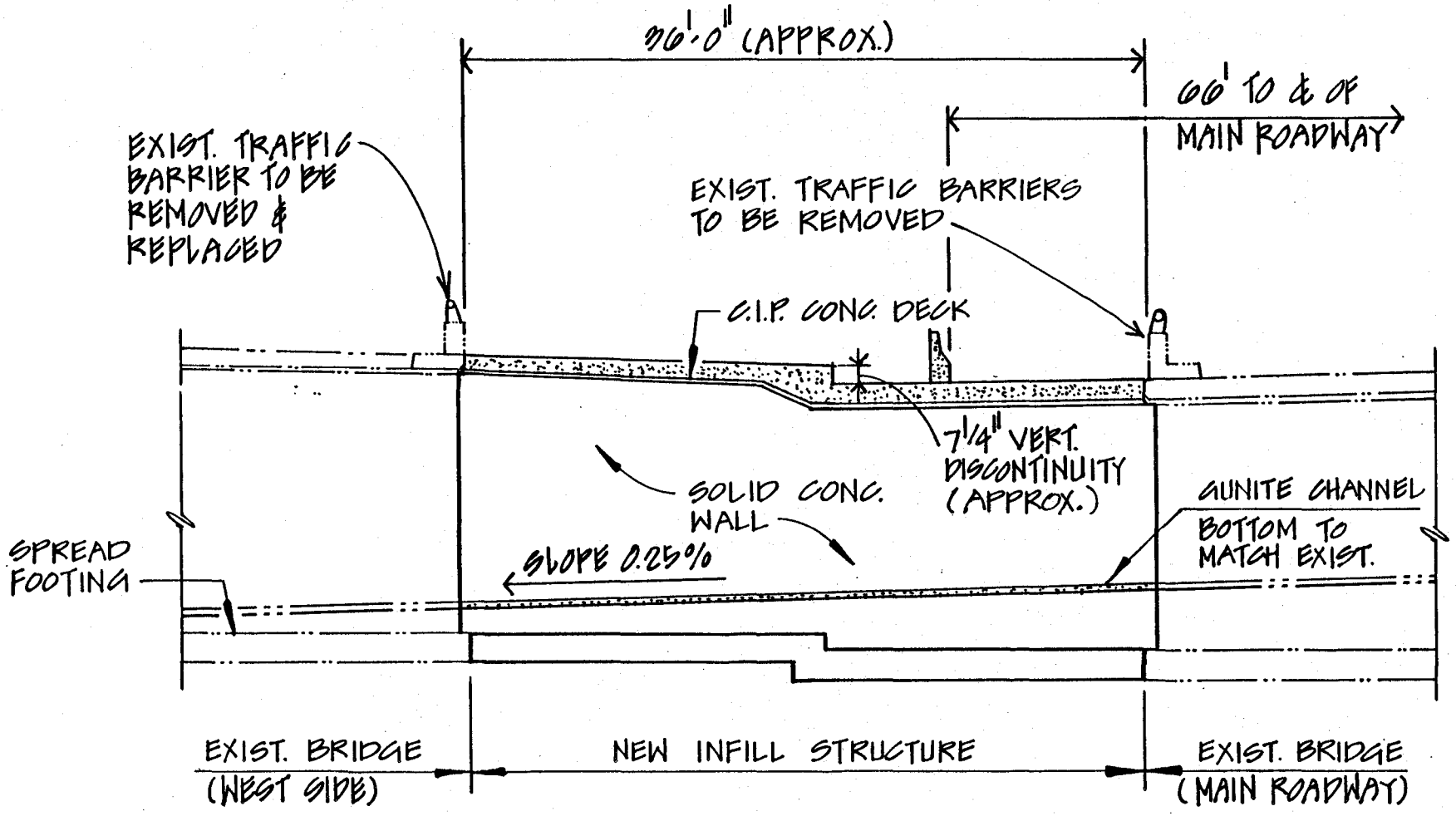
ALTERNATE 7
PHASE 2



ALTERNATE 7
PHASE 3

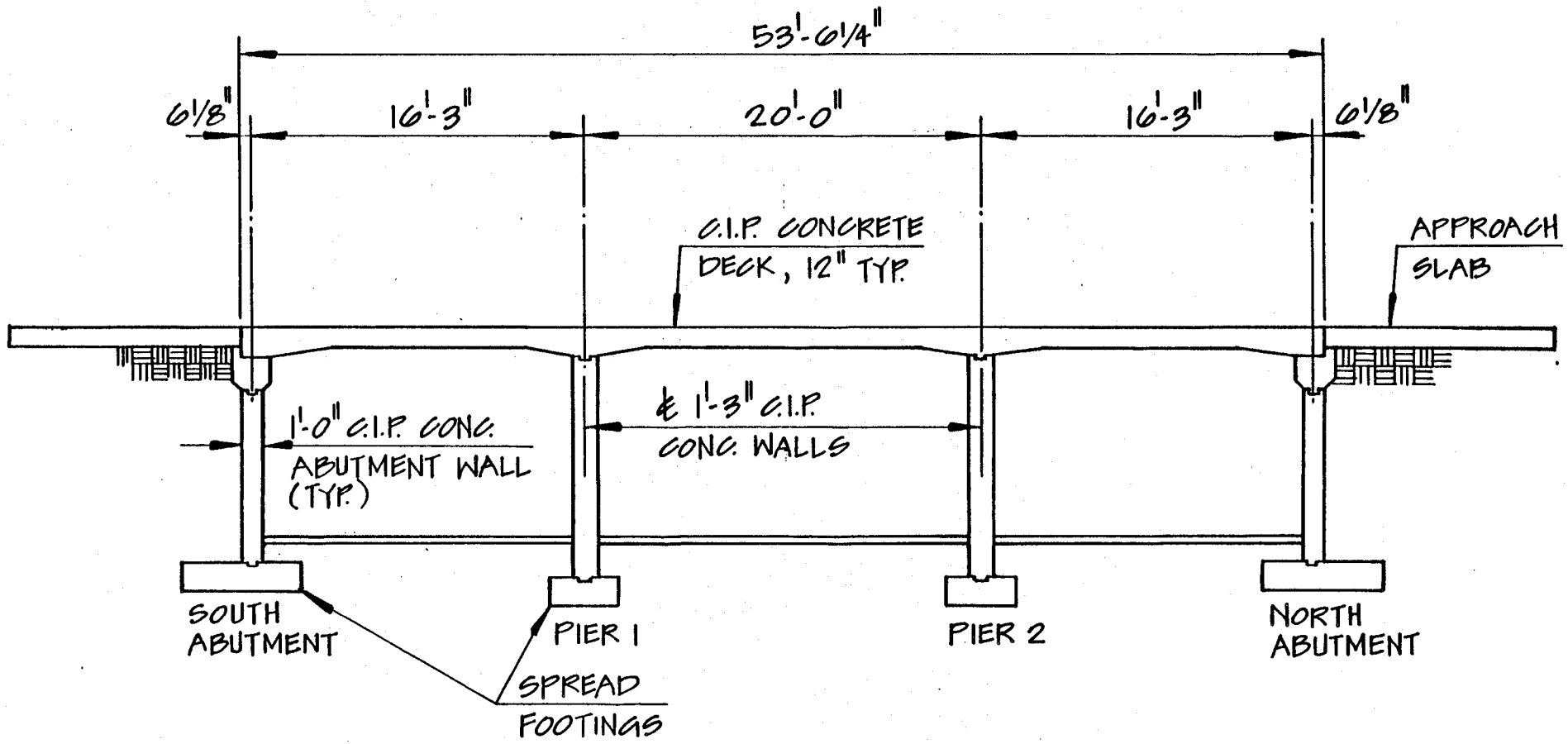
* NOTE: BRIDGE STRUCTURE MUST CLEAR TOP OF WALL.





