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SOUTHWEST BASIN MANAGEMENT STUDY
PHASE II, PART A

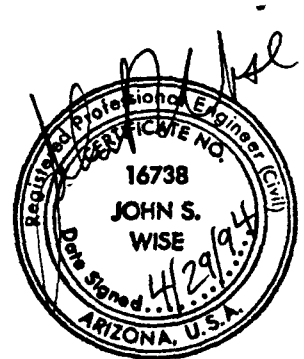
(INCLUDING SECTION 34, T14S, R12E
AND TUCSON ESTATES SUBDIVISION)

VOLUME 2 OF 2

April 29, 1994
CBA File No. 106579-01-0280
JLL00130.02R

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4911 East Broadway Boulevard
Tucson, Arizona 85711

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APPENDIX A

Scope of Work

EXHIBIT "A"

SOUTHWEST BASIN MANAGEMENT STUDY: PHASE II, PART A

STATEMENT OF PURPOSE

This study is being undertaken to develop and compare alternative methods of mitigating existing hazards within Section 34 of Township 14 South, Range 12 East and the areas tributary thereto which were initially documented in Phase I of the Southwest Basin Management Study (SWBMS/I). The specific objectives of this study are as follows:

1. To identify alternatives for mitigating the hazards and problems identified as existing within the study area as documented within Phase I of this study and other previous studies.
2. To evaluate mitigation alternatives for flood mitigation potential and cost effectiveness relative to other alternatives.
3. To recommend a preferred alternative for mitigation of the identified hazards and to develop recommendations for flood control policy changes specific to the study area which will prevent the future occurrence of the types of problems which currently exist within the study area.

STUDY AREA

The study area, for purposes of hazard mitigation, is in Section 34 of Township 14 South, Range 12 East and the areas tributary thereto (see Figure 1, attached). The study area, as described in the Phase I of the SWBMS/I report, consists of poorly defined flow patterns and inadequate channel capacity where channels do exist. Floodplain definition and associated damage potential is indeterminate, however, documentation of extensive and recurrent flooding problems has accumulated over the years.

The study should consider implementation of alternatives which involve improvements anywhere within the study area, including locations within Tucson Mountain Park, to mitigate hazards within the study area. The study shall include analysis of impacts to any areas within Section 34 and the areas tributary thereto which are affected by the alternative identified flood control improvements. In particular the study shall include an evaluation of potential benefits and impacts on the Tucson Estates Subdivision resulting from any improvements considered within the areas upstream of the subdivision.

SCOPE OF WORK

TASK 1 - REVIEW OF EXISTING INFORMATION

A. Collect, review and evaluate existing data and reports pertaining to Southwest Basin Management Study.

CONSULTANT shall initiate this task by correlating the required data to be reviewed to the specific objectives of the Southwest Basin Management Study (SWBMS/I). The documents identified in the scope of work shall be reviewed, as will other documents deemed necessary to this project.

Phase I of the SWBMS addressed existing basin conditions, feasible flood control alternatives/projects and identified floodplain management policies. The overall study area encompassed Black Wash watershed, and includes area A for this project. The Southwest Area Plan identifies potential zoning which would allow residential development in the eastern portion of the Black Wash area, which includes area A. Aerials (1936-1988), topography and peak discharge estimates are available from SWBMS Phase I, and shall be utilized for this project to the extent possible. In general, natural washes lack relief to contain flow, and represent a distributary flow system with potential for breakout throughout the area.

Area A includes Tucson Estates Mobile Home Park, and Tierra Bonita and Golden Gate Subdivisions. Numerous mobile homes in the former property have been flooded, as have homes in the subdivisions. All-weather access is lacking within the residential projects, as well as along Bopp Road and Camino Verde Road. Sheet flow occurs across roads, which denies access to the residents. Roads and subdivision drainage improvements do not comply with current drainage standards. The areas have been designated as a critical basin, with associated detention requirements. Issues identified for future studies include public safety, public and private drainage improvements, transportation impacts (including all weather access) and future improvements/developments. One potential means of controlling runoff in the area was identified as providing detention storage via impounding runoff behind elevated roadway embankments.

Survey information shall be obtained, if deemed necessary and so directed by **OWNER**. **OWNER** will provide general, available survey and topographic mapping information. Field verification of specific areas, intersections, etc. will be conducted by hydrologists/engineers on a limited basis via observation techniques or simple survey efforts, as required to conduct the project tasks.

B. Hydrologic and Hydraulic Analysis for Cooke Residence Drainage Complaint.

The Cooke residence, located on the west side of Fred Avenue north of Irvington Road, was flooded during a rain event on July 24, 1990 (approximately 4.7 inches over 2 hours). The analysis investigated the event, runoff sources, and impact of runoff from the new CAP plant and associated detention basin, located east of the subject property. The conclusion of the study indicates that the CAP project and detention basin did not significantly alter drainage conditions.

C. Conceptual Plan for Flood Protection for Tucson Water Treatment Facility.

The CAP Water Treatment Plant includes a detention basin (constructed) at the northwest corner of Section 35, immediately east of and adjacent to Section 34. There is potential for the basin to be enlarged in order to collect runoff from the upstream watershed area, if deemed feasible and appropriate to assist in mitigating flood potential.

D. Review Existing Drainage Complaints on File at Pima County Flood Control District.

Phase I of the SWBMS included an initial review of drainage complaint files, and will be updated with a thorough review of the files. Drainage complaints will be catalogued relative to location, severity, cause, damage, and other criteria; and used to develop an historic perspective of flooding problems in the area.

E. Collect, Review and Evaluate Historical Aerial Photographs/Topography and Maps.

Depending upon data availability, applicability, reliability and accuracy for the study area gathered for this task, CONSULTANT shall seek additional data by conducting field reconnaissance/observation surveys and newspaper review. Individuals living in the study area shall also be interviewed to confirm the validity of the available hydrology and floodplain data. Geology and soils maps shall be used in conducting drainage and erosion/geomorphic assessments. Aerial photographs shall be used in identifying flow paths, and potentially in locating floodplain limits based on vegetation density.

F. Subdivision Files.

Research and assess subdivision files for flooding, erosion, floodplain use permits, violations and litigations to gain historical perspective of the project areas. In addition, basic platting information, original drainage plans/considerations, hydrologic conditions, etc. will be determined from these records.

OWNER shall minimize costs for Task 1 by gathering information, such as document data/complaint records, construction plans, area plans, etc., and providing as much material as possible from its files.

TASK 2 - PERFORM HYDROLOGIC AND TOPOGRAPHIC ANALYSES

A. Map existing flood and erosion hazards and drainage-related problems.

Mapping and delineation of existing flood (100-year floodplain) and erosion hazard limits for flows in excess of 500 cfs shall be based on information generated from Task 1. Existing drainage problems identified in Task 1 shall be located on the maps. Peak discharge data from the Phase I SWBMS shall be utilized to assess existing conditions. Additional concentration points, as required, utilizing **OWNER** method will be evaluated. This information shall be used to delineate the main flow paths and determine transects through the study area.

In the event specific areas of the project reach dictate the necessity for additional peak discharge and/or modelling efforts based on modified watershed boundaries, significant channel change, etc., **CONSULTANT** shall identify this need and notify **OWNER**. Flow depths curves of 0-1, 1-2 and 2-3 feet shall be mapped based on the distribution of flow along the main flow paths.

CONSULTANT has developed an earthworks computer model (COGO Software) which is utilized to determine cut and fill quantities, for grading projects. An additional routine has been added to the model which allows the user to conduct a Manning's Rating analysis for any specific cross-section. This model allows extreme flexibility in conducting Manning's Ratings: cross-sections may be very wide (1 mile plus if desired), 300 station/elevation points, Manning's or values between each point if desired, imaginary "walls" to contain flow between specific stations (thereby not allowing breakout to occur). The approach using this modelling tool shall be as follows:

1. Develop cross-sections encompassing entire watershed width.
2. Apply concentration point runoff to specific portions of each cross-section.
3. Apply "walls" at specific stations to determine capacities of existing channels prior to breakout.
4. Combine flows above breakout capacity levels, remove walls along cross-section, and allow flow to seek equilibrium elevation (an iterative process) over selected portions, or entire width of cross-section.
5. When an equilibrium elevation is obtained, flow values for specific portions of the cross-section will be known, and can be utilized as initial input for next downstream section.

NOTE: This procedure will need to be initiated far enough upstream in order to begin with concentrated flow locations, where breakout does not occur. In this way, initial flow values for specific concentration points along cross-sections will be relatively fixed, prior to reaching the distributary flow areas of the watershed.

