Report

ANALYSIS OF DESIGN SOUTH TEMPE STORM WATER MANAGEMENT SYSTEM PROJECT NO. 84058

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CITY OF TEMPE

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CHAPTER I

INTRODUCTION

A. GENERAL

The purpose of this report is to present the findings of a preliminary analysis of design of a storm water management system for an area located in south Tempe. The general area for this analysis is from 56th Street on the west to Price Road on the east, and from the Western Canal on the north to Ray Road on the south. Plate 1 presents the specific bounds of the analysis area. The objective of the analysis was to define a storm sewer system configuration that would serve as a basis for design of future improvements and of future private developments.

B. PROBLEM DEFINITION

Rainfall collection and disposal within the City of Tempe is handled by "on-site retention". Essentially this means that if rain falls on a parcel of property (interpreted from single lot to an entire subdivision), all runoff flows must be intercepted and held within that property. Subdivisions and other properties must also intercept and hold all rainfall runoff within public rights-of-way (streets), except that runoff from major arterial streets. The City of Tempe has accepted the responsibility of handling the major arterial rainfall runoff. Therefore, this analysis deals only with the interception and disposal of rainfall runoff within the right-of-way of major arterials located in the analysis area.

C. RELATED PROJECTS

Two street improvement and storm sewer projects within the analysis area on Elliot Road are currently under design. The first project extends from 56th Street to the Kyrene Canal with a spur to the north at Kyrene Road and a

stub to the south at Kyrene Road for connection to a future storm sewer (to be designed based on the results of this analysis). The second project extends from the Kyrene Canal to McClintock Drive with spurs to the north at Rural Road and at McClintock Drive, and a stub to the south at Rural Road for connection to a future storm sewer. Both projects are shown on Plate 2.

Preliminary design drawings were obtained and conversations were held with the design engineers of both projects to insure that the storm drain design portion of each project could be incorporated within this analysis insofar as was practical.

D. ANALYSIS ASSUMPTIONS

1. Profiles: The grades used to determine street flow and establish pipe profiles were based on the City of Tempe bench mark data, the preliminary storm sewer drawings, and the Gila Drain Preliminary Design Report for the Flood Control District of Maricopa County dated April 1979 (Coe & Van Loo). USGS maps and limited field surveys were used to supplement this data.

2. Existing Warner Road Irrigation/Storm Drain System: A combination irrigation waste drain/storm drain system exists in Warner Road from Rural Road to east of McClintock, with a spur north on McClintock terminating at a delivery lateral at Palomino Drive. This drain system was constructed by the Salt River Valley Water Users Association (SRVWUA) and is operated in conjunction with the City of Tempe. The City of Tempe desires to continue utilizing this system as a part of the South Tempe storm water management system. Currently, a series of dry wells, located and connected at various points along the drain, receives and disposes of storm water carried in the drain. Additionally, the system in McClintock Drive, north of Warner Road, is connected to an existing retention basin located just east of McClintock, north of the Warner-McClintock intersection.

Limits. No allowances have been made for water passed on to the City of Tempe.

4. Storm Water Runoff West of 56th Street: It is assumed that any runoff west of 56th Street will be handled by the planned 56th Street storm drain project to be designed in the near future . No allowances have been made for water crossing over the western boundary line of this analysis area.

5. Gila Drain Usage: The current policy of the Salt River Valley Water Users Association (SRVWUA) is to prohibit use of the Gila Drain for unrestricted storm water runoff discharge. There is currently an understanding between the City of Tempe and SRVWUA that storm water runoff could be discharged into the Gila Drain, but only if regulated and in quantities not exceeding 75 cfs. This understanding effectively requires the City to use some sort of outfall detention basin to hold the runoff waters until it is convenient and allowable to pump the runoff into the Gila Drain.

The SRVWUA has agreed to having the Gila Drain tiled from the Western Canal to approximately 600 feet south of Elliot Road as a part of the City's Elliot Road street improvements.

6. Knox Road Detention Basin: Currently a 15 acre parcel of land immediately adjacent to the Gila Drain just south of Knox Road has been set aside for use as a storm sewer outfall. The outfall is planned to be used as a detention basin for runoff until it can be discharged into the Gila Drain as hereinbefore described. The outfall is shown on Plate 3.

7. Runoff Discharges to Chandler: It is assumed that all runoff within the limits of this analysis' recommended system must be retained within the City of Tempe and not passed on to the City of Chandler.

CHAPTER II

HYDROLOGY

A. ANALYSIS STORM EVENT CRITERIA

In conjunction with the City of Tempe Engineering Staff, it was determined that two storm events would be used for this analysis. The ten year frequency, two hour duration storm and the one hundred year frequency, one hour duration storm were the selected storm events.

The rational for selecting the ten year, two hour storm event is that it represents a reasonably economical storm sewer system providing for two way traffic on an arterial street with flooding of the curb lanes only. The rational for selecting the one hundred year, one hour storm is that residential and commerical buildings foundations are generally constructed at elevations above that produced by runoff from this particluar event. It is a common guideline for many financial institution's lending approval. The use in this analysis of the hundred year event will provide an additional secondary measure whereby arterial runnoff from the event will remain within public right-of-way limits without spilling over into private land and increasing the potential for flooding.

B. DRAINAGE AREAS

The drainage area is naturally broken into two distinct sub areas by topographic features. The western sub area, hereinafter referred to as the Kyrene Road Storm Sewer System, is bounded roughly by 56th Street on the west and Kyrene Road on the east. The eastern sub area, hereinafter referred to as the Rural Road Storm Sewer System, is bounded roughly by Kyrene Road on the west and Price Road on the east. The two sub areas are shown on Plate 3. A third area from Knox Road, south along Rural Road, to Ray Road and from Rural

Road, west along Ray Road, to the Gila Drain is discussed only briefly because it will be the responsibility of the developer of the SE quarter of Section 22 to handle the flow generated in that stretch.

C. WATERSHED HYDROLOGY

1. Analysis Methods: Numerous methods for analyzing the watershed area are available. The Rational Method (Q=CiA) is probably the most common method for modeling watersheds because of its ease of application. The major problem with this method and other empirical or correlative methods is the return periods and runoff return periods are assumed equal, the formulas are subjective with respect to coefficients and they are limited in application because they rely on extremely localized data and are not valid when extrapolated to other regions. Because of these concerns, it was decided to use the more definitive synthetic unit hydrograph method and route the flow by hydrograph addition.

2. Unit Hydrograph Method: A thunderstorm based methodology was selected for analysis. The methodology is found in the "Design of Small Dams", published by the U.S. Department of Interior, Bureau of Reclamation. Essentially the process is 1.) develop watershed characteristics (Appendix A); 2.) develop thunderstorm rainfall data, infiltration and storage requirements; (Appendix B); 3.) develop a series of 15 minute thunderstorm hydrographs and lag them to produce a unit hydrograph for each watershed sub area; 4.) create a watershed sub area hydrograph by factoring the unit hydrograph by the rainfall generated in the selected storm event; and 5.) route the water through the watershed by hydrograph addition. The watershed sub area hydrograph peaks are shown in Appendix C for the 10 year and 100 year storm events. The surface routing is contained in Appendix D.

3. Plates 4 and 5 show peak street flows and catchment requirements at the termination of each sub area. Where the catchment requirement exceeds the 10 year flow, it means the 100 year flow controls catchment basin requirements.

D. OTHER HYDROLOGY PARAMETERS

1. Pervious and Impervious Land: The parkways adjacent to the paved areas and sidewalks are designated as pervious land with the remaining paved areas designated as impervious.

2. Curve Numbers: Soil Conservation Service curve numbers were used to estimate the amounts and distributions of runoff. All runoff analyses were based on type B soils. Parkway areas were assigned a curve number of 95, and paved areas a curve number of 98.

3. Concentration Times: The time of concentration is very short in a very narrow and long drainage area such as in a street right-of-way. The minimum time of concentration was set at ten minutes which is a common default value for situations such as this.

CHAPTER III

HYDRAULICS

A. GENERAL

1. Routing Criteria:

a. Manning's "n" for pipe flow = 0.012

b. Manning's "n" for street/gutter flow = 0.015

c. Desired velocity at one fourth of full flow depth = 3.0 to 2.5 feet per second.

2. Street Flow Criteria:

a. Ten Year Storm Event: A single traffic lane in each direction must remain open for driving. When the water depth reaches the point where water begins encroaching into the one open lane, then the water must be intercepted by the storm sewer.

b. One Hundred Year Storm Event: All arterial runoff must remain within the street right-of-way. When the water depth reaches the point where the water begins to encroach on private property, then additional water above that produced by the ten year event must be intercepted by the storm sewer. Maintenance of driving lanes is not a criteria for this storm event.

c. Special Cases:

1.) Some one hundred year storm street surface flows will not follow the proposed storm sewer alignment. Storm sewer alignment was kept separate from the general street slope as a matter of efficiency. (e.g. Due to street design grades, the one hundred year surface flow on Elliot Road, east of McClintock Drive will not cross the McClintock Drive crown and flow west on Elliot Road toward Rural Road . Rather, the surface flow in excess of the that produced by a ten year event which is not intercepted by catch basins at the

intersection of McClintock Drive and Elliot Road, will turn at McClintock and travel south on McClintock Drive toward Warner Road where it will be caught by the McClintock Drive system.)

2.) Flow south in Kyrene Road and Rural Road, regardless of the storm event, was intercepted in total at Knox Road to prevent the water from passing on to the City of Chandler.

3.) Flow in Rural Road south of Knox and along Ray Road to the Gila Drain (drainage areas 37 and 38, Plate 3) is the responsibility of the developer of the SE quarter of Section 22. Other than sizing the flows and storm sewer consistant with the criteria herein specified, no further consideration is given to this area in this report.

B. SYSTEM DESCRIPTIONS

1. Kyrene Road Storm Sewer System:

a. This system incorporates flows from drainage areas 1 through 16, exclusive of drainage area 6. Refer to Plate 3 for specific information as to the configuration of the referenced areas.

b. Three ponding areas are present in this system. Two are the result of damming action created by the railroad spur running diagonally across the analysis area. The third is the result of a reverse grade in street alignment. In all three locations, the damming action would result in runoff flows exceeding the street flow criteria. The one hundred year storm runoff could not be contained within the right-of-way. Therefore, the storm sewer was sized in these areas to intercept the portion of the one hundred year flows in excess of that which can be captured and held within the capacity of the street section.

c. Drainage area 6 would normally have been intercepted at the Kyrene Canal and piped back to the intersection of Kyrene Road and Elliot Road. However, the street grade east of that intersection is fairly steep causing the catchment basin elevation at Kyrene Canal to be quite a bit lower than the intersection elevation. Piping the flow back to the intersection would dictate a storm sewer elevation in the Kyrene Road Storm Sewer System being deeper than is necessary. Given that the street flow criteria would not be exceeded, the flow was allowed to pass over the Kyrene Canal within the street curb lines and intercepted in the Rural Road Storm Sewer System.

d. Drainage area 13 is similar to drainage area 6 in the way it flows to the east. However the runoff can feasibly be piped back to the intersection of Warner Road and Kyrene Road because the storm sewer system is already deep enough to accept the pipeback.

e. The catch basin and pipe at the intersection of Kyrene Road and Warner Road are designed to intercept the one hundred year storm runoff. This was done to insure the street flow is not passed on to the City of Chandler. Three conditions require the flow to be handled this way. First, the street grade south of the intersection drops suddenly and the flow cannot be turned effectively onto Knox Road. Second, Knox Road is a mid-section street and the drainage responsibility becomes the developer's and not the City of Tempe's. Third, the right-of-way shrinks from 110 feet down to 60 feet which will abruptly constrict the one hundred year street flow width and cause encroachment of water into private areas.

2. Rural Road Storm Sewer System

a. This system incorporates flows from the remaining drainage areas 17 through 39, exclusive of 37 & 38 and inclusive of 6. The system combines flow from two sub systems (drainage areas 6, 17 through 27 and drainage areas 28 through 35) at the intersection of Rural Road and Warner Road

and directs flow to the detention basin on Knox Road. Refer to Plate 3 for specific information as to the configuration of the referenced areas. This system is identified as Rural Road Storm Sewer System, Alternative A and is shown on Plate 6A.

b. Presently the Gila Drain is not available for use as a component of the storm drain system or release point. However, with the continued urbanization of this area, the need for tailwater ditches will become less and less and it is highly recommended that a joint use agreement be pursued between the City of Tempe and SRVWUA. The joint use agreement could allow a tiled Gila Drain to be used both as a Western Canal waste drain as well as an intergral part of the City of Tempe's Rural Road Storm Sewer System.

The incorporation of the Gila Drain into the Rural Road Storm Sewer System is identified as Alternative B and is shown on Plate 6B.

c. One ponding area is present in this system on McClintock Drive, north of Warner Road. The ponding is the result of a reverse grade in the street alignment. The one hundred year storm runoff is in excess of that that can be held within the right-of-way. In this location, however, storm water is intercepted by the existing combination SRVWUA irrigation drain/Tempe storm drain and the existing City Park retention basin adjacent to the east. Both are sufficient to intercept the required flows to maintain the street flow criteria.

d. Drainage area 28 is limited to the south half of Warner Road. The north half of the street will be drained through the storm drain system serving the ASU Research Park immediately to the north.

e. The ten year storm street flow from drainage area 29 is intercepted at the intersection of McClintock Drive and Warner Road. However, the one hundred storm street flow that is not intercepted at the intersection

will flow to the south along McClintock Drive toward the City of Chandler. This excess flow must be diverted into the existing right-of-way retention basins and new ones built as development occurs in the area. Should this not be possible or desirable, the catch basins serving the aforementioned intersection must be modified to prevent the excess flow from being passed on to the City of Chandler.

f. The catch basin and pipe at the intersection of Rural Road and Knox Road are designed to intercept the one hundred year storm runoff. This was done to insure the street flow is not passed on to the City of Chandler. Three conditions require the flow to be handled this way. First, the street grade available in the intersection is not sufficient to turn the flow effectively onto Knox Road. Second, Knox Road is a mid-section street and the drainage responsibility becomes the developer's not the City of Tempe's. Third, the right-of-way shrinks from 110 feet down to 60 feet which will abruptly constrict the one hundred year street flow width and cause encroachment of water into private areas.

C. PIPE HYDRAULICS

1. The street is the system's most cost effective storm sewer conveyance, and as such the surface flow is carried in the street as far as feasible. When either the 10 year or 100 year street flow criteria is no longer satisfied, the excess flow is intercepted and the rest is carried in the street into the next watershed sub area. Appendix D contains the results of the pipe flow routing. Qi is the excess flow required to be intercepted, Qc is the flow that is carried over into the next sub area, and Qp is the peak flow carried in the pipe. Note that the Qi and Qp are not directly additive because they represent peaks from a hydrograph and do not portray their time

relationship to each other. Pipes were sized based on maintaining minimum desired velocities and on keeping the hydraulic grade line below the ground surface.

2. Surcharge flow was investigated and incorporated where technically feasible. The best and most cost efficient pipe storm sewer system is one that is running surcharged at peak flow with the hydraulic grade line just below the ground surface. Appendix F contains the hydraulic grade line calculations.

3. Plate 6A and 6B shows recommended pipe sizes and slopes based on the flows obtained from the hydrograph routing. Plate 6A represents the system without incorporation of the Gila Drain. Plate 6B represents the system utilizing a tiled Gila Drain. Slopes and sizes are based on the best available information at the time relative to utility conflicts. Potential utility conflicts should be further investigated at the time of actual design of individual sections.

D. SYSTEMS PROFILES

Plates 7 through 33 show the preliminary pipe profiles, recommended pipe sizes and the calculated hydraulic grade lines for both the Kyrene Road Storm Sewer System and the Rural Road Storm Sewer System (Alternatives A and B). No attempt has been made to show catch basin locations as this must be accomplished during actual design when actual street and curb grades and conditions are available. As previously stated, the profiles are not based on actual field surveys, but rather from other information that is satisfactory from an planning standpoint and must be refined during design.

E. KNOX ROAD DETENTION BASIN

A fifteen acre parcel of land immediately south of Knox Road and just west of the Gila Drain has tentatively been set aside for use as a detention basin for the storm water runoff from the Kyrene Road and the Knox Road Storm

Sewer Systems. The parcel is a portion of a larger tract of land currently slated for a residential subdivision. The exact bounds of the parcel have not been fixed because the land ownership and development plan is still preliminary.

An analysis of the detention basin requirements was made using the latest development plan available from Continental Homes. Every attempt was made to keep the analysis as generic as possible. Under Alternative A, the Rural Road Storm Sewer System controlled the depth of the detention basin at 26 feet. A plan and section for this basin is shown on Plate 34A and Plate 35A respectively. Under Alternative B, the Kyrene Road Storm Sewer System controlled the depth of the detention basin at 16 feet. Likewise Plate 34B and Plate 35B show a plan and section, respectively, under Alternative B.

Both basin configurations are set to be compatible with park and recreation type activities. The side slopes are set at 6H:IV. This slope is acceptable for mowing requirements and should not represent a potential hazard to the public in terms of falling down the slope in an uncontrolled manner. Every effort was made to maximize the amount of "level" bottom area for use as soccer and related sports fields. The bottom of the basin is set to slope gently to the outfall structure in an effort to minimize the amount of nuisance water present in the basin which obviously would disrupt its usage for recreational activities.

Under Alternative B, a flow control structure, such as is shown on Plate 35B, can be located and constructed in the Gila Drain. This structure will allow up to 75 cfs to continue down the Gila Drain while, diverting the balance of flow into the detention basin utilizing a weir structure. With the

incorporation of slide gates this control structure can provide the flexibility of diverting the entire flow into the basin. Such a structure is very reliable and provides a minimum of "hands on" operation.

The disposal of the outfall water in the basin is to be handled by a lift station that pumps to the Gila Drain when allowed by SRVWUA and by natural percolation of the water into the subgrade. The lift station can be set to blend into the landscape and to essentially be out of the public assembly areas. It is recommended that submersible pumps be used. The pumps should be set in a wet well that is deeper than the bottom of the basin. This provides the drain-back feature desired to keep the nuisance water from the basin bottom and allows the storm sewer pipe system to completely drain after storms. There are submersible pumps available that are suspended on a slide bar, and coupled to the discharge piping by a quick connect/release assembly which facilitate their insertion into the wet well. Some of these pumps can be operated in a wet or dry state which is desireable from an "exercise" point of view without danger of burning up. In addition the complete pump assembly is completely out of the public view yet readily accessible for maintenance purposes. The operation of the pumps can be controlled from a remote control station or by a set of controls on the site. The only items required on site besides the buried wet well are a transformer, motor control center and possibly the site control panel. These items can be housed in a vault, also out of the public view, or in a small above ground building. For either option the requirements for space are the same.

Both basins are potentially capable of detaining the PMP flood. An exact determination of the capability cannot be made until the basin's parameters are better defined. The basins probably will be less than 1/3 full for the 10 year storm event which means normally only a few feet of water will ever be in the basin.

CHAPTER IV

ALTERNATIVE SYSTEM INVESTIGATIONS

A. PIPE VELOCITY

It is the premise of this and most other storm sewer analyses that the velocity of the storm water runoff in the pipe should be kept at a sufficiently high level to avoid maintenance problems caused by silting. When topography allows, a 3.0 to 2.5 feet per second (fps) velocity in a pipe flowing one- quarter full is desired. Experience indicates that this velocity is sufficient to scour the pipe at lower flows in order to avoid major silting problems, and not too high to drop out the solids during full pipe flow which can cause problems also. However, the available slope in the area is not sufficient to allow strict adherence to this criteria without having the storm sewer become excessively deep. Accordingly the 2.5 fps requirement was lowered to 1.75 fps flowing at one fourth full at the City of Tempe's request which allows the storm drain to be as shallow as possible. Further deviation from the 2.5 fps flowing one-quarter full criteria is not recommended.

B. RURAL ROAD DETENTION BASINS

Under Alternative A, construction of smaller detention basins along Rural Road in the vicinity of Elliot Road and at Warner Road were investigated as a sub-alternative in order to reduce the depth of the pipe in Rural Road and, ultimately, the depth of the Knox Road Detention Basin.

Such a system is technically feasible and would include a minimum 3 1/2 acre, 16 foot deep detention basin in the vicinity of Rural Road and Elliot Road; and a minimum 3 1/2 acre, 16 foot deep detention basin in the vicinity of the intersection of Rural Road and Warner Road. The required depth of each

basin is controlled by the depth of collection storm sewers, which is basically controlled by the depth of the Gila Drain. This is due to the fact that the north lateral must pass under the Gila Drain at Rural Road and Elliot Road and the south lateral must pass under the Gila Drain at Rural Road and Warner Road.

The Knox Road Detention Basin would still be required but could be raised from a depth of 26 feet to 16 feet; depth being controlled by the Kyrene Road Storm Sewer System.

Additionally, each of the two new basins would require a lift station and discharge line to the Gila Drain similar to that proposed for the Knox Road Detention Basin.

CHAPTER V

COST ESTIMATE

A. PRELIMINARY COST ESTIMATE

A preliminary cost estimate was developed for the storm sewer, detention basin and related appurtenances. Costs were based on recent bid tabulations from various municipalities within the Phoenix Metropolitan area, from cost estimating guides, and from recent past projects that incorporate some of the same design concepts. These costs are in 1984 dollars. It must be emphasized that these figures are planning level cost estimates and preliminary in nature until the project development is at sufficient detail to produce more refined figures. A detailed breakdown of the estimate is contained in Appendix G.

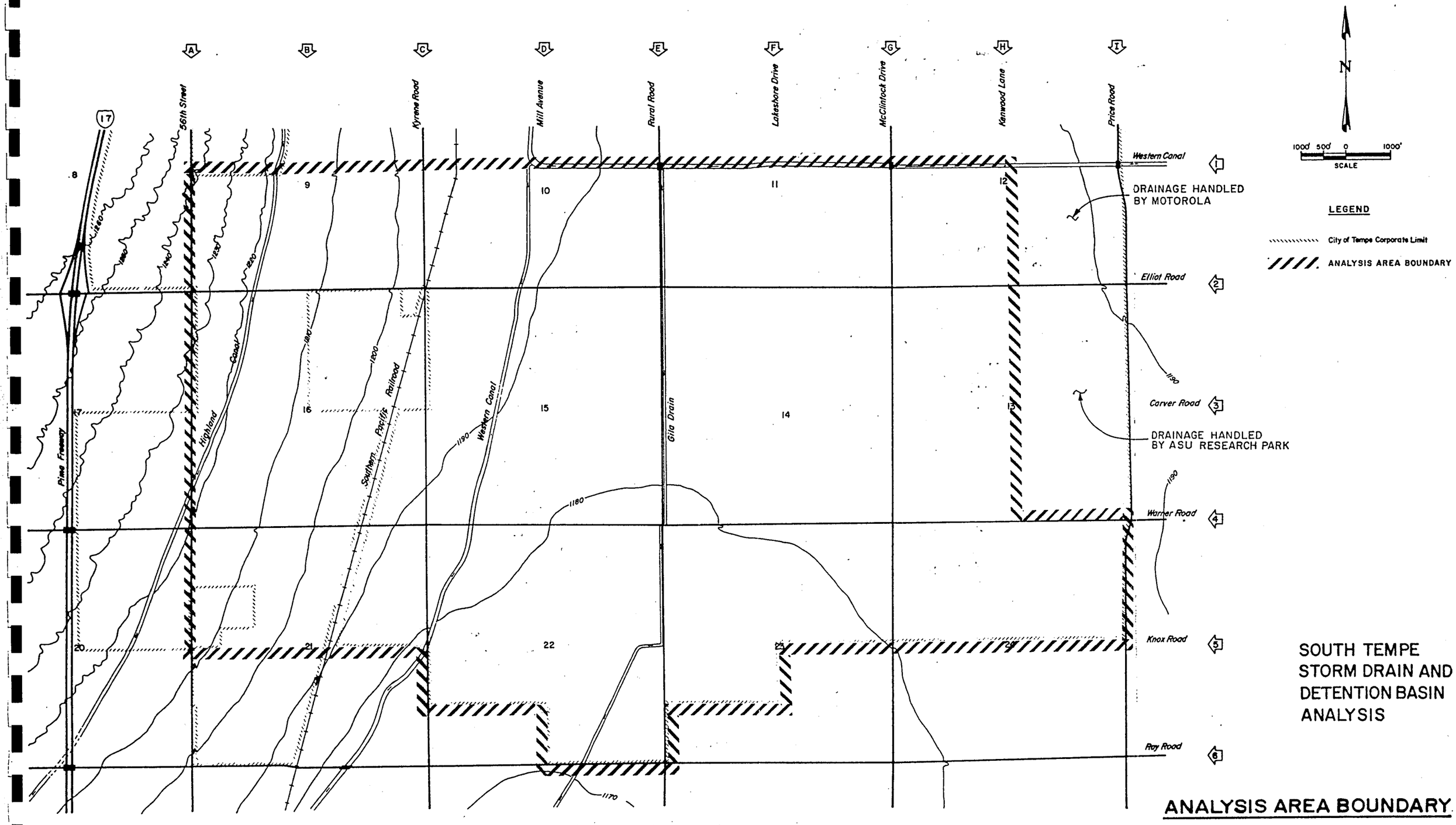
	Alternative A	Alternative B
Kyrene Road Storm Sewer Piped System	$ 1,714,857	$1,714,857
Rural Road Storm Sewer Pipe System	1,931,548	1,577,432
Knox Road Detention Basin	1,590,000	1,300,000
Subtotal	$ 5,236,405	$ 4,592,289
Contingency @ 15%	785,461	688,843
Engineering and Inspection @ 12%	628,369	551,075
TOTAL	$ 6,650,235	$ 5,832,207

B. COST MITIGATING MEASURES

Knox Road Detention Basin: The Majority of the detention basin construction cost is for excavation and disposal of soil. The seeding, irrigation system, pump station etc., are not significant cost factors by

comparison. The soil contained in the basin is a saleable commodity, and as such, under Alternative A or Alternative B, not only could the City get the basin excavated possibly for "free" but also could possibly generate revenue to help pay for the storm sewer facilities. The largest factor in selling soil in this quantity is time. If put out for bid, with a sufficient excavation period to allow the vendor to choose when to excavate the soil, the basin could net as much as one dollar a cubic yard. It is recommended this alternative be investigated.

Under Alternative B, the soil might also be a source of backfill for tiling the Gila Drain.



SOUTH TEMPE STORM DRAIN AND DETENTION BASIN ANALYSIS

ANALYSIS AREA BOUNDARY

plate I

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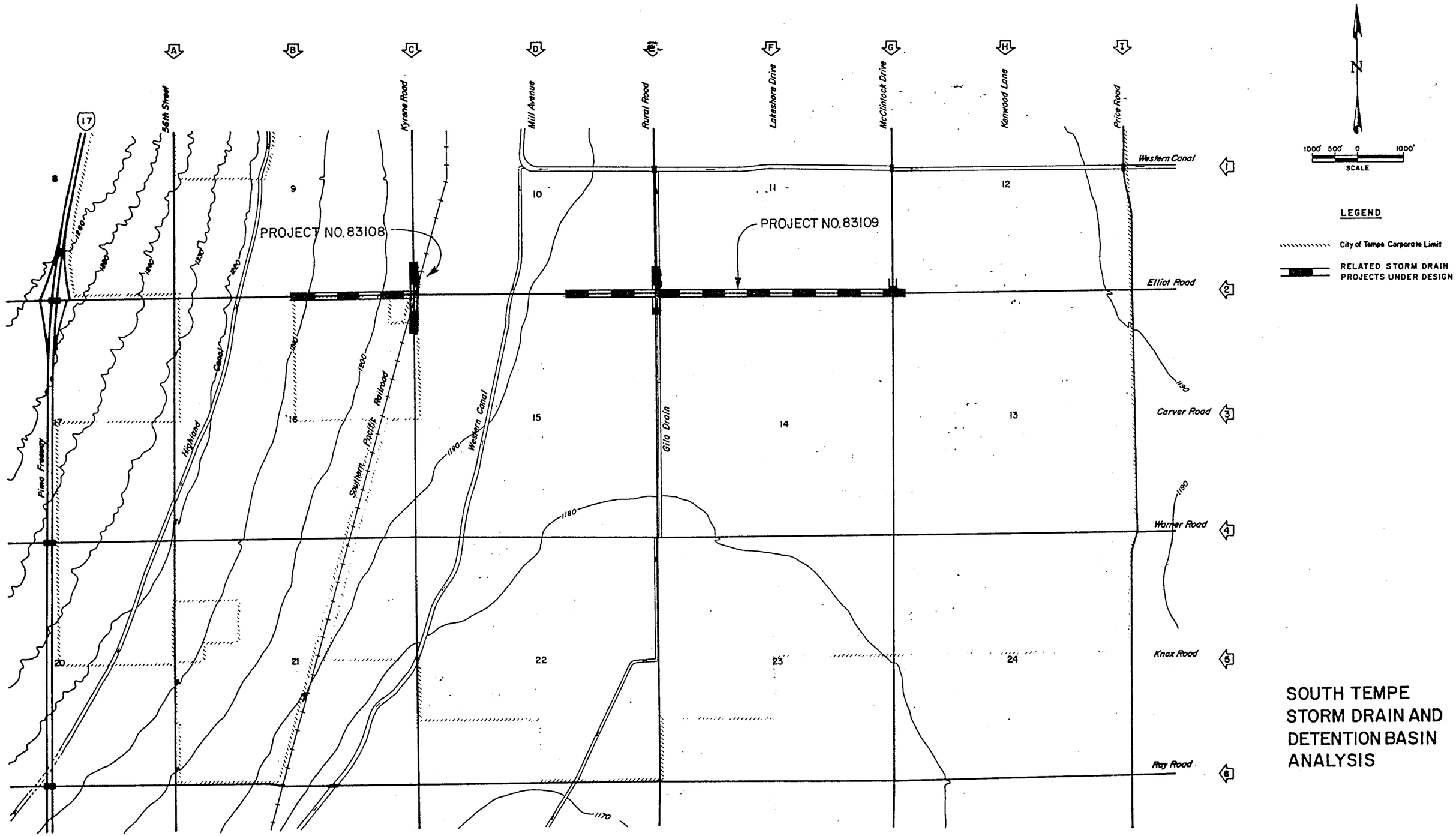

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

RELATED PROJECTS

plate 2

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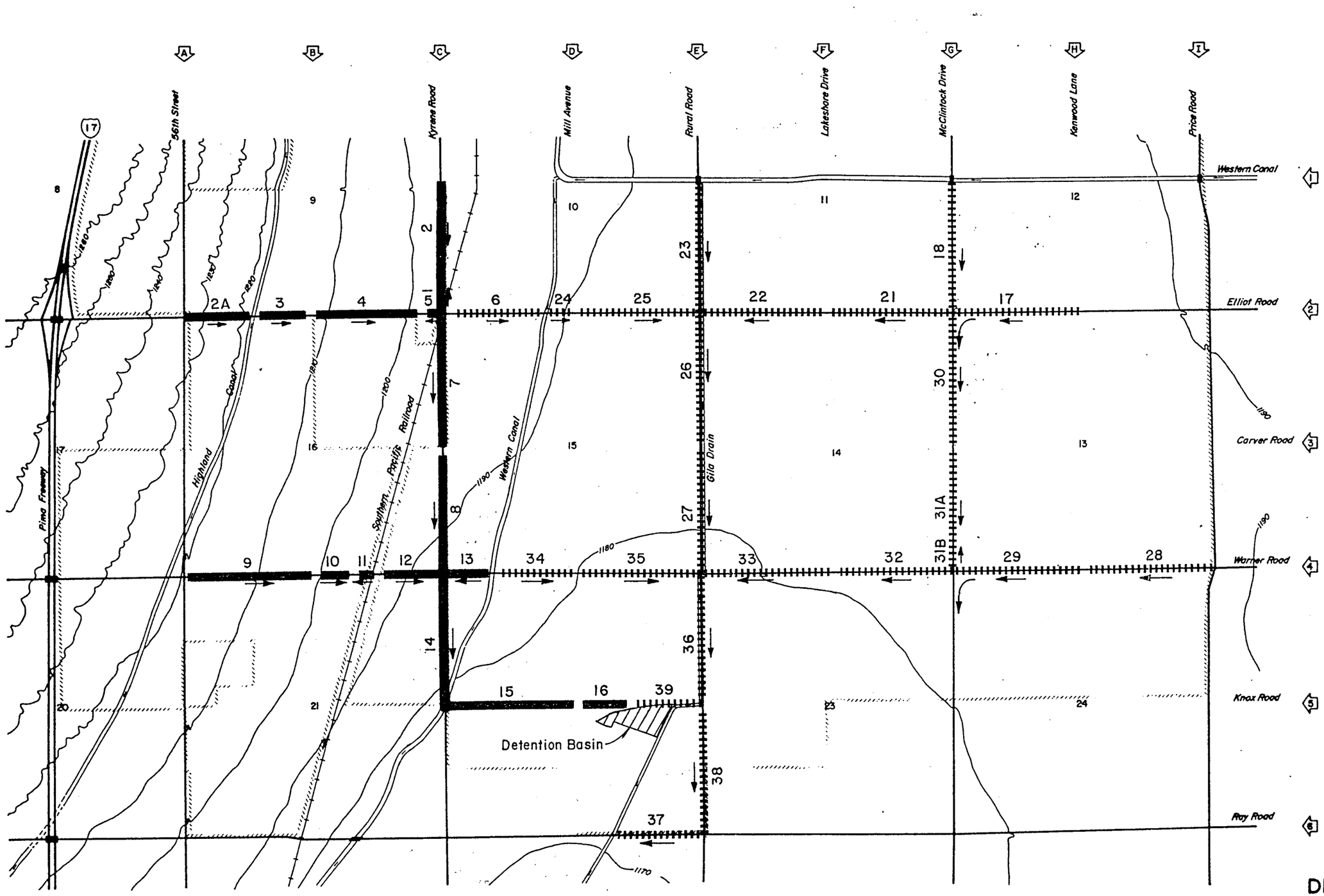