TRANSVERSE SECTION - WEST INFILL BRIDGE

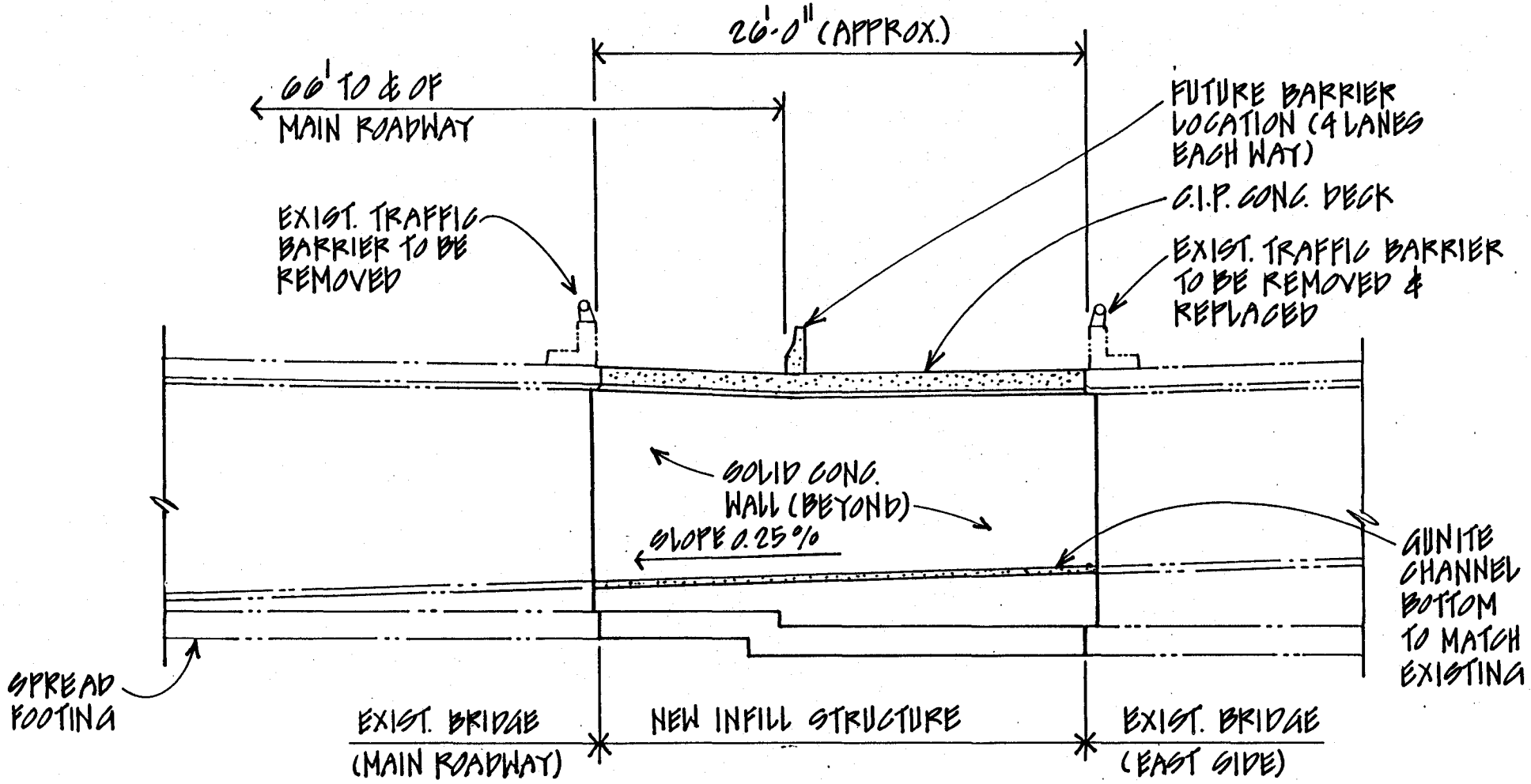
rga engineering corporation



LONGITUDINAL SECTION - WEST INFILL BRIDGE

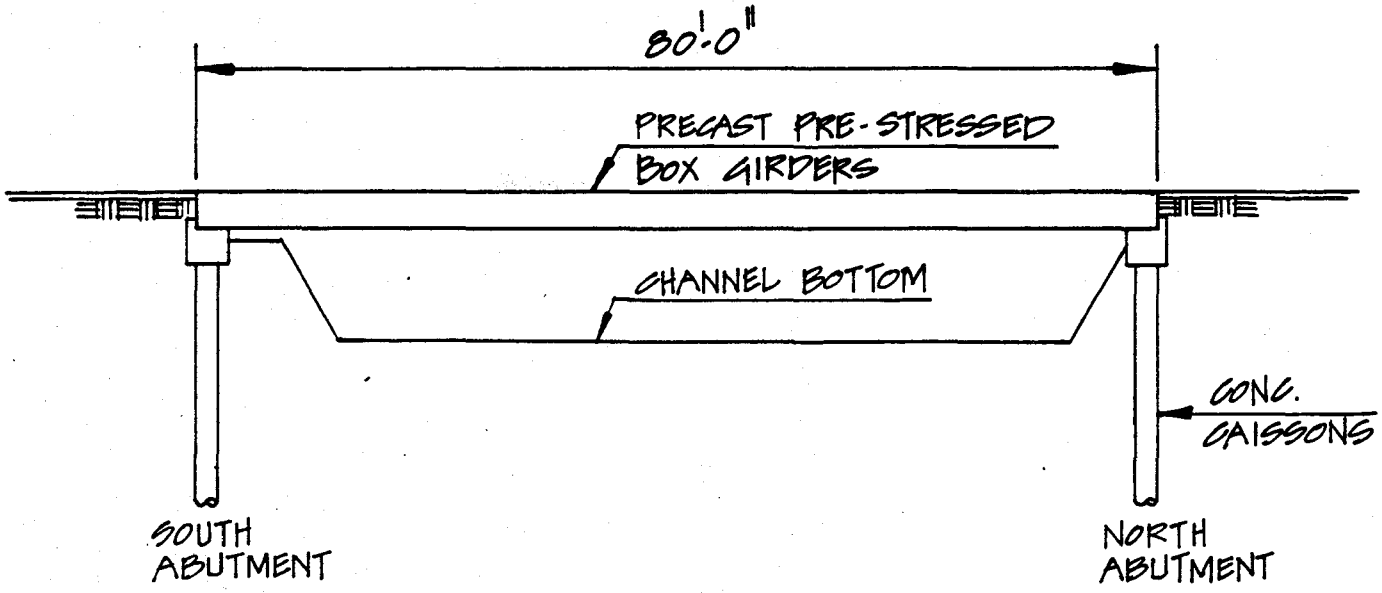
(EAST INFILL BRIDGE SIMILAR)