CONSULTANT shall conduct a field observation survey of the study area to assist in determining hydrologic/hydraulic and geomorphologic changes, and to assist in identifying potential floodplain and erosion hazard areas. This survey will investigate processes including, but not limited to, erosion, aggradation and degradation. Quantitative and qualitative assessments (Level 1 and 2) will be offered to support the observations, which will assist in identifying flowpaths, erosion problem areas and zones/reaches, and resultant channel transect areas and depth zones. Description of Level 1 and 2 assessments are described below:

Level I - Qualitative Geomorphic Analysis - Field investigation (observations) will be conducted to assess current, general trends of the wash towards streambed aggradation or degradation, bank erosion and meander migration. Available aerial photographs of the study reach will be compared to assess historical channel behavior, including general channel widening or narrowing, meander migration, and locations of significant bank scour along the study reach.

Level II - Engineering Geomorphic Analysis

The degradation and aggradation potential can be quantitatively determined through application of available engineering analyses. The quantitative engineering analysis combines a sediment distribution analysis with a hydraulic analysis of the main channel in order to allow an estimate to be made of sediment transport capacities and sediment supply within the channel and floodplain areas. The following tasks shall be performed as part of this analysis, as applicable, to assist in identifying floodprone/erosion areas: profile analysis, equilibrium slope determination, incipient motion analysis, and scour calculations. Information and preliminary results generated from Tasks 1 and 2 shall be summarized in report format (for inclusion in Final Report) and presented to OWNER at a coordination meeting.

TASK 3 - IDENTIFY PRIMARY PROBLEM AREAS

Based on results of Task 2, problem areas will be located within the study area and categorized based on type of problem and severity of problem (i.e., flooding depth, erosion potential, damage potential, access problems, safety issues). Potential categories for types of problems will include sheet flooding, undefined flow patterns/breakout potential, erosion hazards and access limitations.

TASK 4 - QUALITATIVE ASSESSMENT OF NON-COMPLIANCE WITH PIMA COUNTY FLOODPLAIN MANAGEMENT AND EROSION HAZARD ORDINANCE (1988-FC2)

The current ordinance will be evaluated relative to the identified flooding potential and problem areas, i.e., if the current ordinance had been in effect at time of development, would the same flooding potential and problem areas still be in existence. In addition, non-compliance/violations will be identified if any are evident. Examples of areas to be evaluated include subdivision developments, roadways, etc.; i.e., if homes had been developed under current standards and elevated appropriately, and if roadway crossings were designed to comply with all-weather access criteria, would specific areas be subject to existing flooding conditions.

TASK 5 - IDENTIFICATION OF POSSIBLE STRUCTURAL AND NON-STRUCTURAL FLOOD CONTROL ALTERNATIVES (MINIMUM OF FIVE ALTERNATIVES)

CONSULTANT shall address structural and non-structural alternatives as specified. In addition to the list of individual alternatives itemized below, CONSULTANT shall assess a combination of interactive alternatives, which will be proposed at this juncture. Another alternative that shall be considered is the possibility of limiting discharges through modifying existing zoning densities in the watershed.

CONSULTANT is well aware of the importance of this task due to recent interest shown by the community in environmental issues. This task will be critical in order to establish future development trends and goals in the SWBMS/IIA watershed. The following lists describe specific, possible structural and non-structural alternatives:

- A. Structural alternatives for flood and erosion hazard mitigation measures shall include, but are not limited to: a) full reach channelization, partial reach channelization, low flow channelization; b) flood control levees/berms; c) construction of one or more dams or regional retention/detention basins; d) structural roadway drainage crossings; e) upstream diversion with channelization; f) individual and/or group/large scale floodproofing measures.**

- Structure Relocation
- Improved Drainage Channels/Corridors
- Dip Crossings
- Culverts
- Bridges
- Storm Drains
- Detention/Retention Facilities
- Sediment Basins
- Energy Dissipation Structures
- Grade-Control Structures (Check Dams)
- Erosion Protection
- Levees/Dikes
- Dams/Floodwalls
- Diversion Structures (Potentially effective at apices and avulsion zones)
- Channel Parkways
- Roadway Improvements
- Street Conveyance
- Parking Lot Conveyance

- B. Non-structural measures for mitigating flood and erosion hazards shall be assessed in the study area. The measures shall include, but are not limited to, total or partial property acquisition, advanced warning systems, site specific land use/development regulations and policies, and a no-action alternative, which maintains existing, natural floodplains.**

- Structural Floodproofing/Erosion Proofing
- New Development Design Criteria
- Impact Fees
- Drainage Plan Review/Approval
- Building/Floodplain Permitting
- Maintenance/Operation
- Enforcement
- Public Education/Involvement Ordinances/Policies
- Organization/Management
- Property Acquisition

Information and preliminary results generated from Tasks 3, 4 and 5 will be summarized in report format (for inclusion in Final Report) and presented to **OWNER** at a coordination meeting.

TASK 6 - PERFORM AN EVALUATION OF THE ALTERNATIVES

All structural and non-structural alternatives shall be evaluated using available data, models, studies, plans, etc. to provide information on completeness, effectiveness, efficiency (costs) and acceptableness (social/environmental advantages and disadvantages).

CONSULTANT's Project Team will utilize the available data, models and information gathered in Tasks 1 through 5 to assess the engineering feasibility and effectiveness of proposed alternatives. These evaluations will be conducted to conceptualize hydrologic and hydraulic impacts on the study reach and watershed. Order of magnitude cost estimates will be obtained from available resource material. Empirical equations will be employed to evaluate channelization alternatives, channel routing impacts, dams, detention/ retention facilities, etc. Social and environmental impacts will be identified from existing resource material. These analyses will provide a basis for evaluation and ranking of the alternatives in the subsequent task.

- A. Completeness - Address components of alternatives relative to overall desired benefits of this project. Specific design parameters for each alternative will be identified and conceptually analyzed/sized in order to satisfy the overall goal of mitigating/controlling runoff and erosion.**
- B. Effectiveness - Identify level of flooding/erosion protection each alternative provides, while at the same time utilizes available opportunities (i.e, roadways for ponding, etc.) and does not create adverse impacts to adjacent areas.**

Each alternative will be evaluated as to the above considerations. Level of protection relative to frequency flood event will be identified. Opportunities for multi-use will be identified, including roadway, recreation, etc. Finally, impacts to adjacent areas will be addressed for each alternative.

- C. Efficiency - Provide a cost estimate for each alternative including property acquisition/right-of-way, construction, engineering and administrative costs.**

CONSULTANT shall estimate costs for each alternative as specified above. In addition, the assessments conducted in Tasks 1-5 shall be incorporated into the cost estimates as applicable. This data shall will be included in the decision matrix, as it will be extremely critical in determining which alternatives are feasible. Costs will be compared to a "no action" cost, which will qualitatively assess basin flood damage information, such as number of homes in floodplain zones, approximation of flood insurance premiums, approximation of flood damage based on assessor's records for structure/property values.

Cost estimates shall be addressed for each concept alternative, and shall include: construction and right-of-way costs, engineering/administrative costs, (as a standard percentage of construction costs), utility relocation costs, life-cycle operation and maintenance costs, and property acquisition costs based on an average cost per acre (to be obtained from OWNER Property Management).

- D. Acceptableness - Assess non-tangible elements associated with implementing each of the alternatives, including water quality, cultural resources, riparian habitat, open space, public acceptance, implementation, maintenance and compatibility with other plans.**

CONSULTANT concurs with **OWNER** that the assessment of non-tangible elements will be critical to the acceptability and viability of alternatives to the community. All too often, project feasibilities have been based on economic benefit/cost analyses without considering environmental impacts and public acceptance. Interpretation of available environmental data and inventories will be conducted and related to the structural and non-structural alternatives. In addition, planning ordinances, area plan, new comprehensive plan (in draft stages), etc., information will be reviewed and related to proposed alternatives.

Advantages and disadvantages for each alternative shall be tabulated in table format for ease of comparison, and will include hydrologic, hydraulic, geomorphic, social, cultural, legal, political and economic impacts or benefits.

"No action" will be evaluated relative to the economical/damage ramifications for the properties located within the project reach. Safety, access and public welfare issues will be addressed. Existing and proposed/anticipated land uses will be reviewed, and incorporated into the evaluation.

TASK 7 - SELECT A PREFERRED ALTERNATIVE

CONSULTANT shall prepare a ranking of the concept alternatives through the use of a matrix format based on above described criteria and prepare a master ranking of alternatives using the objectives established for this project (completeness of purpose, effectiveness in achieving desired goals, economic efficiency and acceptability based on social, economic, environmental, legal and political considerations).

CONSULTANT's Project Team shall consolidate Task 5 and Task 6 results and develop a rating system for evaluation of the various components. **CONSULTANT** shall obtain **OWNER'S** written acceptance of the rating system prior to commencing component evaluation. A systematic, logical approach will provide the basis for conducting this task, which shall result in a final listing/ranking of all alternatives, including non-structural, structural, and multiple combinations of same; and finally result in a recommended viable alternative. Hydraulic design parameters, including preliminary detention/retention routings if necessary, will be developed for the recommended alternative for use in preparation of concept plans.