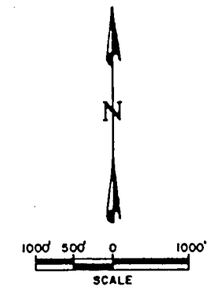

LEGEND

- City of Tempe Corporate Limit
- KYRENE RD. REACH
- RURAL RD. REACH
- 00 REACH NUMBER
- DIRECTION OF FLOW

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

SURFACE DRAINAGE PATTERNS

plate 3

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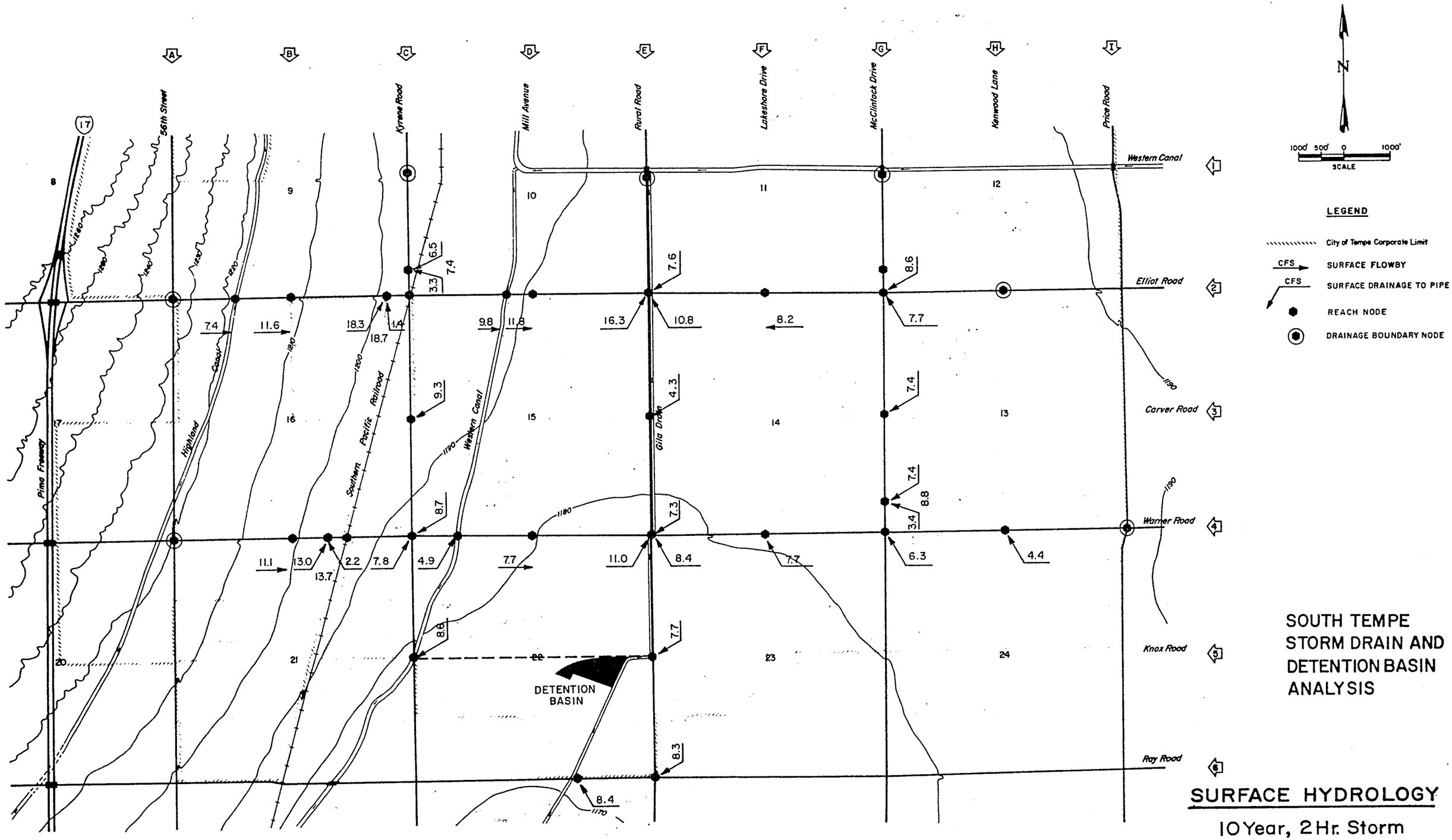

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

SURFACE HYDROLOGY

10 Year, 2 Hr. Storm

plate 4

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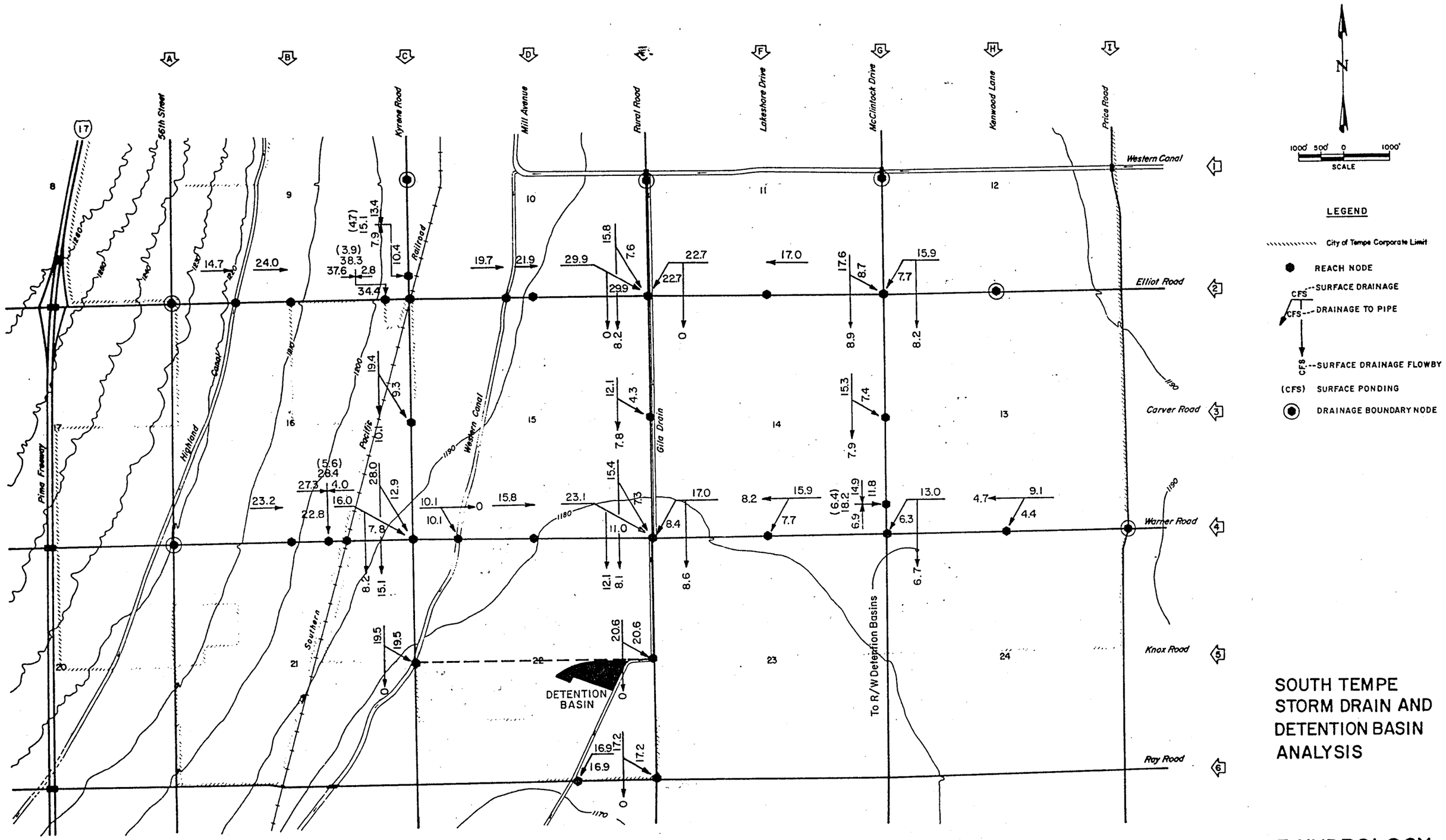

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

SURFACE HYDROLOGY

100Year, 1 Hr. Storm

plate 5

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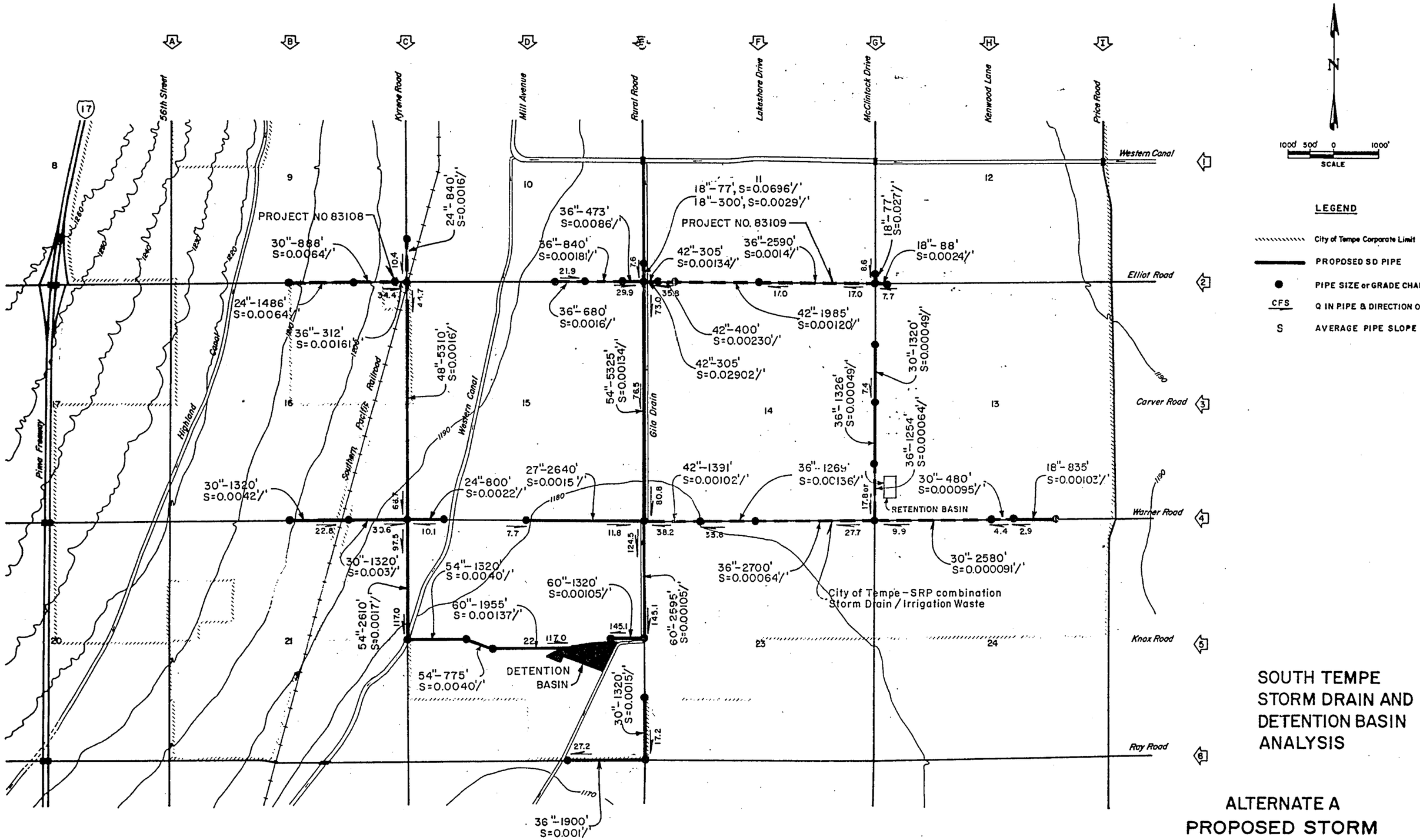
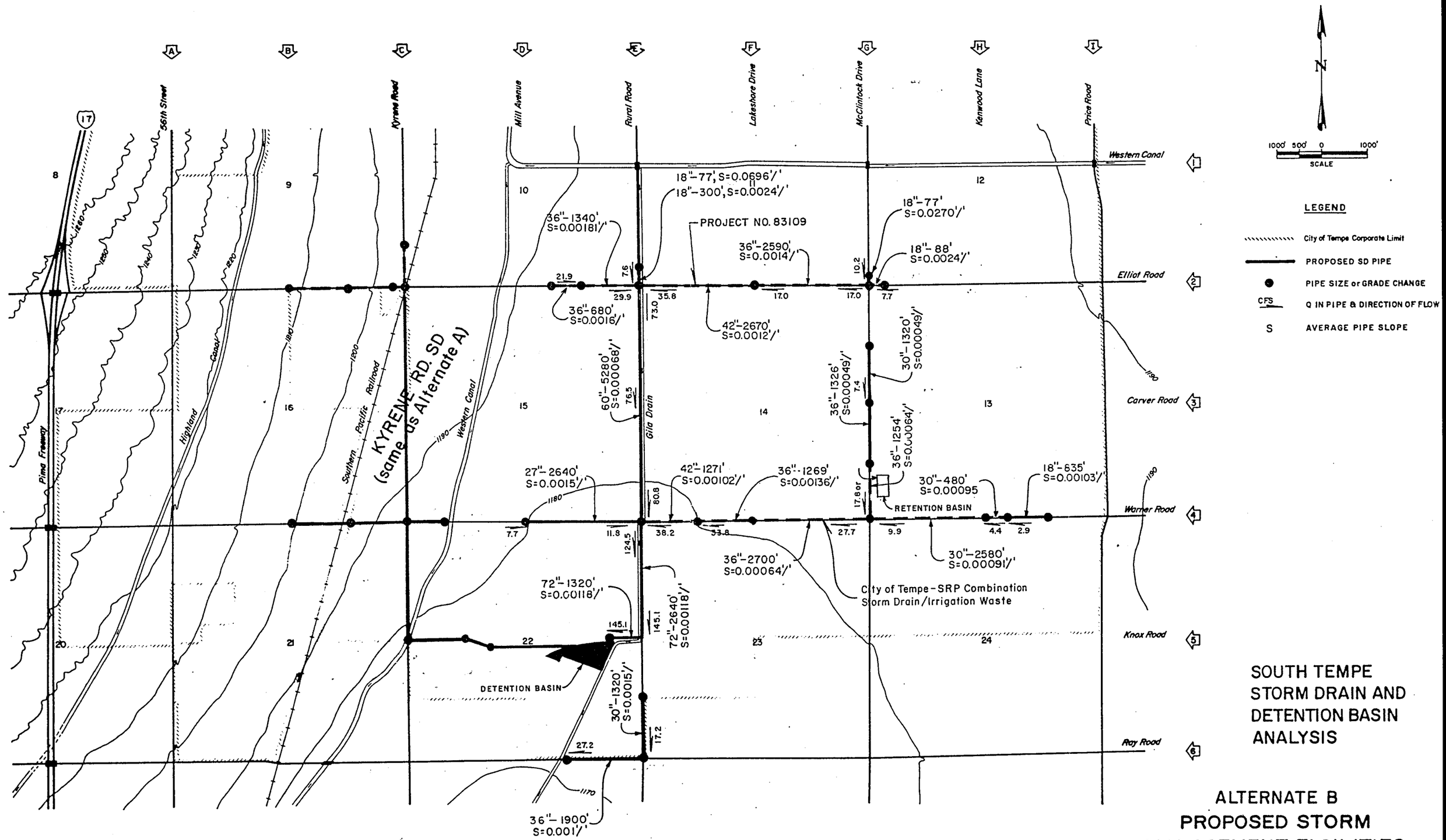


SOUTH TEMPE STORM DRAIN AND DETENTION BASIN ANALYSIS

ALTERNATE A
PROPOSED STORM
MANAGEMENT FACILITIES

plate 6A

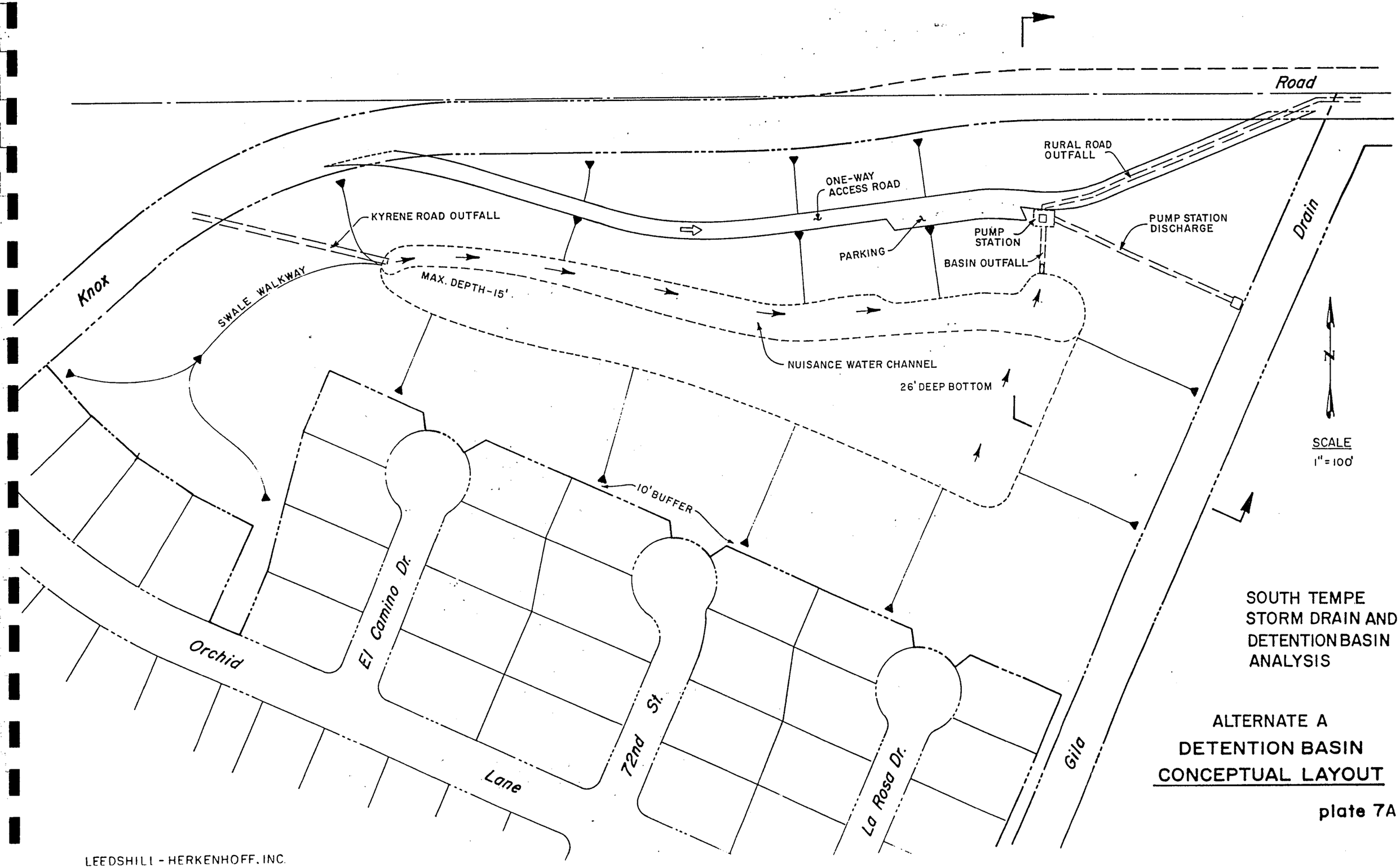
LEEDSHILL-HERKENHOFF, INC.



SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

ALTERNATE B
PROPOSED STORM
MANAGEMENT FACILITIES

plate 6 B

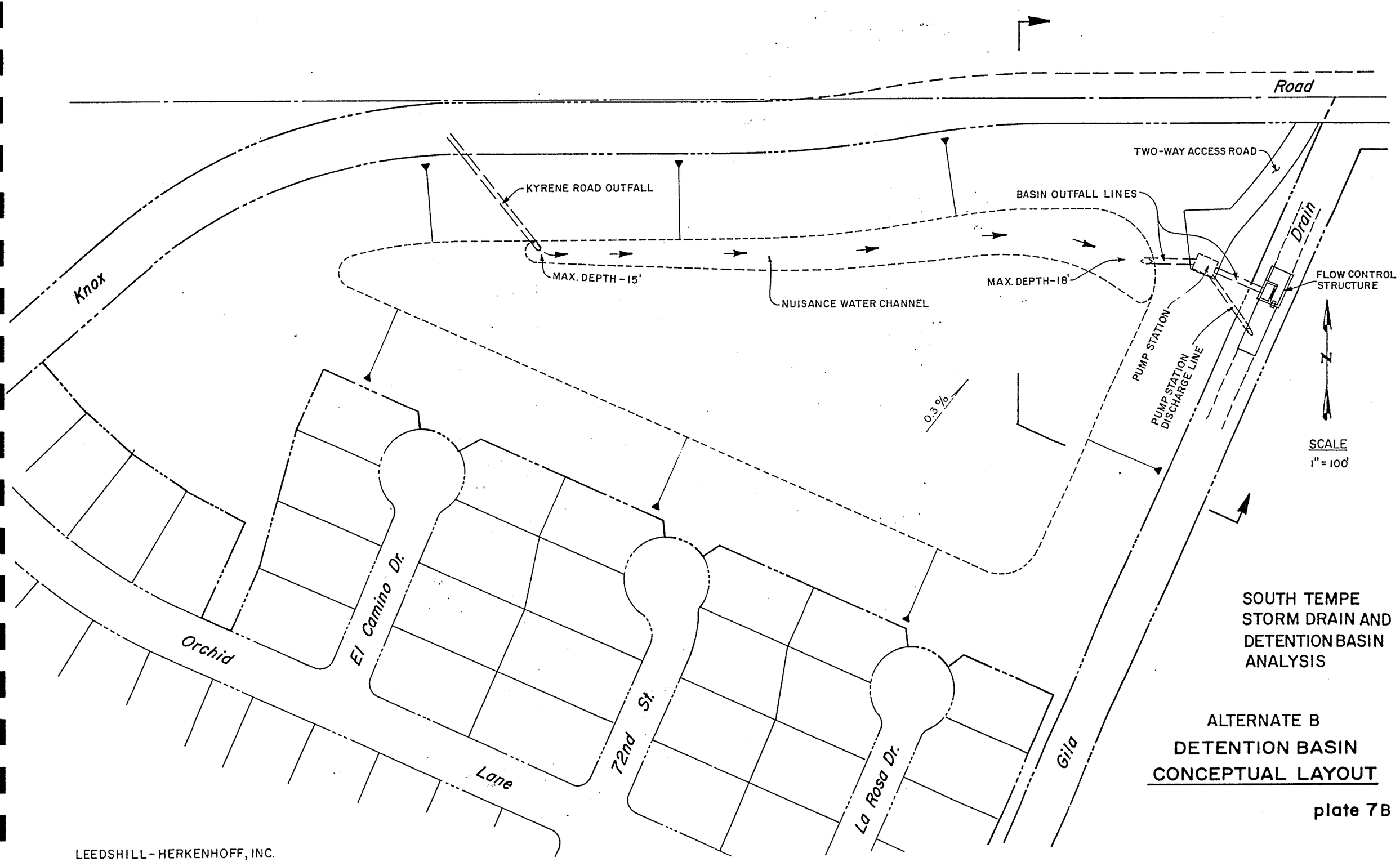


SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

ALTERNATE A
DETENTION BASIN
CONCEPTUAL LAYOUT

plate 7A

LEEDSHILL - HERKENHOFF, INC.



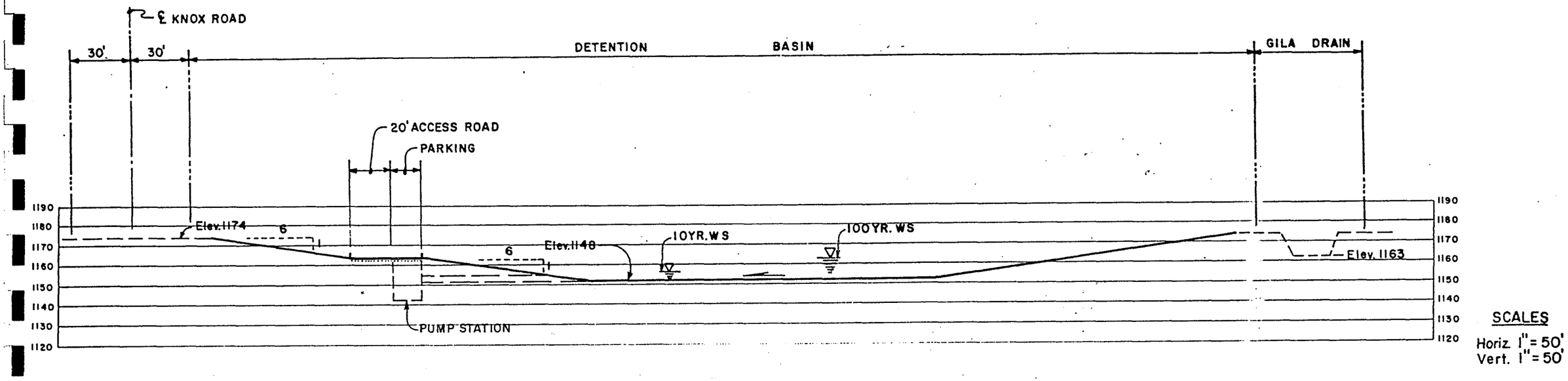
SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

ALTERNATE B

DETENTION BASIN
CONCEPTUAL LAYOUT

plate 7B

LEEDSHILL-HERKENHOFF, INC.



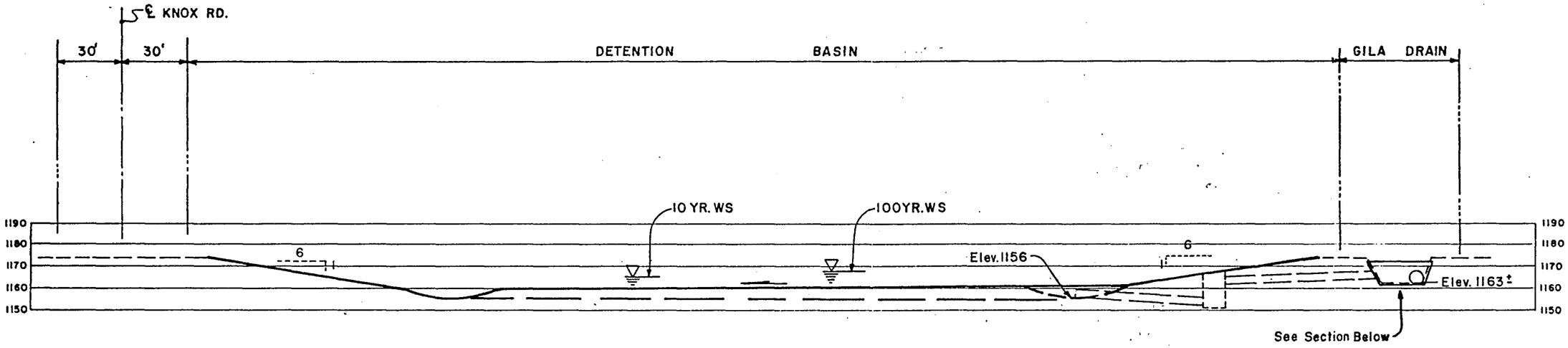
DETENTION BASIN SECTION & DETAILS

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

ALTERNATE A
DETENTION BASIN
CONCEPTUAL SECTION

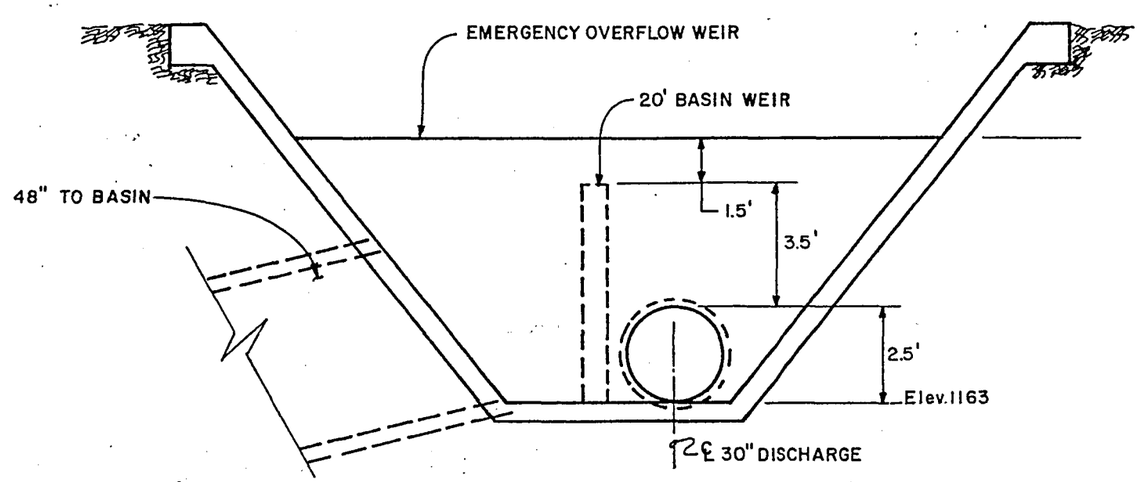
plate 8A

LEEDSHILL-HERKENHOFF, INC.



SCALES
Horiz. 1" = 50'
Vert. 1" = 50'

DETENTION BASIN SECTION & DETAILS



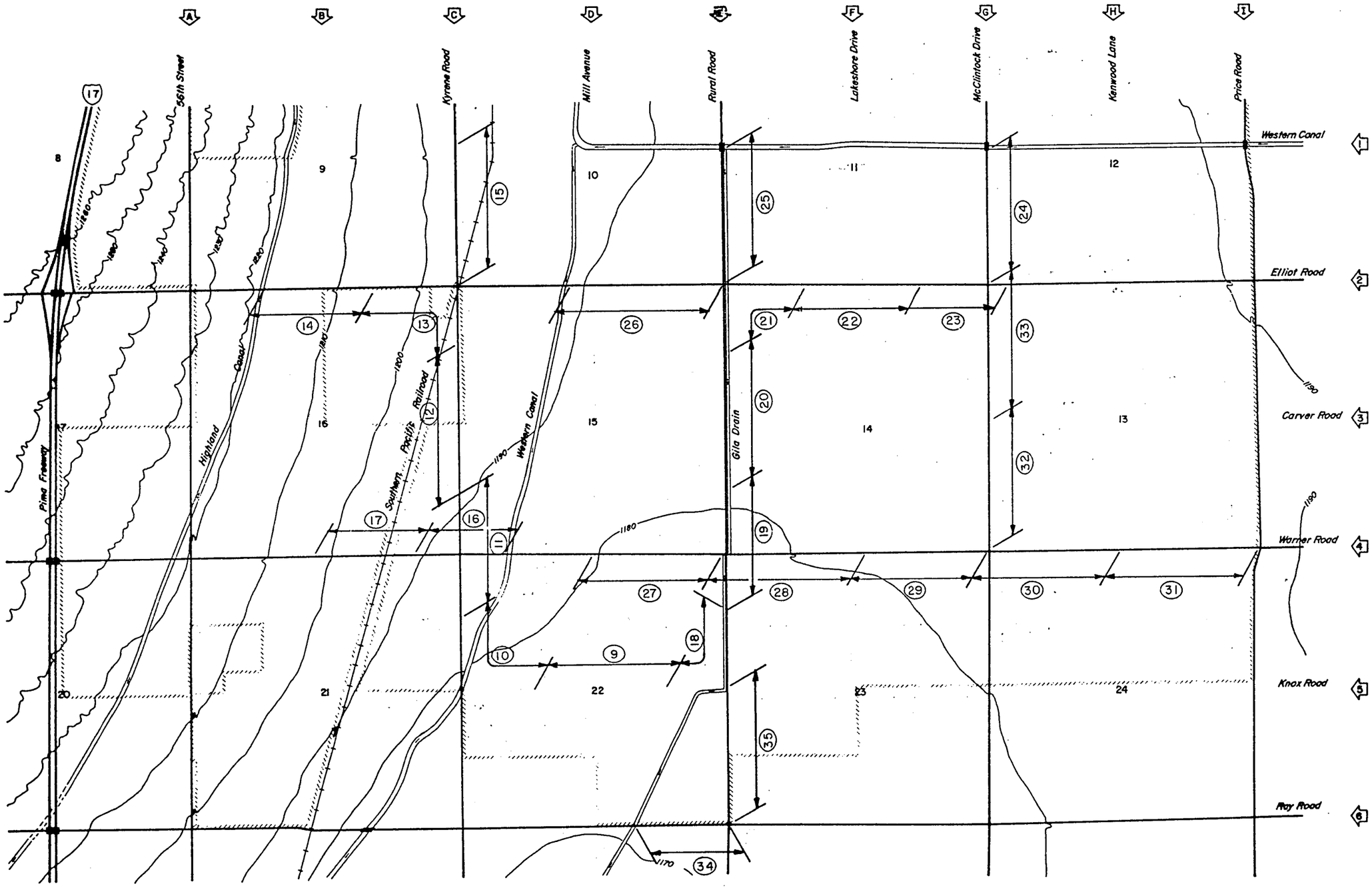
FLOW CONTROL END SECTION

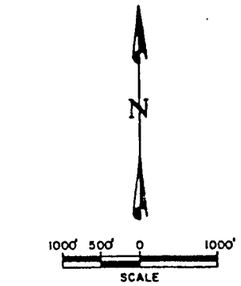
SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

ALTERNATE B
DETENTION BASIN
CONCEPTUAL SECTION

plate 8B

LEEDSHILL-HERKENHOFF, INC.