rga engineering corporation

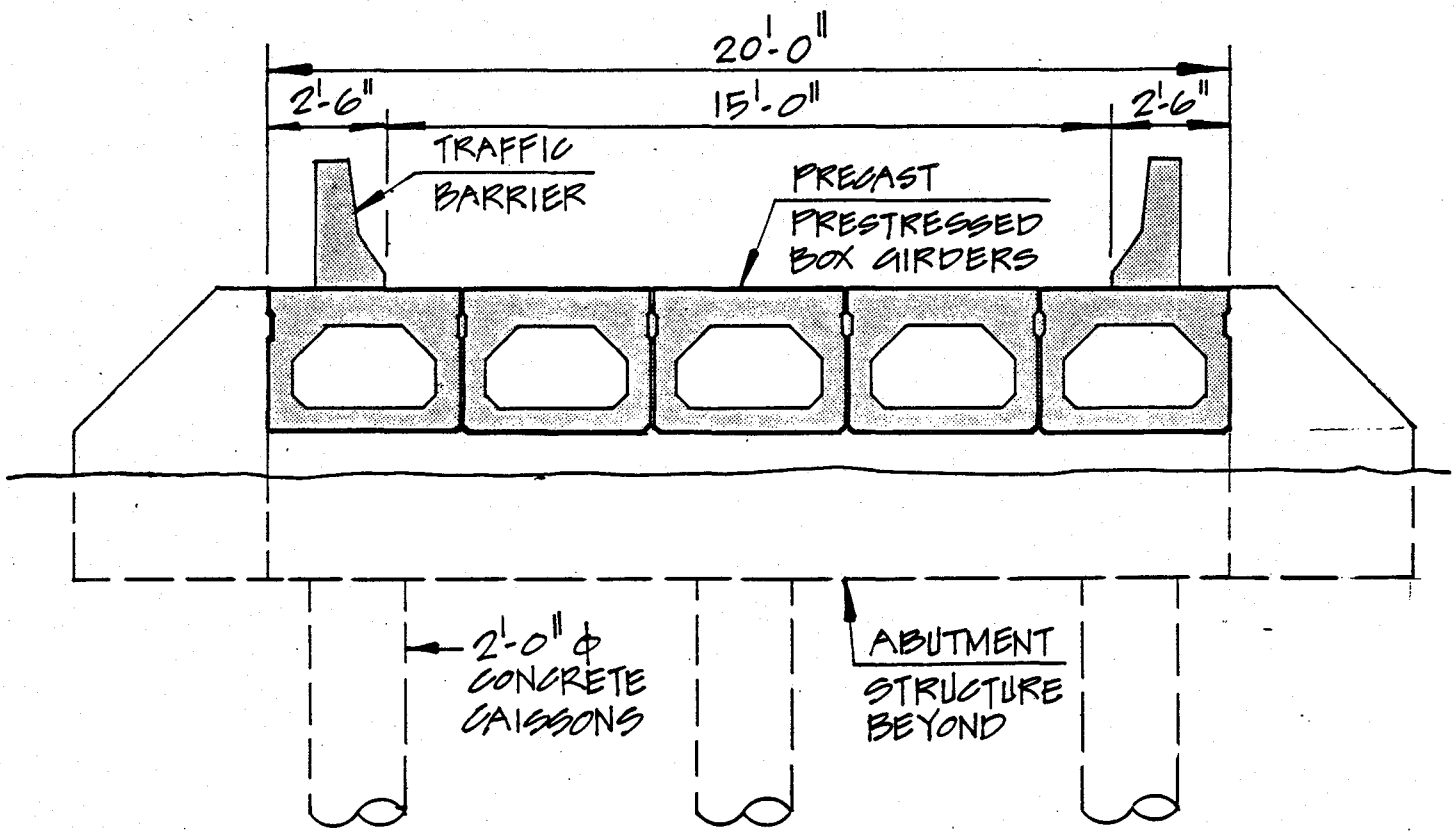


TRANSVERSE SECTION - EAST INFILL BRIDGE

rga engineering corporation

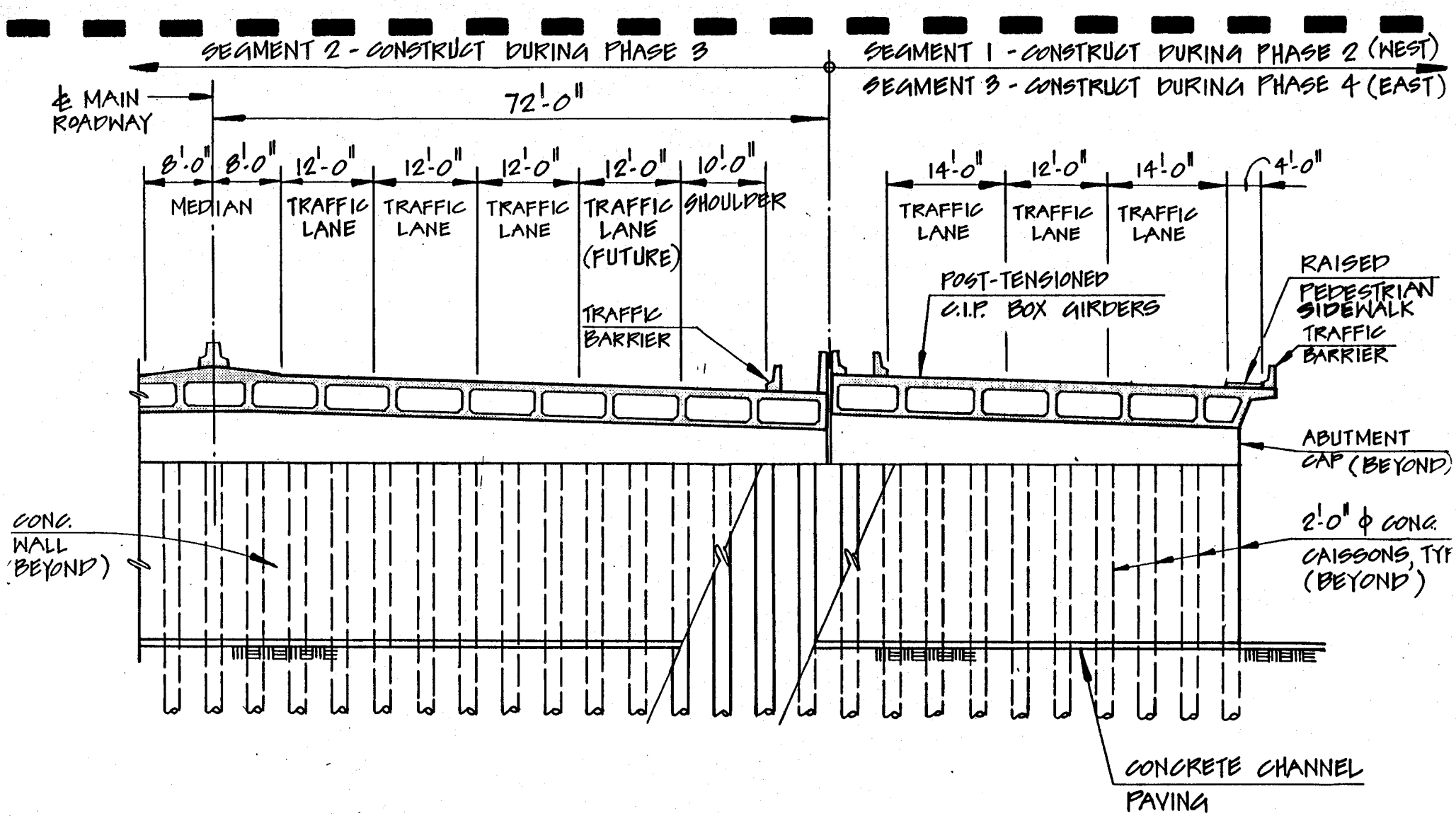


LONGITUDINAL SECTION OF TEMPORARY BRIDGE



TEMPORARY BRIDGE CROSS-SECTION

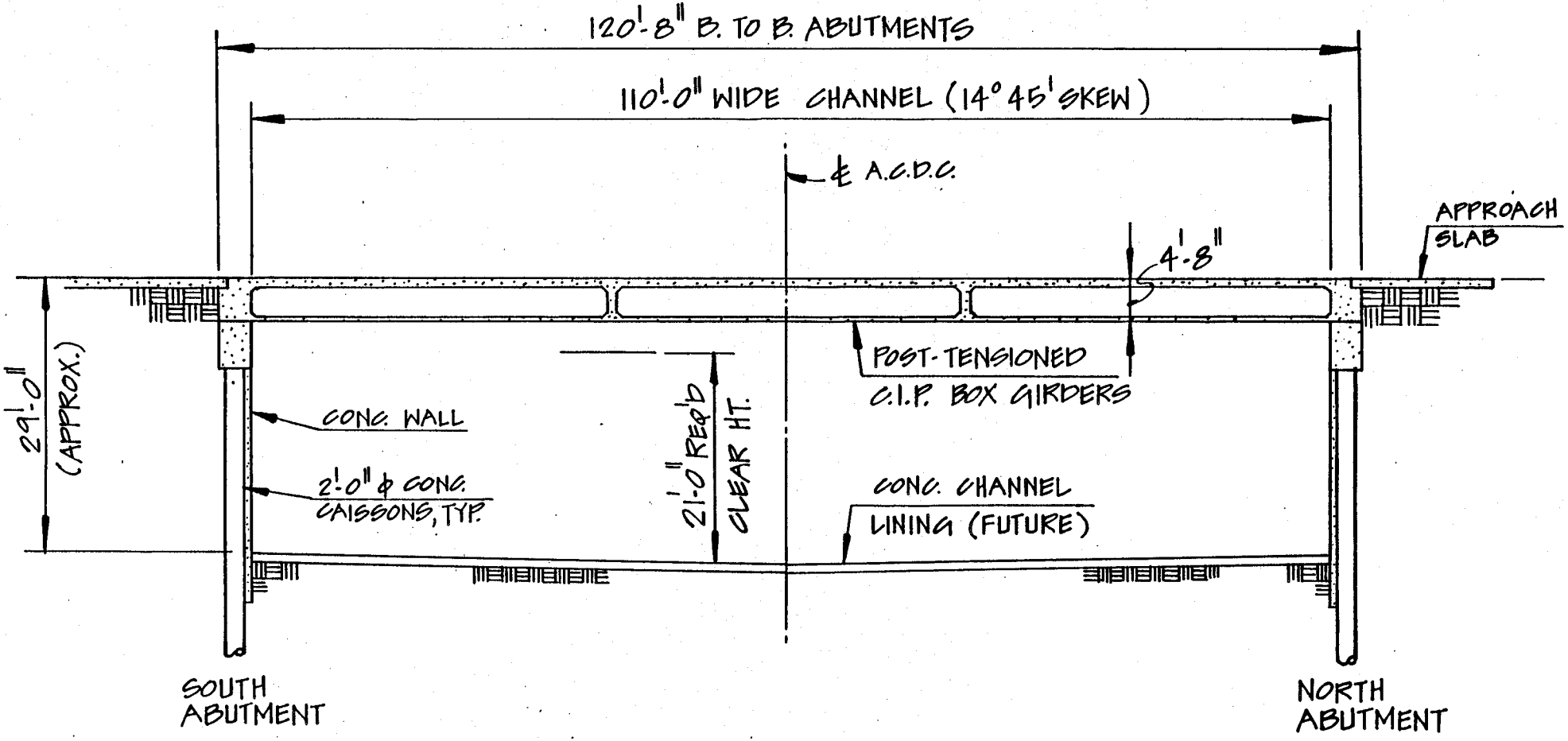
rga engineering corporation



A.C.D.C. BRIDGE SECTION (FUTURE)

(EAST HALF SHOWN)

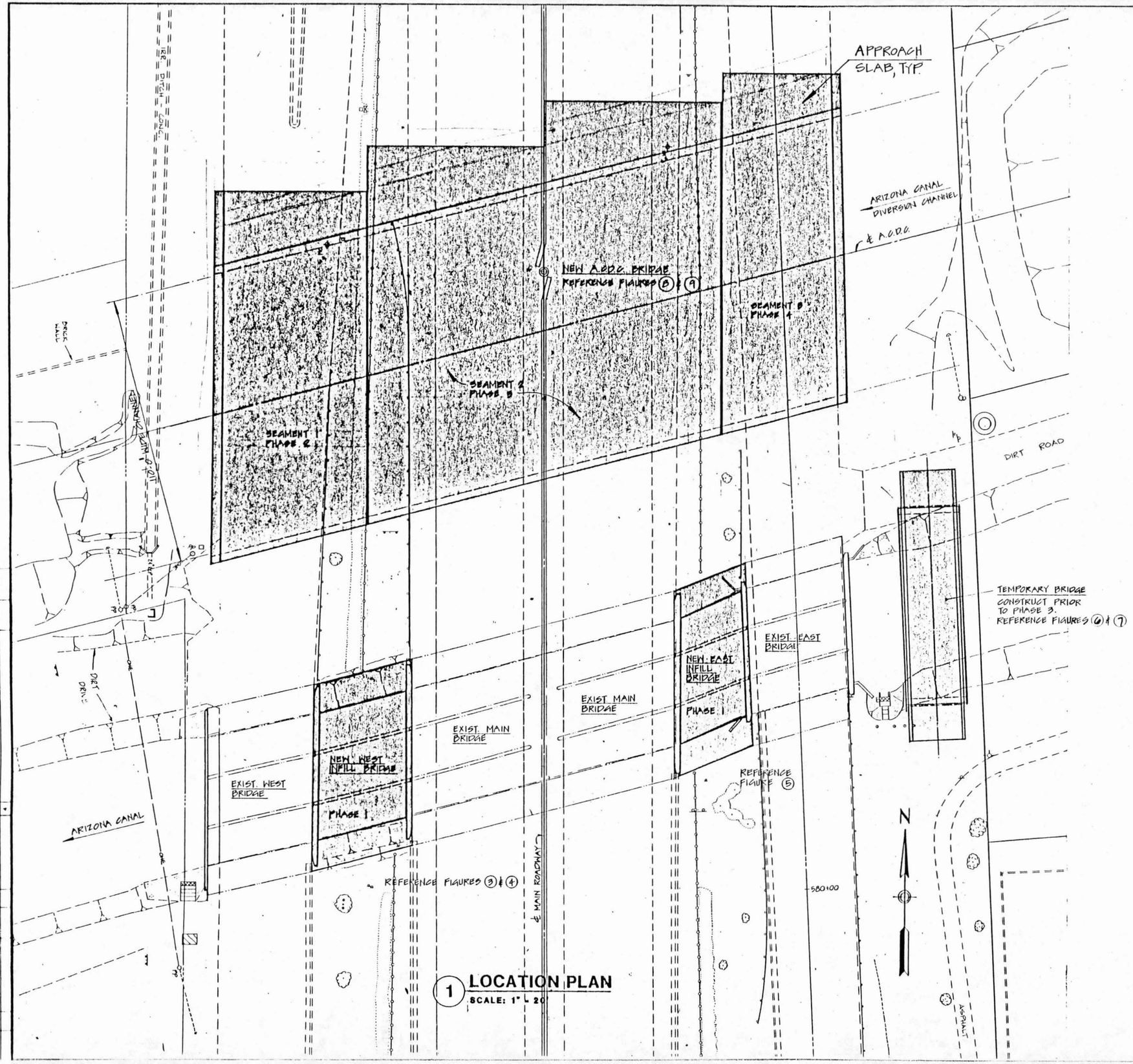
rga engineering corporation



LONGITUDINAL SECTION - A.C.D.C. BRIDGE

rga engineering corporation

FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZONA				



1 **LOCATION PLAN**
SCALE: 1" = 20'

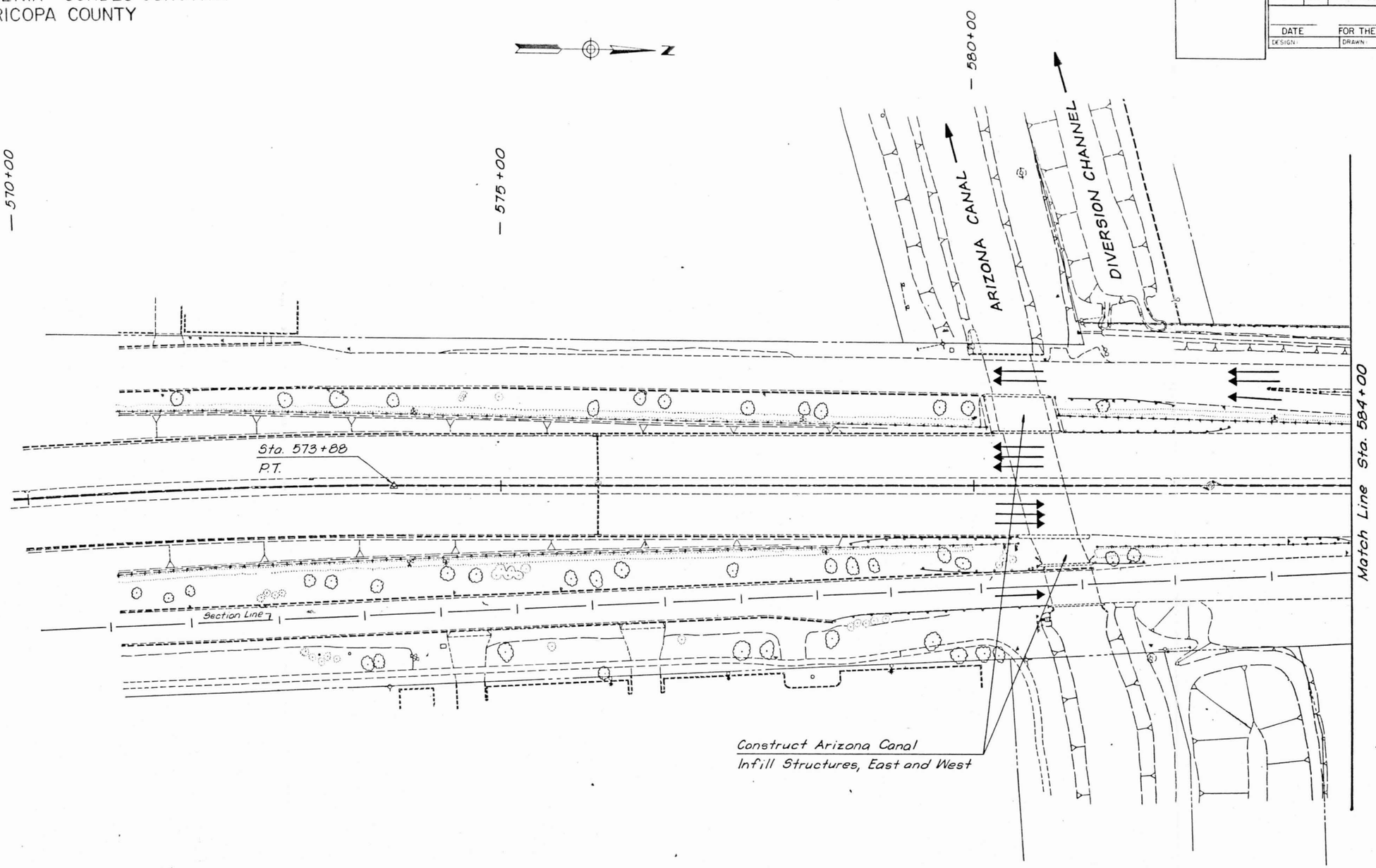
		DATE	ARIZONA DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION STRUCTURES SECTION
LAYOUT			
DESIGN			
DESIGN CK'D			
DRAWN			
DWG. CK'D			
APPROVED			