A decision matrix and ranking procedure shall be developed to evaluate the concept alternatives. The following is a sample list of possible criteria, issues and parameters which will be weighted and utilized to evaluate the alternatives, from which a ranking of the alternatives will be developed:

Construction Costs
Benefit Area Versus Impact Area
Right-of-Way Restrictions

Short-Term Versus Long-Term Effects
Engineering Feasibility
Environmental Considerations
Pima County, State and Federal Regulations
Aesthetics (social impacts)
Transportation
Jurisdictional Boundaries
Utilities
Maintenance Needs
Multiple-Use
Structural Improvements Impact on Infiltration Loss of Flow Attenuation
General Benefits Versus Costs
Effectiveness (Short-Term Versus Long-Term)
Potential for Phased Construction
Acceptability to the Public
Compatibility with Other Projects and Plans
Funding Options
Hydrologic and Sediment Impacts on Surrounding

Information and preliminary results from Tasks 6 and 7 shall be summarized in report format (for inclusion in Final Report) and presented to OWNER at a coordination meeting.

TASK 8 - PREPARE CONCEPT PLANS FOR THE PREFERRED ALTERNATIVE

CONSULTANT shall prepare preliminary concept plans for the selected alternative which shall consist of 100 scale plan and profile sheets based on current aerial topography. The plans shall include alignment and grades of recommended improvements, existing utilities and existing culture (as available from existing information, i.e. plans, aerials, topographic maps, etc.), all of which shall constitute approximately 15% to 30% drawings. Utility relocations, construction details and project control survey data will be part of subsequent phases of work.

TASK 9 - DEVELOP POLICY RECOMMENDATIONS

Site specific floodplain management and land use regulations and policies that should be considered for future development within the study area or tributary drainage basins will be evaluated and recommended.

Based on information generated in the above-referenced tasks, and review of existing local, state and federal ordinances, area plans, development regulations/policies, etc., **CONSULTANT** will recommend alternative management and land use policies for the SWBMS area. Regulations and policies will be recommended on a interim basis, i.e., until drainage improvements from the selected alternative are implemented, and on a final basis, assuming improvements have been constructed. Regulations and policies will address both existing developed areas, and undeveloped areas with potential for future development (i.e., southern portion of Section 34).

By way of example the recommendations shall cover, at a minimum, the following possible categories of policy issues:

- A. Restrictions on construction in sensitive sheet flow areas which would act to divert, retard or obstruct floodwaters such as continuous fencing around properties.
- B. Limitations on increased residential development densities for rezonings which would reduce potential for flow concentrations and/or diversion.
- C. Revisions to access restrictions which would allow instances of flow crossings of roads to exceed one foot to discourage channelization and structural drainage crossing improvements which act to concentrate flow and further exacerbate flow concentrations and diversions.
- D. Limitations on construction of future roadways along alignments which act to divert, retard or obstruct floodwaters such as alignments not parallel or perpendicular to the direction of natural drainage.

Specific local, state and federal ordinances/programs which shall be addressed include the following: Pima County Floodplain Ordinance, Pima County Riparian Ordinance, Pima County Wildlife Habitats, Pima County Trails Master Plan, U.S. Army Corps of Engineers 404 Program, U.S. EPA NPDES Stormwater Permit Program, FEMA Flood Insurance Study Program.

Information and preliminary results generated from Tasks 8 and 9 shall be summarized in report format (for inclusion in Final Report) and presented to OWNER at a coordination meeting.

TASK 10 - FINAL REPORT

The Final Report shall document the results of Tasks 1 through 9, and will follow the basic organization of the scope of work. The following specific items shall be included at a minimum:

- A. Mapping on an aerial photograph and topographic base showing the flow depth zones determined in Task 2.
- B. Mapping on an aerial photograph and topographic base showing the locations of the problem areas identified in Task 3.
- C. Exhibits showing the location/extent/nature of the elements of the alternative plans prepared in Task 5.
- D. Tables showing, in matrix format, the process used and results obtained in the Task 6 evaluation process.
- E. Concept plans on an aerial photographic and topographic base map at a scale of 1" = 100' showing the plan elements in plan, section and profile for the plan prepared in Task 8.

The Final Report will be easily accomplished, as **CONSULTANT** shall be preparing specific portions of the report throughout the process of the study. The draft versions of the report prepared at the completion of specific tasks, as indicated above, will serve as progress summaries as well as coordination meeting summary documents.

Future tasks, analyses, calculations, information, survey, topographic data, etc., to be conducted in subsequent phases for final analyses and designs of the selected alternative will be identified and included in the report.

TASK 11 - PUBLIC PARTICIPATION (Optional task to be performed at the option of the Owner)

Public involvement in the form of one (1) open house (or similar format) shall be scheduled during the course of the project, during the alternative development, evaluation and section tasks. Advertisement for the open house will consist of an appropriate notice in a daily newspaper, and mailing of a letter to neighborhood associations or interest groups registered with Pima County Planning and Development Services, as well as to local residents, within the project area. **CONSULTANT** will assist in preparing the notice and letter, with **OWNER** responsible for actual publishing and mailings (including obtaining addresses and costs for publishing and mailings). **CONSULTANT** will assist **OWNER** in preparing and participating in a brief presentation (utilizing exhibits prepared for this project, mounted and possibly colored or highlighted for presentation purposes), including time for open house interaction and question/answer period. Two to three **CONSULTANT** project team members will attend, with an anticipated time frame of 2 to 3 hours for the open house. **OWNER** will locate and schedule a meeting space, including associated costs.

DELIVERABLES

The deliverable product(s) for the project shall include:

1. Up to three separate submittals of three copies of a draft version of the final report described in Task 10 of the scope of work for review purposes.
2. Ten (10) copies of the final report amended in response to comments on the draft reports in (1), including reproducible versions of all text and exhibits and 5 1/4" floppy disks containing all computer input/output files used in developing data referenced in the report.