LEGEND

City of Tempe Corporate Limit

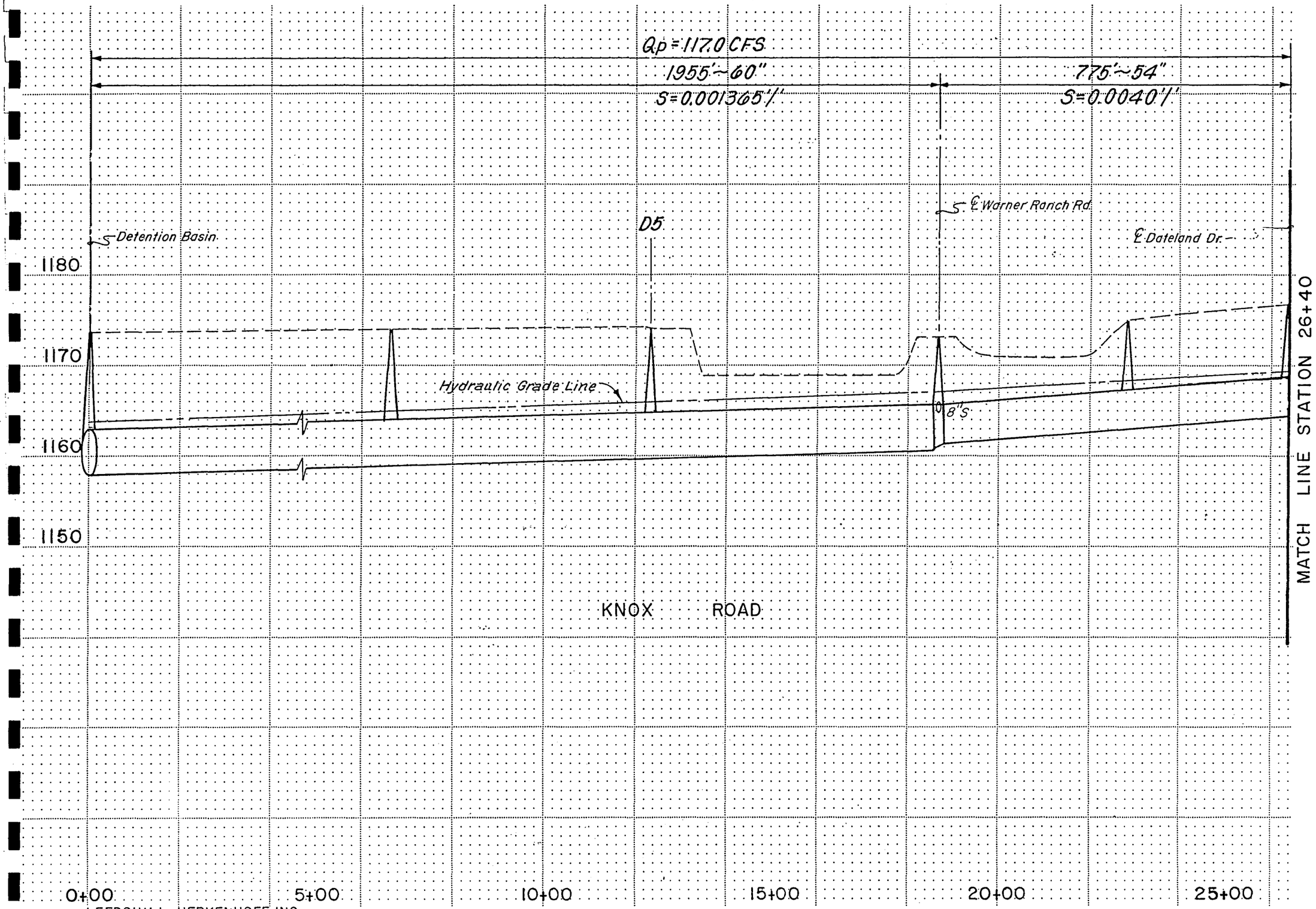
(00) PLATE NUMBER

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

INDEX TO PIPE PROFILES

index

LEEDSHILL-HERKENHOFF, INC.



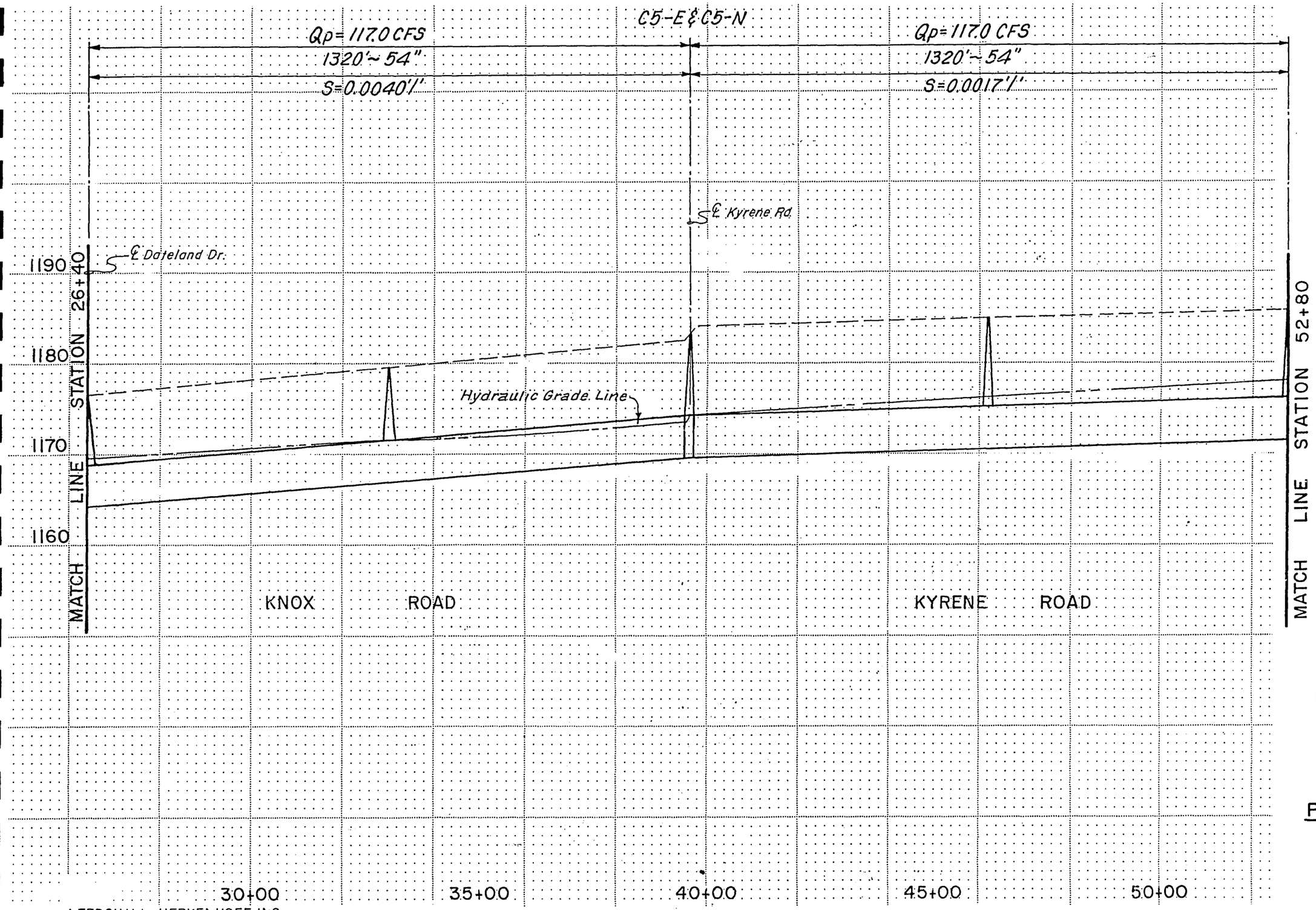
SCALES
Horiz. 1" = 200'
Vert. 1" = 10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 9

LEEDSHILL-HERKENHOFF, INC.



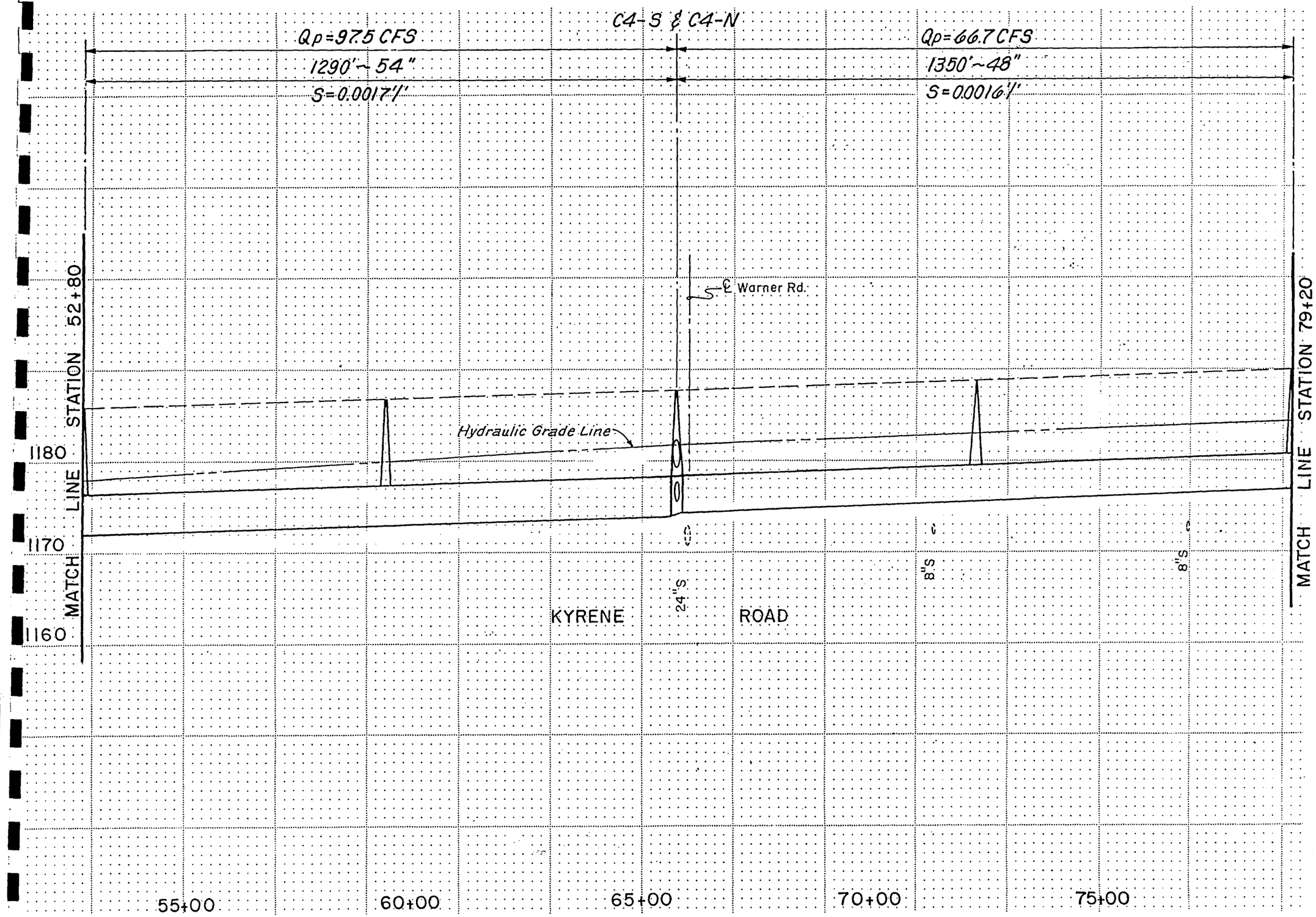
SCALES
Horiz. 1" = 20.0'
Vert. 1" = 10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 10

LEEDSHILL-HERKENHOFF, INC.



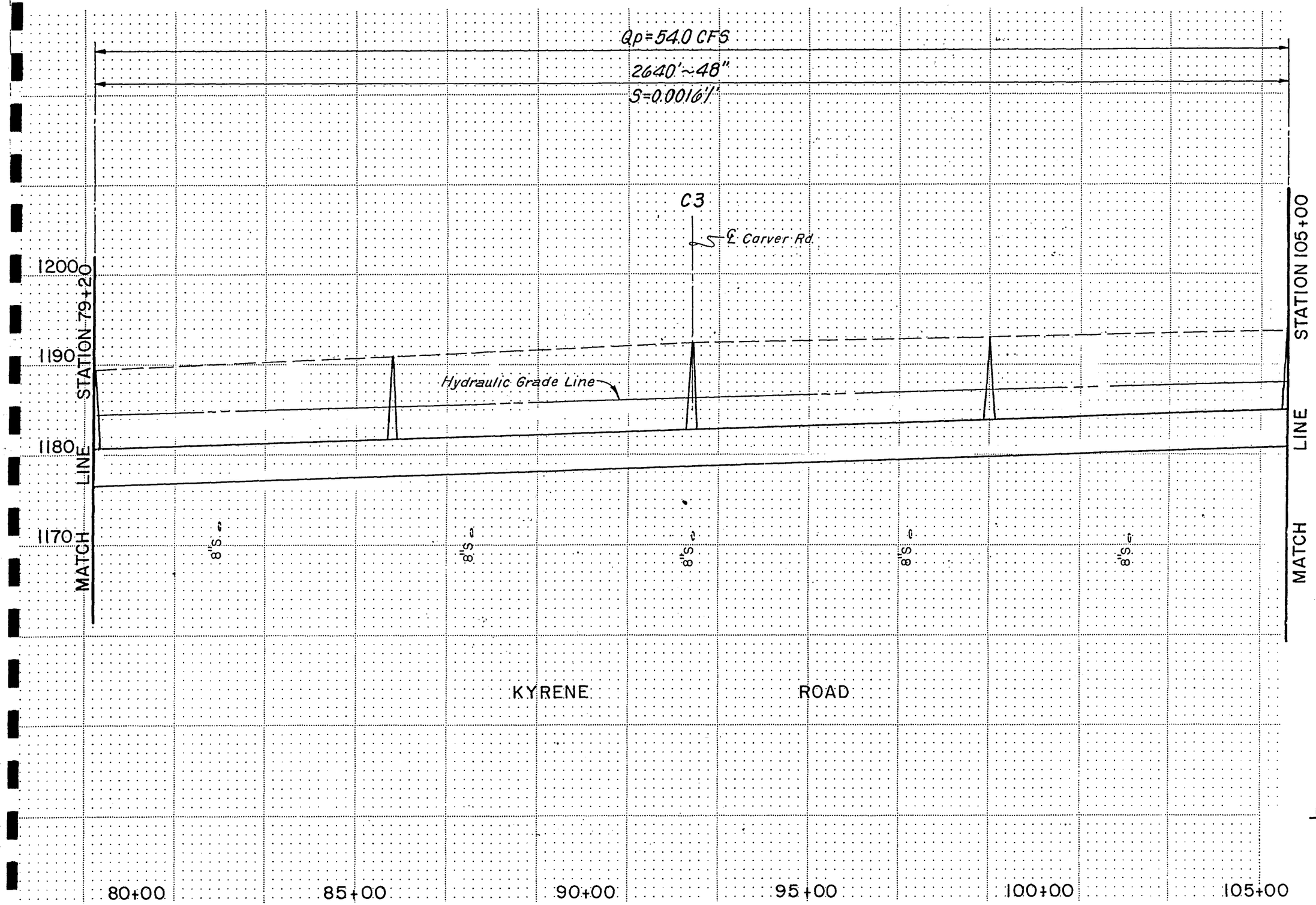
SCALES
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 11

LEEDSHILL-HERKENHOFF, INC.



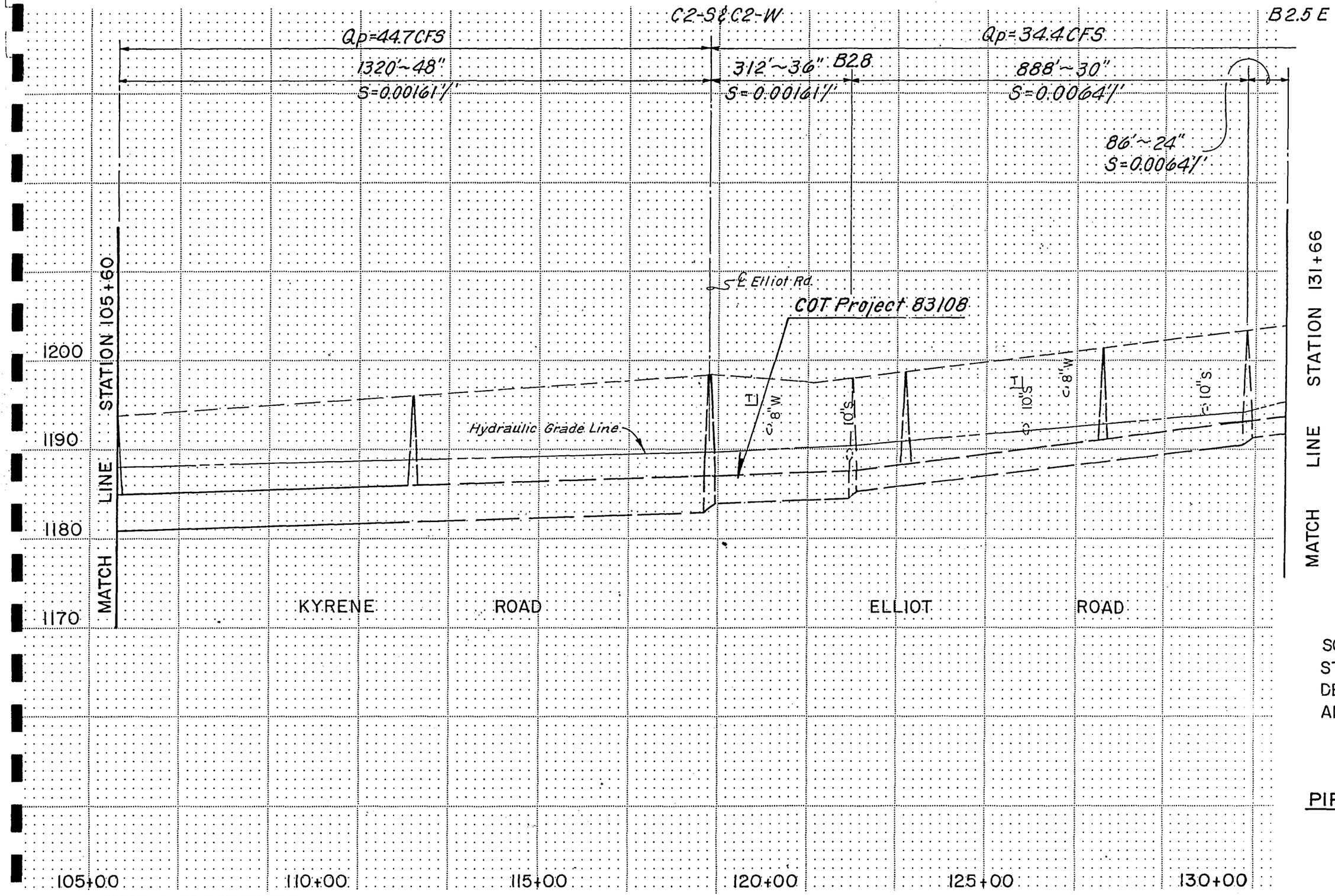
SCALES
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 12

LEEDSHILL-HERKENHOFF INC.



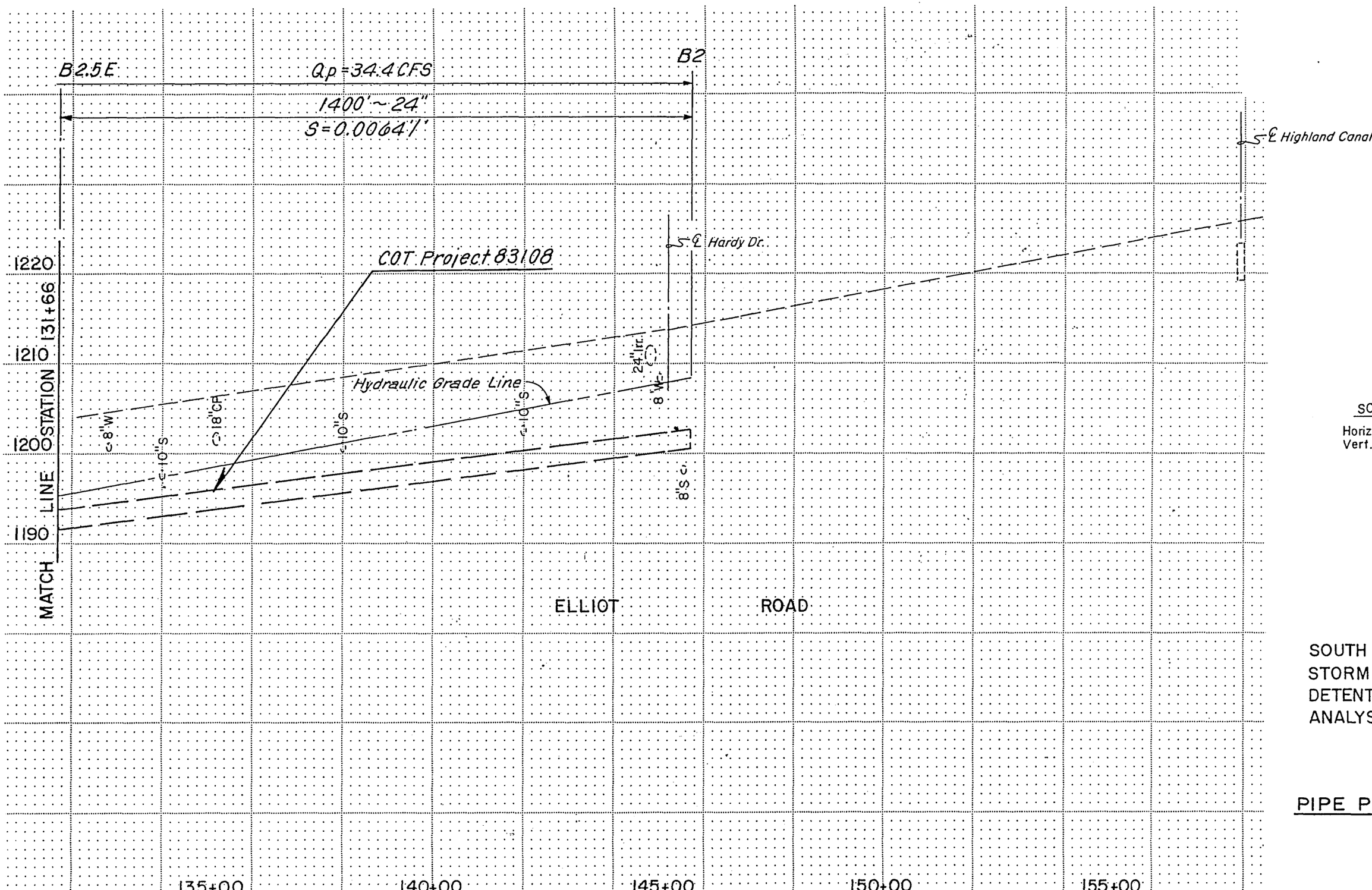
SCALES
Horiz. 1" = 200'
Vert. 1" = 10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 13

LEEDSHILL-HERKENHOFF INC



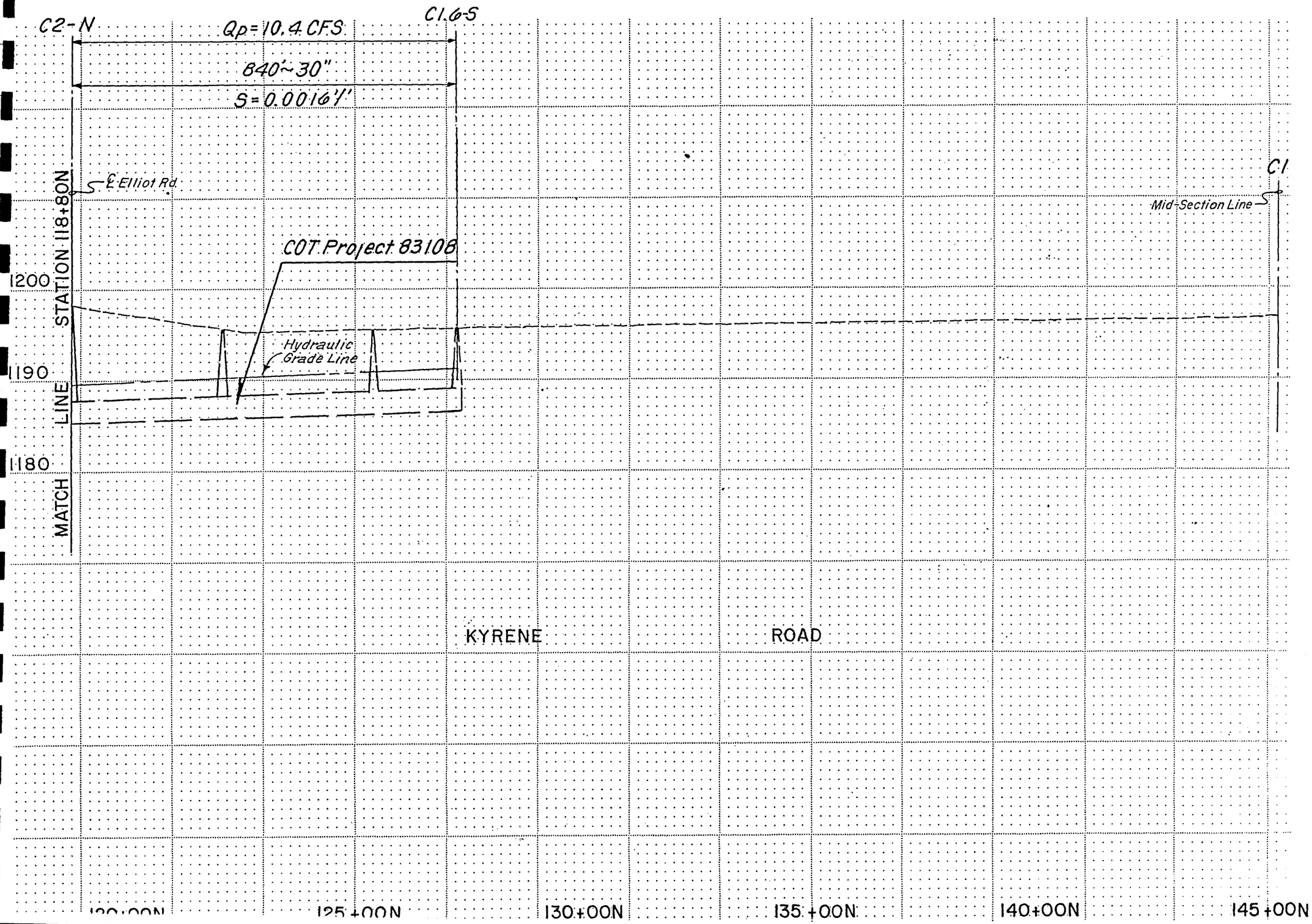
SCALES
Horiz. 1" = 200'
Vert. 1" = 10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 14

LEEDSHILL-HERKENHOFF, INC.

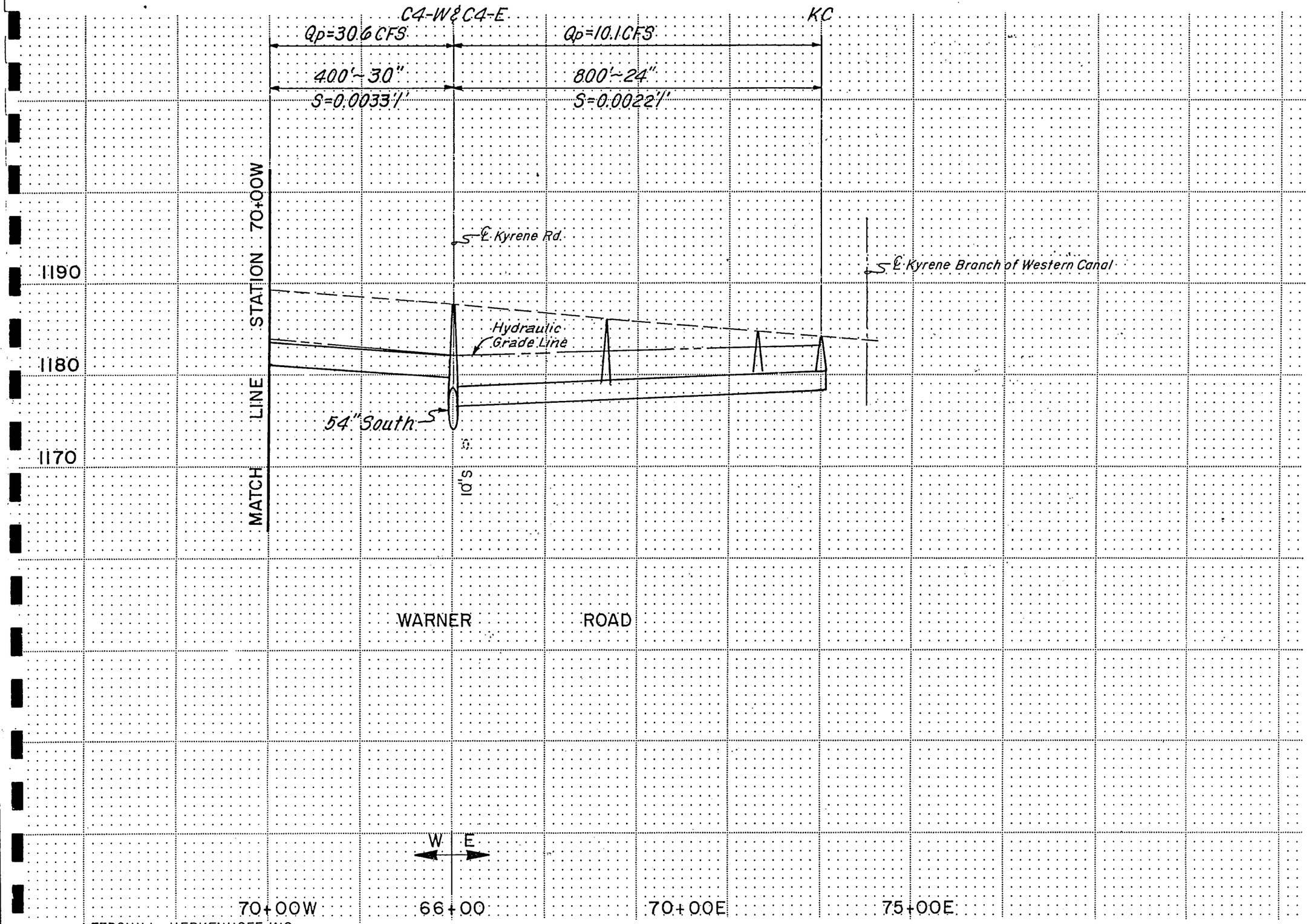


SCALES
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 15



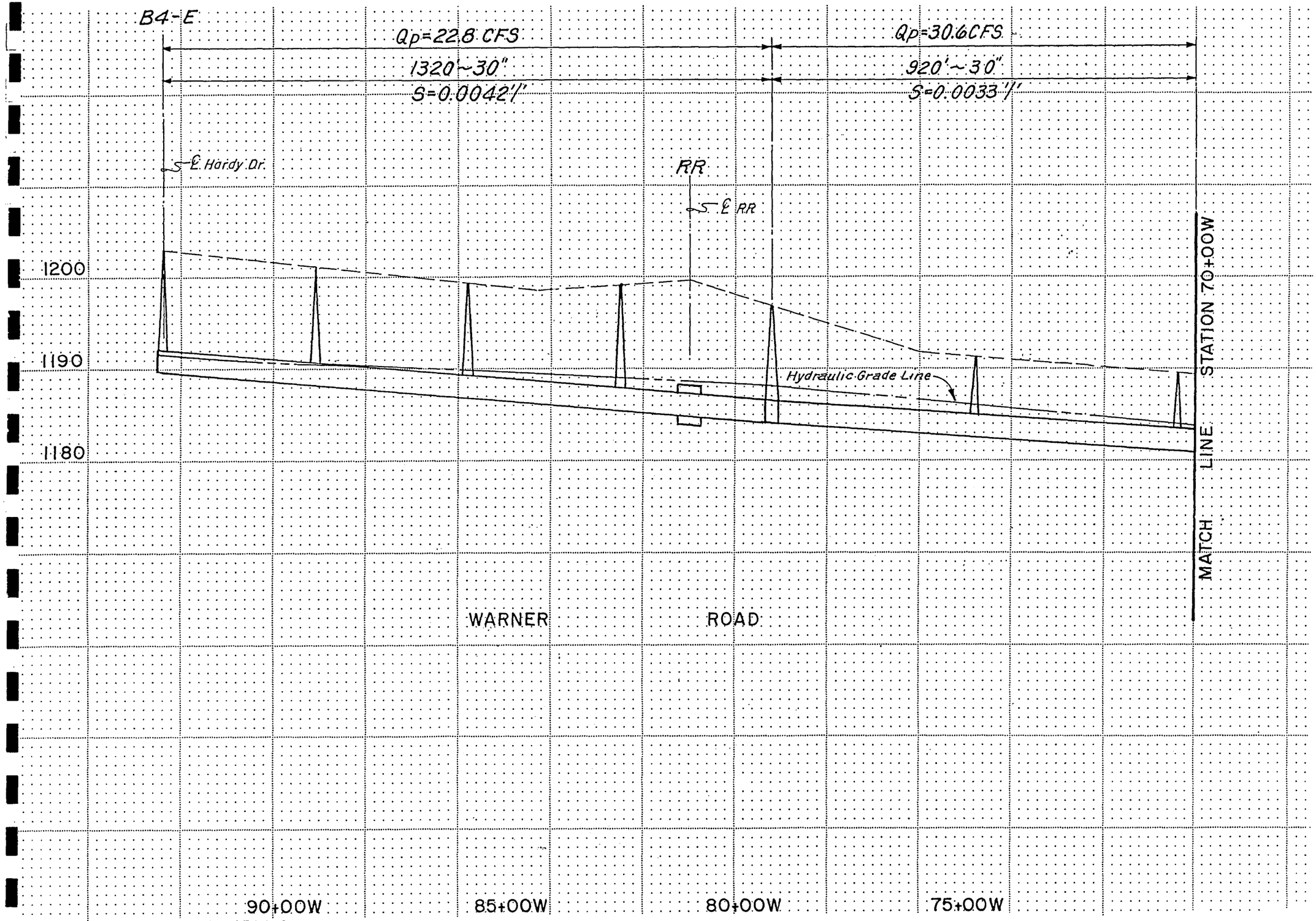
SCALES
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 16

LEEDSHILL-HERKENHOFF, INC.