SHEET NO	OF	ROUTE	MILEPOST	STRUCTURE NO	PROJECT NO	BRIDGE ENGINEER

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	1	13	

DATE | FOR THE CONSULTING ENGINEER
DESIGN: | DRAWN: | CHECKED:



ARIZONA CANAL DIVERSION CHANNEL
PHASE IA

SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

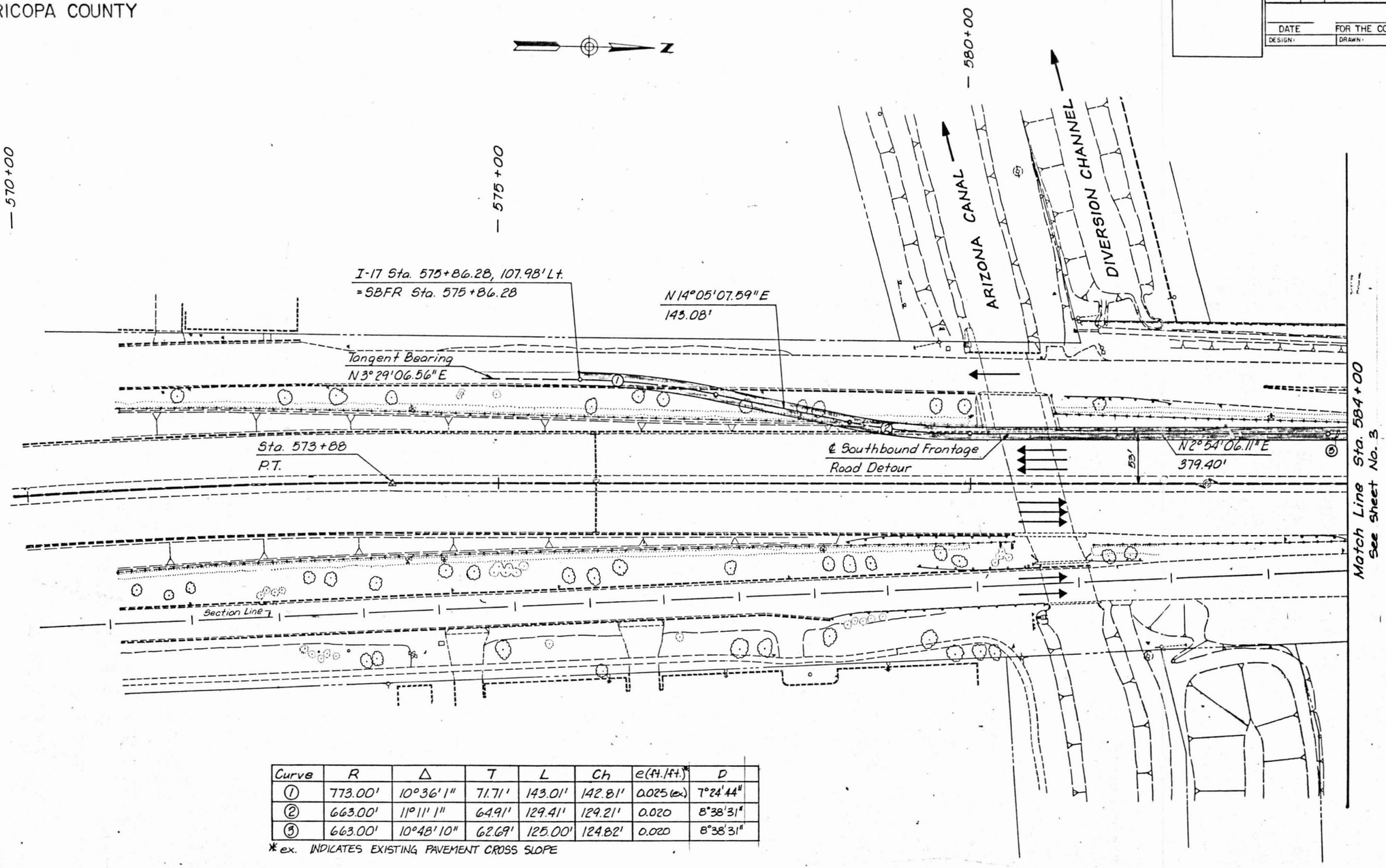
DRAWING NO. 107

I-17-3-912 PE

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	2	13	

DATE FOR THE CONSULTING ENGINEER
DESIGN: DRAWN: CHECKED:



Curve	R	Δ	T	L	Ch	e(ft./ft.)*	D
1	773.00'	10°36'1"	71.71'	143.01'	142.81'	0.025 (ex.)	7°24'44"
2	663.00'	11°11'1"	64.91'	129.41'	129.21'	0.020	8°38'31"
3	663.00'	10°48'10"	62.69'	125.00'	124.82'	0.020	8°38'31"

*ex. INDICATES EXISTING PAVEMENT CROSS SLOPE

NOTE: SEE SHEET NO. 13 FOR PROFILE.

ARIZONA CANAL DIVERSION CHANNEL
PHASE IB

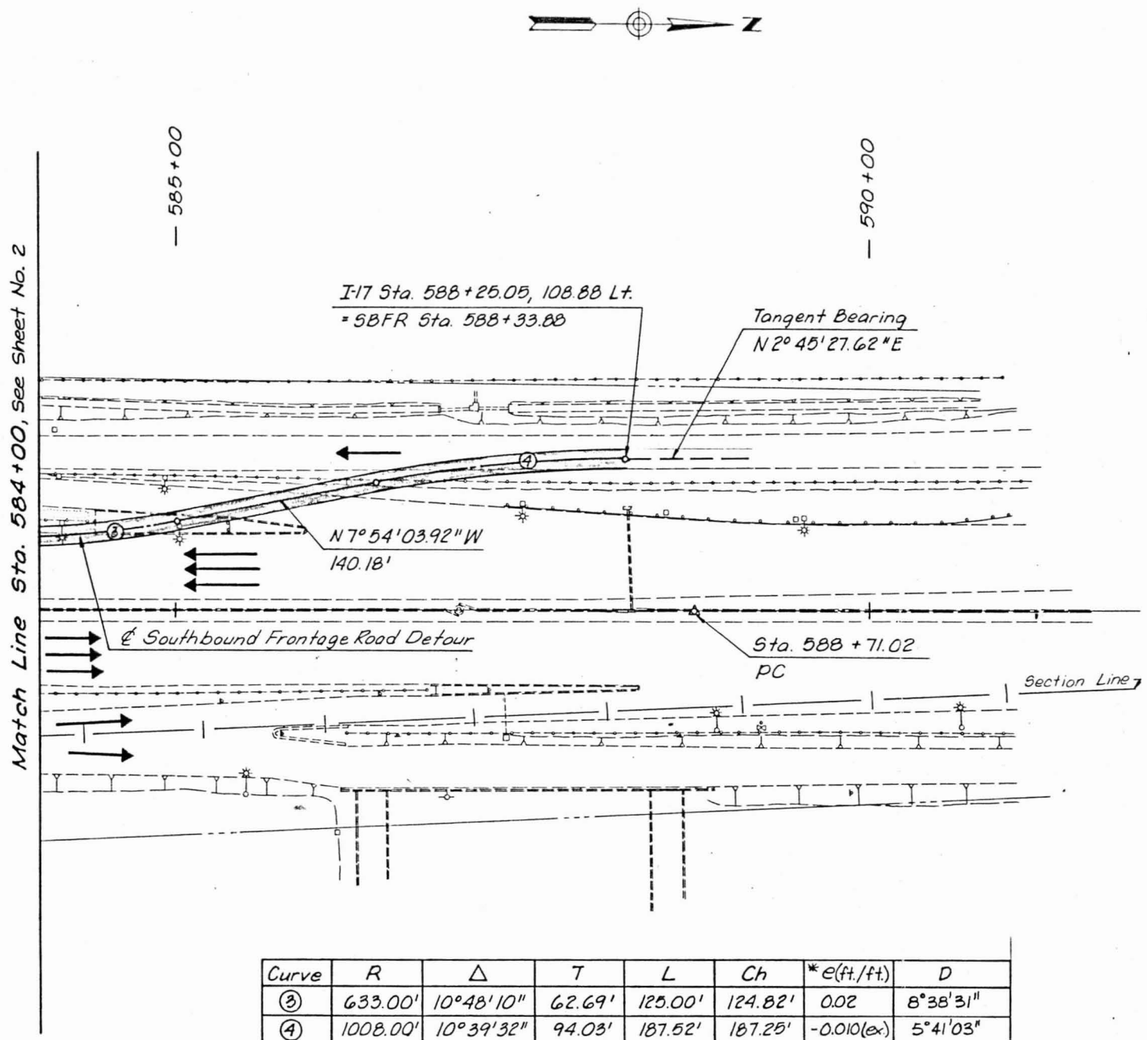
SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

I-17-3-912 PE

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	3	13	

DATE FOR THE CONSULTING ENGINEER
DESIGN: DRAWN: CHECKED:



Curve	R	Δ	T	L	Ch	*e(ft./ft.)	D
3	633.00'	10°48'10"	62.69'	125.00'	124.82'	0.02	8°38'31"
4	1008.00'	10°39'32"	94.03'	187.52'	187.25'	-0.010(ex)	5°41'03"

*ex INDICATES EXISTING PAVEMENT CROSS SLOPE.

NOTE: SEE SHEET NO. 13 FOR PROFILE.