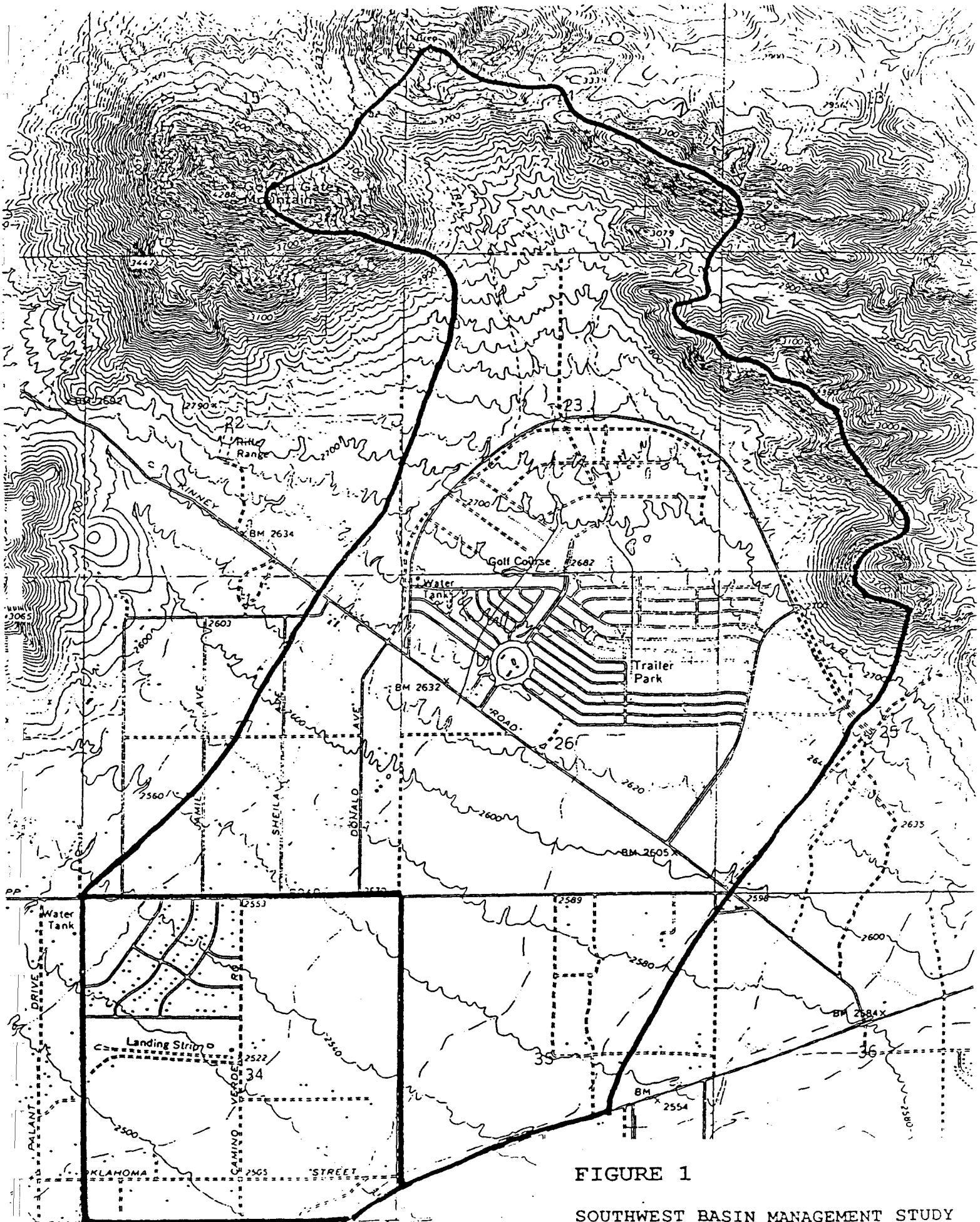


FIGURE 1

SOUTHWEST BASIN MANAGEMENT STUDY
 PHASE II, PART A (SWBMS/IIA)
 STUDY AREA LOCATION MAP

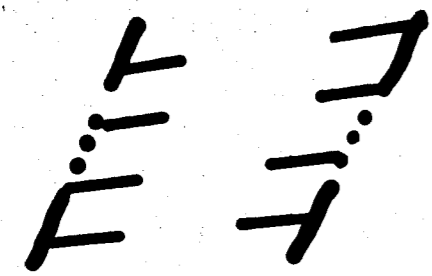
APPENDIX B

Floodplain Maps

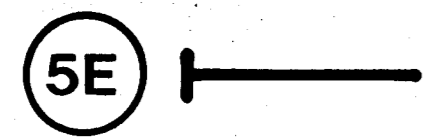
**Pima County Department of Transportation
and Flood Control District**

**SOUTHWEST BASIN
MANAGEMENT STUDY:
PHASE II, PART A**

LEGEND:



**Approximate 100-year
floodplain limits**



**Cross-Section location
with water surface elevation**



**100-year peak discharge
computed by CBA**



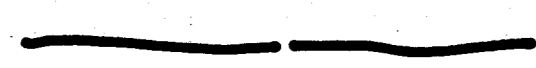
**100-year peak discharge
taken from APA, 1990
(Improved Channel)**



**Drainage complaints per
Pima County**



Zone A02



**Erosion Hazard Setback
Limits (EHS)**

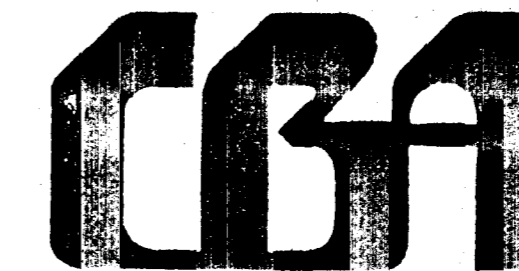
**T 14 S, R 12 E
SECTION 34**

Cover Sheet 1 of 5

APPENDIX B

C.B.A. JOB # 106579-01-0280

**August 12, 1993
(REVISED FEBRUARY 14, 1994)**



4911 East Broadway
Tucson, Arizona 85711
(602) 750-7474



KEY:

- Approximate 100-year floodplain limits
- Cross-section locations with water surface elevations
- Erosion Hazard Setback (EHS)

- 100-year peak discharges computed by CBA
- 100-year peak discharges taken from APA, 1990
- Drainage complaints per Pima County
- Zone A02

SCALE 1" = 100'
 CONTOUR INTERVAL = 2 FT.
 PHOTO DATE MAY, 1983

QUARTER SECTION MAPS
 McLain Aerial Mapping & Surveying, Inc.
 1665 E 18th Street TUCSON, ARIZONA

NW 1/4, SEC. 34, T. 14 S., R. 12 E.
 PIMA COUNTY, ARIZONA
APPENDIX B



MATCH SHEET 5

3 of 5

KEY:

- Approximate 100-year floodplain limits
- Cross-section locations with water surface elevations
- Erosion Hazard Setback (EHS)

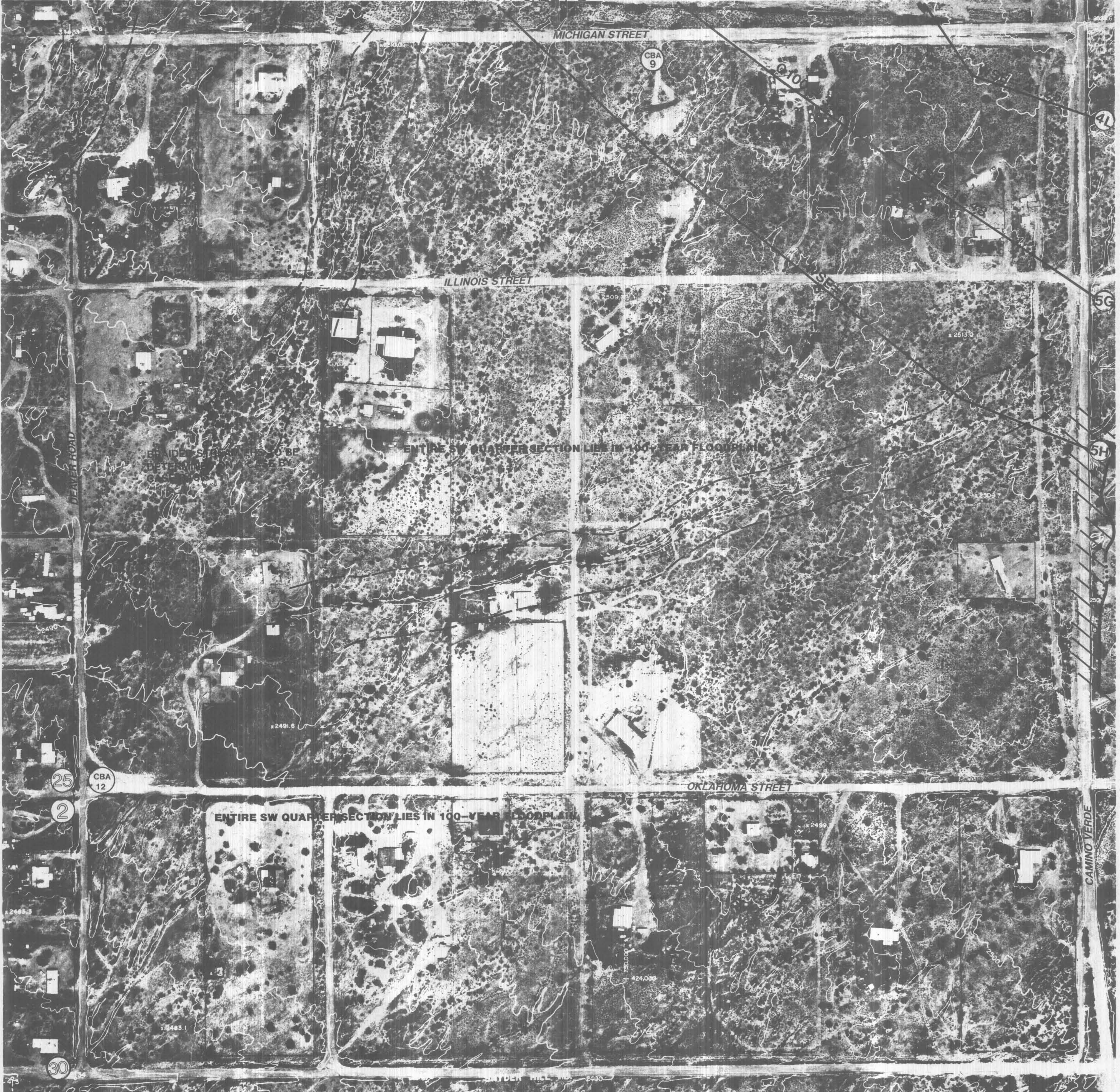
- 100-year peak discharges computed by CBA
- 100-year peak discharges taken from APA, 1990
- Drainage complaints per Pima County
- Zone AO2

SCALE 1" = 100'
 CONTOUR INTERVAL = 2 FT.
 PHOTO DATE: MAY, 1983

QUARTER SECTION MAPS
 McLain Aerial Mapping & Surveying, Inc.
 1665 E 18th Street TUCSON, ARIZONA

NE 1/4, SEC. 34, T.14 S., R.12 E.
 PIMA COUNTY, ARIZONA

APPENDIX B



MATCH SHEET 5

ENTIRE SOUTHWEST QUARTER SECTION LIES IN 100-YEAR FLOODPLAIN

4 of 5

KEY:

- Approximate 100-year floodplain limits
- Cross-section locations with water surface elevations
- Erosion Hazard Setback (EHS)

- 100-year peak discharges computed by CBA
- 100-year peak discharges taken from APA, 1990
- Drainage complaints per Pima County
- Zone A02




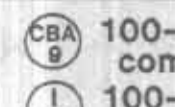
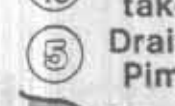