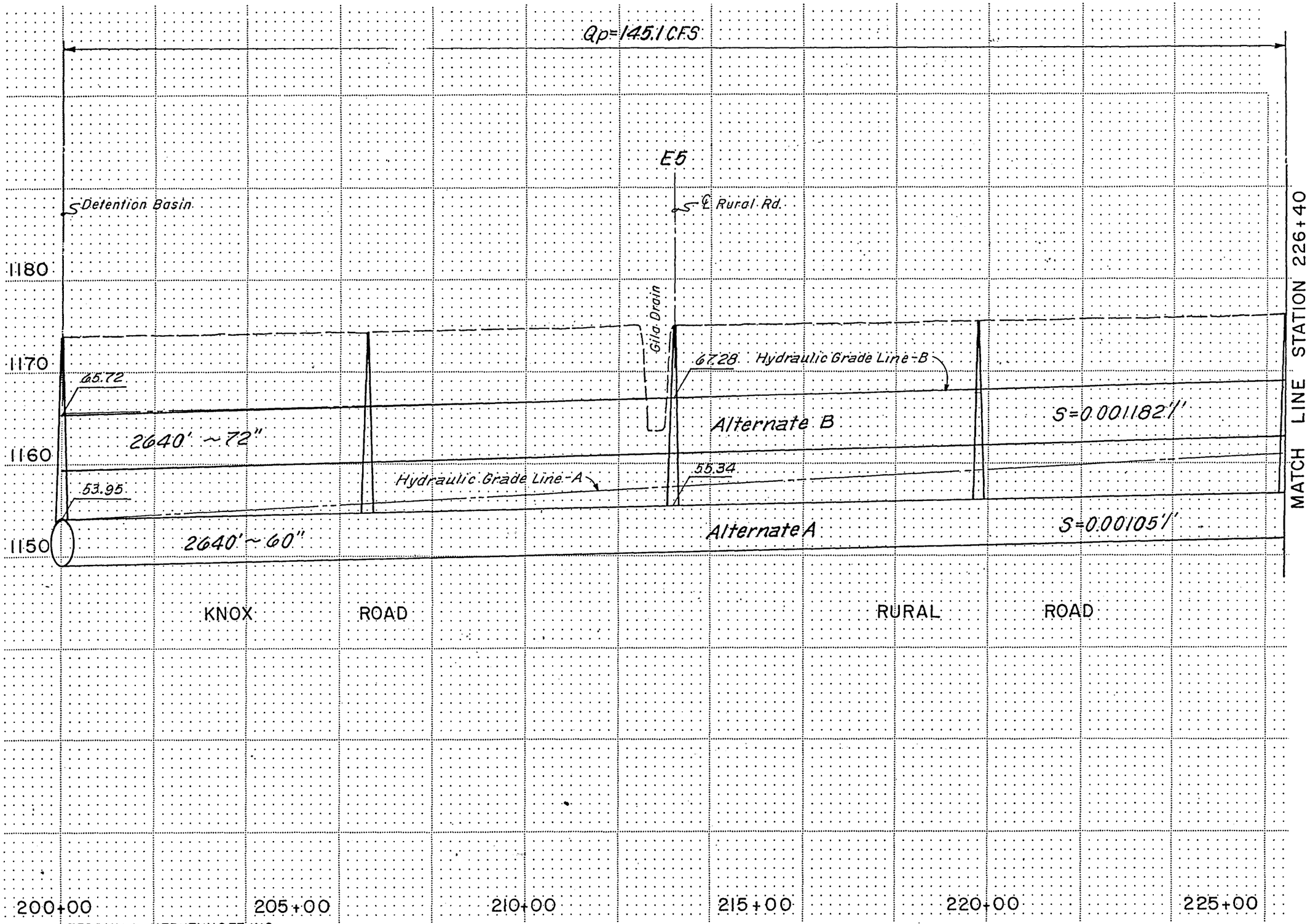
SCALES
Horiz. 1"=200'
Vert. 1"= 10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 17

FEDSHILL-HERKENHOFF INC



SCALES

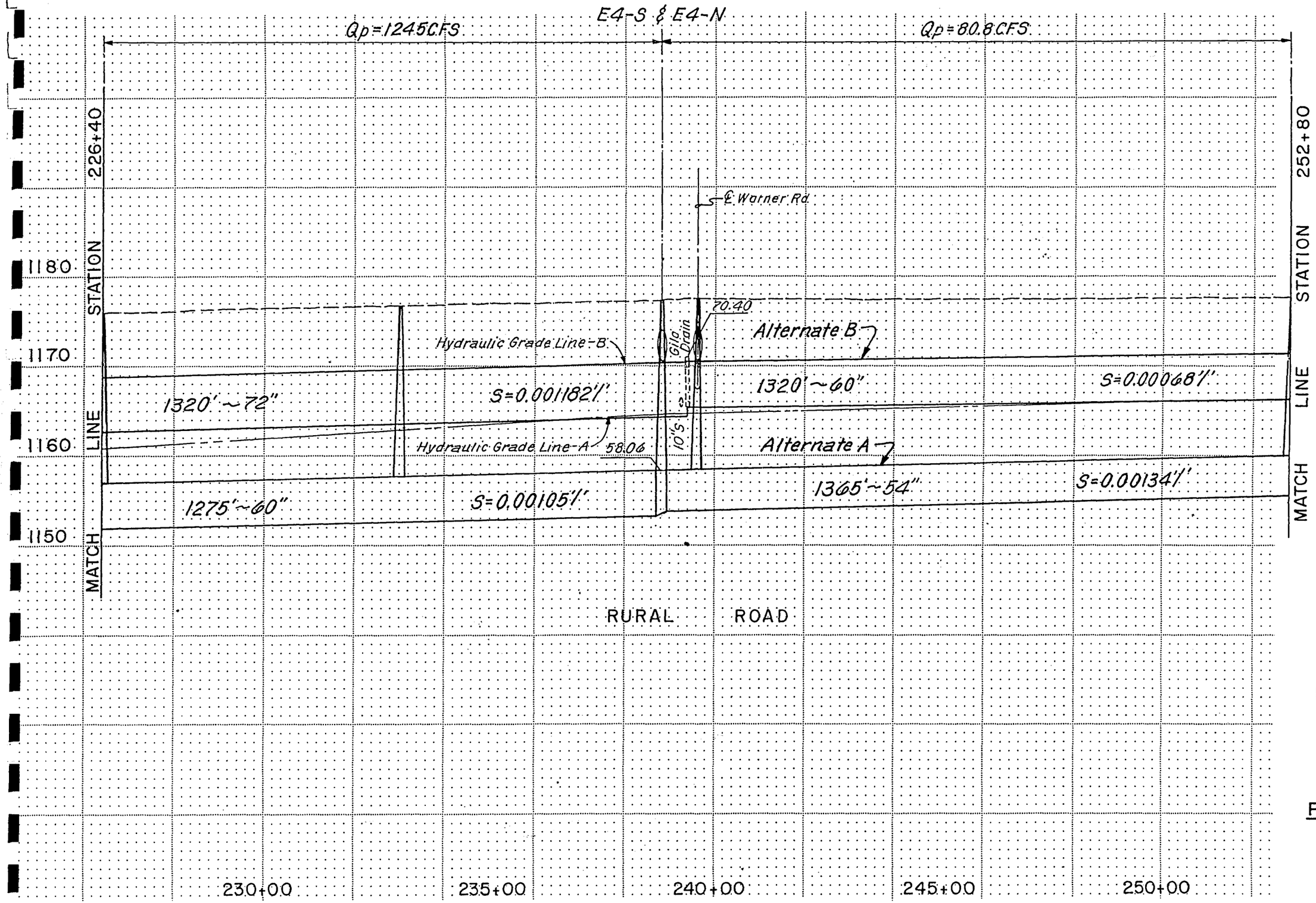
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 18

LEEDSHILL-HERKENHOFF, INC.



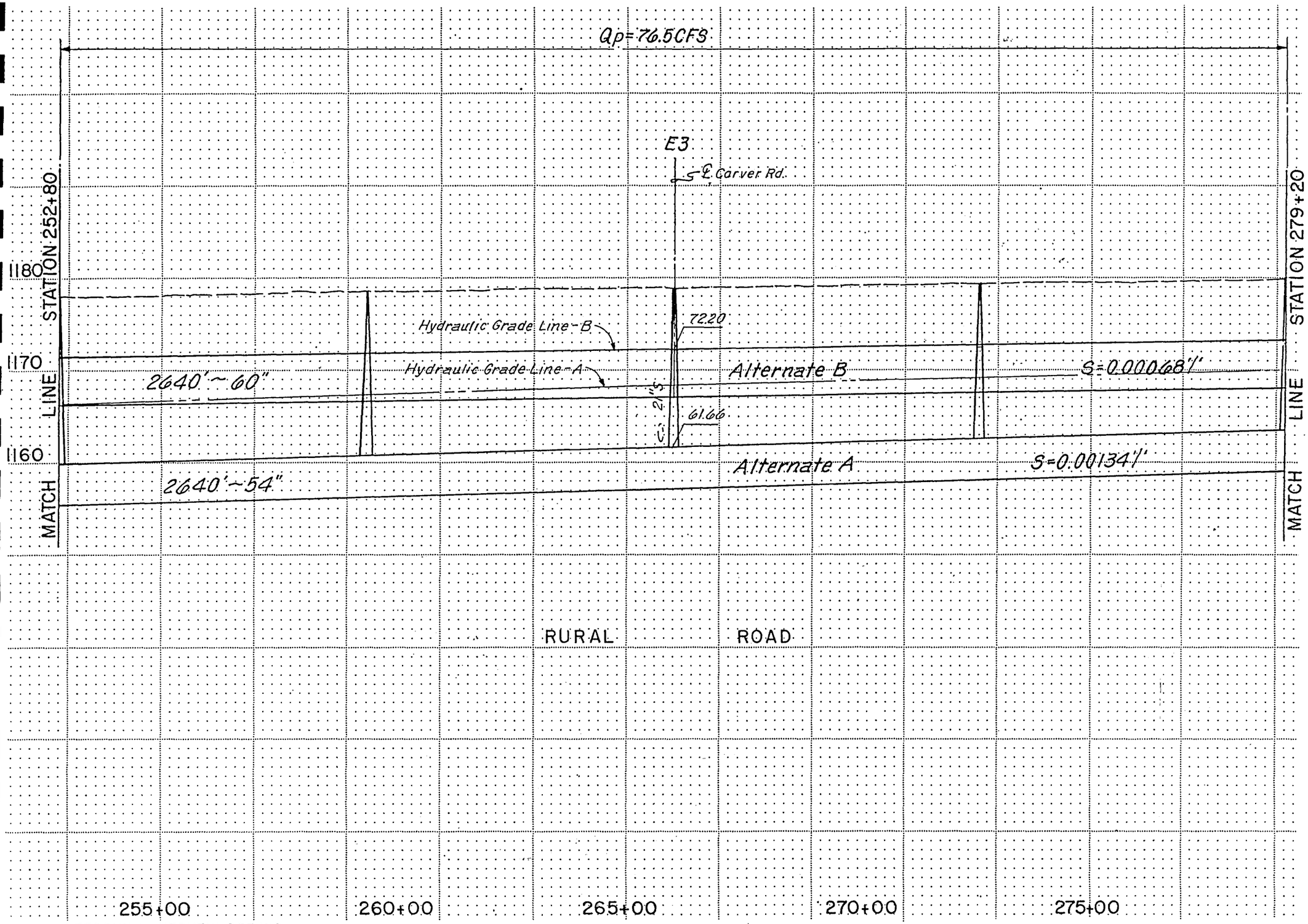
SCALES
Horiz. 1"=200'
Vert. 1"= 10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 19

LEEDSHILL-HERKENHOFF, INC.



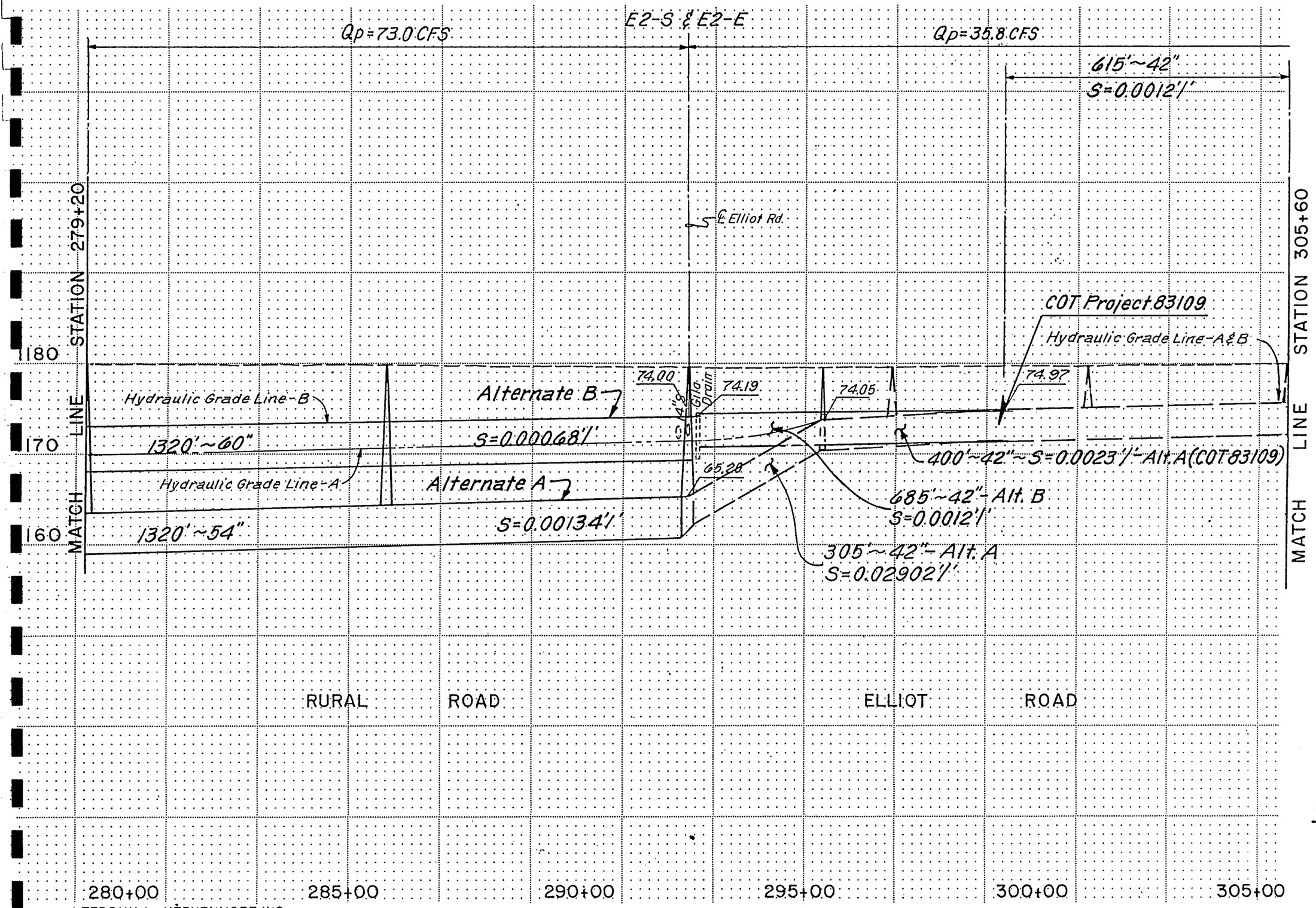
SCALES
Horiz. 1"=200'
Vert. 1"= 10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 20

LEEDSHILL-HERKENHOFF, INC.



SCALES

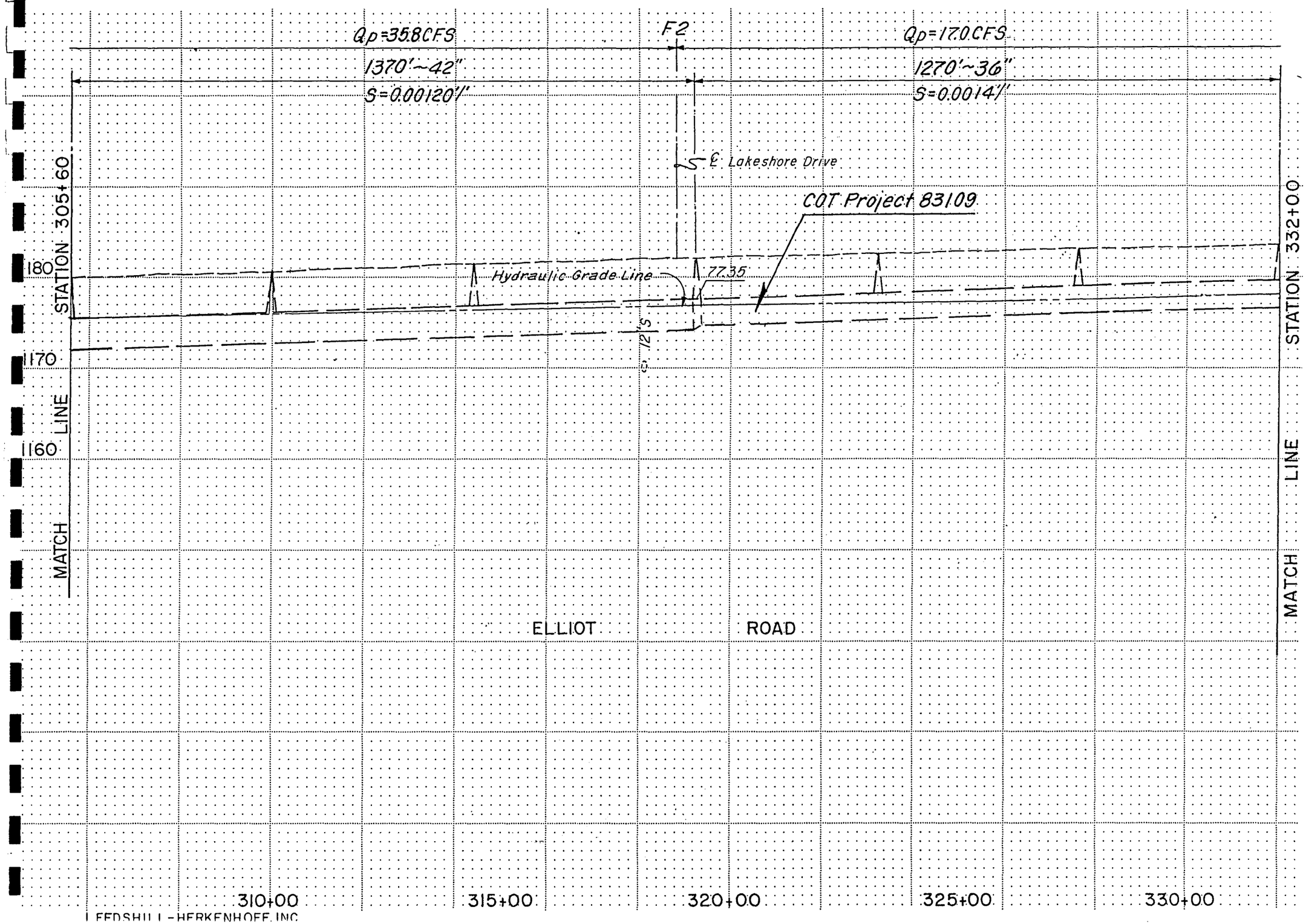
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 21

LEEDSHILL-HERKENHOFF, INC.



SCALES

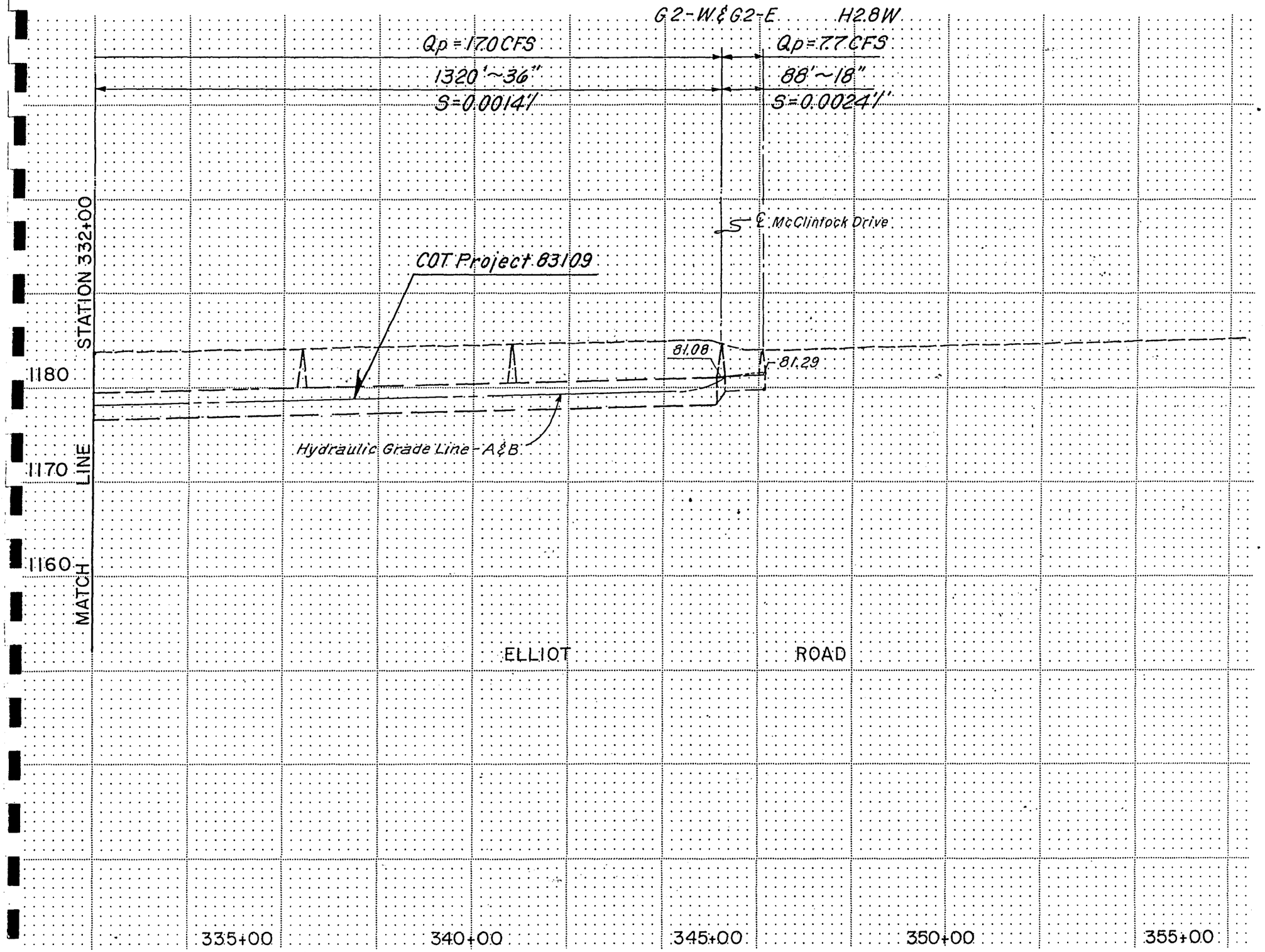
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 22

LEEDSHILL-HERKENHOFF, INC.



SCALES

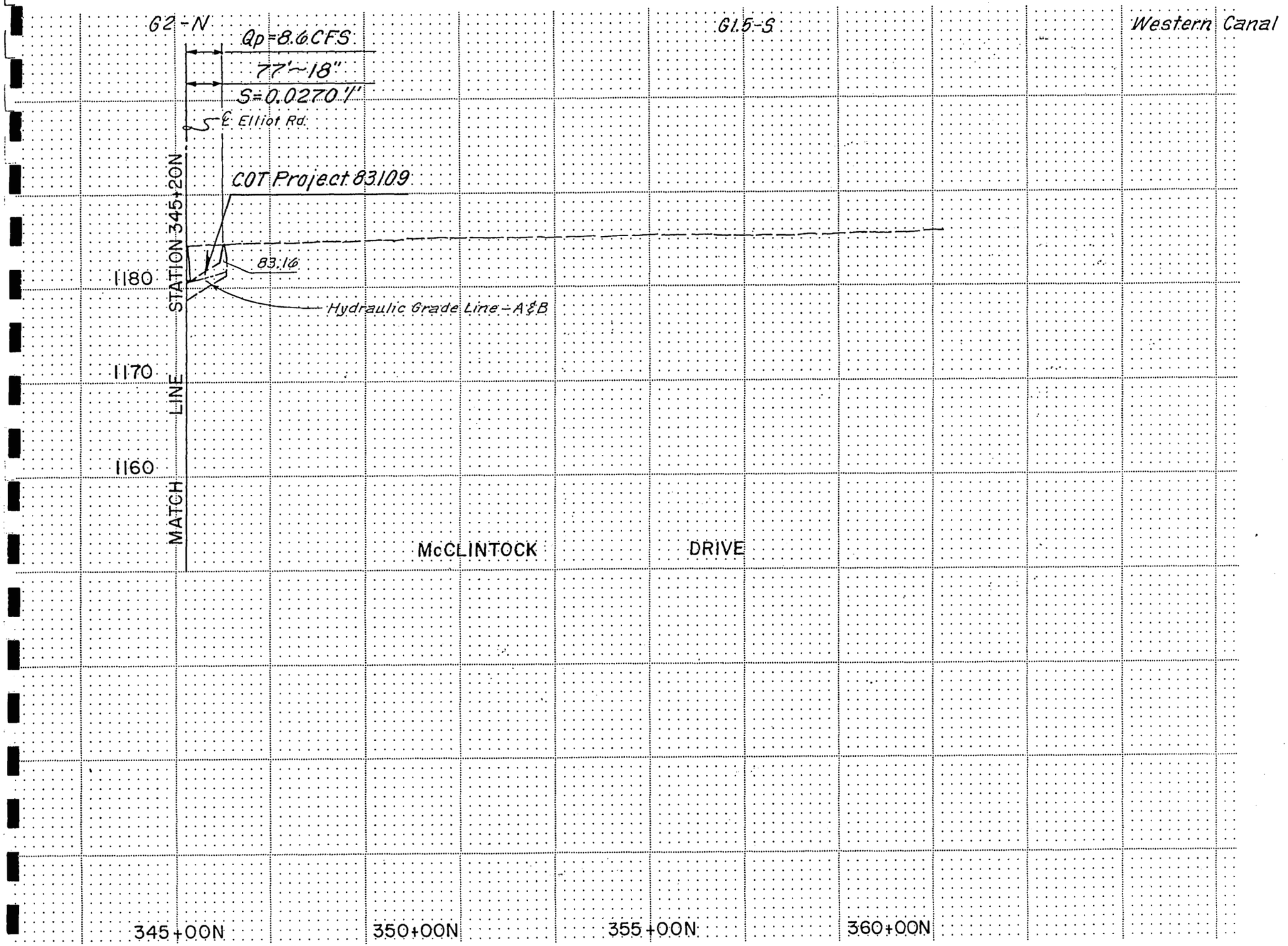
Horiz. 1" = 200'
Vert. 1" = 10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate23

LEEDSHILL-HERKENHOFF INC.



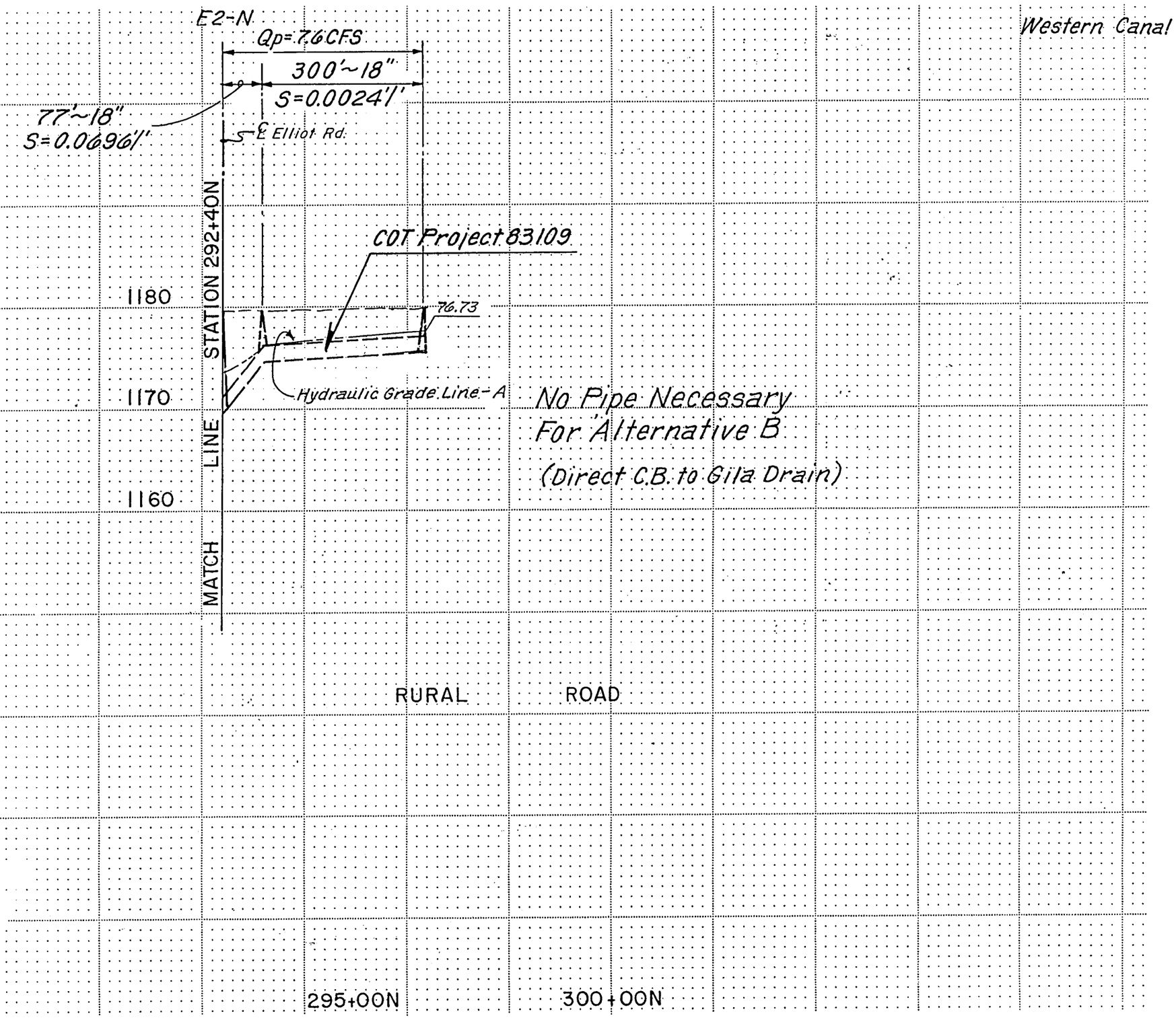
SCALES
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 24

LEEDSHILL-HERKENHOFF, INC.



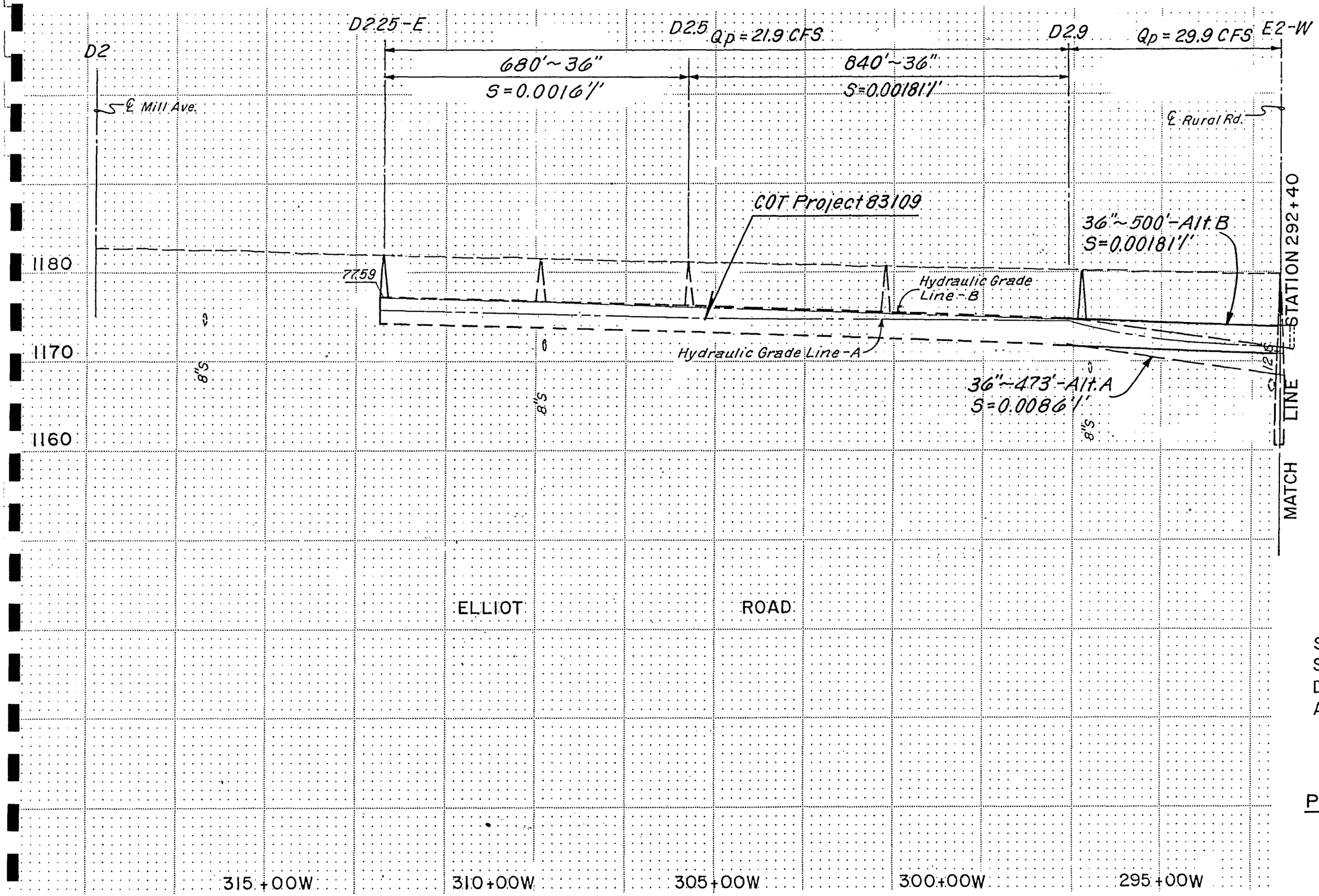
SCALES
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 25

LEEDSHILL-HERKENHOFF, INC.