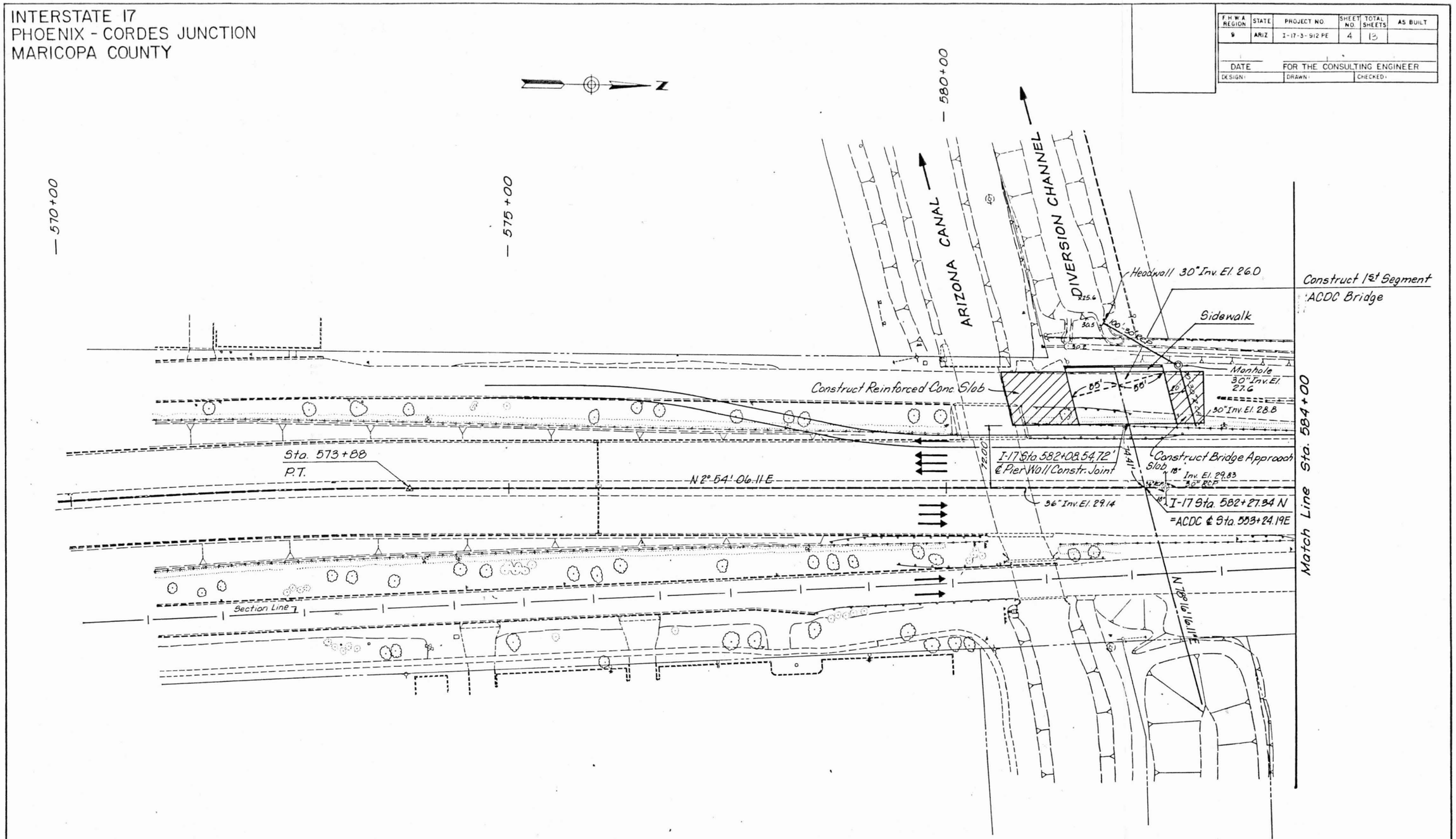
SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

ARIZONA CANAL DIVERSION CHANNEL
PHASE IB

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	4	13	

DATE | FOR THE CONSULTING ENGINEER
DESIGN: | DRAWN: | CHECKED:



ARIZONA CANAL DIVERSION CHANNEL
PHASE 2

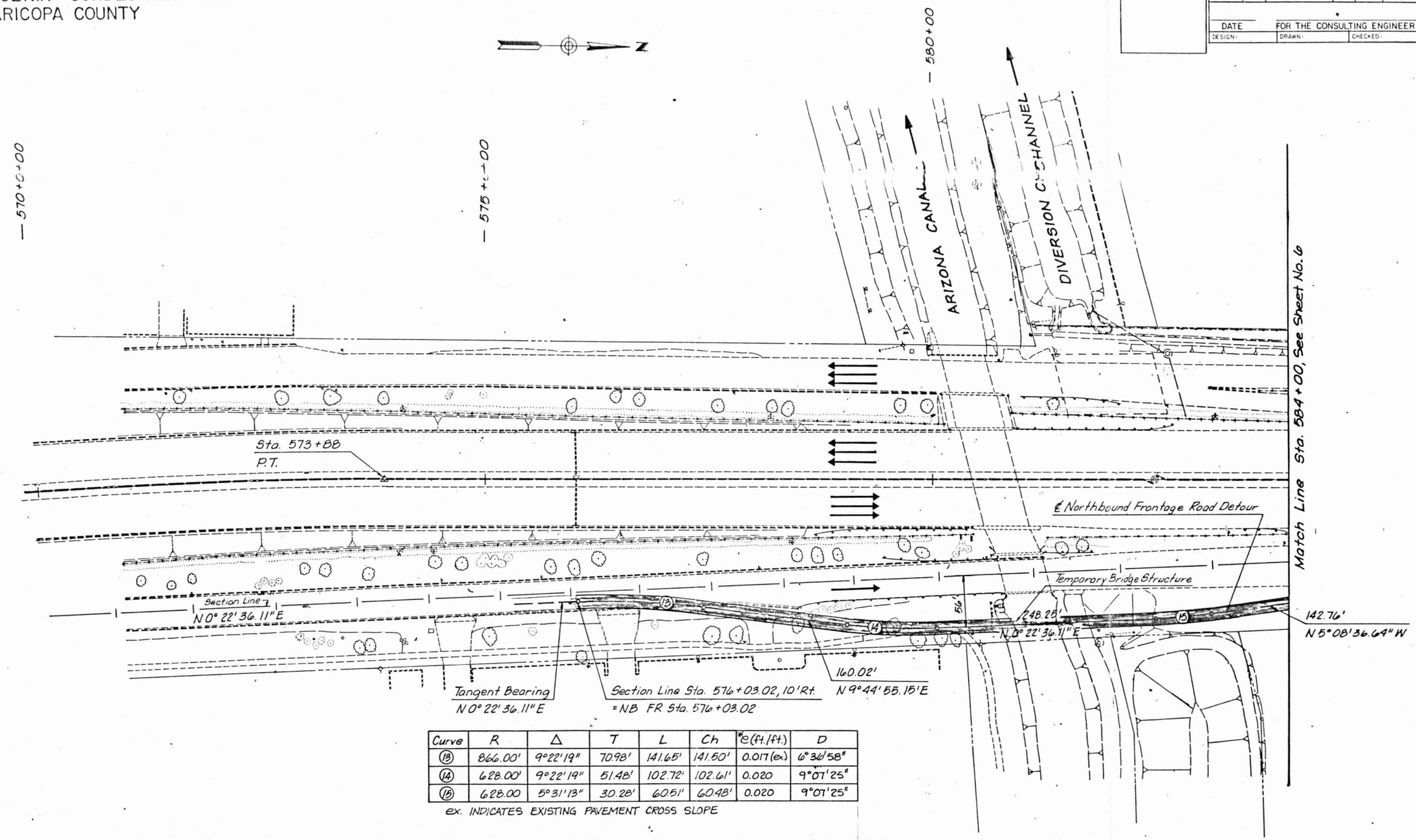
SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

I-17-3-912 PE

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	5	13	

DATE FOR THE CONSULTING ENGINEER
DESIGN: DRAWN: CHECKED:



Curve	R	Δ	T	L	Ch	*e (ft./ft.)	D
13	866.00'	9°22'19"	70.98'	141.65'	141.50'	0.017 (ex.)	6°36'58"
14	628.00'	9°22'19"	51.48'	102.72'	102.61'	0.020	9°07'25"
15	628.00	5°31'13"	30.28'	60.51'	60.48'	0.020	9°07'25"

ex. INDICATES EXISTING PAVEMENT CROSS SLOPE

NOTE: SEE SHEET NO. 13 FOR PROFILE

ARIZONA CANAL DIVERSION CHANNEL
PHASE 3A

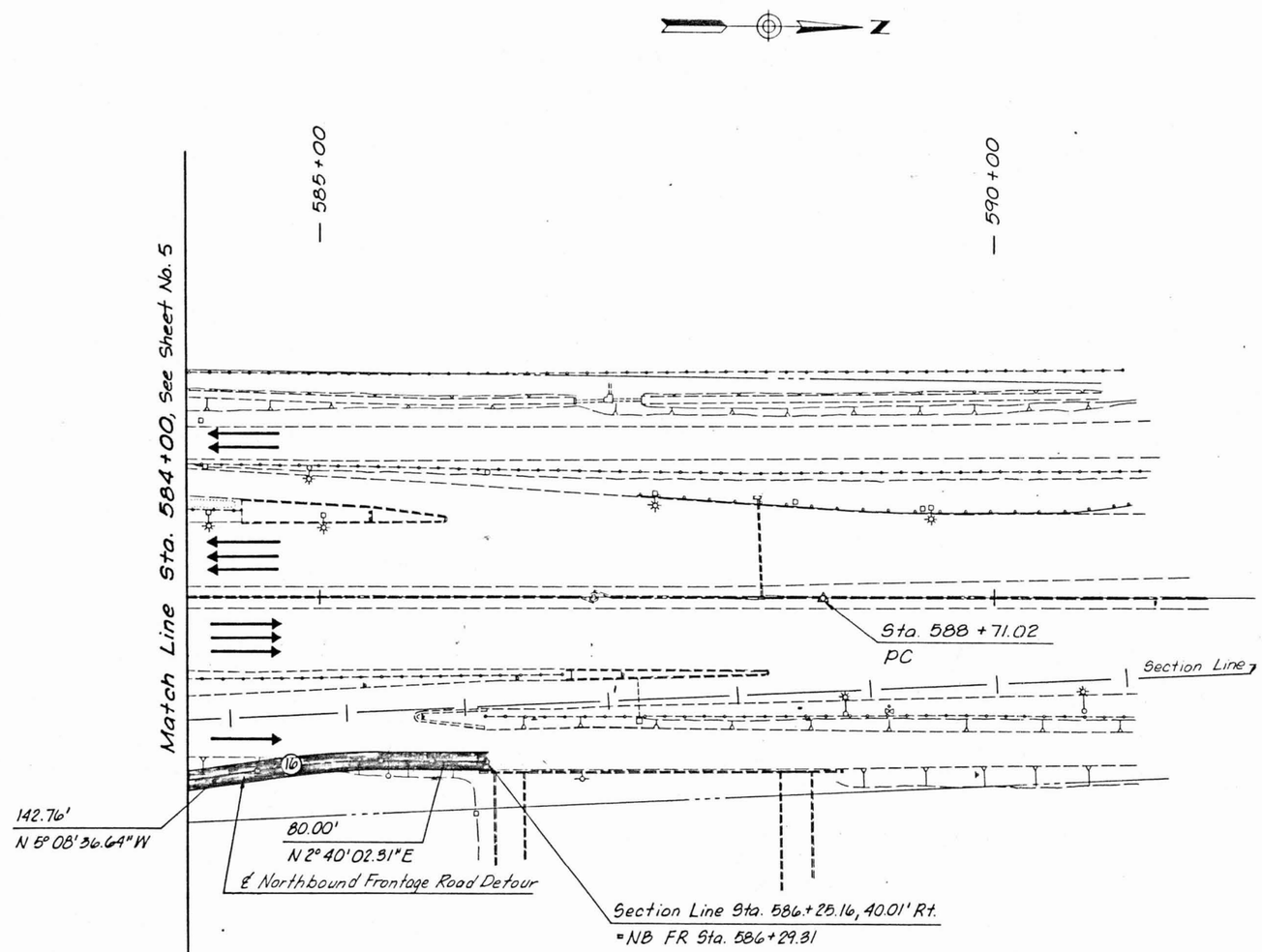
SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