SCALE 1" = 100'
 CONTOUR INTERVAL = 2 FT.
 PHOTO DATE: MAY, 1983

QUARTER SECTION MAPS
 McLain Aerial Mapping & Surveying, Inc.
 1665 E 18th Street TUCSON, ARIZONA

SW 1/4, SEC. 34, T. 14 S., R. 12 E.
 PIMA COUNTY, ARIZONA



KEY:

-  Approximate 100-year floodplain limits
-  Cross-section locations with water surface elevations
-  Erosion Hazard Setback (EHS)
-  100-year peak discharges computed by CBA
-  100-year peak discharges taken from APA, 1990
-  Drainage complaints per Pima County
-  Zone A02

SCALE 1" = 100'
 CONTOUR INTERVAL = 2 FT.
 PHOTO DATE: MAY 1983

QUARTER SECTION MAPS SE 1/4, SEC. 34, T. 14 S., R. 12 E.
 McLain Aerial Mapping & Surveying, Inc.
 1665 E. 18th Street TUCSON, ARIZONA
 PIMA COUNTY, ARIZONA

APPENDIX C

Sample Scour Calculations

SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

APPENDIX B

SCOUR CALCULATIONS FOR AREA 5 WITHIN
STUDY AREA, SECTION 34

SCOUR EQUATION PER ZELLER, 1981:

$$Z_{gs} = Y_{\max} \left(\frac{0.0685 V_m^{0.8}}{Y_h^{0.4} S_e^{0.3}} - 1 \right)$$

X-SECTION 5A (2+00)

$$V_m = 2.35$$

$$Y_{\max} = 2.6$$

$$Y_h = 271/811 = 0.33$$

$$S_e = .01$$

$$2.6 \left(\frac{0.0685 (2.35^{0.8})}{0.33^{0.4} (.01^{0.3})} - 1 \right)$$

$$Z_{gs} = -0.41, = 0 \text{ FEET}$$

X-SECTION 5B (3+00)

$$V_m = 1.8$$

$$Y_{\max} = 4.4$$

$$Y_h = 275/794 = 0.35$$

$$S_e = .009$$

$$4.4 \left(\frac{0.0685 (1.8^{0.8})}{0.35^{0.4} (.009^{0.3})} - 1 \right)$$

$$Z_{gs} = -1.38, = 0 \text{ FEET}$$

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APPENDIX C

SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

X-SECTION 5C (4+00)

$$V_m = 2.1$$

$$Y_{max} = 0.82$$

$$Y_h = 192/314 = 0.61$$

$$S_e = .006$$

$$.82 \left(\frac{0.0685 (2.1^{0.8})}{0.61^{0.4} (.006^{0.3})} - 1 \right)$$

$$Z_{gs} = -0.24, = 0 \text{ FEET}$$

X-SECTION 5D (5+00)

$$V_m = 1.24$$

$$Y_{max} = 2.5$$

$$Y_h = 404/1777 = 0.23$$

$$S_e = .008$$

$$2.5 \left(\frac{0.0685 (1.24^{0.8})}{0.23^{0.4} (.008^{0.3})} - 1 \right)$$

$$Z_{gs} = -0.94, = 0 \text{ FEET}$$

X-SECTION 5E (6+00)

$$V_m = 0.98$$

$$Y_{max} = 1.4$$

$$Y_h = 416/2135 = 0.195$$

$$S_e = .009$$

$$1.4 \left(\frac{0.0685 (0.98^{0.8})}{0.195^{0.4} (.009^{0.3})} - 1 \right)$$

$$Z_{gs} = -0.65, = 0 \text{ FEET}$$

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SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

X-SECTION 5F (7+00)

$$V_m = 0.82$$

$$Y_{max} = 1.4$$

$$Y_h = 360/1597 = 0.23$$

$$S_e = .009$$

$$1.4 \left(\frac{0.0685 (0.82^{0.8})}{0.23^{0.4} (.009^{0.3})} - 1 \right)$$

$$Z_{gs} = -0.79, = 0 \text{ FEET}$$

X-SECTION 5G (8+00)

$$V_m = 1.65$$

$$Y_{max} = 3.1$$

$$Y_h = 2097/4677 = 0.45$$

$$S_e = .008$$

$$3.1 \left(\frac{0.0685 (1.65^{0.8})}{0.45^{0.4} (.008^{0.3})} - 1 \right)$$

$$Z_{gs} = -1.24, = 0 \text{ FEET}$$

X-SECTION 5H (9+00)

$$V_m = 1.4$$

$$Y_{max} = 2.2$$

$$Y_h = 2137/5633 = 0.38$$

$$S_e = .009$$

$$2.2 \left(\frac{0.0685 (1.4^{0.8})}{0.38^{0.4} (.009^{0.3})} - 1 \right)$$

$$Z_{gs} = -1.0, = 0 \text{ FEET}$$

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SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

X-SECTION 9 (10+00) NOT ON FLOODPLAIN MAP

$$V_m = 1.89$$

$$Y_{max} = 1.8$$

$$Y_h = 2113/3475 = 0.6$$

$$S_e = .005$$

$$1.8 \left(\frac{0.0685 (1.89^{0.8})}{0.6^{0.4} (.005^{0.3})} - 1 \right)$$

$$Z_{gs} = -0.57, = 0 \text{ FEET}$$

FOR AREA 1, SECTIONS 27 & 34

X-SECTION 1A (2+00)

$$V_m = 1.48$$

$$Y_{max} = .68$$

$$Y_h = 44/168 = 0.26$$

$$S_e = .009$$

$$.68 \left(\frac{0.0685 (1.48^{0.8})}{0.26^{0.4} (.009^{0.3})} - 1 \right)$$

$$Z_{gs} = -0.23, = 0 \text{ FEET}$$

X-SECTION 1B (3+00)

$$V_m = 1.4$$

$$Y_{max} = 0.9$$

$$Y_h = 44/112 = 0.39$$

$$S_e = .005$$

$$.9 \left(\frac{0.0685 (1.4^{0.8})}{0.39^{0.4} (.005^{0.3})} - 1 \right)$$

$$Z_{gs} = -0.32, = 0 \text{ FEET}$$

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SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

X-SECTION 1C (5+00)

$V_m = 2.2$

$Y_{max} = 1.3$

$Y_h = 33/63 = 0.53$

$S_e = .014$

$$1.3 \left(\frac{0.0685 (2.2^{0.8})}{.5304 (0.014^{0.3})} - 1 \right)$$

$Z_{qs} = -0.52, = 0 \text{ FEET}$

X-SECTION 1D (6+00)

$V_m = 1.14$

$Y_{max} = .90$

$Y_h = 113/345 = 0.33$

$S_e = .005$

$$.90 \left(\frac{0.0685 (1.14^{0.8})}{.3304 (.005^{0.3})} - 1 \right)$$

$Z_{qs} = -0.38, = 0 \text{ FEET}$

X-SECTION 1E (7+00)

$V_m = 1.24$

$Y_{max} = 0.56$

$Y_h = 161/808 = 0.20$

$S_e = .009$

$$.56 \left(\frac{0.0685 (1.24^{0.8})}{.20^{0.4} (.009^{0.3})} - 1 \right)$$

$Z_{qs} = -0.20, = 0 \text{ FEET}$

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SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

X-SECTION 1F (8+00)

$$V_m = 1.6$$

$$Y_{max} = 1.4$$

$$Y_h = 136/313 = 0.43$$

$$S_e = .007$$

$$1.4 \left(\frac{0.0685 (1.6^{0.8})}{0.43^{0.4} (.007^{0.3})} - 1 \right)$$

$$Z_{qs} = -0.50, = 0 \text{ FEET}$$

X-SECTION 1G (9+00)

$$V_m = .90$$

$$Y_{max} = .97$$

$$Y_h = 253/964 = 0.26$$

$$S_e = .005$$

$$.97 \left(\frac{0.0685 (.90^{0.8})}{0.26^{0.4} (.005^{0.3})} - 1 \right)$$

$$Z_{qs} = -0.46, = 0 \text{ FEET}$$

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APPENDIX D

Equilibrium Slope Calculations

SUBJECT:

SOUTH WEST BASIN MANAGEMENT STUDY

JOB NO.:

APPENDIX D

CALCULATIONS FOR EQUILIBRIUM SLOPE (S_{eq})
 AREA 5 WITHIN STUDY AREA, SECTION 34

PER ZELLER AND FULLERTON, 1983:

$$S_{eq} = \left[\left(\frac{N_u}{N_n} \right)^2 \left(\frac{Q_{u,10}}{Q_{n,10}} \right)^{-1.1} \left(\frac{b_u}{b_n} \right)^{0.4} (1-R_s)^{0.7} \right] S_n$$

X-SECTION 5A (2+00)