SCALES

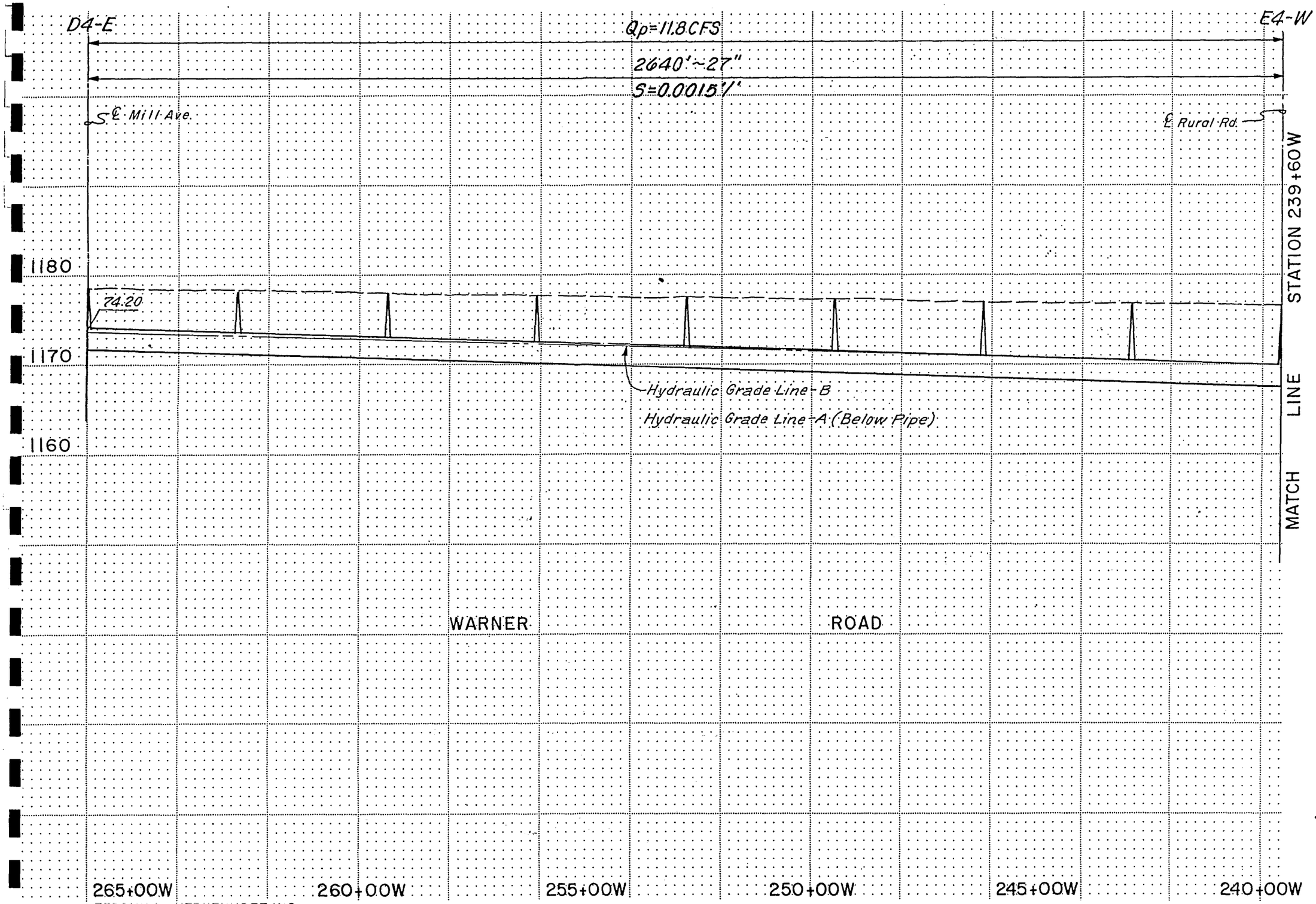
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 26

LEEDSHILL-HERKENHOFF, INC.



SCALES

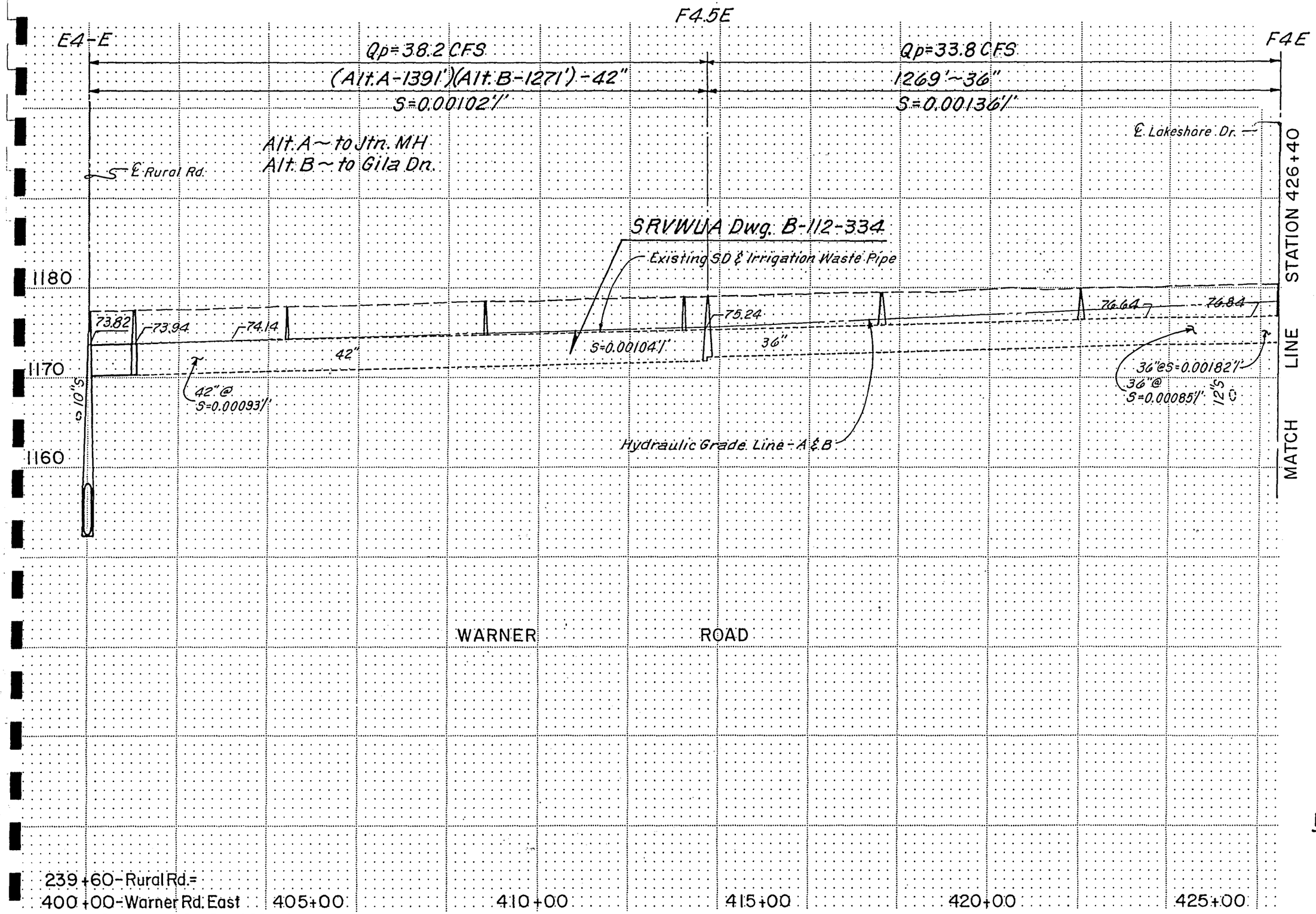
Horiz. 1" = 200'
Vert. 1" = 10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 27

LEEDSHILL-HERKENHOFF, INC



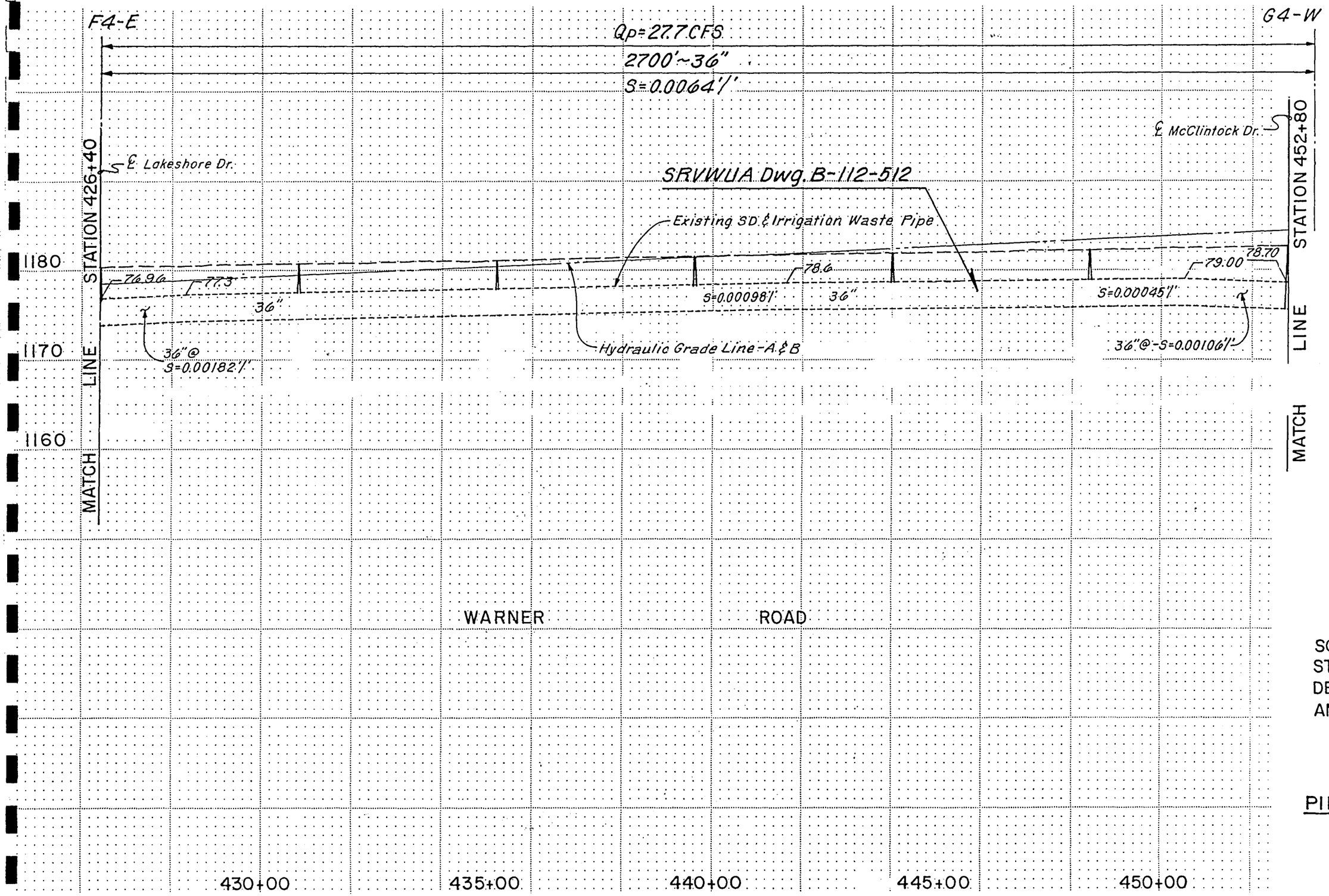
SCALES
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 28

LEEDSHILL-HERKENHOFF, INC.



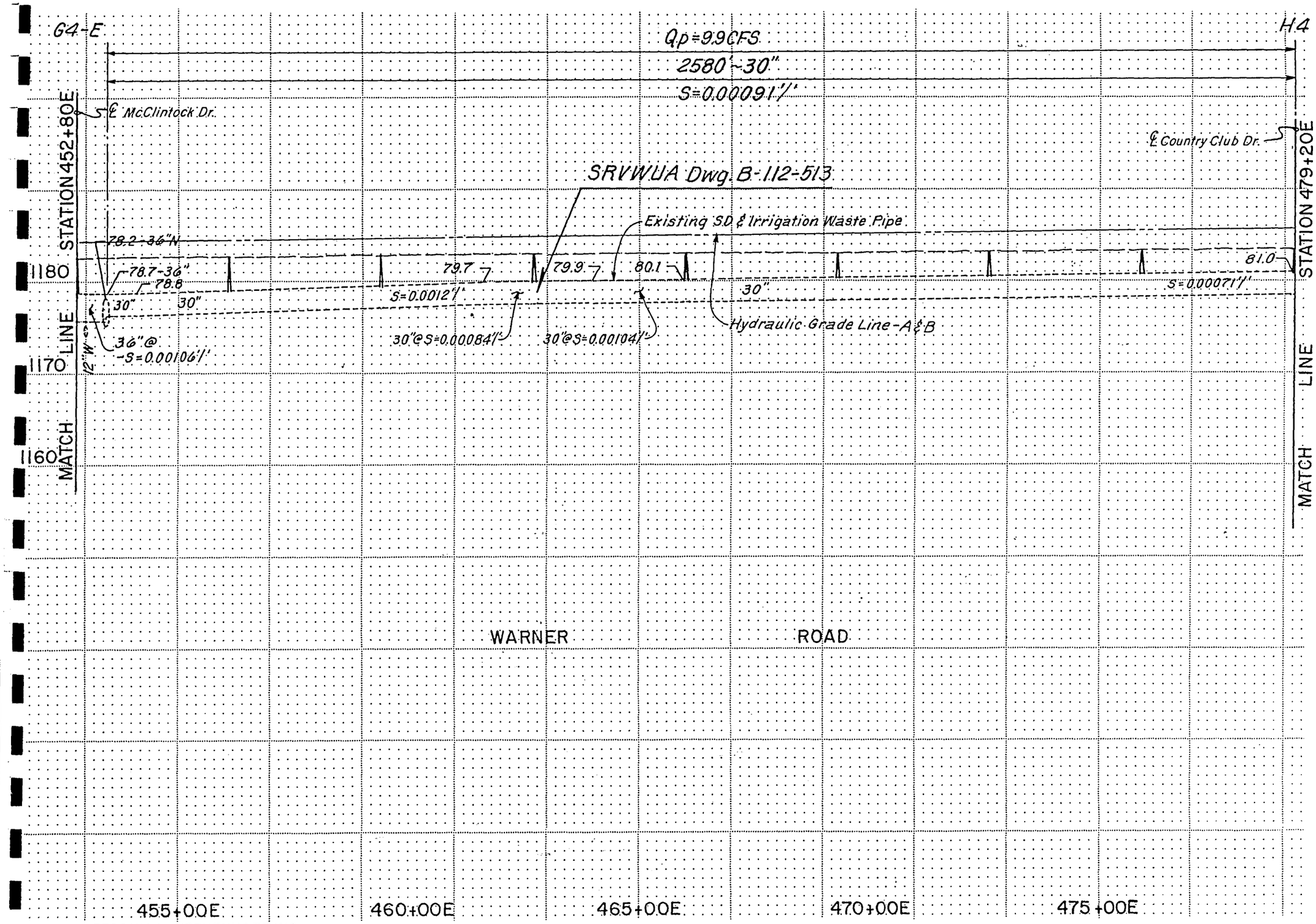
SCALES
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 29

LEEDSHILL-HERKENHOFF, INC.



SCALES

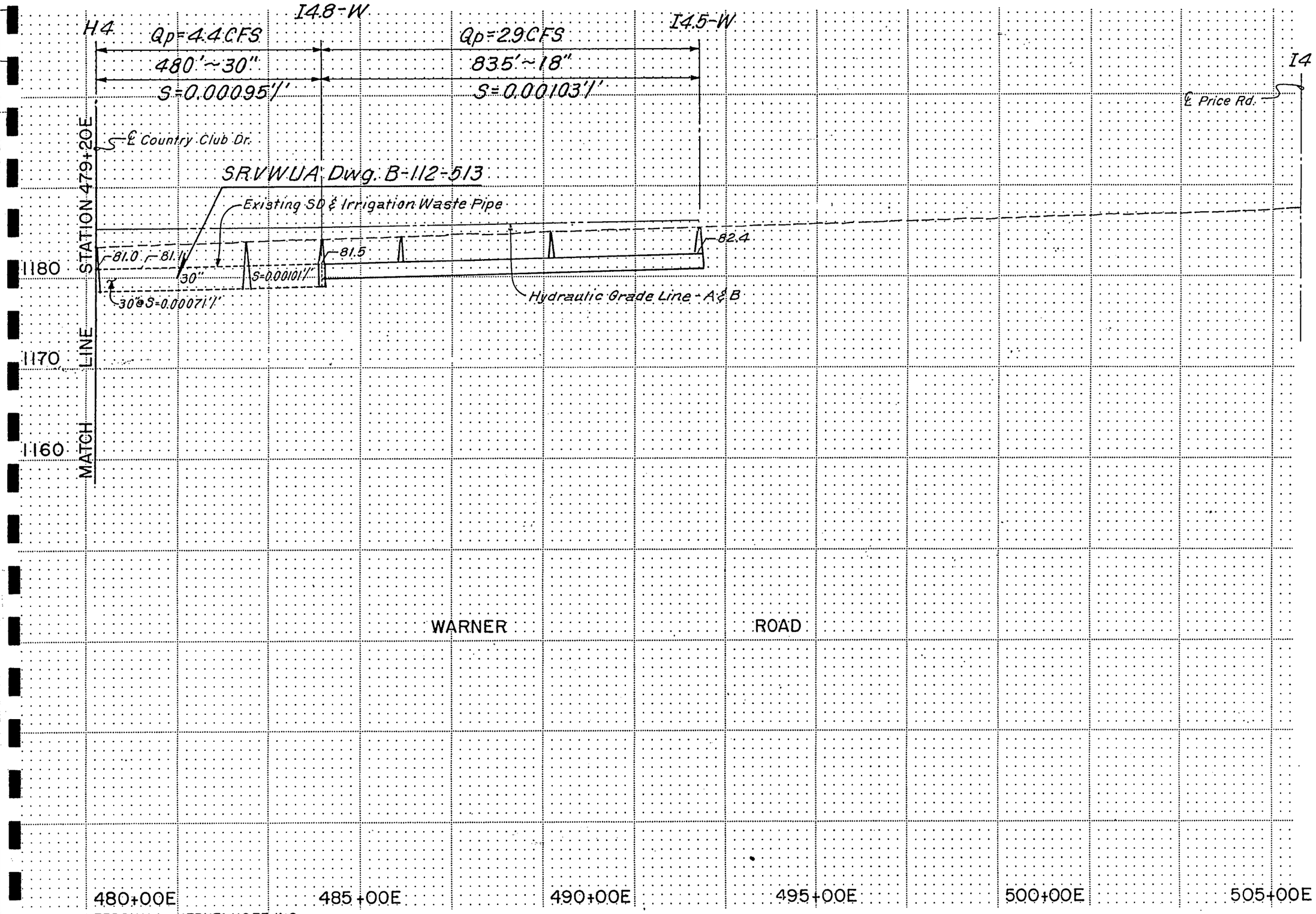
Horiz. 1"=200'
Vert 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 30

LEEDSHILL-HERKENHOFF, INC.



SCALES

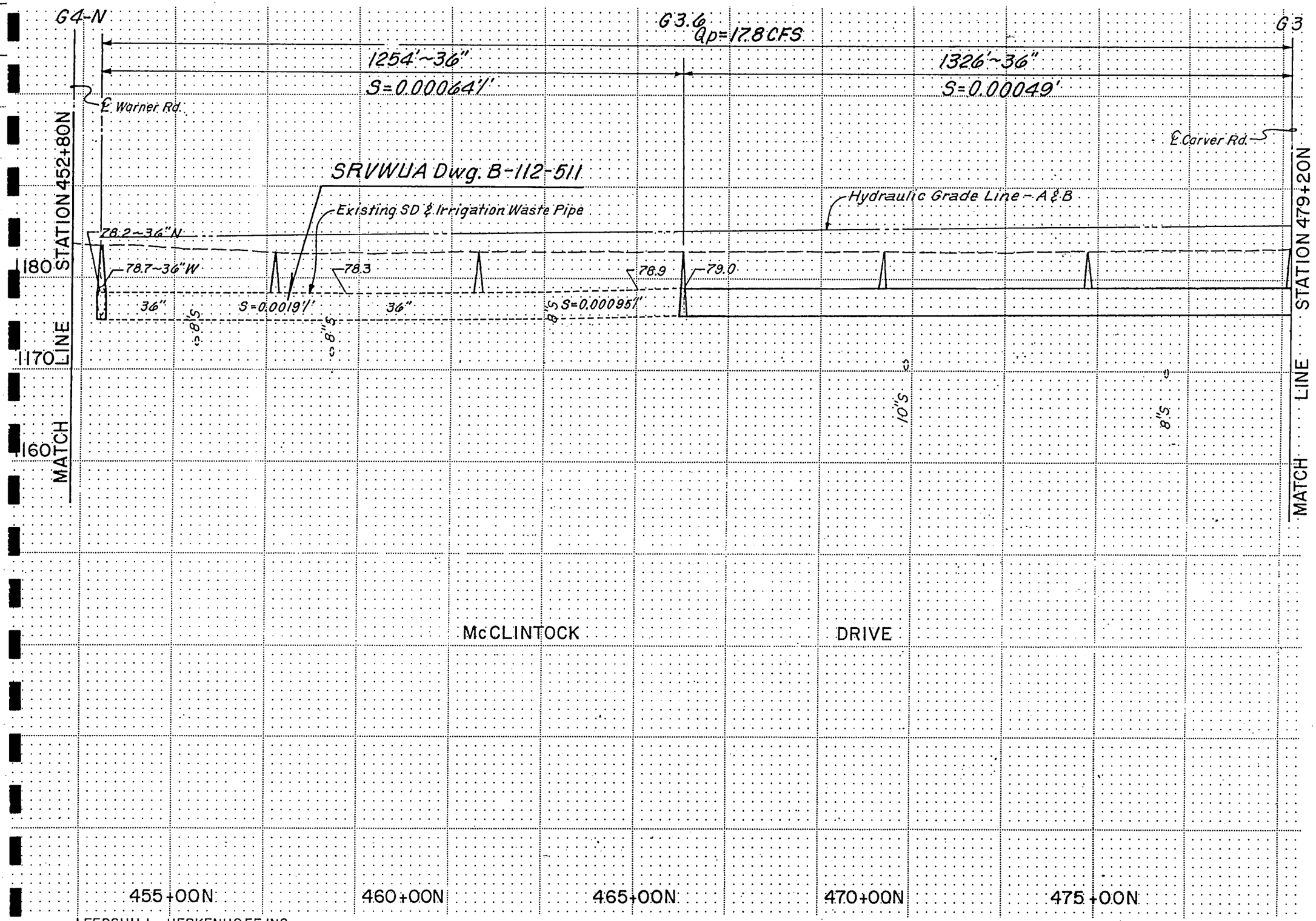
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 31

LEEDSHILL-HERKENHOFF, INC.



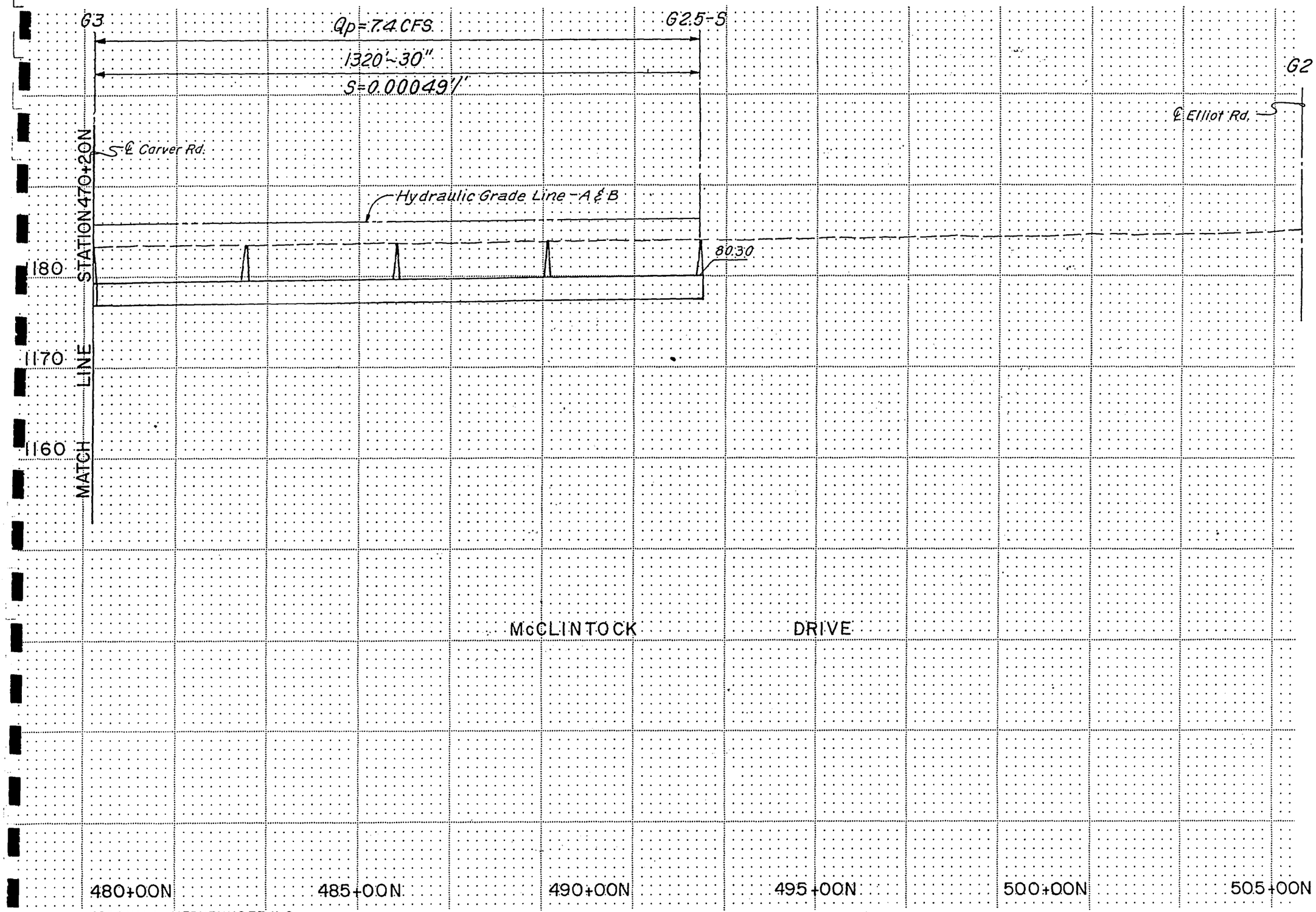
SCALES
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 32

LEEDSHILL-HERKENHOFF, INC.



SCALES

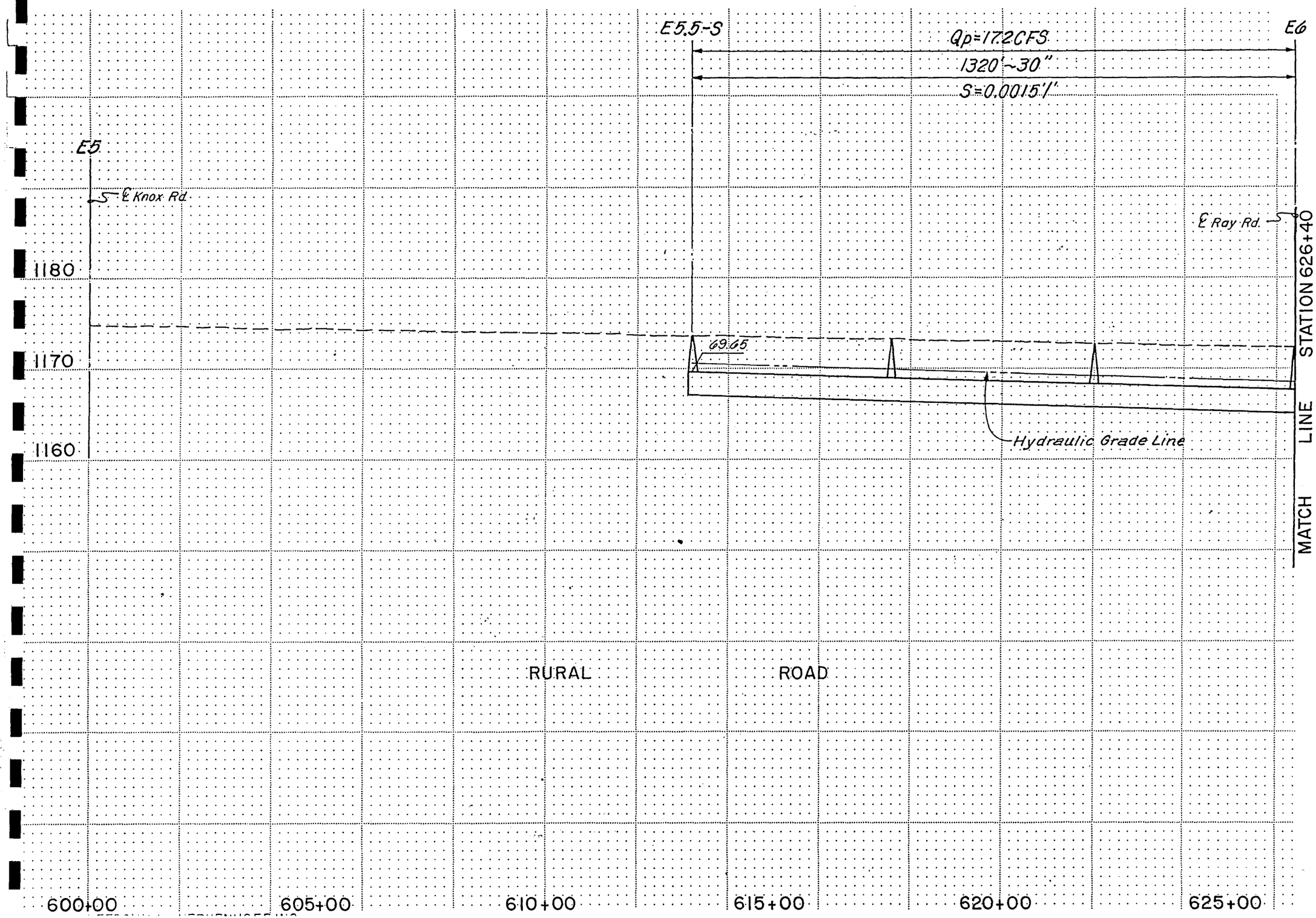
Horiz. 1" = 200'
Vert. 1" = 10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 33

LEEDSHILL-HERKENHOFF, INC.