BALUNING 60-107

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	6	13	

DATE FOR THE CONSULTING ENGINEER
DESIGN: DRAWN: CHECKED:



Curve	R	Δ	T	L	Ch	e(ft./ft.)*	D
16	663.00'	7°48'39"	45.26'	90.38'	90.31'	0.0125(ex)	8°38'31"

* ex INDICATES EXISTING PAVEMENT CROSS SLOPE

NOTE: SEE SHEET NO. 13 FOR PROFILE.

ARIZONA CANAL DIVERSION CHANNEL
PHASE 3A

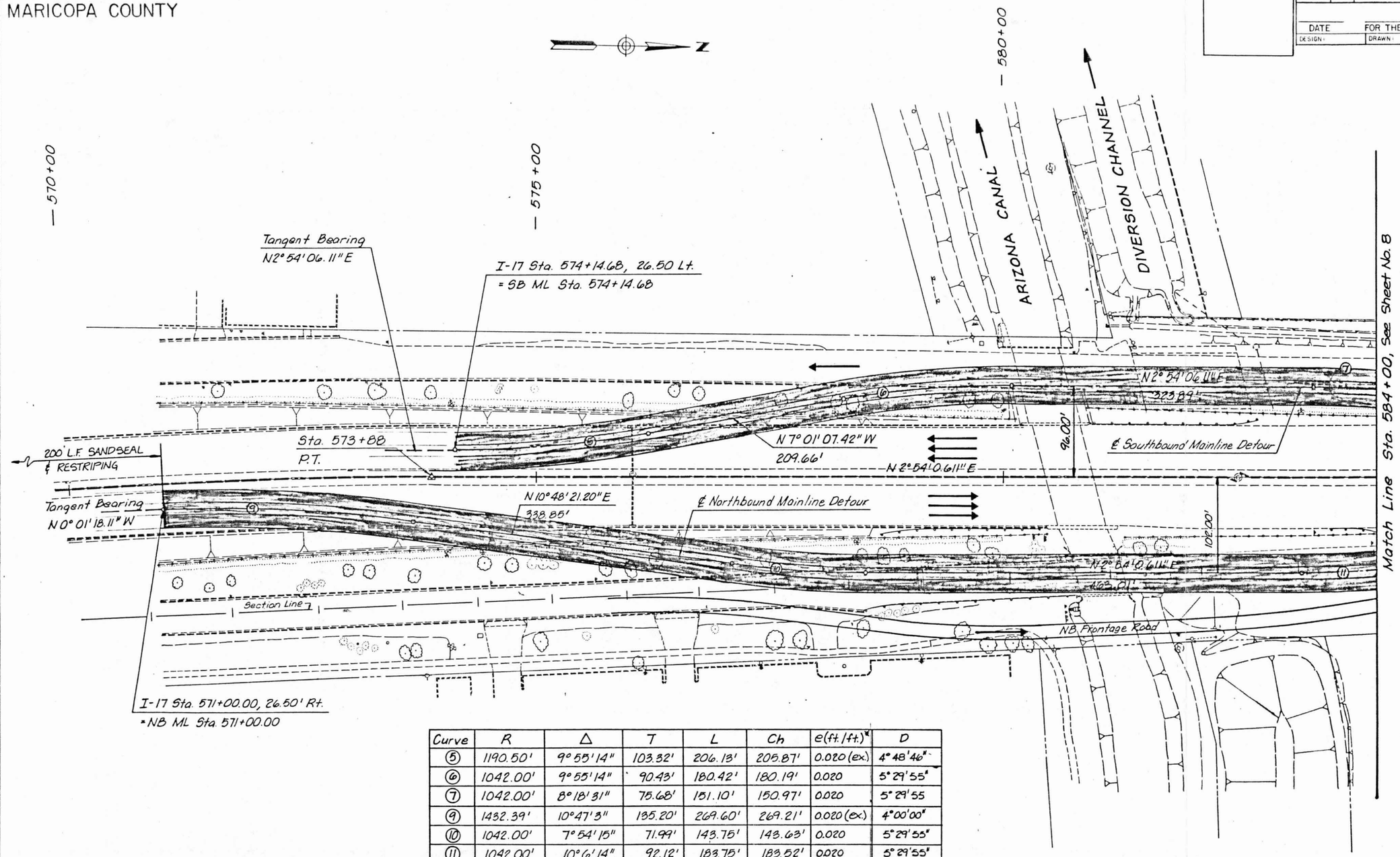
SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

BRL/PRINC NO. 107

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	7	13	

DATE FOR THE CONSULTING ENGINEER
DESIGN: DRAWN: CHECKED:



Curve	R	Δ	T	L	Ch	e(ft./ft.)*	D
5	1190.50'	9° 55' 14"	103.32'	206.13'	205.87'	0.020 (ex.)	4° 48' 46"
6	1042.00'	9° 55' 14"	90.43'	180.42'	180.19'	0.020	5° 29' 55"
7	1042.00'	8° 18' 31"	75.68'	151.10'	150.97'	0.020	5° 29' 55
9	1432.39'	10° 47' 3"	135.20'	269.60'	269.21'	0.020 (ex.)	4° 00' 00"
10	1042.00'	7° 54' 15"	71.99'	143.75'	143.63'	0.020	5° 29' 55"
11	1042.00'	10° 6' 14"	92.12'	183.75'	183.52'	0.020	5° 29' 55"

* ex INDICATES EXISTING PAVEMENT CROSS SLOPE.

NOTE: SEE SHEET NO. 11 FOR N.B. PROFILE
SEE SHEET NO. 12 FOR S.B. PROFILE

ARIZONA CANAL DIVERSION CHANNEL
PHASE 3B

SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

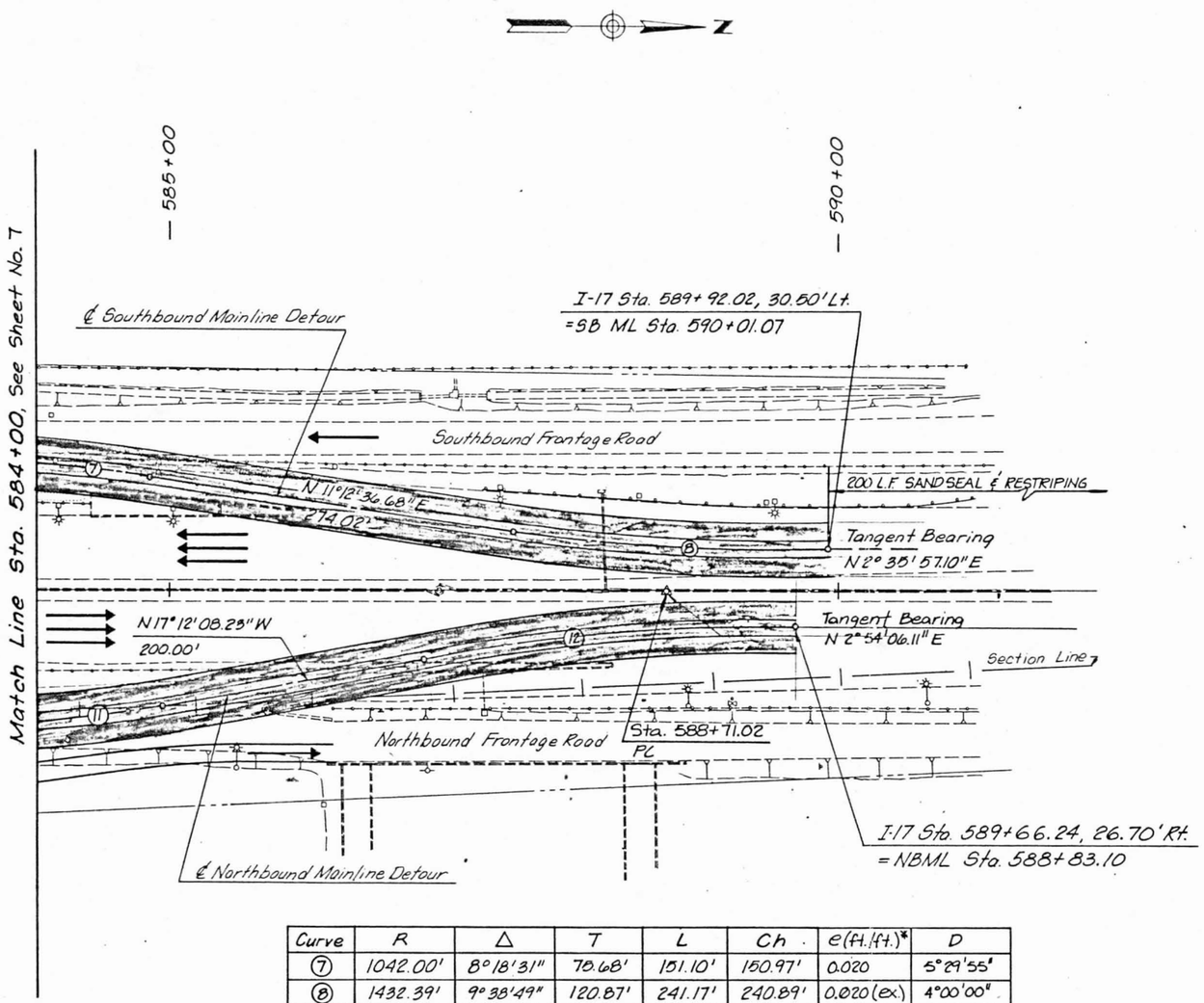
BALPLANNING 40-107

I-17-3-912 PE

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	8	13	

DATE | FOR THE CONSULTING ENGINEER
DESIGN: | DRAWN: | CHECKED:



Curve	R	Δ	T	L	Ch	e(ft./ft.)*	D
7	1042.00'	8°18'31"	75.68'	151.10'	150.97'	0.020	5°29'55"
8	1432.39'	9°38'49"	120.87'	241.17'	240.89'	0.020 (ex.)	4°00'00"
11	1042.00'	10°6'14"	92.12'	183.75'	183.52'	0.020	5°29'55"
12	1563.79'	10°06'14"	138.24'	275.77'	275.41'	0.020 (ex)	3°39'50"

* ex = INDICATES EXISTING PAVEMENT CROSS SLOPE.