$N_u = .025$

$N_n = .04$

$Q_{u,10} = 72$

$Q_{n,10} = 65$

$b_u = 10$

$b_n = 100$

$R_s = .25$

$S_n = .01$

$$\left[\left(\frac{.025}{.04} \right)^2 \left(\frac{72}{65} \right)^{-1.1} \left(\frac{10}{100} \right)^{0.4} (1-.25)^{0.7} \right] .01$$

$S_{eq} = .00114$

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SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

X-SECTION 5B (3+00)

$$N_u = .025$$

$$N_n = .040$$

$$Q_u, 10 = 72$$

$$Q_n, 10 = 65$$

$$b_u = 10$$

$$b_n = 100$$

$$R_B = .25$$

$$S_n = .009$$

$$\left(\left[\frac{.025}{.04} \right]^2 \left[\frac{72}{65} \right]^{-1.1} \left[\frac{10}{100} \right]^{0.4} (1-.25)^{0.7} \right) \cdot 0.009$$

$$S_{eq} = .0010$$

X-SECTION 5C (4+00)

$$N_u = .025$$

$$N_n = .040$$

$$Q_u, 10 = 72$$

$$Q_n, 10 = 65$$

$$b_u = 10$$

$$b_n = 100$$

$$R_B = .25$$

$$S_n = .006$$

$$\left(\left[\frac{.025}{.04} \right]^2 \left[\frac{72}{65} \right]^{-1.1} \left[\frac{10}{100} \right]^{0.4} (1-.25)^{0.7} \right) \cdot 0.006$$

$$S_{eq} = .0007$$

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SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

X-SECTION 5D (5+00)

$n_H = .025$

$n_n = .04$

$Q_H, 10 = 72$

$Q_n, 10 = 65$

$b_H = 10$

$b_n = 100$

$R_S = .25$

$S_n = .008$

$$\left[\left(\frac{.025}{.04} \right)^2 \left(\frac{72}{65} \right)^{-1.1} \left(\frac{10}{100} \right)^{0.4} (1-.25)^{0.7} \right] .008$$

$S_{eq} = .0009$

X-SECTION 5E (6+00) AND
X-SECTION 5F (7+00)

$n_H = .025$

$n_n = .04$

$Q_H, 10 = 72$

$Q_n, 10 = 65$

$b_H = 10$

$b_n = 100$

$R_S = .25$

$S_n = .009$

$$\left[\left(\frac{.025}{.04} \right)^2 \left(\frac{72}{65} \right)^{-1.1} \left(\frac{10}{100} \right)^{0.4} (1-.25)^{0.7} \right] .009$$

$S_{eq} = .0010$

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SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

X-SECTION 5G (8+00)

$$N_u = .025$$

$$N_n = .04$$

$$Q_{u,10} = 597 \quad \left[\left(\frac{.025}{.04} \right)^2 \left(\frac{597}{538} \right)^{-1.1} \left(\frac{10}{100} \right)^{0.4} (1-.25)^{0.7} \right] .0075$$

$$Q_{n,10} = 538$$

$$b_u = 10$$

$$b_n = 100$$

$$R_s = .25$$

$$S_n = .0075$$

$$S_{eq} = .0009$$

X-SECTION 5H (9+00)

$$N_u = .025$$

$$N_n = .04$$

$$Q_{u,10} = 597$$

$$Q_{n,10} = 538$$

$$b_u = 10$$

$$b_n = 100$$

$$R_s = .25$$

$$S_n = .009$$

$$\left[\left(\frac{.025}{.04} \right)^2 \left(\frac{597}{538} \right)^{-1.1} \left(\frac{10}{100} \right)^{0.4} (1-.25)^{0.7} \right] .009$$

$$S_{eq} = .0010$$

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SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

EQUILIBRIUM SLOPE FOR AREA 1

X-SECTION 1A (2+00)

$$N_u = .025$$

$$N_n = .040$$

$$Q_{u,10} = 9$$

$$Q_{n,10} = 8$$

$$b_u = 10$$

$$b_n = 50$$

$$R_s = .25$$

$$S_n = .009$$

$$\left(\left[\frac{.025}{.04} \right]^2 \left[\frac{9}{8} \right]^{-1.1} \left[\frac{10}{50} \right]^{0.4} (1-.25)^{0.7} \right) \cdot .009$$

$$S_{eq} = .0013$$

X-SECTION 1B (3+00)

$$N_u = .025$$

$$N_n = .040$$

$$Q_{u,10} = 9$$

$$Q_{n,10} = 8$$

$$b_u = 10$$

$$b_n = 50$$

$$R_s = .25$$

$$S_n = .005$$

$$\left(\left[\frac{.025}{.04} \right]^2 \left[\frac{9}{8} \right]^{-1.1} \left[\frac{10}{50} \right]^{0.4} (1-.25)^{0.7} \right) \cdot .005$$

$$S_{eq} = .0007$$

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SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

X-SECTION 1C (5+00)

$$N_u = .025$$

$$N_n = .04$$

$$Q_u, 10 = 16$$

$$Q_n, 10 = 14$$

$$b_u = 10$$

$$b_n = 50$$

$$R_s = .25$$

$$S_n = .014$$

$$\left[\left(\frac{.025}{.04} \right)^2 \left(\frac{16}{14} \right)^{-1.1} \left(\frac{10}{50} \right)^{0.4} (1-.25)^{0.7} \right] \cdot 0.014$$

$$S_{eq} = .0020$$

X-SECTION 1D (6+00)

$$N_u = .025$$

$$N_n = .04$$

$$Q_u, 10 = 23$$

$$Q_n, 10 = 21$$

$$b_u = 10$$

$$b_n = 50$$

$$R_s = .25$$

$$S_n = .005$$

$$\left[\left(\frac{.025}{.04} \right)^2 \left(\frac{23}{21} \right)^{-1.1} \left(\frac{10}{50} \right)^{0.4} (1-.25)^{0.7} \right] \cdot 0.005$$

$$S_{eq} = .0008$$

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SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

X-SECTION 1E (7+00)

$$N_u = .025$$

$$N_n = .04$$

$$Q_u, 10 = 30$$

$$Q_n, 10 = 27$$

$$b_u = 10$$

$$b_n = 50$$

$$R_s = .25$$

$$S_n = .005$$

$$\left(\left[\frac{.025}{.04} \right]^2 \left[\frac{30}{27} \right]^{-1.1} \left[\frac{10}{50} \right]^{0.4} (1-.25)^{0.7} \right) \cdot .005$$

$$S_{eq} = .0013$$

X-SECTION 1F (8+00)

$$N_u = .025$$

$$N_n = .04$$

$$Q_u, 10 = 36$$

$$Q_n, 10 = 32$$

$$b_u = 10$$

$$b_n = 50$$

$$R_s = .25$$

$$S_n = .007$$

$$\left(\left[\frac{.025}{.04} \right]^2 \left[\frac{36}{32} \right]^{-1.1} \left[\frac{10}{50} \right]^{0.4} (1-.25)^{0.7} \right) \cdot .007$$

$$S_{eq} = .0010$$

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SUBJECT:

SOUTHWEST BASIN MANAGEMENT STUDY

JOB NO.:

X-SECTION 1G (9+00)

$n_u = .025$

$n_n = .04$

$Q_{u, 10} = 43$

$Q_{n, 10} = 39$

$b_u = 10$

$b_n = 50$

$R_s = .25$

$S_n = .005$

$$\left(\left(\frac{.025}{.04} \right)^2 \left(\frac{43}{39} \right)^{-1.1} \left(\frac{10}{50} \right)^{0.4} (1-.25)^{0.7} \right) .005$$

$S_{eq} = .0008$

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APPENDIX E

Hydrologic Data Sheets

Bobb road
NEW Q

HYDROLOGIC DATA SHEET

Project Name and Location: SOUTHWEST

Drainage Concentration Point: SUBAREA CBA-1 (A1)

Watershed Area (A): 11 acres/square miles.

Length of Watercourse (L_c): 1700 ft. Length to Center of Gravity (L_{cg}): 850 ft

Incremental Change in Length (L_i) - ft. Incremental Change in Elevation (H_i) - ft

1700

30

Mean Slope (S_c): .0176 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): .035 (future) Flood Frequency: 100 yrs

24 (24 hour): _____ in. Areal Value: _____ in.

6 (6 hour): _____ in. Areal Value: _____ in.

1 (1 hour): 2.87 in. Areal Value: _____ in.

2 (2 hour): _____ in. Areal Value: _____ in.

3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 100% B Cover Type(s): _____

Cover Density (pervious areas): _____ Impervious Cover: 10% (future)

N(s): 53 (curve number) (pervious & impervious areas) CN* (s): _____ (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): _____ (pervious areas) _____ (impervious areas)

Runoff Supply Rate (q): .617 in./hr. (function of 1)

Time of Concentration (T_c): 18 hrs./mins. (function of 1)

Iterative Solution of T_c: 7 hrs./mins.