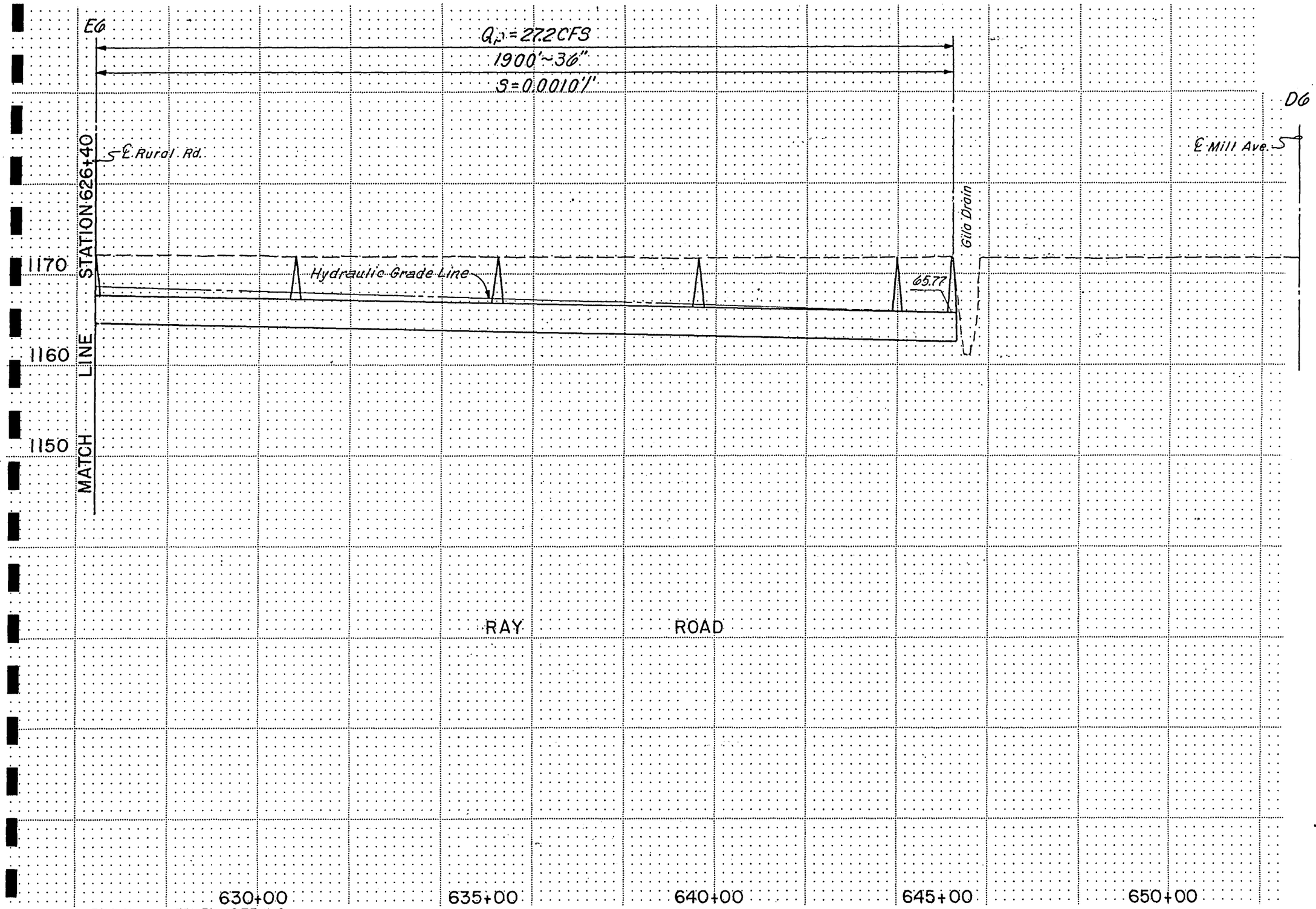


SCALES
Horiz. 1"=200'
Vert. 1"=10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 34



SCALES

Horiz. 1" = 200'
Vert. 1" = 10'

SOUTH TEMPE
STORM DRAIN AND
DETENTION BASIN
ANALYSIS

PIPE PROFILE

plate 35

LEEDSHILL-HERKENHOFF, INC.

REACH	AREA NO.	UPS PT NO.	UPS PT ELEV (FT)	DNS PT NO.	DNS PT ELEV (FT)	DELTA ELEV (FT)	IMPERV. WATERSHED TOTAL LENGTH (FT)	IMPERV. WATERSHED TOTAL WIDTH (FT)	IMPERV. WATERSHED TOTAL AREA (AC.)	PERV. WATERSHED TOTAL LENGTH (FT)	PERV. WATERSHED TOTAL WIDTH (FT)	PERV. WATERSHED TOTAL AREA (AC.)	TOTAL WATERSHED TOTAL LENGTH (FT)	TOTAL WATERSHED TOTAL WIDTH (FT)	TOTAL WATERSHED TOTAL AREA (AC.)
WEST SECTION															
1	1	C2	1198.65	C1.9	1195.32	3.33	500	101.0	1.159	500	9.0	0.103	500	110	1.263
2		C1	1196.75	C1.9	1195.32	1.43	2,140	101.0	4.962	2,140	9.0	0.442	2,140	110	5.404
2A	2	A1	1235.50	HC	1225.50	10.00	1,380	101.0	3.200	1,380	9.0	0.285	1,380	110	3.485
3		HC	1225.50	B2	1213.00	12.50	1,260	101.0	2.921	1,260	9.0	0.260	1,260	110	3.182
4		B2	1213.00	B2.8	1197.75	15.25	2,440	101.0	5.657	2,440	9.0	0.504	2,440	110	6.162
5		C2	1198.30	B2.8	1197.75	0.55	200	101.0	0.464	200	9.0	0.041	200	110	0.505
7	4	C2	1198.30	C3	1192.00	6.30	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
8		C3	1192.00	C4	1187.90	4.10	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
9	5	A4	1219.00	B4	1203.00	16.00	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
10		B4	1203.00	B4.2	1198.80	4.20	830	101.0	1.924	830	9.0	0.171	830	110	2.096
11		RR	1199.60	B4.2	1198.80	0.80	318	101.0	0.737	318	9.0	0.066	318	110	0.803
12		RR	1199.60	C4	1187.90	11.70	1,492	101.0	3.459	1,492	9.0	0.308	1,492	110	3.768
13	6	C4	1187.90	KC	1183.80	4.10	900	101.0	2.087	900	9.0	0.186	900	110	2.273
14	7	C4	1187.90	C5	1184.00	3.90	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
15	8	C5	1184.00	D5	1174.17	9.83	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
16		D5	1174.17	RB	1173.80	0.37	1,320	101.0	3.061	1,320	9.0	0.273	1,320	110	3.333
EAST SECTION															
17	9	H2	1187.20	G2	1185.00	2.20	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
18	10	WC	1189.00	G2	1185.00	4.00	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
21	11	G2	1185.00	F2	1182.00	3.00	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
22		F2	1182.00	E2	1179.50	2.50	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
23	12	WC	1181.70	E2	1179.50	2.20	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
6	13	C2	1198.30	KC	1186.00	12.30	2,100	101.0	4.869	2,100	9.0	0.434	2,100	110	5.303
24		KC	1186.00	D2	1182.75	3.25	540	101.0	1.252	540	9.0	0.112	540	110	1.364
25		D2	1182.75	E2	1179.50	3.25	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
26	14	E2	1179.50	E3	1179.30	0.20	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
27		E3	1179.30	E4	1177.50	1.80	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
28	15	I4	1187.50	H4	1183.50	4.00	2,640	50.5	3.061	2,640	4.5	0.273	2,640	55	3.333
29		H4	1183.50	G4	1182.60	0.90	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
30	16	G2	1185.00	G3	1183.20	1.80	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
31A		G3	1183.20	G3.8	1180.40	2.80	2,051	101.0	4.756	2,051	9.0	0.424	2,051	110	5.179
31B		G4	1181.84	G3.8	1180.40	1.44	589	101.0	1.366	589	9.0	0.122	589	110	1.487
32	17	G4	1182.60	F4	1180.30	2.30	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
33		F4	1180.30	E4	1177.50	2.80	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
34	18	KC	1183.80	D4	1178.20	5.60	1,740	101.0	4.034	1,740	9.0	0.360	1,740	110	4.394
35		D4	1178.20	E4	1177.50	0.70	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
36	19	E4	1177.50	E5	1175.20	2.30	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
37	20	E6	1172.10	GD	1165.40	6.70	1,900	101.0	4.405	1,900	9.0	0.393	1,900	110	4.798
38		E5	1175.20	E6	1172.10	3.10	2,640	101.0	6.121	2,640	9.0	0.545	2,640	110	6.667
39	21	E5	1175.20	RB	1173.80	1.40	1,320	101.0	3.061	1,320	9.0	0.273	1,320	110	3.333
TOTAL							78,460		178.860	78,460		15.938	78,460		194.798

STORM EVENT		PRECEPITATION AMOUNT	
PROB.MAX.PRECIP.	=	10.70 INCHES	
100 YR, 24 HR	=	3.70 INCHES	
50 YR, 24 HR	=	3.25 INCHES	
100 YR, 6 HR	=	3.17 INCHES	
25 YR, 24 HR	=	2.80 INCHES	
100 YR, 2 HR	=	2.76 INCHES	
50 YR, 6 HR	=	2.75 INCHES	
100 YR, 1 HR	=	2.55 INCHES	* SEE BELOW
50 YR, 2 HR	=	2.40 INCHES	
25 YR, 6 HR	=	2.38 INCHES	
10 YR, 24 HR	=	2.32 INCHES	
50 YR, 1 HR	=	2.15 INCHES	
25 YR, 2 HR	=	2.07 INCHES	
10 YR, 6 HR	=	1.95 INCHES	
25 YR, 1 HR	=	1.85 INCHES	
10 YR, 2 HR	=	1.67 INCHES	* SEE BELOW
10 YR, 1 HR	=	1.53 INCHES	
2 YR, 24 HR	=	1.35 INCHES	
2 YR, 6 HR	=	1.10 INCHES	
2 YR, 2 HR	=	0.92 INCHES	
2 YR, 1 HR	=	0.83 INCHES	

STORM EVENT OF 100 YR, 1 HR= 2.55 INCHES, CN=97, MIN LOSS RATE = .02"/15 MINUTES

PERIOD	INCRMNTS (hrs)	ACCUM. % OF RAIN-FALL (%)	ACCUM. 15 MIN RAINFALL (inches)	INCRMNT 15 MIN RAINFALL (inches)	ARRG-MENT	INCRMNT DESIGN RAINFALL (inches)	ACCUM. DESIGN RAINFALL (inches)	ACCUM. DIRECT RUNOFF (inches)	INCRMNT DIRECT RUNOFF (inches)	INCRMNT LOSS (inches)
0	0.00	0%	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
1	0.25	48%	1.22	1.22	4	0.31	0.31	0.12	0.12	0.19
2	0.50	71%	1.81	0.59	3	0.43	0.74	0.40	0.28	0.15
3	0.75	88%	2.24	0.43	2	0.59	1.33	0.97	0.57	0.02
4	1.00	100%	2.55	0.31	1	1.22	2.55	2.17	1.20	0.02
5	1.25	110%	2.81	0.26	5	0.26	2.81	2.41	0.24	0.02
6	1.50	117%	2.98	0.18	6	0.18	2.98	2.57	0.16	0.02
7	1.75	122%	3.11	0.13	7	0.13	3.11	2.68	0.11	0.02
8	2.00	126%	3.21	0.10	8	0.10	3.21	2.76	0.08	0.02
9	2.25	129%	3.29	0.08	9	0.08	3.29	2.82	0.06	0.02
10	2.50	132%	3.35	0.06	10	0.06	3.35	2.86	0.04	0.02
11	2.75	133%	3.39	0.04	11	0.04	3.39	2.88	0.02	0.02
12	3.00	134%	3.42	0.03	12	0.03	3.42	2.90	0.02	0.01
				3.42		3.42			2.90	0.52

STORM EVENT OF 10 YR, 2 HR = 1.67 INCHES, CN=97, MIN LOSS RATE = .02"/15 MINUTES

PERIOD	INCRMNTS (hrs)	ACCUM. % OF RAIN-FALL (%)		ACCUM. 15 MIN RAINFALL (inches)	INCRMNT 15 MIN RAINFALL (inches)	ARRG-MENT	INCRMNT DESIGN RAINFALL (inches)	ACCUM. DESIGN RAINFALL (inches)	ACCUM. DIRECT RUNOFF (inches)	INCRMNT DIRECT RUNOFF (inches)	INCRMNT LOSS (inches)
0	0.00	0%	0%	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
1	0.25	48%	38%	0.64	0.64	4	0.16	0.16	0.02	0.02	0.14
2	0.50	71%	56%	0.94	0.30	3	0.23	0.38	0.19	0.17	0.06
3	0.75	88%	70%	1.17	0.23	2	0.30	0.69	0.44	0.25	0.05
4	1.00	100%	79%	1.33	0.16	1	0.64	1.33	1.03	0.59	0.05
5	1.25	110%	87%	1.46	0.13	5	0.13	1.46	1.15	0.11	0.02
6	1.50	117%	93%	1.55	0.09	6	0.09	1.55	1.25	0.07	0.02
7	1.75	122%	97%	1.62	0.07	7	0.07	1.62	1.30	0.05	0.02
8	2.00	126%	100%	1.67	0.05	8	0.05	1.67	1.33	0.03	0.02
9	2.25	129%	102%	1.71	0.04	9	0.04	1.71	1.35	0.02	0.02
10	2.50	132%	104%	1.74	0.03	10	0.03	1.74	1.36	0.01	0.02
11	2.75	133%	106%	1.76	0.02	11	0.02	1.76	1.36	0.00	0.02
12	3.00	134%	106%	1.78	0.01	12	0.01	1.78	1.36	0.00	0.01
					1.78		1.78			1.32	0.46

CITY OF TEMPE PROJECT NO. 84058
10YR,2HR & 100YR,1HR (QSUMMARY)
8410102.2

REACH	AREA NO.	UPS PT NO.	UPS PT ELEV (FT)	DNS PT NO.	DNS PT ELEV (FT)	DELTA ELEV (FT)	TOTAL WATERSHED TOTAL LENGTH (FT)	TOTAL WIDTH (FT)	TOTAL AREA (AC.)	AVERAGE SLOPE (FT/FT)	TIME OF CONC. (MIN.)	TIME OF CONC. (HR.)	INCRMNTL Q-10 PEAK (CFS)	INCRMNTL Q-100 PEAK (CFS)
WEST SECTION														
1	1	C2	1198.65	C1.9	1195.32	3.33	500	110	1.263	0.00666	6.44	0.11	3.30	7.90
2		C1	1196.75	C1.9	1195.32	1.43	2,140	110	5.404	0.00067	47.80	0.80	6.50	13.40
2A	2	A1	1235.50	HC	1225.50	10.00	1,380	110	3.485	0.00725	13.62	0.23	7.35	14.70
3		HC	1225.50	B2	1213.00	12.50	1,260	110	3.182	0.00992	11.25	0.19	7.05	14.50
4		B2	1213.00	B2.8	1197.75	15.25	2,440	110	6.162	0.00625	22.36	0.37	10.60	22.10
5		C2	1198.30	B2.8	1197.75	0.55	200	110	0.505	0.00275	4.47	0.07	1.35	2.78
7	4	C2	1198.30	C3	1192.00	6.30	2,640	110	6.667	0.00239	34.42	0.57	9.30	19.40
8		C3	1192.00	C4	1187.90	4.10	2,640	110	6.667	0.00155	40.61	0.68	8.65	18.10
9	5	A4	1219.00	B4	1203.00	16.00	2,640	110	6.667	0.00606	24.04	0.40	11.10	23.15
10		B4	1203.00	B4.2	1198.80	4.20	830	110	2.096	0.00506	10.57	0.18	4.75	9.65
11		RR	1199.60	B4.2	1198.80	0.80	318	110	0.803	0.00252	6.61	0.11	2.15	4.00
12		RR	1199.60	C4	1187.90	11.70	1,492	110	3.768	0.00784	14.03	0.23	7.75	15.97
13	6	C4	1187.90	KC	1183.80	4.10	900	110	2.273	0.00456	11.72	0.20	4.90	10.10
14	7	C4	1187.90	C5	1184.00	3.90	2,640	110	6.667	0.00148	41.40	0.69	8.60	17.72
15	8	C5	1184.00	D5	1174.17	9.83	2,640	110	6.667	0.00372	29.00	0.48	10.05	21.10
16		D5	1174.17	RB	1173.80	0.37	1,320	110	3.333	0.00028	46.04	0.77	4.10	8.55
EAST SECTION														
17	9	H2	1187.20	G2	1185.00	2.20	2,640	110	6.667	0.00083	51.61	0.86	7.70	15.90
18	10	WC	1189.00	G2	1185.00	4.00	2,640	110	6.667	0.00152	41.00	0.68	8.60	17.60
21	11	G2	1185.00	F2	1182.00	3.00	2,640	110	6.667	0.00114	45.80	0.76	8.20	16.95
22		F2	1182.00	E2	1179.50	2.50	2,640	110	6.667	0.00095	49.13	0.82	8.00	16.30
23	12	WC	1181.70	E2	1179.50	2.20	2,640	110	6.667	0.00083	51.61	0.86	7.60	15.80
6	13	C2	1198.30	KC	1186.00	12.30	2,100	110	5.303	0.00586	20.42	0.34	9.75	19.65
24		KC	1186.00	D2	1182.75	3.25	540	110	1.364	0.00602	7.10	0.12	3.50	6.95
25		D2	1182.75	E2	1179.50	3.25	2,640	110	6.667	0.00123	44.41	0.74	8.30	17.25
26	14	E2	1179.50	E3	1179.30	0.20	2,640	110	6.667	0.00008	129.91	2.17	4.25	8.55
27		E3	1179.30	E4	1177.50	1.80	2,640	110	6.667	0.00068	55.75	0.93	7.30	15.35
28	15	I4	1187.50	H4	1183.50	4.00	2,640	55	3.333	0.00152	41.00	0.68	4.40	9.10
29		H4	1183.50	G4	1182.60	0.90	2,640	110	6.667	0.00034	72.81	1.21	6.30	12.90
30	18	G2	1185.00	G3	1183.20	1.80	2,640	110	6.667	0.00068	55.75	0.93	7.35	15.25
31A		G3	1183.20	G3.8	1180.40	2.80	2,051	110	5.179	0.00137	35.14	0.59	7.35	14.90
31B		G4	1181.84	G3.8	1180.40	1.44	589	110	1.487	0.00244	10.74	0.18	3.35	6.90
32	17	G4	1182.60	F4	1180.30	2.30	2,640	110	6.667	0.00087	50.73	0.85	7.70	15.90
33		F4	1180.30	E4	1177.50	2.80	2,640	110	6.667	0.00106	47.03	0.78	8.40	17.00
34	18	KC	1183.80	D4	1178.20	5.60	1,740	110	4.394	0.00322	22.25	0.37	7.65	15.80
35		D4	1178.20	E4	1177.50	0.70	2,640	110	6.667	0.00027	80.20	1.34	5.95	12.10
36	19	E4	1177.50	E5	1175.20	2.30	2,640	110	6.667	0.00087	50.73	0.85	7.65	16.00
37	20	E6	1172.10	GD	1165.40	6.70	1,900	110	4.798	0.00353	22.99	0.38	8.35	16.85
38		E5	1175.20	E6	1172.10	3.10	2,640	110	6.667	0.00117	45.22	0.75	8.30	17.20
39	21	E5	1175.20	RB	1173.80	1.40	1,320	110	3.333	0.00106	27.58	0.46	5.80	10.95
TOTAL							78,460		194.798					

SOUTH TEMPE - SURFACE HYDROLOGY EAST SIDE
PROJECT NO. 85058
n=.015

DA NO	STATION	STORM TYPE	Q (cfs)	Qc (cfs)	Qt (cfs)	So %	Sx %	Z	D (ft)	T (ft)	ALLOWABLE D	ALLOWABLE T	STATUS	Qi (cfs)	Qc (cfs)	D (ft)	T (ft)	STATUS	Qc to DA No.
17	H2-G2	100	15.9	-	15.9	0.08	2.5	40	0.53	21.2	0.77	30.8	1	7.7	8.2	0.43	17.4	1	30
		10	7.7	-	7.7	0.08	2.5	40	0.40	16.2	0.57	22.9	1	7.7	0.0			TO SD	
18	WC-G2	100	17.6	-	17.6	0.24	2.5	40	0.45	18.0	0.85	33.9	1	8.6	9.0				30
		10	8.6	-	8.6	0.24	2.5	40	0.34	13.8	0.40	15.9	1	8.6	0.0			TO SD	
21	G2-F2	100	17.0	0.0	17.0	0.11	2.5	40	0.51	20.5	0.77	30.8	1	0	17.0				22
		10	8.2	0.0	8.2	0.11	2.5	40	0.39	15.6	0.57	22.9	1	0	8.2				22
22	F2-E2	100	16.3	17.0	22.7	0.10	2.5	40	0.59	23.7	0.77	30.8	1	22.7	0.0			TO SD	
		10	8.0	8.2	10.8	0.10	2.5	40	0.45	17.9	0.57	22.9	1	10.8	0.0			TO SD	
23	WC-E2	100	15.8	-	15.8	0.08	2.5	40	0.53	21.2	0.85	33.9	1	7.6	8.2	0.43	17.4	1	26
		10	7.6	-	7.6	0.08	2.5	40	0.40	16.1	0.40	15.9	99	7.6	0.0			TO SD	
6	C2-KC	100	19.7	0.0	19.7	0.59	2.5	40	0.40	16.0	0.85	33.9	1	0	19.7				24
		10	9.8	0.0	9.8	0.59	2.5	40	0.31	12.3	0.40	15.9	1	0	9.8				24
24	KC-D2	100	7.0	19.7	21.9	0.60	2.5	40	0.41	16.5	0.77	30.8	1	0	21.9				25
		10	3.5	9.8	11.8	0.60	2.5	40	0.33	13.1	0.57	22.9	1	0	11.8				25
25	D2-E2	100	17.3	21.9	29.9	0.12	2.5	40	0.62	25.0	0.77	30.8	1	29.9	0.0			TO SD	
		10	8.3	11.8	16.3	0.12	2.5	40	0.50	19.9	0.57	22.9	1	16.3	0.0			TO SD	
26	E2-E3	100	8.6	8.2	12.1	0.01	2.5	40	0.74	29.7	0.85	33.9	1	4.3	7.8	0.66	26.4	1	27
		10	4.3	0.0	4.3	0.01	2.5	40	0.50	20.2	0.40	15.9	99	4.3	0.0			TO SD	
27	E3-E4	100	15.4	7.8	15.4	0.07	2.5	40	0.54	21.8	0.85	33.9	1	7.3	8.1	0.45	17.9	1	36
		10	7.3	0.0	7.3	0.07	2.5	40	0.41	16.5	0.40	15.9	99	7.3	0.0			TO SD	
28	I4-H4	100	9.1	-	9.1	0.15	2.5	40	0.38	15.4	0.85	33.9	1	4.4	4.7	0.31	12.6	1	29
		10	4.4	-	4.4	0.15	2.5	40	0.29	11.7	0.40	15.9	1	4.4	0.0			TO SD	
29	H4-G4	100	12.9	4.7	13.0	0.03	2.5	40	0.58	23.3	0.85	33.9	1	6.3	6.7	0.48	19.0	1	McCL. DET
		10	6.3	0.0	6.3	0.03	2.5	40	0.44	17.7	0.40	15.9	99	6.3	0.0			TO SD	
30	G2-G3	100	15.3	17.2	28.5	0.07	2.5	40	0.69	27.4	0.85	33.9	1	7.4	21.1	0.64	25.7	1	31A
		10	7.4	0.0	7.4	0.07	2.5	40	0.41	16.5	0.40	15.9	99	7.4	0.0			TO SD	
31A	G3-G3.8	100	14.9	21.1	14.9	0.14	2.5	40	0.47	18.9	0.85	33.9	1	0	14.9	0.49	19.8	1	31B
		10	7.4	0.0	7.4	0.14	2.5	40	0.36	14.5	0.40	15.9	1	0	7.4			TO SD	
31B	G4-G3.8	100	6.9	14.9	18.2	0.24	2.5	40	0.46	18.2	0.85	33.9	1	11.8	6.4	0.32	12.9	1	PONDING
		10	3.4	7.4	8.8	0.24	2.5	40	0.35	13.9	0.40	15.9	1	8.8	0.0			TO SD	
32	G4-F4	100	15.9	0	15.9	0.09	2.5	40	0.53	21.0	0.85	33.9	1	7.7	8.2	0.43	17.2	1	33
		10	7.7	0	7.7	0.09	2.5	40	0.40	16.0	0.40	15.9	99	7.7	0.0			TO SD	
33	F4-E4	100	17.0	8.2	17.0	0.11	2.5	40	0.52	20.8	0.85	33.9	1	8.4	8.6	0.42	16.9	1	36
		10	8.4	0	8.4	0.11	2.5	40	0.40	16.0	0.40	15.9	99	8.4	0.0			TO SD	

SOUTH TEMPE - SURFACE HYDROLOGY EAST SIDE
PROJECT NO. 85058
n=.015

DA NO	STATION	STORM TYPE	Q (cfs)	Qc (cfs)	Qt (cfs)	So %	Sx %	Z	D (ft)	T (ft)	ALLOWABLE D	ALLOWABLE T	STATUS	Qi (cfs)	Qc (cfs)	D (ft)	T (ft)	STATUS	Qc to DA No.
34	KC-D4	100	15.8	0	15.8	0.32	2.5	40	0.41	16.4	0.85	33.9	1	0	15.8				35
		10	7.7	0	7.7	0.32	2.5	40	0.31	12.5	0.40	15.9	1	0	7.7				35
35	D4-E4	100	12.1	15.8	23.1	0.03	2.5	40	0.75	30.2	0.85	33.9	1	11.0	12.1	0.62	24.8	1	36
		10	6.0	7.7	11.0	0.03	2.5	40	0.57	22.8	0.40	15.9	99	11.0	0.0			TO SD	
36	E4-E5	100	16.0	28.8	20.6	0.09	2.5	40	0.58	23.2	0.85	33.9	1	20.6	0.0			TO SD	
		10	7.7	0	7.7	0.09	2.5	40	0.40	16.0	0.40	15.9	99	7.7	0.0			TO SD	
37	E6-GD	100	16.9	0	16.9	0.35	2.5	40	0.41	16.6	0.85	33.9	1	16.9	0.0			TO SD	
		10	8.4	0	8.4	0.35	2.5	40	0.32	12.7	0.40	15.9	1	8.4	0.0			TO SD	
38	E5-E6	100	17.2	0	17.2	0.12	2.5	40	0.51	20.5	0.85	33.9	1	17.2	0.0			TO SD	
		10	8.3	0	8.3	0.12	2.5	40	0.39	15.6	0.40	15.9	1	8.3	0.0			TO SD	
39	E5-RB	100	11.0	0	12.0	0.11	2.5		RIBBON	CURB									SHOULDER
		10	5.8	0	5.8	0.11	2.5		RIBBON	CURB									SHOULDER

SOUTH TEMPE - SURFACE HYDROLOGY WEST SIDE
PROJECT 85058
n=.015

DA NO	STATION	STORM TYPE	Q (cfs)	Qc (cfs)	Qt (cfs)	So %	Sx %	Z	D (ft)	T (ft)	ALLOWABLE D	ALLOWABLE T	STATUS	Qi (cfs)	Qc (cfs)	D (ft)	T (ft)	STATUS	Qc TO
1	C2-C1.9	100	7.9	-	7.9	0.67	2.5	40	0.28	11.1	0.85	33.9	1	0	7.9				2
		10	3.3	-	3.3	0.67	2.5	40	0.20	8.0	0.40	15.9	1	0	3.3				2
2	C1-C1.9	100	13.4	7.9	15.1	0.07	2.5	40	0.54	21.7	0.85	33.9	1	10.4	4.7	0.37	14.7	1	PONDING
		10	6.5	3.3	7.4	0.07	2.5	40	0.41	16.6	0.40	15.9	99	7.4	0.0			TO SD	
2A	A2-HC	100	14.7	-	14.7	0.73	2.5	40	0.34	13.7	0.77	30.8	1	0	14.7				3
		10	7.4	-	7.4	0.73	2.5	40	0.27	10.6	0.57	22.9	1	0	7.4				3
3	HC-B2	100	14.5	14.7	24.0	0.99	2.5	40	0.39	15.6	0.77	30.8	1	0	24.0				4
		10	7.1	7.4	11.6	0.99	2.5	40	0.30	11.8	0.57	22.9	1	0	11.6				4
4	B2-B2.8	100	22.1	24.0	37.6	0.63	2.5	40	0.50	20.1	0.77	30.8	1	0	37.6				5
		10	10.6	11.6	18.3	0.63	2.5	40	0.38	15.3	0.57	22.9	1	0	18.3				5
5	C2-B2.8	100	2.8	37.6	38.3	0.28	2.5	40	0.59	23.6	0.77	30.8	1	34.4	3.9	0.26	10.5	1	PONDING
		10	1.4	18.3	18.7	0.28	2.5	40	0.45	18.0	0.57	22.9	1	18.7	0.0			TO SD	
7	C2-C3	100	19.4	0.0	19.4	0.24	2.5	40	0.47	18.8	0.85	33.9	1	9.3	10.1	0.38	15.4	1	8
		10	9.3	0.0	9.3	0.24	2.5	40	0.36	14.2	0.40	15.9	1	9.3	0.0			TO SD	
8	C3-C4	100	18.1	10.1	28.0	0.16	2.5	40	0.58	23.4	0.85	33.9	1	12.9	15.1	0.49	19.4	1	14
		10	8.7	0.0	8.7	0.16	2.5	40	0.38	15.1	0.40	15.9	1	8.7	0.0			TO SD	
9	A4-B4	100	23.2	-	23.2	0.61	2.5	40	0.42	16.9	0.85	33.9	1	0	23.2				10
		10	11.1	-	11.1	0.61	2.5	40	0.32	12.8	0.40	15.9	1	0	11.1				10
10	B4-B4.2	100	9.7	23.2	27.3	0.51	2.5	40	0.46	18.5	0.85	33.9	1	0	27.3				11
		10	4.8	11.1	13.0	0.51	2.5	40	0.35	14.0	0.40	15.9	1	0	13.0				11
11	RR-B4.2	100	4.0	27.3	28.4	0.25	2.5	40	0.54	21.4	0.85	33.9	1	22.8	5.6	0.31	12.2	1	PONDING
		10	2.2	13.0	13.7	0.25	2.5	40	0.41	16.3	0.40	15.9	99	13.7	0.0			TO SD	
12	RR-C4	100	16.0	0.0	16.0	0.78	2.5	40	0.35	14.0	0.85	33.9	1	7.8	8.2	0.28	11.4	1	14
		10	7.8	0.0	7.8	0.78	2.5	40	0.27	10.7	0.40	15.9	1	7.8	0.0			TO SD	
13	C4-KC	100	10.1	0.0	10.1	0.46	2.5	40	0.33	13.0	0.85	33.9	1	10.1	0.0			TO SD	
		10	4.9	0.0	4.9	0.46	2.5	40	0.25	9.9	0.40	15.9	1	4.9	0.0			TO SD	
14	C4-C5	100	17.8	23.3	19.5	0.15	2.5	40	0.51	20.6	0.85	33.9	1	19.5	0.0			TO SD	
		10	8.6	0.0	8.6	0.15	2.5	40	0.38	15.1	0.40	15.9	1	8.6	0.0			TO SD	
15	C5-D5	100	21.1	0.0	20.7	0.37	2.5	40			RIBBON CURB			0	20.7				SHOULDER
		10	10.1	0.0	10.1	0.37	2.5	40			RIBBON CURB			0	10.1				SHOULDER
16	D5-RB	100	8.6	0.0	8.5	0.03	2.5	40			RIBBON CURB			0	8.5				SHOULDER
		10	4.1	0.0	4.1	0.03	2.5	40			RIBBON CURB			0	4.1				SHOULDER

WEST SIDE

RUN NO.	Qi (cfs)	ACCUM Qp (cfs)	PIPE SLOPE (ft/ft)	PIPE DIA. (inch)	PIPE VEL. (fps)	Q flowing full	PIPE LGTH (feet)	TRAVEL TIME (hours)	CROWN IN (feet)	CROWN OUT (feet)	GROUND ELEVATION (feet)	DEPTH UPSTRM (feet)	DEPTH DWNSTRM (feet)	STREET SLOPE (ft/ft)
C1.9	10.4								1189.00		1196.00	7.00		
	(7.4)													-0.0027
C2-NORTH		10.4	0.00160	24	3.1	9.80	840	0.07		1187.66	1198.30		10.64	
B2-EAST									1202.74		1214.50	11.76		
														0.0074
B2.5-WEST		24.0	0.00640	24	6.2	19.60	1486	0.07		1193.23	1203.50		10.27	
B2.5-EAST									1193.23		1203.50	10.27		
														0.0062
B2.8-WEST		30.0	0.00640	30	7.2	35.54	888	0.03		1187.55	1198.00		10.45	
B2.8-EAST	34.4								1187.55		1198.00	10.45		
	(18.7)													-0.0010
C2-WEST		34.4	0.00161	36	4.1	28.99	312	0.02		1187.04	1198.30		11.26	
C2-SOUTH		44.7							1187.04		1198.30	11.26		
														0.0022
C3-NORTH	9.3	54.0	0.00161	48	5.0	62.44	2,640	0.15		1182.79	1192.50		9.71	
C3-SOUTH									1182.79		1192.50	9.71		
														0.0017
C4-NORTH	12.9	66.7	0.00161	48	5.0	62.44	2,670	0.15		1178.49	1187.90		9.41	
	(8.7)													
B4	22.8								1192.00		1203.00	11.00		
	(13.7)													0.0045
RR-WEST		22.8	0.00420	30	5.9	28.79	1,320	0.06		1186.46	1197.00		10.54	
RR-EAST									1186.46		1197.00	10.54		
														0.0069
C4-WEST	7.8	30.6	0.00330	30	5.2	25.52	1,320	0.07		1182.10	1187.90		5.80	
KC	10.1								1180.26		1184.26	4.00		
	(4.9)													-0.0046
C4-EAST		10.1	0.00220	24	3.7	11.49	800	0.06		1178.50	1187.90		9.40	
C4-SOUTH		97.5							1178.50		1187.90	9.40		
														0.0018
C5-NORTH	19.5	117.0	0.00170	54	5.5	87.84	2,610	0.13		1174.06	1183.30		9.24	
	(8.6)													
C5-EAST		117.0							1174.06		1183.30	9.24		
														0.0049
C5.5-WEST	0	117.0	0.00400	54	8.5	134.74	1,320	0.04		1168.78	1176.80		8.02	
C5.5-EAST									1168.78		1176.80	8.02		
														0.0049
C7.5-WEST	0	117.0	0.00400	54	8.5	134.74	775	0.03		1165.68	1173.00		7.32	
C7.5-EAST									1165.68		1173.00	7.32		
														-0.0006
RET BAS	0	117.0	0.00137	60	5.3	104.25	1,955	0.10		1163.01	1174.20		11.19	