NOTE: SEE SHEET NO. 11 FOR N.B. PROFILE
SEE SHEET NO. 12 FOR S.B. PROFILE

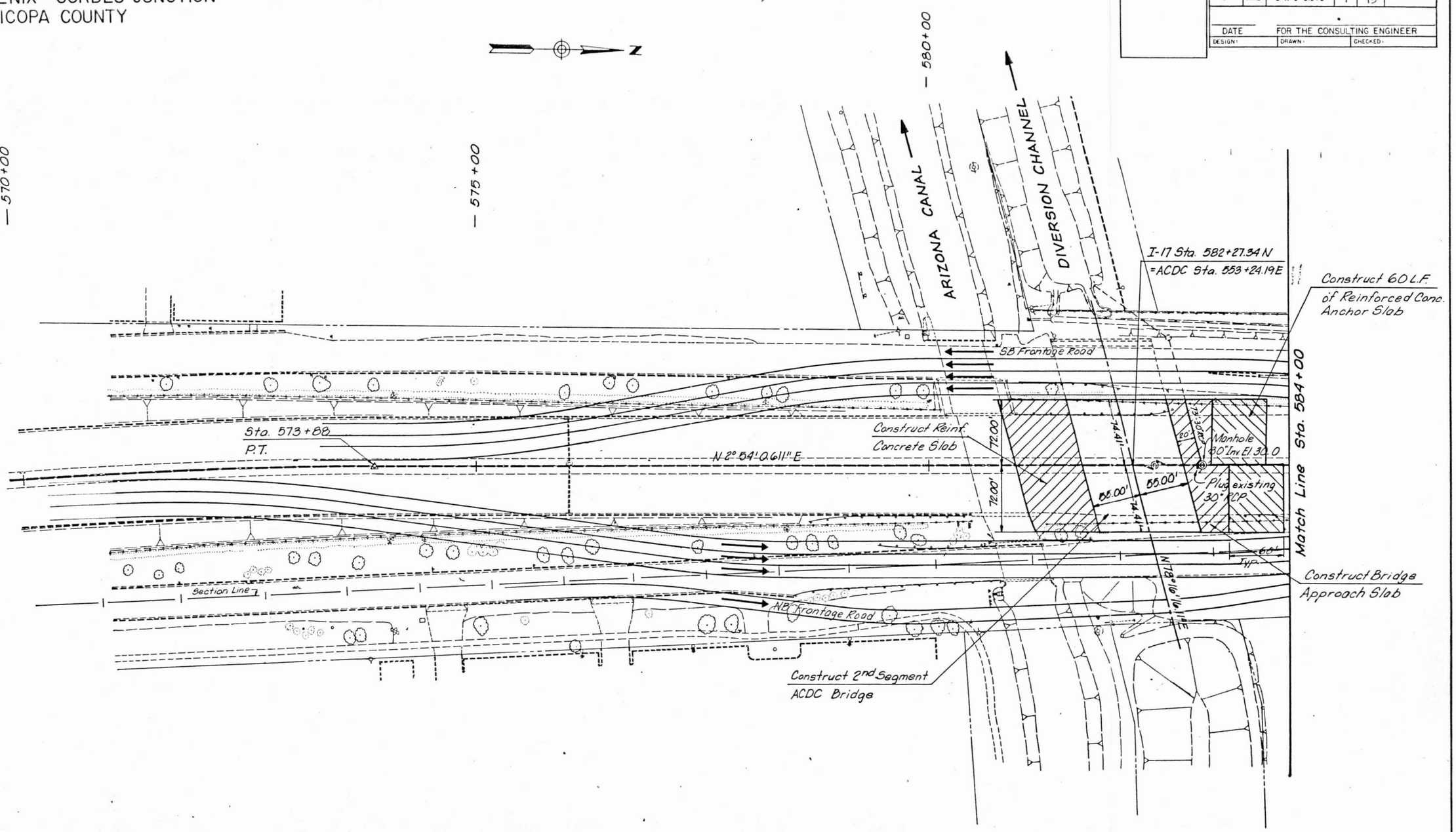
ARIZONA CANAL DIVERSION CHANNEL
PHASE 3B

SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	9	13	

DATE FOR THE CONSULTING ENGINEER
DESIGN: DRAWN: CHECKED:



ARIZONA CANAL DIVERSION CHANNEL
PHASE 3C

SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

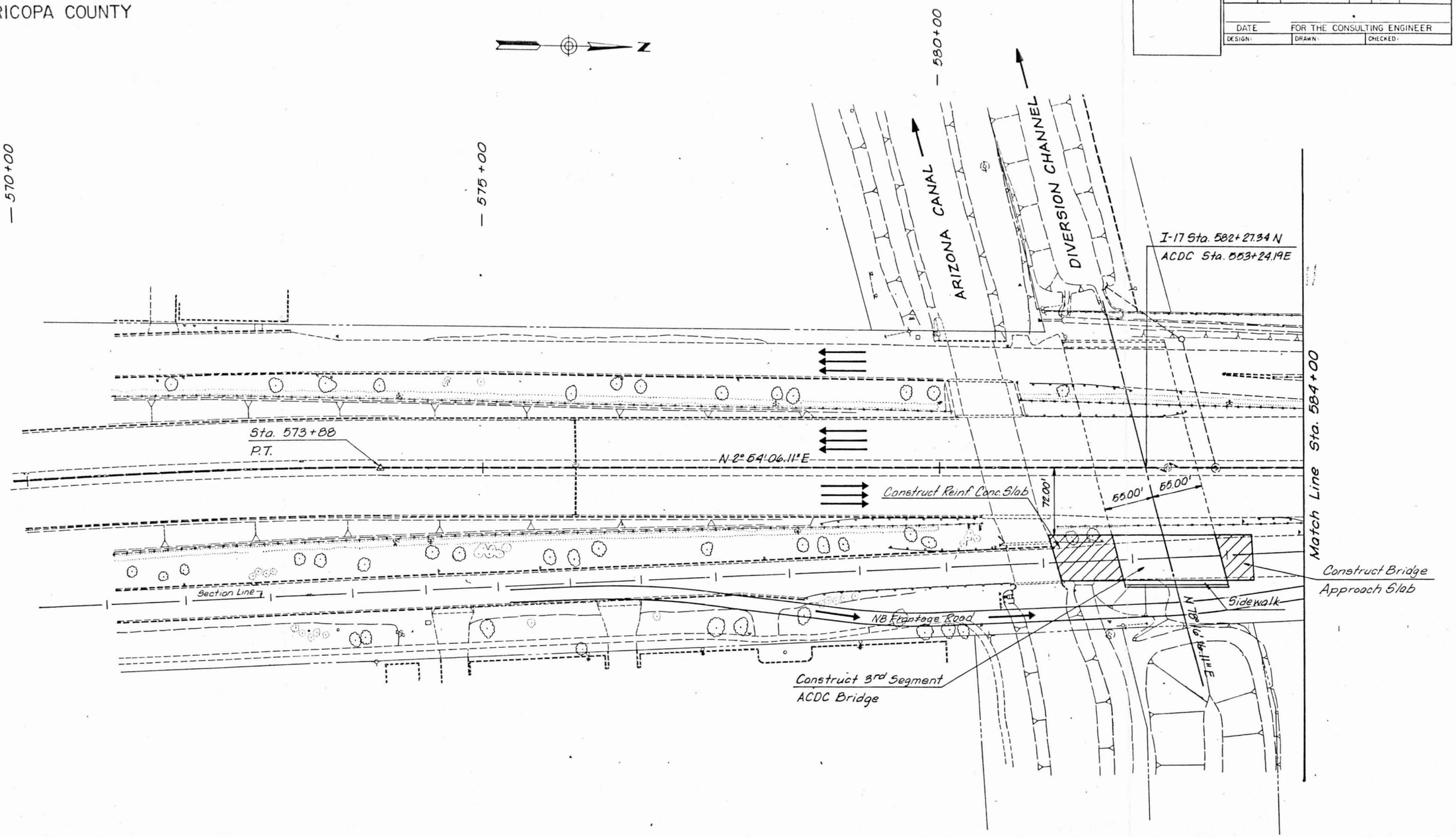
BPLANNING 40-187

I-17-3-912 PE

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	10	13	

DATE FOR THE CONSULTING ENGINEER
DESIGN: DRAWN: CHECKED:



ARIZONA CANAL DIVERSION CHANNEL
PHASE 4

SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

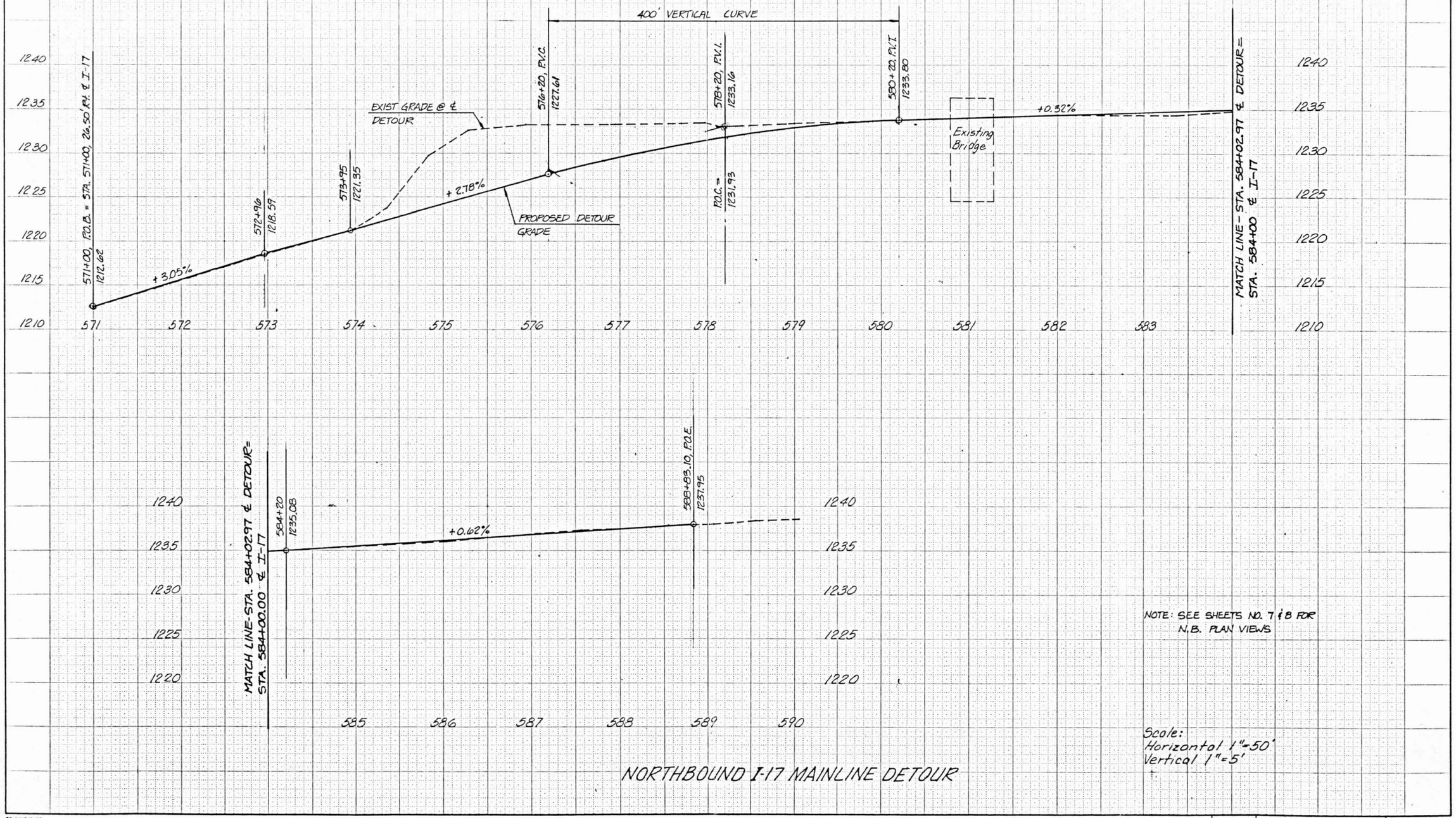
BRUNING NO. 107

I-17-3-912 PE

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	11	13	

DATE FOR THE CONSULTING ENGINEER
DESIGN: DRAWN: CHECKED:



NORTHBOUND I-17 MAINLINE DETOUR

NOTE: SEE SHEETS NO. 7 & 8 FOR N.B. PLAN VIEWS

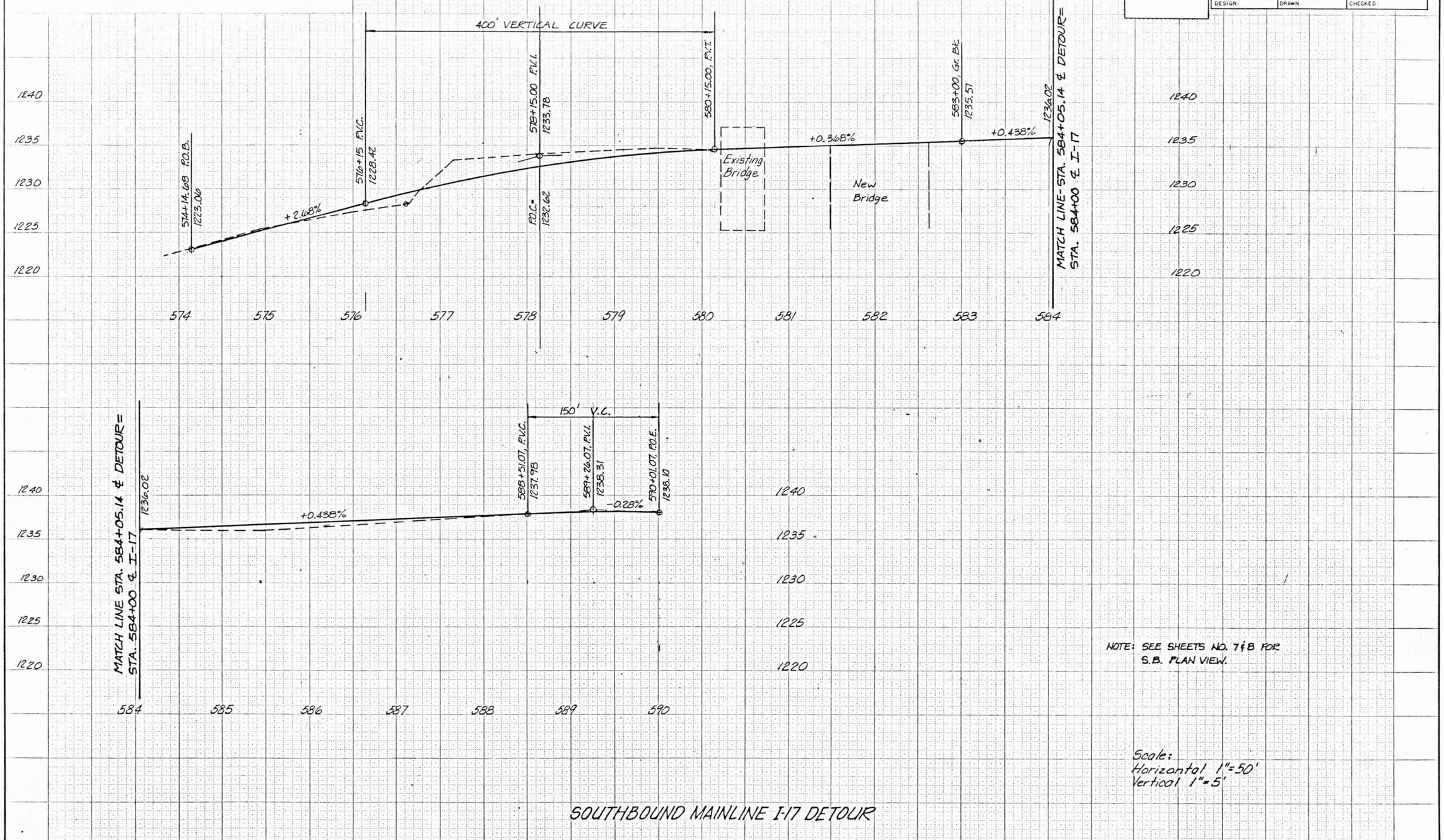
Scale:
Horizontal 1" = 50'
Vertical 1" = 5'

SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	12	13	

DATE FOR THE CONSULTING ENGINEER
DESIGN: DRAWN: CHECKED:



NOTE: SEE SHEETS NO. 7 & 8 FOR S.B. PLAN VIEW.

Scale:
Horizontal 1"=50'
Vertical 1"=5'

SOUTHBOUND MAINLINE I-17 DETOUR

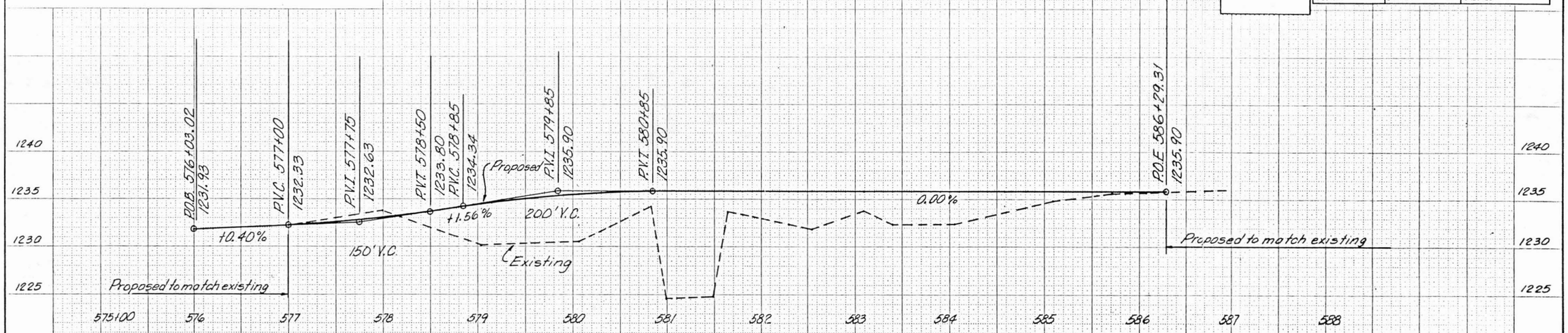
SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

I-17-3-912 PE

INTERSTATE 17
PHOENIX - CORDES JUNCTION
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	I-17-3-912 PE	13	13	

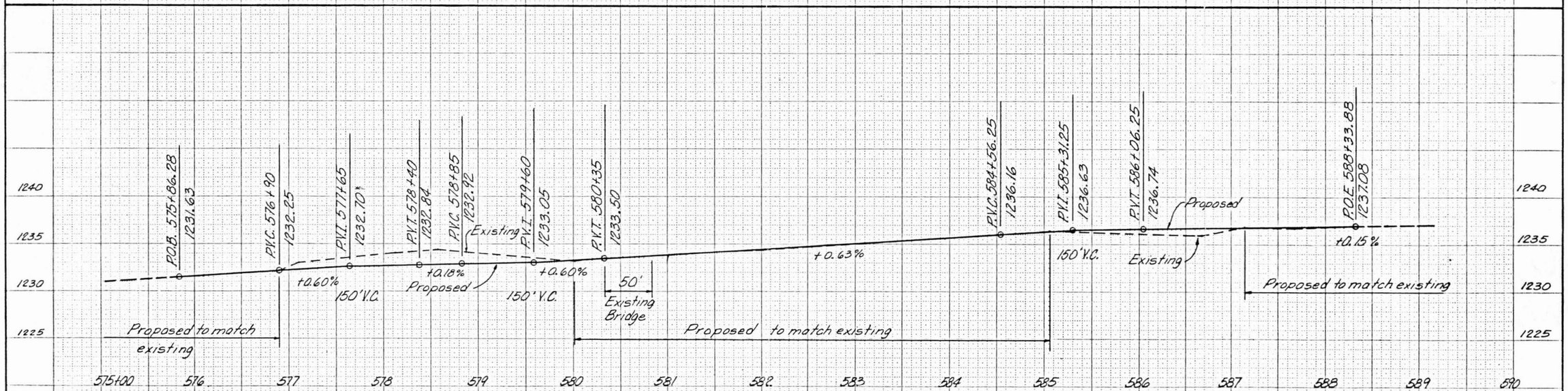
DATE FOR THE CONSULTING ENGINEER
DESIGN: DRAWN: CHECKED:



NORTHBOUND FRONTAGE ROAD - DETOUR

NOTE: All Sta. along ℄, new Detour
See Sheets No. 5 & 6 For Plan View

Scale:
Horizontal 1"=50'
Vertical 1"=5'



NOTE: All Sta. along ℄, new Detour.
See Sheets No. 2 & 3 For Plan View.

Scale:
Horizontal 1"=50'
Vertical 1"=5'

SOUTHBOUND FRONTAGE ROAD - DETOUR

SURVEY NOS.	FINISHED PLANS	REVISIONS	LOCATION	DATE

I-17-3-912 PE