Rainfall Intensity (i) at T_c: 9.040 in./hr. Equation for T_c:

Runoff Supply Rate (q) at T_c: 5.58 in./hr. $T_c = \frac{n_b (L_c L_{cg})^{.3}}{50 (S_c)^{.4}} q^{-.4}$ hours.

Peak Discharge:
1.008 qA (acres): 62 cfs.
645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

Figure # E
Sheet 1 of 12

HYDROLOGIC DATA SHEET

Project Name and Location: SOUTHWEST

Drainage Concentration Point: CBA - 2 (A2)

Watershed Area (A): 5660 acres/square miles.

Length of Watercourse (L_c): 14700 ft. Length to Center of Gravity (L_{cg}): 7350 ft

Incremental Change in Length (L_i) - ft.

Incremental Change in Elevation (H_i) - ft

14700

2510

Average Slope (S_c): 0.17075 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): .038 (future) Flood Frequency: _____ yrs

24 (24 hour): _____ in. Areal Value: _____ in.

6 (6 hour): _____ in. Areal Value: _____ in.

1 (1 hour): 2.87 in. Areal Value: _____ in.

2 (2 hour): _____ in. Areal Value: _____ in.

3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 100% B Cover Type(s): _____

Soil Density (pervious areas): 20% Impervious Cover: 15% (future)

N(s): 83 (pervious & impervious areas) CN*(s): _____ (adjusted curve number)

Soil to Rainfall Ratio(s), (C): _____ (pervious areas) _____ (impervious areas)

Soil Supply Rate (q): .635 in./hr. (function of I)

Time of Concentration (T_c): 29 hrs./mins. (function of I)

Operative Solution of T_c: 13 hrs./mins.

Rainfall Intensity (i) at T_c: 7.003 in./hr.

Equation for T_c:

Soil Supply Rate (q) at T_c: 4.45 in./hr.

$$T_c = \frac{R_h}{50} \frac{(L_c L_{cg})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 2539 cfs.

Note: For impervious areas, CN* = 99 (constant).

645.33qA (square miles): _____ cfs.

Figure # E
Sheet 2 of 12

HYDROLOGIC DATA SHEET

Project Name and Location: CBA - 3 215 Ctd (A2)

Drainage Concentration Point: _____

Watershed Area (A): 581 acres/square miles.

Length of Watercourse (L_c): 14700 ft. Length to Center of Gravity (L_{cg}): 7350 ft

Incremental Change in Length (L_i) - ft. Incremental Change in Elevation (H_i) - ft

14700

2510

Mean Slope (S_c): 0.17075 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): 0.038 (future) Flood Frequency: 100 yrs

24 (24 hour): _____ in. Areal Value: _____ in.

6 (6 hour): _____ in. Areal Value: _____ in.

1 (1 hour): 2.87 in. Areal Value: _____ in.

2 (2 hour): _____ in. Areal Value: _____ in.

3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 100% B Cover Type(s): _____

Soil Density (pervious areas): 20% Impervious Cover: 15% (future)

N(s): 83 (pervious & impervious areas) CN*(s): 87.5
(curve number) (adjusted curve number)

Soil to Rainfall Ratio(s), (C): _____ (pervious areas) _____ (impervious areas)

Soil Supply Rate (q): 0.635 in./hr. (function of i)

Time of Concentration (T_c): 29 i^{-0.4} hrs./mins. (function of i)

Operative Solution of T_c: 13 hrs./mins.

Rainfall Intensity (i) at T_c: 7.003 in./hr. Equation for T_c:

Soil Supply Rate (q) at T_c: 4.45 in./hr. T_c = $\frac{n_b}{50} \frac{(L_c L_{cg})^{.3}}{(S_c)^{.4}} q^{-.4}$ hours.

Peak Discharge:

1.008 qA (acres): 26000 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

Figure # E
Sheet 3 of 12

HYDROLOGIC DATA SHEET

Project Name and Location: CBA-4 4+3+2
b+c+d (A2)

Drainage Concentration Point: _____

Watershed Area (A): 688 acres/square miles.

Length of Watercourse (L_c): 14700 ft. Length to Center of Gravity (L_{cg}): 7350 ft

Incremental Change in Length (L_i) - ft.

Incremental Change in Elevation (H_i) - ft

14700

2510

Average Slope (S_c): 0.17075 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): .039 (future)

Flood Frequency: 100 yrs

24 (24 hour): _____ in.

Areal Value: _____ in.

6 (6 hour): _____ in.

Areal Value: _____ in.

1 (1 hour): 2.87 in.

Areal Value: _____ in.

2 (2 hour): _____ in.

Areal Value: _____ in.

3 (3 hour): _____ in.

Areal Value: _____ in.

Soil Group(s): 100% B Cover Type(s): _____

Soil Density (pervious areas): 20% Impervious Cover: 15% (future)

Curve Number(s): 83 (curve number) (pervious & impervious areas) CN* (s): 87.5 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): _____ (pervious areas) _____ (impervious areas)

Runoff Supply Rate (q): .635 in./hr. (function of i)

Time of Concentration (T_c): 29 i^{-0.4} hrs./mins. (function of i)

Iterative Solution of T_c: 13 hrs./mins.

Rainfall Intensity (i) at T_c: 7.003 in./hr.

Equation for T_c:

Runoff Supply Rate (q) at T_c: 4.45 in./hr.

$$T_c = \frac{n_b}{50} \frac{(L_c L_{cg})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 3086 cfs.

Note: For impervious areas, CN* = 99 (constant).

645.33qA (square miles): _____ cfs.

Figure # E

Sheet 4 of 12

HYDROLOGIC DATA SHEET

Project Name and Location: CBA - 5 5 + 4 + 3 + 2
a + b + c + d (A2)

Drainage Concentration Point: _____

Watershed Area (A): 715 acres/square miles.

Length of Watercourse (L_c): 14700 ft. Length to Center of Gravity (L_{cg}): 7350 ft

Incremental Change in Length (L₁) - ft. Incremental Change in Elevation (H₁) - ft

14700 2510

Mean Slope (S_c): 0.17075 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): .038 (future) Flood Frequency: 100 yrs

24 (24 hour): _____ in. Areal Value: _____ in.

6 (6 hour): _____ in. Areal Value: _____ in.

1 (1 hour): 2.87 in. Areal Value: _____ in.

2 (2 hour): _____ in. Areal Value: _____ in.

3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 10070B Cover Type(s): _____

Soil Cover Density (pervious areas): 20% Impervious Cover: 15% (future)

N(s): 83 (pervious & impervious areas) CN*(s): 87.5
(curve number) (adjusted curve number)

Soil Infiltration Ratio(s), (C): _____ (pervious areas) _____ (impervious areas)

Soil Infiltration Supply Rate (q): .635 in./hr. (function of i)

Time of Concentration (T_c): 29 hrs./mins. (function of i)

Equivalent Solution of T_c: 13 hrs./mins.

Rainfall Intensity (i) at T_c: 7.003 in./hr. Equation for T_c:

Soil Infiltration Supply Rate (q) at T_c: 4.45 in./hr. $T_c = \frac{2h}{50} \frac{(L_c L_{cg})^{.3}}{(S_c)^{.4}} q^{-.4}$ hours.

Peak Discharge:

1.008 qA (acres): 3207 cfs. Note: For impervious areas, CN* = 99 (constant).

645.33qA (square miles): _____ cfs.

Figure # E
Sheet 5 of 12

HYDROLOGIC DATA SHEET

Project Name and Location: _____

Drainage Concentration Point: SURFACE CBA-6 (A1)

Watershed Area (A): 91 acres/square miles.

Length of Watercourse (L_c): 5200 ft. Length to Center of Gravity (L_{cg}): 2600 ft.

Incremental Change in Length (L₁) - ft. Incremental Change in Elevation (H₁) - ft.

5300

70

Mean Slope (S_c): .0135 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): .035 (future) Flood Frequency: 100 yrs

1/24 (24 hour): _____ in. Areal Value: _____ in.

1/6 (6 hour): _____ in. Areal Value: _____ in.

1 (1 hour): 2.87 in. Areal Value: _____ in.

2 (2 hour): _____ in. Areal Value: _____ in.

3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 100% B Cover Type(s): _____

Soil Density (pervious areas): 20% Impervious Cover: 15% (future)

N(s): 83 (curve number) (pervious & impervious areas) CN*(s): 87.5 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): _____ (pervious areas) _____ (impervious areas)

Runoff Supply Rate (q): .635 in./hr. (function of i)

Time of Concentration (T_c): 39 hrs./mins. (function of i)

Iterative Solution of T_c: 19 hrs./mins.

Rainfall Intensity (i) at T_c: 5.855 in./hr. Equation for T_c:

Runoff Supply Rate (q) at T_c: 3.72 in./hr. $T_c = \frac{n_b}{50} \frac{(L_c L_{cg})^{.3}}{(S_c)^{.4}} q^{-.4}$ hours.