EAST SIDE - ALTERNATIVE A

RUN NO.	Qi (cfs)	ACCUM Qp (cfs)	PIPE SLOPE (ft/ft)	PIPE DIA. (inch)	PIPE VEL. (fps)	Q flowing full	PIPE LGTH (feet)	TRAVEL TIME (hours)	CROWN IN (feet)	CROWN OUT (feet)	GROUND ELEVATION (feet)	DEPTH UPSTRM (feet)	DEPTH DWNSTRM (feet)	STREET SLOPE (ft/ft)
H2.8									1181.29		1184.00	2.71		
														-0.0114
G2-EAST	7.7	7.7	0.0024	18	3.2	5.57	88	0.01		1181.08	1185.00		3.92	
G1.5	8.6								1183.16		1184.70	1.54		
														-0.0039
G2-NORTH		8.6	0.0270	18	10.6	18.69	77	.00		1181.08	1185.00		3.92	
G2-WEST	0.7	17.0							1181.08		1185.00	3.92		
														0.0012
F2-EAST		17.0	0.0014	36	3.9	27.42	2,590	0.19		1177.35	1182.00		4.65	
F2-WEST									1177.35		1182.00	4.65		
														0.0011
F2.8-EAST	22.7 (10.8)	35.8	0.00120	42	3.9	37.75	1,985	0.14		1174.97	1179.80		4.83	
F2.8-WEST									1174.97		1179.80	4.83		
														0.2005
F2.9-EAST		35.8	0.00230	42	5.4	52.27	400	0.02		1174.05	1179.60		5.55	
F2.9-WEST									1174.05		1179.60	5.55		
														-0.2213
E2-EAST		35.8	0.02902	42	19.3	185.67	305	.00		1165.20	1180.00		14.80	
E1.8-SOUTH									1176.73		1180.00	3.27		
														0.0010
E1.9-NORTH	7.6	7.6	0.00240	18	3.2	5.57	300	0.03		1175.01	1179.70		3.69	
E1.9-SOUTH									1176.01		1179.70	3.69		
														-0.0039
E2-NORTH		7.6	0.06960	18	17.0	30.01	77	.00		1170.65	1180.00		9.35	
D2.25-EAST	21.9								1177.59		1181.90	4.31		
														0.0013
D2.5-WEST		21.9	0.00160	36	4.1	28.90	680	0.05		1176.50	1181.00		4.50	
D2.5-EAST									1176.50		1181.00	4.50		
														0.0010
D2.8-WEST	17.1 (16.3)	29.9	0.00181	36	4.3	30.73	840	0.05		1174.98	1180.20		5.22	
D2.8-EAST									1174.98		1180.20	5.22		
														0.0004
E2-WEST		29.9	0.00860	36	9.5	67.03	473	0.01		1170.91	1180.00		9.09	
E2-SOUTH		73.0							1165.20		1180.00	14.80		
														0.0003
E3-NORTH	4.3	76.5	0.00134	54	4.9	77.99	2,640	0.15		1161.66	1179.30		17.64	
E3-SOUTH									1161.66		1179.30	17.64		
														0.0007
E4-NORTH	7.3	80.8	0.00134	54	4.9	77.99	2,685	0.15		1158.06	1177.50		19.44	
I4.5-WEST		-							1182.36		1185.50	3.14		

EAST SIDE - ALTERNATIVE A

RUN NO.	Qi (cfs)	ACCUM Qp (cfs)	PIPE SLOPE (ft/ft)	PIPE DIA. (inch)	PIPE VEL. (fps)	Q flowing full	PIPE LGTH (feet)	TRAVEL TIME (hours)	CROWN IN (feet)	CROWN OUT (feet)	GROUND ELEVATION (feet)	DEPTH UPSTRM (feet)	DEPTH DWNSTRM (feet)	STREET SLOPE (ft/ft)
														0.0016
I4.8-EAST	2.9	2.9	0.00103	18	2.1	3.65	835	0.11		1181.50	1184.20		2.70	
I4.8-WEST									1181.50		1184.20	2.70		
														0.0015
H4-EAST	1.9	4.4	0.00095	30	2.8	13.68	480	0.05		1181.04	1183.50		2.46	
H4-WEST									1181.04		1183.50	2.46		
														0.0003
G4-EAST	6.3	9.9	0.00091	30	2.7	13.38	2,580	0.26		1178.70	1182.60		3.90	
G2.5-SOUTH		-							1180.30		1184.30	4.00		
														0.0008
G3-NORTH	7.4	7.4	0.00049	30	2.0	9.86	1,320	0.18		1179.65	1183.20		3.55	
G3-SOUTH									1179.65		1183.20	3.55		
														0.0002
G3.6-NORTH	11.8 (8.8)	17.8	0.00049	36	2.3	15.99	1,326	0.16		1179.00	1183.00		4.00	
G3.6-SOUTH									1179.00		1183.00	4.00		
														0.0023
G4-NORTH		17.8	0.00054	36	2.6	18.25	1,254	0.13		1178.20	1182.60		4.40	
G4-WEST		27.7							1178.70		1182.60	3.90		
														0.0008
F4-EAST	7.7	33.8	0.00064	36	2.6	18.34	2,700	0.29		1176.96	1180.40		3.44	
F4-WEST									1176.96		1180.40	3.44		
														0.0023
F4.5-EAST			0.00136	36	3.8	26.60	1,269	0.09		1175.24	1179.00		2.26	
F4.5-WEST									1175.24		1179.00	3.76		
														0.0006
E4-EAST	8.4	38.2	0.00102	42	3.6	34.86	1,391	0.11		1173.82	1177.50		4.38	
D4-EST		7.7							1174.20		1178.20	4.00		
														0.0003
E4-WEST	11.0	11.8	0.00150	27	3.3	12.99	2,640	0.22		1170.24	1177.50		7.26	
E4-SOUTH		124.5							1158.06		1177.50	19.44		
														0.0010
E5-NORTH	20.6 (7.7)	145.1	0.00105	72	5.3	148.69	2,595	0.14		1155.34	1175.00		19.66	
E5-SOUTH									1155.34		1175.00	19.66		
														0.0009
RET BAS	0	145.1	0.00105	72	5.3	148.69	1,320	0.07		1153.95	1173.80		19.85	

EAST SIDE - ALTERNATIVE A

RUN NO.	Qi (cfs)	ACCUM Qp (cfs)	PIPE SLOPE (ft/ft)	PIPE DIA. (inch)	PIPE VEL. (fps)	Q flowing full	PIPE LGTH (feet)	TRAVEL TIME (hours)	CROWN IN (feet)	CROWN OUT (feet)	GROUND ELEVATION (feet)	DEPTH UPSTRM (feet)	DEPTH DWNSTRM (feet)	STREET SLOPE (ft/ft)
E5.5SOUTH									1169.65		1173.65	4.00		
														0.0012
E6-NORTH	17.2	17.2	0.00150	30	3.5	17.21	1,320	0.10		1167.67	1172.10		4.43	
	(8.3)													
E6-SOUTH		17.1							1167.67		1172.10	4.43		
														0.0001
GILA DRN	16.9	27.2	0.00100	36	3.2	22.85	1,900	0.16		1165.77	1172.00		6.23	

EAST SIDE - ALTERNATIVE B

RUN NO.	Qi (cfs)	ACCUM Qp (cfs)	PIPE SLOPE (ft/ft)	PIPE DIA. (inch)	PIPE VEL. (fps)	Q flowing full	PIPE LGTH (feet)	TRAVEL TIME (hours)	CROWN IN (feet)	CROWN OUT (feet)	GROUND ELEVATION (feet)	DEPTH UPSTRM (feet)	DEPTH DWNSTRM (feet)	STREET SLOPE (ft/ft)
H2.8									1181.29		1184.00	2.71		
														-0.0114
G2-EAST	7.7	7.7	0.0024	18	3.2	5.57	88	0.01		1181.08	1185.00		3.92	
G1.5	8.6								1183.16		1184.70	1.54		
														-0.0039
G2-NORTH		8.6	0.0270	18	10.6	18.69	77	.00		1181.08	1185.00		3.92	
G2-WEST	0.7	17.0							1181.08		1185.00	3.92		
														0.0012
F2-EAST		17.0	0.0014	36	3.9	27.42	2,590	0.19		1177.35	1182.00		4.65	
F2-WEST									1177.35		1182.00	4.65		
														0.0007
E2-EAST	22.7 (10.8)	35.8	0.00118	42	3.9	37.47	2,670	0.19		1174.19	1180.00		5.81	
E1.8-SOUTH									1176.73		1180.00	3.27		
														0.0010
E1.9-NORTH	7.6	7.6	0.0024	18	3.2	5.57	300	0.03		1176.01	1179.70		3.69	
E1.9-SOUTH									1176.01		1179.70	3.69		
														-0.0039
E2-NORTH			0.05960	18	17.0	30.01	77	.00		1170.65	1180.00		9.35	
D2.25-EAST	21.9								1177.59		1181.90	4.31		
														0.0013
D2.5-WEST		21.9	0.00160	36	4.1	28.90	680	0.05		1176.50	1181.00		4.50	
D2.5-EAST									1176.50		1181.00	4.50		
														0.0007
E2-WEST	17.1 (16.3)	29.9	0.00181	36	4.3	30.73	1,340	0.09		1174.08	1180.00		5.92	
E2-SOUTH		73.0							1174.00		1180.00	6.00		
														0.0003
E3-NORTH	4.3	76.5	0.00068	60	3.8	73.68	2,640	0.20		1172.20	1179.30		7.10	
E3-SOUTH									1172.20		1179.30	7.10		
														0.0007
E4-NORTH	7.3	80.8	0.00068	60	3.8	73.68	2,640	0.20		1170.40	1177.50		7.10	
I4.5-WEST		-							1182.36		1185.50	3.14		
														0.0016
I4.8-EAST	2.9	2.9	0.00103	18	2.1	3.65	835	0.11		1181.50	1184.20		2.70	
I4.8-WEST									1181.50		1184.20	2.70		
														0.0015
H4-EAST	1.9	4.4	0.00095	30	2.8	13.68	480	0.05		1181.04	1183.50		2.46	
H4-WEST									1181.04		1183.50	2.46		
														0.0003
G4-EAST	6.3	9.9	0.00091	30	2.7	13.38	2,580	0.26		1178.70	1182.60		3.90	

EAST SIDE - ALTERNATIVE B

RUN NO.	Qi (cfs)	ACCUM Qp (cfs)	PIPE SLOPE (ft/ft)	PIPE DIA. (inch)	PIPE VEL. (fps)	Q flowing full	PIPE LGTH (feet)	TRAVEL TIME (hours)	CROWN IN (feet)	CROWN OUT (feet)	GROUND ELEVATION (feet)	DEPTH UPSTRM (feet)	DEPTH DWNSTRM (feet)	STREET SLOPE (ft/ft)
G2.5-SOUTH		-							1180.30		1184.30	4.00		
														0.0008
G3-NORTH	7.4	7.4	0.00049	30	2.0	9.86	1,320	0.18		1179.65	1183.20		3.55	
G3-SOUTH									1179.65		1183.20	3.55		
														0.0002
G3.6-NORTH	11.8 (8.8)	17.8	0.00049	36	2.3	15.99	1,326	0.16		1179.00	1183.00		4.00	
G3.6-SOUTH									1179.00		1183.00	4.00		
														0.0003
G4-NORTH		17.8	0.00064	36	2.6	18.25	1,254	0.13		1178.20	1182.60		4.40	
G4-WEST		27.7							1178.70		1182.60	3.90		
														0.0008
F4-EAST	7.7	33.8	0.00064	36	2.6	18.34	2,700	0.29		1176.36	1180.40		3.44	
F4-WEST									1176.96		1180.40	3.44		
														0.0023
F4.5-EAST			0.00136	36	3.8	26.60	1,269	0.09		1175.24	1179.00		2.26	
F4.5-WEST									1175.24		1179.00	3.76		
														0.0006
E4-EAST	8.4	38.2	0.00102	42	3.6	34.86	1,271	0.10		1173.34	1177.50		4.26	
D4-EST		7.7							1174.20		1178.20	4.00		
														0.0003
E4-WEST	11.0	11.8	0.00150	27	3.3	12.99	2,640	0.22		1170.24	1177.50		7.26	
E4-SOUTH		124.5							1170.40		1177.50	7.10		
														0.0009
E5-NORTH	20.6 (7.7)	145.1	0.00118	72	5.6	157.76	2,640	0.13		1167.28	1175.00		7.72	
E5-SOUTH									1167.28		1175.00	7.72		
														0.0009
RET BAS	0	145.1	0.00118	72	5.6	157.76	1,320	0.07		1165.72	1173.80		8.08	
E5.5SOUTH									1169.65		1173.65	4.00		
														0.0012
E6-NORTH	17.2 (8.3)	17.2	0.00150	30	3.5	17.21	1,320	0.10		1167.67	1172.10		4.43	
E6-SOUTH									1167.67		1172.10	4.43		
														0.0001
GILA DRN	16.9	27.2	0.00100	36	3.2	22.85	1,900	0.16		1165.77	1172.00		6.23	

12/31/84 FILE NAME:HGLWEST

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - WEST OF RETENTION BASIN

TITLE			MAINLINE								
FROM:		RB	C7.5	C5.5	C5	C4	C3.5	C3	C2	B2.8	B2.5
TO:		C7.5	C5.5	C5	C4	C3.5	C3	C2	B2.8	B2.5	B2
REACH NO:		15	15	15	14	8	8	7	5	4	4
TYPE OF REACH:											
BEGINNING	STA:	0.00	1955.00	2730.00	4050.00	6660.00	8010.00	9330.00	11970.00	12282.00	13170.00
	INV. EL.	1158.01	1161.18	1164.28	1169.56	1174.50	1176.67	1178.80	1184.05	1185.05	1191.23
BEG PIPE	SIZE(FT)	5.00	4.50	4.50	4.50	4.00	4.00	4.00	3.00	2.50	2.00
END PIPE	SIZE(FT)	5.00	4.50	4.50	4.50	4.00	4.00	4.00	3.00	2.50	2.00
PIPE	SLOPE	0.001355	0.004	0.004	0.0017	0.00161	0.00161	0.00161	0.00161	0.0064	0.0064
Q	(CFS)	117.00	117.00	117.00	117.00	66.70	60.00	54.00	34.40	30.00	24.00
LENGTH	(FT)	1955.00	775.00	1320.00	2610.00	1350.00	1320.00	2640.00	312.00	888.00	1486.00
BEGINNING	HGL EL.	1163.81	1167.17	1169.55	1174.06	1181.93	1184.44	1186.42	1189.59	1190.30	1194.35
PIPE	AREA:	19.63	15.90	15.90	15.90	12.57	12.57	12.57	7.07	4.91	3.14
BEG VEL	(FPS)	5.96	7.36	7.36	7.36	5.31	4.77	4.30	4.87	6.11	7.64
END VEL	(FPS)	5.96	7.36	7.36	7.36	5.31	4.77	4.30	4.87	6.11	7.64
BEGINNING	EGL EL.	1164.36	1168.01	1170.39	1174.90	1182.37	1184.79	1186.70	1189.96	1190.88	1195.26
--LOSSES----------											
FRICTION	! n	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
LOSS	!LOSS(FT)	3.36	2.34	3.98	7.87	2.48	1.96	3.18	0.71	4.05	14.25
TRANS	! D2	0	0	0	0	0	0		0		0
LOSS 5D	!LOSS(FT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MANHOLE	! NO.	0	1	1	0	1	1	0	0	0	0
LOSS	!LOSS(FT)	0.00	0.04	0.04	0.00	0.02	0.02	0.00	0.00	0.00	0.00
BEND	! ANGLE	0	0	0	0	0	0	0	0	0	0
LOSS	!LOSS(FT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANGLE	!ANGLE	0	0	90	0	0	90				
POINT	!LOSS(FT)	0.00	0.00	0.25	0.00	0.00	0.11	0.00	0.00	0.00	0.00
JUNCTURE	!Q UP								0		
LOSS	!D UP								0		
	!Q LAT								0		
	!D LAT								0		
	!ANGLE								0		
	!	0	0	0	0	0	0	0	0	0	0
	!LOSS(FT)	0	0	0	0	0	0	0	0	0	0
MISC.	LOSSES		0								
TOTAL	LOSSES	3.36	2.38	4.02	7.87	2.50	1.98	3.18	0.71	4.05	14.25
END	STATION	1955	2730	4050	6660	8010	9330	11970	12282	13170	14656
END RCH	EGL EL.	1167.72	1170.39	1174.42	1182.77	1184.87	1186.77	1189.88	1190.67	1194.93	1203.51
END RCH	HGL EL.	1167.17	1169.55	1173.58	1181.93	1184.44	1186.42	1189.59	1190.30	1194.35	1208.60
END PIPE	INV EL	1160.68	1164.28	1169.56	1174.00	1176.67	1178.80	1183.05	1184.55	1190.73	1200.74
END RCH	GRND EL.	1173.00	1176.80	1183.30	1187.90	1190.00	1192.50	1198.30	1198.00	1203.50	1214.50
GRND MINUS HGL		5.83	7.25	9.72	5.97	5.56	6.08	8.71	7.70	9.15	5.90

12/31/84 FILE NAME:HGLWEST

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - WEST OF RETENTION BASIN

KYRENE LINE - KYRENE ROAD NORTH

```
          TITLE
          FROM:        C2
            TO:      C1.9
       REACH NO:        2
  TYPE OF REACH:
BEGINNING   STA: 11970.00
       INV. EL.  1185.66
BEG PIPE SIZE(FT)    2.00
END PIPE SIZE(FT)    2.00
PIPE       SLOPE  0.00161
      Q    (CFS)   10.40
  LENGTH    (FT)  840.00
BEGINNING HGL EL.  1189.59
----------------
    PIPE   AREA:    3.14
BEG VEL    (FPS)    3.31
END VEL    (FPS)    3.31
BEGINNING EGL EL.  1189.76
--LOSSES----------
FRICTION ! n        0.012
LOSS     !LOSS(FT)   1.51
TRANS    ! D2          0
LOSS 5D  !LOSS(FT)   0.00
MANHOLE  ! NO.         0
LOSS     !LOSS(FT)   0.00
BEND     ! ANGLE       0
LOSS     !LOSS(FT)   0.00
ANGLE    !ANGLE        0
POINT    !LOSS(FT)   0.00
JUNCTURE !Q UP
LOSS     !D UP
         !Q LAT
         !D LAT
         !ANGLE
         !             0
         !LOSS(FT)     0
MISC.    LOSSES
-------------------------
TOTAL    LOSSES      1.51
END      STATION    12810


END RCH  EGL EL.   1191.27
END RCH  HGL EL.   1191.10
END PIPE INV EL    1187.01
END RCH  GRND EL.  1196.00

GRND MINUS HGL       4.90
```

12/31/84 FILE NAME:HGLWEST

PRESSURIZED STORM SEWER DRM CRITERIA
SOUTH TEMPE S.D. - WEST OF RETENTION BASIN

KYRENE LINE - WARNER ROAD WEST

TITLE		
FROM:	C4	RR-WEST
TO:	RR-EAST	B4
REACH NO:	12	11
TYPE OF REACH:		
BEGINNING STA:	6660.00	7980.00
INV. EL.	1179.60	1183.96
BEG PIPE SIZE(FT)	2.50	2.50
END PIPE SIZE(FT)	2.50	2.50
PIPE SLOPE	0.0033	0.0042
Q (CFS)	30.60	22.80
LENGTH (FT)	1320.00	1320.00
BEGINNING HGL EL.	1181.93	1188.19

PIPE AREA:	4.91	4.91
BEG VEL (FPS)	6.23	4.64
END VEL (FPS)	6.23	4.64
BEGINNING EGL EL.	1182.53	1188.53
--LOSSES---		
FRICTION ! n	0.012	0.012
LOSS !LOSS(FT)	6.26	3.48
TRANS ! D2	0	0
LOSS 5D !LOSS(FT)	0.00	0.00
MANHOLE ! NO.	0	1
LOSS !LOSS(FT)	0.00	0.02
BEND ! ANGLE	0	0
LOSS !LOSS(FT)	0.00	0.00
ANGLE !ANGLE	0	0
POINT !LOSS(FT)	0.00	0.02
JUNCTURE !Q UP		
LOSS !D UP		
!Q LAT		
!D LAT		
!ANGLE		
!	0	0
!LOSS(FT)	0	0
MISC. LOSSES		0

TOTAL LOSSES	6.26	3.49
END STATION	7980	9300

END RCH EGL EL.	1188.79	1192.02
END RCH HGL EL.	1188.19	1191.68
END PIPE INV EL	1183.96	1189.50
END RCH GRND EL.	1197.00	1203.00
GRND MINUS HGL	8.81	11.32

12/31/84 FILE NAME:HGLWEST

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - WEST OF RETENTION BASIN

KYRENE LINE - WARNER ROAD EAST

```
          TITLE
          FROM:        C4
            TO:        KC
       REACH NO:       13
  TYPE OF REACH:
BEGINNING   STA:   6660.00
        INV. EL.   1176.50
BEG PIPE SIZE(FT)     2.00
END PIPE SIZE(FT)     2.00
PIPE       SLOPE   0.0022
      Q    (CFS)    10.10
  LENGTH     (FT)   800.00
BEGINNING HGL EL.  1181.93
-----------------
   PIPE    AREA:     3.14
BEG VEL    (FPS)     3.21
END VEL    (FPS)     3.21
BEGINNING EGL EL.  1182.03
--LOSSES----------
FRICTION ! n         0.012
LOSS     !LOSS(FT)    1.36
TRANS    ! D2           0
LOSS 5D  !LOSS(FT)    0.00
MANHOLE  ! NO.          0
LOSS     !LOSS(FT)    0.00
BEND     ! ANGLE        0
LOSS     !LOSS(FT)    0.00
ANGLE    !ANGLE         0
POINT    !LOSS(FT)    0.00
JUNCTURE !Q UP
LOSS     !D UP
         !Q LAT
         !D LAT
         !ANGLE
         !              0
         !LOSS(FT)      0
MISC.    LOSSES
---------------------------
TOTAL    LOSSES       1.36
END      STATION      7460


END RCH  EGL EL.   1183.45
END RCH  HGL EL.   1183.29
END PIPE INV EL    1178.26
END RCH  GRND EL.  1184.26

GRND MINUS HGL       0.97
```

12/31/84 FILE NAME:HGLEASTB

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

TITLE		ALTERNATIVE A - MAINLINE							
FROM:	RB	E5	E4	E3	E2	F2.9	F2.8	F2	G2
TO:	E5	E4	E3	E2	F2.9	F2.8	F2	G2	H2.8
REACH NO:	39	36	27	26	22	22	22	21	17
TYPE OF REACH:	PIPE								
BEGINNING STA:	0.00	1320.00	3915.00	6600.00	9240.00	9545.00	9945.00	11930.00	14520.00
INV. EL.	1149.0	1150.3	1153.6	1157.2	1161.7	1170.6	1171.5	1174.4	1179.6
BEG PIPE SIZE(FT)	5.00	5.00	4.50	4.50	3.50	3.50	3.50	3.00	1.50
END PIPE SIZE(FT)	5.00	5.00	4.50	4.50	3.50	3.50	3.50	3.00	1.50
PIPE SLOPE	0.00105	0.00105	0.00134	0.00134	0.02902	0.0023	0.0012	0.0014	0.0024
Q (CFS)	145.10	145.10	80.80	76.50	35.80	34.50	32.00	17.00	7.70
LENGTH (FT)	1320.00	2595.00	2685.00	2640.00	305.00	400.00	1985.00	2590.00	88.00
BEGINNING HGL EL.	1153.95	1157.44	1164.35	1168.21	1171.63	1174.05	1174.97	1176.69	1181.08
PIPE AREA:	19.63	19.63	15.90	15.90	9.62	9.62	9.62	7.07	1.77
BEG VEL (FPS)	7.39	7.39	5.08	4.81	3.72	3.59	3.33	2.41	4.36
END VEL (FPS)	7.39	7.39	5.08	4.81	3.72	3.59	3.33	2.40	4.36
BEGINNING EGL EL.	1154.80	1158.29	1164.75	1168.57	1171.85	1174.25	1175.14	1176.78	1181.37
--LOSSES----------									
FRICTION ! n	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
LOSS !LOSS(FT)	3.49	6.86	3.86	3.40	0.33	0.40	1.71	1.43	0.40
TRANS ! D2		0						0	
LOSS 5D !LOSS(FT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MANHOLE ! NO.	0	1	0	1	1	1	1	1	0
LOSS !LOSS(FT)	0.00	0.04	0.00	0.02	0.01	0.01	0.01	.00	0.00
BEND ! ANGLE	0	0	0	0	0	0	0	0	0
LOSS !LOSS(FT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANGLE !ANGLE		0			90			90	
POINT !LOSS(FT)	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.03	0.00
JUNCTURE !Q UP								0	
LOSS !D UP								0	
!Q LAT								0	
!D LAT								0	
!ANGLE								0	
!	0	0	0	0	0	0	0	0	0
!LOSS(FT)	0	0	0	0	0	0	0	0	0
MISC. LOSSES		0							
TOTAL LOSSES	3.49	6.91	3.86	3.42	0.34	0.41	1.72	1.44	0.40
END STATION	1320	3915	6600	9240	9545	9945	11930	14520	14608
END EGL EL.	1158.29	1165.20	1168.61	1171.99	1172.19	1174.66	1176.86	1178.22	1181.78
END HGL EL.	1157.44	1164.35	1168.21	1171.63	1171.97	1174.46	1176.69	1178.13	1181.48
PIPE INV EL.	1150.3	1153.0	1157.2	1160.7	1170.6	1171.5	1173.9	5269.8	1179.8
GRND EL.	1175.00	1177.50	1179.30	1180.00	1179.60	1179.80	1182.00	1185.00	1184.00
GRND MINUS HGL	17.56	13.15	11.09	8.37	7.63	5.34	5.31	6.87	2.52

12/31/84 FILE NAME:HSLEASTB

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

ALTERNATIVE A - ELLIOT ROAD, MCCLINTOCK NORTH

TITLE	
FROM:	G2
TO:	G1.5
REACH NO:	18
TYPE OF REACH:	PIPE
BEGINNING STA:	14520.00
INV. EL.	1179.6
BEG PIPE SIZE(FT)	1.50
END PIPE SIZE(FT)	1.50
PIPE SLOPE	0.027
Q (CFS)	8.60
LENGTH (FT)	77.00
BEGINNING HSL EL.	1181.08

PIPE AREA:	1.77
BEG VEL (FPS)	4.87
END VEL (FPS)	4.87
BEGINNING EGL EL.	1181.45

--LOSSES----------

FRICTION	! n	0.012
LOSS	!LOSS(FT)	0.44
TRANS	! D2	
LOSS 5D	!LOSS(FT)	0.00
MANHOLE	! NO.	0
LOSS	!LOSS(FT)	0.00
BEND	! ANGLE	0
LOSS	!LOSS(FT)	0.00
ANGLE	!ANGLE	
POINT	!LOSS(FT)	0.00
JUNCTURE	!Q UP	
LOSS	!D UP	
	!Q LAT	
	!D LAT	
	!ANGLE	
	!	0
	!LOSS(FT)	0
MISC.	LOSSES	

TOTAL	LOSSES	0.44
END	STATION	14597

END	EGL EL.	1181.89
END	HGL EL.	1181.52
PIPE	INV EL.	1181.7
	GRND EL.	1184.70

GRND MINUS HGL 3.18

12/31/84 FILE NAME:HSLEASTB

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

ALTENATIVE A - RURAL ROAD NORTH

TITLE		
FROM:	E2	E1.9
TO:	E1.9	E1.8
REACH NO:	23	23
TYPE OF REACH:	PIPE	
BEGINNING STA:	9240.00	9317.00
INV. EL.	1169.2	1174.5
BEG PIPE SIZE(FT)	1.50	1.50
END PIPE SIZE(FT)	1.50	1.50
PIPE SLOPE	0.0696	0.0024
Q (CFS)	7.60	7.60
LENGTH (FT)	77.00	300.00
BEGINNING HGL EL.	1171.63	1176.01

PIPE AREA:	1.77	1.77
BEG VEL (FPS)	4.30	4.30
END VEL (FPS)	4.30	4.30
BEGINNING EGL EL.	1171.92	1176.30
--LOSSES---		
FRICTION ! n	0.012	0.012
LOSS !LOSS(FT)	0.34	1.34
TRANS ! D2		0
LOSS SD !LOSS(FT)	0.00	0.00
MANHOLE ! NO.	0	1
LOSS !LOSS(FT)	0.00	0.01
BEND ! ANGLE	0	0
LOSS !LOSS(FT)	0.00	0.00
ANGLE !ANGLE		90
POINT !LOSS(FT)	0.00	0.09
JUNCTURE !G UP		
LOSS !D UP		
!G LAT		
!D LAT		
!ANGLE		
!	0	0
!LOSS(FT)	0	0
MISC. LOSSES		0

TOTAL LOSSES	0.34	1.35
END STATION	9317	9617
END EGL EL.	1172.26	1177.65
END HGL EL.	1171.97	1177.36
PIPE INV EL.	1174.5	1175.2
GRND EL.	1179.70	1180.00
GRND MINUS HGL	7.73	2.64

12/31/84 FILE NAME:HGLEASTB

PRESSURIZED STORM SEWER DRM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

TITLE	ALTERNATIVE A - ELLIOT ROAD WEST		
FROM:	E2	D2.8	D2.5
TO:	D2.8	D2.5	D2.25
REACH NO:	25	25	25
TYPE OF REACH:	PIPE		
BEGINNING STA:	9240.00	9713.00	10553.00
INV. EL.	1167.9	1172.0	1173.5
BEG PIPE SIZE(FT)	3.00	3.00	3.00
END PIPE SIZE(FT)	3.00	3.00	3.00
PIPE SLOPE	0.0086	0.00181	0.0016
Q (CFS)	29.90	29.90	21.90
LENGTH (FT)	473.00	840.00	680.00
BEGINNING HGL EL.	1171.85	1174.40	1175.85

PIPE AREA:	7.07	7.07	7.07
BEG VEL (FPS)	4.23	4.23	3.10
END VEL (FPS)	4.23	4.23	3.10
BEGINNING EGL EL.	1172.13	1174.68	1176.00
--LOSSES---------			
FRICTION ! n	0.012	0.012	0.012
LOSS !LOSS(FT)	0.81	1.44	0.62
TRANS ! D2		0	
LOSS SD !LOSS(FT)	0.00	0.00	0.00
MANHOLE ! NO.	0	1	0
LOSS !LOSS(FT)	0.00	0.01	0.00
BEND ! ANGLE	0	0	0
LOSS !LOSS(FT)	0.00	0.00	0.00
ANGLE !ANGLE		90	
POINT !LOSS(FT)	0.00	0.00	0.00
JUNCTURE !Q UP			
LOSS !D UP			
!Q LAT			
!D LAT			
!ANGLE			
!	0	0	0
!LOSS(FT)	0	0	0
MISC. LOSSES		0	

TOTAL LOSSES	0.81	1.45	0.62
END STATION	9713	10553	11233
END EGL EL.	1172.94	1176.13	1176.63
END HGL EL.	1172.66	1175.85	1176.48
PIPE INV EL.	1172.0	1173.5	1174.6
GRND EL.	1180.20	1181.00	1181.90
GRND MINUS HGL	7.54	5.15	5.42

12/31/84 FILE NAME:HGLEASTB

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

```
          TITLE          ALTERNATIVE A - WARNER ROAD WEST
          FROM:       E4
            TO:       D4
       REACH NO:      35
  TYPE OF REACH:    PIPE
BEGINNING   STA:  3915.00
       INV. EL.   1168.0
BEG PIPE SIZE(FT)     2.25
END PIPE SIZE(FT)     2.25
PIPE       SLOPE   0.0015
      Q    (CFS)    11.80
 LENGTH     (FT)  2640.00
BEGINNING HGL EL.  1170.24
-----------------
   PIPE    AREA:     3.98
BEG VEL     (FPS)     2.97
END VEL     (FPS)     2.97
BEGINNING EGL EL.  1170.38
--LOSSES----------
FRICTION ! n         0.012
LOSS     !LOSS(FT)    3.27
TRANS    ! D2
LOSS 5D  !LOSS(FT)    0.00
MANHOLE  ! NO.           0
LOSS     !LOSS(FT)    0.00
BEND     ! ANGLE         0
LOSS     !LOSS(FT)    0.00
ANGLE    !ANGLE
POINT    !LOSS(FT)    0.00
JUNCTURE !Q UP
LOSS     !D UP
         !Q LAT
         !D LAT
         !ANGLE
         !               0
         !LOSS(FT)       0
MISC.    LOSSES
-----------------------
TOTAL    LOSSES       3.27
END      STATION      6555


END      EGL EL.   1173.64
END      HGL EL.   1173.51
PIPE     INV EL.    1172.0
         GRND EL.  1178.20

GRND MINUS HGL        4.69
```

12/31/84 FILE NAME:HGLEASTB

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

TITLE	ALTENATIVE A - WARNER ROAD EAST					
FROM:	E4	F4.5	F4	G4	H4	I4.8
TO:	F4.5	F4	G4	H4	I4.8	I4.5
REACH NO:	33	33	32	29	28	28
TYPE OF REACH:						
BEGINNING STA:	3915.00	5186.00	6455.00	9155.00	11735.00	12215.00
INV. EL.	1170.3	1172.2	1174.0	1176.2	1178.5	1180.0
BEG PIPE SIZE(FT)	3.50	3.00	3.00	2.50	2.50	1.50
END PIPE SIZE(FT)	3.50	3.00	3.00	2.50	2.50	1.50
PIPE SLOPE	0.00102	0.00136	0.00064	0.00031	0.00095	0.00103
Q (CFS)	38.20	35.00	33.80	9.90	4.40	2.90
LENGTH (FT)	1271.00	1269.00	2700.00	2580.00	480.00	835.00
BEGINNING HGL EL.	1173.82	1175.38	1178.38	1184.30	1185.59	1185.64
PIPE AREA:	9.62	7.07	7.07	4.91	4.91	1.77
BEG VEL (FPS)	3.97	4.95	4.78	2.02	0.90	1.64
END VEL (FPS)	3.97	4.95	4.78	2.02	0.90	1.64
BEGINNING EGL EL.	1174.06	1175.76	1178.73	1184.37	1185.60	1185.68
--LOSSES----------						
FRICTION ! n	0.012	0.012	0.012	0.012	0.012	0.012
LOSS !LOSS(FT)	1.56	2.98	5.91	1.28	0.05	0.54
TRANS ! D2						0
LOSS 5D !LOSS(FT)	0.00	0.00	0.00	0.00	0.00	0.00
MANHOLE ! NO.	0	1	1	1	1	1
LOSS !LOSS(FT)	0.00	0.02	0.02	.00	.00	.00
BEND ! ANGLE	0	0	0	0	0	0
LOSS !LOSS(FT)	0.00	0.00	0.00	0.00	0.00	0.00
ANGLE !ANGLE			90			90
POINT !LOSS(FT)	0.00	0.00	0.11	0.00	0.00	0.01
JUNCTURE !Q UP						0
LOSS !D UP						0
!Q LAT						0
!D LAT						0
!ANGLE						0
!	0	0	0	0	0	0
!LOSS(FT)	0	0	0	0	0	0
MISC. LOSSES						
TOTAL LOSSES	1.56	3.00	5.93	1.28	0.05	0.54
END STATION	5186	6455	9155	11735	12215	13050
END EGL EL.	1175.63	1178.76	1184.66	1185.65	1185.65	1186.22
END HGL EL.	1175.38	1178.38	1184.30	1185.59	1185.64	1186.18
PIPE INV EL.	1171.6	1174.0	1175.7	1178.5	1179.0	5269.8
GRND EL.	1179.00	1180.40	1182.60	1183.50	1184.20	1185.50
GRND MINUS HGL	3.62	2.02	-1.70	-2.09	-1.44	-0.68

12/31/84 FILE NAME:HGLEASTB

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

TITLE	ALTERNATIVE A - WARNER, MCCLINTOCK NORTH		
FROM:	64	63.6	63
TO:	63.6	63	62.5
REACH NO:	31B	31A	30
TYPE OF REACH:			
BEGINNING STA:	9200.00	10454.00	11780.00
INV. EL.	1175.2	1176.0	1177.2
BEG PIPE SIZE(FT)	3.00	3.00	2.50
END PIPE SIZE(FT)	3.00	3.00	2.50
PIPE SLOPE	0.003064	0.000049	0.000049
Q (CFS)	17.80	17.80	7.40
LENGTH (FT)	1254.00	1326.00	1320.00
BEGINNING HGL EL.	1184.30	1185.06	1185.87
PIPE AREA:	7.07	7.07	4.91
BEG VEL (FPS)	2.52	2.52	1.51
END VEL (FPS)	2.52	2.52	1.51
BEGINNING EGL EL.	1184.40	1185.16	1185.91
--LOSSES---------			
FRICTION ! n	0.012	0.012	0.012
LOSS !LOSS(FT)	0.76	0.80	0.37
TRANS ! D2			
LOSS 5D !LOSS(FT)	0.00	0.00	0.00
MANHOLE ! NO.	0	1	1
LOSS !LOSS(FT)	0.00	.00	.00
BEND ! ANGLE	0	0	0
LOSS !LOSS(FT)	0.00	0.00	0.00
ANGLE !ANGLE			90
POINT !LOSS(FT)	0.00	0.00	0.01
JUNCTURE !Q UP			
LOSS !D UP			
!Q LAT			
!D LAT			
!ANGLE			
!	0	0	0
!LOSS(FT)	0	0	0
MISC. LOSSES			
TOTAL LOSSES	0.76	0.81	0.37
END STATION	10454	11780	13100
END EGL EL.	1185.16	1185.97	1186.27
END HGL EL.	1185.06	1185.87	1186.24
PIPE INV EL.	1176.0	1176.6	1177.8
GRND EL.	1183.00	1183.20	1184.30
GRND MINUS HGL	-2.06	-2.67	-1.94

12/31/84 FILE NAME:HGLEASTB

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

TITLE	ALTERNATIVE B - MAINLINE						
FROM:	RB	E5	E4	E3	E2	F2	G2
TO:	E5	E4	E3	E2	F2	G2	H2.8
REACH NO:	39	36	27	26	22	21	17
TYPE OF REACH:	PIPE						
BEGINNING STA:	0.00	1320.00	3960.00	6600.00	9240.00	11910.00	14500.00
INV. EL.	1159.7	1161.3	1165.4	1167.2	1170.7	1174.4	1179.6
BEG PIPE SIZE(FT)	6.00	6.00	5.00	5.00	3.50	3.00	1.50
END PIPE SIZE(FT)	6.00	6.00	5.00	5.00	3.50	3.00	1.50
PIPE SLOPE	0.00118	0.00118	0.00068	0.00068	0.00118	0.0014	0.0024
Q (CFS)	145.10	145.10	80.80	76.50	35.80	17.00	7.70
LENGTH (FT)	1320.00	2640.00	2640.00	2640.00	2670.00	2590.00	88.00
BEGINNING HGL EL.	1165.72	1167.04	1169.70	1171.87	1173.82	1176.71	1181.08
PIPE AREA:	28.27	28.27	19.63	19.63	9.62	7.07	1.77
BEG VEL (FPS)	5.13	5.13	4.12	3.90	3.72	2.41	4.36
END VEL (FPS)	5.13	5.13	4.11	3.90	3.72	2.40	4.36
BEGINNING EGL EL.	1166.13	1167.45	1169.95	1172.10	1174.03	1176.80	1181.37
--LOSSES----------							
FRICTION ! n	0.012	0.012	0.012	0.012	0.012	0.012	0.012
LOSS !LOSS(FT)	1.32	2.64	2.17	1.94	2.88	1.43	0.40
TRANS ! D2		0					
LOSS 5D !LOSS(FT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MANHOLE ! NO.	0	1	0	1	1	1	1
LOSS !LOSS(FT)	0.00	0.02	0.00	0.01	0.01	.00	0.01
BEND ! ANGLE	0	0	0	0	0	0	0
LOSS !LOSS(FT)	0.00	0.00	0.00	0.00	0.02	0.00	0.00
ANGLE !ANGLE		0			90		
POINT !LOSS(FT)	0.00	0.00	0.00	0.00	0.06	0.00	0.00
JUNCTURE !Q UP							
LOSS !D UP							
!Q LAT							
!D LAT							
!ANGLE							
!	0	0	0	0	0	0	0
!LOSS(FT)	0	0	0	0	0	0	0
MISC. LOSSES		0					
TOTAL LOSSES	1.32	2.66	2.17	1.95	2.89	1.44	0.42
END STATION	1320	3960	6600	9240	11910	14500	14588
END EGL EL.	1167.45	1170.11	1172.13	1174.06	1176.93	1178.24	1181.79
END HGL EL.	1167.04	1169.70	1171.87	1173.82	1176.71	1178.15	1181.50
PIPE INV EL.	1161.3	1164.4	1167.2	1169.0	1173.8	1178.0	1179.8
GRND EL.	1175.00	1177.50	1179.30	1180.00	1182.00	1185.00	1184.00
GRND MINUS HGL	7.96	7.80	7.43	6.18	5.29	6.85	2.50

12/31/84 FILE NAME:HGLEASTB

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

ALTERNATIVE B - ELLIOT ROAD, MCCLINT CK NORTH

TITLE	
FROM:	62
TO:	61.5
REACH NO:	18
TYPE OF REACH:	PIPE
BEGINNING STA:	14500.00
INV. EL.	1179.6
BEG PIPE SIZE(FT)	1.50
END PIPE SIZE(FT)	1.50
PIPE SLOPE	0.027
Q (CFS)	8.60
LENGTH (FT)	77.00
BEGINNING HGL EL.	1181.08

PIPE AREA:	1.77
BEG VEL (FPS)	4.87
END VEL (FPS)	4.87
BEGINNING EGL EL.	1181.45

--LOSSES---------

FRICTION	! n	0.012
LOSS	!LOSS(FT)	0.44
TRANS	! D2	
LOSS 5D	!LOSS(FT)	0.00
MANHOLE	! NO.	1
LOSS	!LOSS(FT)	0.02
BEND	! ANGLE	0
LOSS	!LOSS(FT)	0.00
ANGLE	!ANGLE	
POINT	!LOSS(FT)	0.00
JUNCTURE	!Q UP	
LOSS	!D UP	
	!Q LAT	
	!D LAT	
	!ANGLE	
	!	0
	!LOSS(FT)	0
MISC.	LOSSES	

TOTAL	LOSSES	0.46
END	STATION	14577

END	EGL EL.	1181.91
END	HGL EL.	1181.54
PIPE	INV EL.	1181.7
	GRND EL.	1184.70

GRND MINUS HGL 3.16

12/31/84 FILE NAME:HGLEASTB

PRESSURIZED STORM SEWER DAM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

ALTERNATIVE B - RURAL ROAD NORTH

TITLE		
FROM:	E2	E1.9
TO:	E1.9	E1.8
REACH NO:	18	18
TYPE OF REACH:	PIPE	
BEGINNING STA:	9240.00	9317.00
INV. EL.	1170.7	1170.7
BEG PIPE SIZE(FT)	1.50	1.50
END PIPE SIZE(FT)	1.50	1.50
PIPE SLOPE	0.0596	0.0024
Q (CFS)	7.60	7.60
LENGTH (FT)	77.00	300.00
BEGINNING HGL EL.	1171.63	1176.01

PIPE AREA:	1.77	1.77
BEG VEL (FPS)	4.30	4.30
END VEL (FPS)	4.30	4.30
BEGINNING EGL EL.	1171.92	1176.30
--LOSSES---		
FRICTION : n	0.012	0.012
LOSS !LOSS(FT)	0.34	1.34
TRANS ! D2		0
LOSS SD !LOSS(FT)	0.00	0.00
MANHOLE ! NO.	1	1
LOSS !LOSS(FT)	0.01	0.01
BEND ! ANGLE	0	0
LOSS !LOSS(FT)	0.00	0.00
ANGLE !ANGLE		0
POINT !LOSS(FT)	0.00	0.00
JUNCTURE !Q UP		
LOSS !D UP		
!Q LAT		
!D LAT		
!ANGLE		
!	0	0
!LOSS(FT)	0	0
MISC. LOSSES		0

TOTAL LOSSES	0.36	1.35
END STATION	9317	9617
END EGL EL.	1172.28	1177.65
END HGL EL.	1171.99	1177.36
PIPE INV EL.	1176.0	1171.4
GRND EL.	1179.70	1180.00
GRND MINUS HGL	7.71	2.64

12/31/84 FILE NAME:HSLEASTB

PRESSURIZED STORM SEWER DFM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

ALTERNATIVE B - ELLIOT ROAD WEST

TITLE		
FROM:	E2	D2.5
TO:	D2.5	D2.25
REACH NO:	25	25
TYPE OF REACH:	PIPE	
BEGINNING STA:	9240.00	10580.00
INV. EL.	1171.1	1173.5
BEG PIPE SIZE(FT)	3.00	3.00
END PIPE SIZE(FT)	3.00	3.00
PIPE SLOPE	0.00181	0.0016
Q (CFS)	29.90	21.90
LENGTH (FT)	1340.00	680.00
BEGINNING HGL EL.	1174.09	1176.37
PIPE AREA:	7.07	7.07
BEG VEL (FPS)	4.23	3.10
END VEL (FPS)	4.23	3.10
BEGINNING EGL EL.	1174.36	1176.52
--LOSSES---------		
FRICTION ! n	0.012	0.012
LOSS !LOSS(FT)	2.29	0.62
TRANS ! D2		0
LOSS 5D !LOSS(FT)	0.00	0.00
MANHOLE ! NO.	0	1
LOSS !LOSS(FT)	0.00	0.01
BEND ! ANGLE	0	0
LOSS !LOSS(FT)	0.00	0.00
ANGLE !ANGLE		90
POINT !LOSS(FT)	0.00	0.04
JUNCTURE !Q UP		
LOSS !D UP		
!Q LAT		
!D LAT		
!ANGLE		
!	0	0
!LOSS(FT)	0	0
MISC. LOSSES		0
TOTAL LOSSES	2.29	0.63
END STATION	10580	11260
END EGL EL.	1176.65	1177.16
END HGL EL.	1176.37	1177.01
PIPE INV EL.	1173.5	1174.6
GRND EL.	1181.00	1181.90
GRND MINUS HGL	4.63	4.89

12/31/84 FILE NAME:HGLEASTB

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

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          TITLE          ALTERNATIVE B - WARNER ROAD WEST
          FROM:       RB
            TO:       E5
       REACH NO:      39
  TYPE OF REACH:    PIPE
BEGINNING   STA:    0.00
       INV. EL.   1168.0
BEG PIPE SIZE(FT)    2.25
END PIPE SIZE(FT)    2.25
PIPE       SLOPE  0.0015
     Q    (CFS)   11.80
 LENGTH     (FT) 2640.00
BEGINNING HGL EL. 1170.24
----------------
   PIPE    AREA:    3.98
BEG VEL    (FPS)    2.97
END VEL    (FPS)    2.97
BEGINNING EGL EL. 1170.38
--LOSSES---------
FRICTION ! n        0.012
LOSS     !LOSS(FT)   3.27
TRANS    ! D2
LOSS SD  !LOSS(FT)   0.00
MANHOLE  ! NO.          0
LOSS     !LOSS(FT)   0.00
BEND     ! ANGLE        0
LOSS     !LOSS(FT)   0.00
ANGLE    !ANGLE
POINT    !LOSS(FT)   0.00
JUNCTURE !Q UP
LOSS     !D UP
         !Q LAT
         !D LAT
         !ANGLE
         !              0
         !LOSS(FT)      0
MISC.    LOSSES
----------------------
TOTAL    LOSSES      3.27
END      STATION     2640


END      EGL EL.   1173.64
END      HGL EL.   1173.51
PIPE     INV EL.    1172.0
         GRND EL.  1178.20

GRND MINUS HGL       4.69
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12/31/84 FILE NAME:HGLEASTB

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

TITLE ALTERNATIVE B - WARNER ROAD EAST

FROM:	E4	F4.5	F4	G4	H4	I4.8
TO:	F4.5	F4	G4	H4	I4.8	I4.5
REACH NO:	33	33	32	29	28	28
TYPE OF REACH:						
BEGINNING STA:	3960.00	5231.00	6500.00	9200.00	11780.00	12260.00
INV. EL.	1170.3	1172.2	1174.0	1176.2	1178.5	1180.0
BEG PIPE SIZE(FT)	3.50	3.00	3.00	2.50	2.50	1.50
END PIPE SIZE(FT)	3.50	3.00	3.00	2.50	2.50	1.50
PIPE SLOPE	0.00102	0.00136	0.00064	0.00091	0.00095	0.00103
Q (CFS)	38.20	35.00	33.80	9.90	4.40	2.90
LENGTH (FT)	1271.00	1269.00	2700.00	2580.00	480.00	835.00
BEGINNING HGL EL.	1173.82	1175.38	1178.38	1184.30	1185.59	1185.64
PIPE AREA:	9.62	7.07	7.07	4.91	4.91	1.77
BEG VEL (FPS)	3.97	4.95	4.78	2.02	0.90	1.64
END VEL (FPS)	3.97	4.95	4.78	2.02	0.90	1.64
BEGINNING EGL EL.	1174.06	1175.76	1178.73	1184.37	1185.60	1185.68
--LOSSES----------						
FRICTION ! n	0.012	0.012	0.012	0.012	0.012	0.012
LOSS !LOSS(FT)	1.56	2.98	5.91	1.28	0.05	0.54
TRANS ! D2						0
LOSS 50 !LOSS(FT)	0.00	0.00	0.00	0.00	0.00	0.00
MANHOLE ! NO.	0	1	1	1	1	1
LOSS !LOSS(FT)	0.00	0.02	0.02	.00	.00	.00
BEND ! ANGLE	0	0	0	0	0	0
LOSS !LOSS(FT)	0.00	0.00	0.00	0.00	0.00	0.00
ANGLE !ANGLE			90			90
POINT !LOSS(FT)	0.00	0.00	0.11	0.00	0.00	0.01
JUNCTURE !D UP						0
LOSS !D UP						0
!D LAT						0
!D LAT						0
!ANGLE						0
!	0	0	0	0	0	0
!LOSS(FT)	0	0	0	0	0	0
MISC. LOSSES						
TOTAL LOSSES	1.56	3.00	5.93	1.28	0.05	0.54
END STATION	5231	6500	9200	11780	12260	13095
END EGL EL.	1175.63	1178.76	1184.66	1185.65	1185.65	1186.22
END HGL EL.	1175.38	1178.38	1184.30	1185.59	1185.64	1186.18
PIPE INV EL.	1171.6	1174.0	1175.7	1178.5	1179.0	5269.8
GRND EL.	1179.00	1180.40	1182.60	1183.50	1184.20	1185.50
GRND MINUS HGL	3.62	2.02	-1.70	-2.09	-1.44	-0.68

12/31/84 FILE NAME:HGLEASTB

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

TITLE ALTERNATIVE B - WARNER ROAD, MCCLINTOCK NORTH

FROM:	G4	G3.6	G3
TO:	G3.6	G3	G2.5
REACH NO:	31A	31A	30
TYPE OF REACH:			
BEGINNING STA:	9200.00	10454.00	11780.00
INV. EL.	1175.2	1176.0	1177.2
BEG PIPE SIZE(FT)	3.00	3.00	2.50
END PIPE SIZE(FT)	3.00	3.00	2.50
PIPE SLOPE	0.00064	0.00043	0.00043
Q (CFS)	17.80	17.80	7.40
LENGTH (FT)	1254.00	1326.00	1320.00
BEGINNING HGL EL.	1184.30	1185.05	1185.87
PIPE AREA:	7.07	7.07	4.91
BEG VEL (FPS)	2.52	2.52	1.51
END VEL (FPS)	2.52	2.52	1.51
BEGINNING EGL EL.	1184.40	1185.16	1185.91
--LOSSES----------			
FRICTION ! n	0.012	0.012	0.012
LOSS !LOSS(FT)	0.76	0.80	0.37
TRANS ! D2			
LOSS ED !LOSS(FT)	0.00	0.00	0.00
MANHOLE ! NO.	0	1	1
LOSS !LOSS(FT)	0.00	.00	.00
BEND ! ANGLE	0	0	0
LOSS !LOSS(FT)	0.00	0.00	0.00
ANGLE !ANGLE			90
POINT !LOSS(FT)	0.00	0.00	0.01
JUNCTURE !Q UP			
LOSS !D UP			
!Q LAT			
!D LAT			
!ANGLE			
!	0	0	0
!LOSS(FT)	0	0	0
MISC. LOSSES			
TOTAL LOSSES	0.76	0.81	0.37
END STATION	10454	11780	13100
END EGL EL.	1185.16	1185.97	1186.27
END HGL EL.	1185.06	1185.87	1186.24
PIPE INV EL.	1176.0	1176.6	1177.8
GRND EL.	1183.00	1183.20	1184.30
GRND MINUS HGL	-2.06	-2.67	-1.94

12/31/84 FILE NAME:HGLEASTB

PRESSURIZED STORM SEWER DPM CRITERIA
SOUTH TEMPE S.D. - EAST OF RETENTION BASIN

TITLE	RAY ROAD, RURAL ROAD	
FROM:	GD	E6
TO:	E6	E5.5
REACH NO:	37	38
TYPE OF REACH:	PIPE	
BEGINNING STA:	0.00	1900.00
INV. EL.	1162.8	1165.2
BEG PIPE SIZE(FT)	3.00	2.50
END PIPE SIZE(FT)	3.00	2.50
PIPE SLOPE	0.001	0.0015
Q (CFS)	27.20	17.20
LENGTH (FT)	1900.00	1320.00
BEGINNING HGL EL.	1165.77	1168.46
PIPE AREA:	7.07	4.91
BEG VEL (FPS)	3.85	3.50
END VEL (FPS)	3.85	3.50
BEGINNING EGL EL.	1166.00	1168.65
--LOSSES---------		
FRICTION ! n	0.012	0.012
LOSS !LOSS(FT)	2.69	1.98
TRANS ! D2		0
LOSS 5D !LOSS(FT)	0.00	0.00
MANHOLE ! NO.	0	1
LOSS !LOSS(FT)	0.00	0.01
BEND ! ANGLE	0	0
LOSS !LOSS(FT)	0.00	0.00
ANGLE !ANGLE		90
POINT !LOSS(FT)	0.00	0.06
JUNCTURE !Q UP		
LOSS !D UP		
!Q LAT		
!D LAT		
!ANGLE		
!	0	0
!LOSS(FT)	0	0
MISC. LOSSES		0
TOTAL LOSSES	2.69	1.99
END STATION	1900	3220
END EGL EL.	1168.69	1170.64
END HGL EL.	1168.46	1170.45
PIPE INV EL.	1164.7	1167.2
GRND EL.	1172.10	1173.65
GRND MINUS HGL	3.64	3.20

KYRENE ROAD STORM DRAIN

DESCRIPTION	UNITS	UNIT PRICE	KYRENE-KNOX MAIN LINE QTY.	AMT.	WARNER BRANCH WEST QTY	AMT	WARNER BRANCH EAST QTY	AMT
STORM DRAIN PIPE								
24" RCP	LF	$35	0	$0	0	$0	800	$28,000
30" RCP	LF	$40	0	$0	2640	$105,600	0	$0
36" RCP	LF	$50	0	$0	0	$0	0	$0
48" RCP	LF	$65	4910	$319,150	0	$0	0	$0
54" RCP	LF	$79	4705	$371,695	0	$0	0	$0
60" RCP	LF	$86	1955	$168,130	0	$0	0	$0
TRENCHING,BACKFILLING & COMPACTION 18"-36" PIPE								
LESS THAN 8'	LF	$10	0	$0	0	$0	340	$3,264
8' TO 14'	LF	$14	0	$0	2420	$34,751	460	$6,606
14' TO 20'	LF	$22	0	$0	220	$4,814	0	$0
GREATER THAN 20'	LF	$36	0	$0	0	$0	0	$0
TRENCHING, BACKFILLING & COMPACTION 42" AND OVER PIPE								
LESS THAN 8'	LF	$12	0	$0	0	$0	0	$0
8'TO 14'	LF	$17	7530	$129,893	0	$0	0	$0
14' TO 20'	LF	$25	4040	$101,000	0	$0	0	$0
GREATER THAN 20'	LF	$39	0	$0	0	$0	0	$0
MANHOLE TYPE 520 & 522								
BASE TO 6' DEPTH	EA	$1,750	13	$22,750	6	$10,500	3	$5,250
6'-10' DEPTH	VF	$58	52	$3,016	20	$1,160	4	$232
10'-14' DEPTH	VF	$60	48	$2,880	14	$840	0	$0
OVER 14' DEPTH	VF	$62	6	$372	0	$0	0	$0
MANHOLE TYPE 521 & 522								
BASE TO 6' DEPTH	EA	$2,300	2	$4,600	1	$2,300	0	$0
6'-10' DEPTH	VF	$58	8	$464	4	$232	0	$0
10'-14' DEPTH	VF	$60	5	$300	3	$180	0	$0
OVER 14' DEPTH	VF	$62	0	$0	0	$0	0	$0
JUNCTION BOX	EA	$6,000	5	$30,000	0	$0	0	$0
CURB INLETS	EA	$2,300	18	$41,400	10	$23,000	4	$9,200
15" CONNECTOR PIPE	LF	$45	810	$36,450	450	$20,250	180	$8,100
REMOVAL & REPLACEMENT ITEMS								
PAVEMENT TYPE "A"	SY	$13	7485	$97,305	1478	$19,214	375	$4,875
PAVEMENT TYPE "B"	SY	$25	360	$9,000	130	$3,250	43	$1,075
WESTERN CANAL CROSSING	LS	$25,000	1	$25,000	0	$0	0	$0
RR SPUR CROSSING	LS	$25,000	0	$0	1	$25,000	0	$0
TRAFFIC CONTROL DEVICES	LF	$2	11570	$23,140	2640	$5,280	800	$1,600
OFF DUTY OFFICER	HR	$17	200	$3,400	20	$340	0	$0
SUBTOTAL				$1,389,945		$256,711		$68,202

KYRENE ROAD STORM DRAIN

DESCRIPTION	UNITS	UNIT PRICE	KYRENE-KNOX MAIN LINE QTY.	KYRENE-KNOX MAIN LINE AMT.	WARNER BRANCH WEST QTY	WARNER BRANCH WEST AMT	WARNER BRANCH EAST QTY	WARNER BRANCH EAST AMT
15% MISC. & CONTINGENCY				$208,492		$38,507		$10,230
12% ENG. AND INSPECTION COSTS				$166,793		$30,805		$8,184
SUBTOTAL				$1,765,230		$326,023		$86,616
GRAND TOTAL				$2,177,868				

RURAL ROAD STORM DRAIN; Alternate A

DESCRIPTION	UNITS	UNIT PRICE	RURAL-KNOX MAIN LIN QTY.	RURAL-KNOX MAIN LIN AMT.	WARNER BRANCH WEST QTY	WARNER BRANCH WEST AMT	WARNER BRANCH EAST QTY	WARNER BRANCH EAST AMT
STORM DRAIN PIPE								
18" RCP	LF	$20	0	$0	0	$0	835	$16,700
24" RCP	LF	$35	0	$0	0	$0	0	$0
27" RCP	LF	$38	0	$0	2640	$100,320	0	$0
30" RCP	LF	$40	0	$0	0	$0	1320	$52,800
36" RCP	LF	$50	0	$0	0	$0	1326	$66,300
42" RCP	LF	$52	0	$0	0	$0	100	$5,200
54" RCP	LF	$78	5325	$415,350	0	$0	0	$0
60" RCP	LF	$86	3915	$336,690	0	$0	0	$0
TRENCHING, BACKFILLING & COMPACTION 18"-36" PIPE								
LESS THAN 8'	LF	$10	0	$0	1500	$14,400	3481	$33,418
8' TO 14'	LF	$14	0	$0	1140	$16,370	0	$0
14' TO 20'	LF	$22	0	$0	0	$0	0	$0
GREATER THAN 20'	LF	$36	0	$0	0	$0	0	$0
TRENCHING, BACKFILLING & COMPACTION 42" AND OVER PIPE								
LESS THAN 8'	LF	$12	0	$0	0	$0	100	$1,240
8' TO 14'	LF	$17	0	$0	0	$0	0	$0
14' TO 20'	LF	$25	530	$13,250	0	$0	0	$0
GREATER THAN 20'	LF	$39	8710	$341,258	0	$0	0	$0
MANHOLE TYPE 520 & 522								
BASE TO 6' DEPTH	EA	$1,750	0	$0	8	$14,000	11	$19,250
6'-10' DEPTH	VF	$58	0	$0	32	$1,856	10	$580
10'-14' DEPTH	VF	$60	0	$0	15	$900	0	$0
OVER 14' DEPTH	VF	$62	0	$0	0	$0	0	$0
MANHOLE TYPE 521 & 522								
BASE TO 6' DEPTH	EA	$2,300	12	$27,600	0	$0	0	$0
6'-10' DEPTH	VF	$58	48	$2,784	0	$0	0	$0
10'-14' DEPTH	VF	$60	48	$2,880	0	$0	0	$0
OVER 14' DEPTH	VF	$62	109	$6,758	0	$0	0	$0
JUNCTION BOX	EA	$6,000	4	$24,000	0	$0	0	$0
CURB INLETS	EA	$2,300	18	$41,400	6	$13,800	6	$13,800
15" CONNECTOR PIPE	LF	$45	810	$36,450	270	$12,150	270	$12,150
REMOVAL & REPLACEMENT ITEMS								
PAVEMENT TYPE "A"	SY	$13	9500	$123,500	1400	$18,200	2025	$26,325
PAVEMENT TYPE "B"	SY	$25	903	$22,575	101	$2,525	157	$3,925
GILA DRAIN CROSSING	LS	$56,250	1	$56,250	0	$0	0	$0
TRAFFIC CONTROL DEVICES	LF	$2	9240	$18,480	2640	$5,280	3581	$7,162
OFF DUTY OFFICER	HR	$17	200	$3,400	0	$0	16	$272
SUBTOTAL				$1,472,625		$199,801		$259,122

RURAL ROAD STORM DRAIN; Alternate A

DESCRIPTION	UNITS	UNIT PRICE	RURAL-KNOX MAIN LIN QTY.	RURAL-KNOX MAIN LIN AMT.	WARNER BRANCH WEST QTY	WARNER BRANCH WEST AMT	WARNER BRANCH EAST QTY	WARNER BRANCH EAST AMT
15% MISC. & CONTINGENCY				$220,894		$29,970		$38,868
12% ENG. AND INSPECTION COSTS				$176,715		$23,976		$31,095
SUBTOTAL				$1,870,233		$253,748		$329,084
GRAND TOTAL				$2,453,066				

RURAL ROAD STORM DRAIN; Alternate B

DESCRIPTION	UNITS	UNIT PRICE	RURAL-KNOX MAIN LIN QTY.	RURAL-KNOX MAIN LIN AMT.	WARNER BRANCH WEST QTY	WARNER BRANCH WEST AMT	WARNER BRANCH EAST QTY	WARNER BRANCH EAST AMT
STORM DRAIN PIPE								
18" RCP	LF	$20	0	$0	0	$0	835	$16,700
24" RCP	LF	$35	0	$0	0	$0	0	$0
27" RCP	LF	$38	0	$0	2640	$100,320	0	$0
30" RCP	LF	$40	0	$0	0	$0	1320	$52,800
36" RCP	LF	$50	0	$0	0	$0	1326	$66,300
42" RCP	LF	$60	0	$0	0	$0	100	$6,000
60" RCP	LF	$75	5280	$396,000	0	$0	0	$0
72" RCP	LF	$100	3960	$396,000	0	$0	0	$0
84"RCP	LF	$124	0	$0				
TRENCHING,BACKFILLING & COMPACTION 18"-36" PIPE								
LESS THAN 8'	LF	$10	0	$0	1500	$14,400	3481	$33,418
8' TO 14'	LF	$14	0	$0	1140	$16,370	0	$0
14' TO 20'	LF	$22	0	$0	0	$0	0	$0
GREATER THAN 20'	LF	$36	0	$0	0	$0	0	$0
TRENCHING, BACKFILLING & COMPACTION 42" AND OVER PIPE								
LESS THAN 8'	LF	$12	0	$0	0	$0	100	$1,240
8'TO 14'	LF	$17	8240	$142,140	0	$0	0	$0
14' TO 20'	LF	$25	1000	$25,000	0	$0	0	$0
GREATER THAN 20'	LF	$39	0	$0	0	$0	0	$0
MANHOLE TYPE 520 & 522								
BASE TO 6' DEPTH	EA	$1,750	0	$0	8	$14,000	11	$19,250
6'-10' DEPTH	VF	$58	0	$0	32	$1,856	10	$580
10'-14' DEPTH	VF	$60	0	$0	15	$900	0	$0
OVER 14' DEPTH	VF	$62	0	$0	0	$0	0	$0
MANHOLE TYPE 521 & 522								
BASE TO 6' DEPTH	EA	$2,300	12	$27,600	0	$0	0	$0
6'-10' DEPTH	VF	$58	48	$2,784	0	$0	0	$0
10'-14' DEPTH	VF	$60	28	$1,680	0	$0	0	$0
OVER 14' DEPTH	VF	$62	0	$0	0	$0	0	$0
JUNCTION BOX	EA	$6,000	4	$24,000	0	$0	0	$0
CURB INLETS	EA	$2,300	18	$41,400	6	$13,800	6	$13,800
15" CONNECTOR PIPE	LF	$45	810	$36,450	270	$12,150	270	$12,150
REMOVAL & REPLACEMENT ITEMS								
PAVEMENT TYPE "A"	SY	$13	0	$0	1400	$18,200	2025	$26,325
PAVEMENT TYPE "B"	SY	$25	111	$2,775	101	$2,525	157	$3,925
TRAFFIC CONTROL DEVICES	LF	$2	9240	$18,480	2640	$5,280	3581	$7,162
OFF DUTY OFFICER	HR	$17	200	$3,400	0	$0	16	$272
SUBTOTAL				$1,117,709		$199,801		$259,922

RURAL ROAD STORM DRAIN; Alternate B

DESCRIPTION	UNITS	UNIT PRICE	RURAL-KNOX MAIN LIN QTY.	RURAL-KNOX MAIN LIN AMT.	WARNER BRANCH WEST QTY	WARNER BRANCH WEST AMT	WARNER BRANCH EAST QTY	WARNER BRANCH EAST AMT
15% MISC. & CONTINGENCY				$167,656		$29,970		$38,988
12% ENG. AND INSPECTION COSTS				$134,125		$23,976		$31,191
SUBTOTAL				$1,419,490		$253,748		$330,100

GRAND TOTAL OF ALL SEGMENTS $2,003,339

DETENTION BASIN AND PUMPING STATION

DESCRIPTION	UNITS	UNIT PRICE	ALTERNATE A QTY.	ALTERNATE A AMT.	ALTERNATE B QTY.	ALTERNATE B AMT.

DETENTION BASIN AND PUMPING STATION

DESCRIPTION	UNITS	UNIT PRICE	ALTERNATE A QTY.	ALTERNATE A AMT.	ALTERNATE B QTY.	ALTERNATE B AMT.
DETENION BASIN						
EXCAVATION	CY	$3	450000	$1,350,000	350000	$1,050,000
SEEDING	AC	$1,000	15	$15,000	15	$15,000
IRRIGATION SYSTEM	AC	$3,000	15	$45,000	15	$45,000
LANDSCAPING	LS	$100,000	1	$100,000	1	$100,000
PUMP STATION	LS	$60,000	1	$60,000	1	$60,000
GILA DRAIN STR.	LS	$20,000	1	$20,000	-	-
GILA DRAIN STR.	LS	$30,000	-	-	1	$30,000
SUBTOTAL				$1,550,000		$1,300,000
15% MISC. & CONTINGENCY				$238,500		$195,000
12% ENG. AND INSPECTION COSTS				$190,800		$156,000
TOTAL EACH ALTERNATE				$2,019,300		$1,651,000