Peak Discharge:

1.008 qA (acres): 341 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

Figure # E
Sheet 6 of 12

HYDROLOGIC DATA SHEET

Project Name and Location: _____

Drainage Concentration Point: CBA-7 (CBA-4 + CBA-6)

Watershed Area (A): 868 acres/square miles.

Length of Watercourse (L_c): 18210 ft. Length to Center of Gravity (L_{cg}): 9105 ft

Incremental Change in Length (L₁) - ft. Incremental Change in Elevation (H₁) - ft

18210 2550

Average Slope (S_c): 0.140 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): 0.38 (future) Flood Frequency: 100 yrs

24 (24 hour): _____ in. Areal Value: _____ in.

6 (6 hour): _____ in. Areal Value: _____ in.

1 (1 hour): 2.87 in. Areal Value: _____ in.

2 (2 hour): _____ in. Areal Value: _____ in.

3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 100% B Cover Type(s): _____

Soil Density (pervious areas): 20% Impervious Cover: 15% (future)

K(s): 83 (pervious & impervious areas) CN*(s): 87.5
(curve number) (adjusted curve number)

Soil to Rainfall Ratio(s), (C): _____ (pervious areas) _____ (impervious areas)

Soil Supply Rate (q): 0.635 in./hr. (function of i)

Time of Concentration (T_c): 35 hrs./mins. (function of i)

Derivative Solution of T_c: 16 hrs./mins.

Rainfall Intensity (i) at T_c: 6.371 in./hr. Equation for T_c:

Soil Supply Rate (q) at T_c: 4.05 in./hr. $T_c = \frac{nh}{50} \frac{(L_c L_{cg})^{.3}}{(S_c)^{.4}} q^{-.4}$ hours.

Peak Discharge:

1.008 qA (acres): 3542 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

Figure # E
Sheet 7 of 12

D42

HYDROLOGIC DATA SHEET

Project Name and Location: _____

Drainage Concentration Point: CBA-8 (CBA 7 + a) South of Michigan

Watershed Area (A): 964 acres/square miles.

Length of Watercourse (L_c): 19310 ft. Length to Center of Gravity (L_{cg}): 9655 ft

Incremental Change in Length (L_i) - ft.

19310

Incremental Change in Elevation (H_i) - ft

2565

Mean Slope (S_c): 0.133 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): 0.36 (future)

Flood Frequency: 100 yrs

24 (24 hour): _____ in.

Areal Value: _____ in.

6 (6 hour): _____ in.

Areal Value: _____ in.

1 (1 hour): 2.87 in.

Areal Value: _____ in.

2 (2 hour): _____ in.

Areal Value: _____ in.

3 (3 hour): _____ in.

Areal Value: _____ in.

Soil Group(s): 100% B Cover Type(s): _____

Soil Density (pervious areas): 20% Impervious Cover: 17% (future)

N(s): 83 (curve number) (pervious & impervious areas) CN*(s): 87.5 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): _____ (pervious areas) _____ (impervious areas)

Runoff Supply Rate (q): 0.643 in./hr. (function of I)

Time of Concentration (T_c): 35 hrs./mins. (function of I)

Iterative Solution of T_c: 16 hrs./mins.

Rainfall Intensity (i) at T_c: 6.371 in./hr.

Equation for T_c:

Runoff Supply Rate (q) at T_c: 4.10 in./hr.

$$T_c = \frac{n_b}{50} \frac{(L_c L_{cg})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 3980 cfs.

Note: For impervious areas, CN* = 99 (constant).

645.33qA (square miles): _____ cfs.

Figure # E
Sheet 8 of 12

HYDROLOGIC DATA SHEET

Project Name and Location: _____

Drainage Concentration Point: CBA-9 (5+4) A5

Watershed Area (A): 134 acres/square-miles.

Length of Watercourse (L_c): 6800 ft. Length to Center of Gravity (L_{cg}): 3400 ft

Incremental Change in Length (L_i) - ft. Incremental Change in Elevation (H_i) - ft

6800 165

Mean Slope (S_c): .024 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): .042 (future) Flood Frequency: 100 yrs

24 (24 hour): _____ in. Areal Value: _____ in.

6 (6 hour): _____ in. Areal Value: _____ in.

1 (1 hour): 2.87 in. Areal Value: _____ in.

2 (2 hour): _____ in. Areal Value: _____ in.

3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 100% B Cover Type(s): _____

Soil Cover Density (pervious areas): _____ Impervious Cover: 15% (future)

N(s): 83 (curve number) (pervious & impervious areas) CN*(s): 87.5 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): _____ (pervious areas) _____ (impervious areas)

Runoff Supply Rate (q): .635 in./hr. (function of i)

Time of Concentration (T_c): 43 i^{-0.4} hrs./mins. (function of i)

Iterative Solution of T_c: 21 hrs./mins.

Rainfall Intensity (i) at T_c: 5.539 in./hr. Equation for T_c:

Runoff Supply Rate (q) at T_c: 3.52 in./hr. $T_c = \frac{1.49}{50} \frac{(L_c L_{cg})^{.76}}{(S_c)^{.4}} q^{-.4}$ hours.

Peak Discharge:
1.008 qA (acres): 415 cfs.
645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

Figure # E
Sheet 9 of 12

HYDROLOGIC DATA SHEET

Project Name and Location: _____

Drainage Concentration Point: CBA-10 Area 8 (Jaimie Ave.)

Watershed Area (A): 20 acres/square miles.

Length of Watercourse (L_c): 2200 ft. Length to Center of Gravity (L_{cg}): 1100 ft

Incremental Change in Length (L_i) - ft.

Incremental Change in Elevation (H_i) - ft

2200

30

Mean Slope (S_c): .0136 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): .038 (future) Flood Frequency: 100 yrs

24 (24 hour): _____ in. Areal Value: _____ in.

6 (6 hour): _____ in. Areal Value: _____ in.

1 (1 hour): 2.87 in. Areal Value: _____ in.

2 (2 hour): _____ in. Areal Value: _____ in.

3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 93% B, 7% C Cover Type(s): _____

Soil Density (pervious areas): 20% Impervious Cover: 6% (future)

N(s): 83, 88 (pervious & impervious areas) CN*(s): 87.5, 91.2
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): _____ (pervious areas) _____ (impervious areas)

Runoff Supply Rate (q): .609 in./hr. (function of i)

Time of Concentration (T_c): 25 hrs./mins. (function of i)

Iterative Solution of T_c: 11 hrs./mins.

Rainfall Intensity (i) at T_c: 7.491 in./hr.

Runoff Supply Rate (q) at T_c: 4.56 in./hr.

Equation for T_c:

$$T_c = \frac{Hh}{50} \frac{(L_c L_{cg})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 q_A (acres): 92 cfs.

645.33q_A (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

Figure # E
Sheet 10 of 12 04

HYDROLOGIC DATA SHEET

Project Name and Location: _____

Drainage Concentration Point: CBA-11 (Area 10) along Tindon Estate's Flk

Watershed Area (A): 64 acres/square miles.

Length of Watercourse (L_c): 2988 ft. Length to Center of Gravity (L_{cg}): 1494 ft

Incremental Change in Length (L_i) - ft. Incremental Change in Elevation (H_i) - ft

45

Mean Slope (S_c): .0151 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): .038 (future) Flood Frequency: 100 yrs

1/24 (24 hour): _____ in. Areal Value: _____ in.

1/6 (6 hour): _____ in. Areal Value: _____ in.

1 (1 hour): 2.87 in. Areal Value: _____ in.

1/2 (2 hour): _____ in. Areal Value: _____ in.

1/3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 100% B Cover Type(s): _____

Soil Cover Density (pervious areas): _____ Impervious Cover: 10% (future)

Runoff Curve Number(s): 83 (pervious & impervious areas) CN* (s): 87.5 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): _____ (pervious areas) _____ (impervious areas)

Runoff Supply Rate (q): .617 in./hr. (function of i)

Time of Concentration (T_c): 30 hrs./mins. (function of i)

Iterative Solution of T_c: 13 hrs./mins.

Rainfall Intensity (i) at T_c: 7.003 in./hr.

Runoff Supply Rate (q) at T_c: 4.32 in./hr.

Peak Discharge:

1.008 qA (acres): 279 cfs.

645.33qA (square miles): _____ cfs.

Equation for T_c:

$$T_c = \frac{n_b (L_c L_{cg})^{.3}}{50 (S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

Figure # E
Sheet 11 of 12

HYDROLOGIC DATA SHEET

Project Name and Location: SOUTHWEST

Drainage Concentration Point: CBA 12 (CBA-9 + CBAs plus S. of Bopp Road)

Watershed Area (A): 864 acres/square miles.

Length of Watercourse (L_c): 18300 ft. Length to Center of Gravity (L_{ca}): 9150 ft.

Incremental Change in Length (L_i) - ft.

18300

Incremental Change in Elevation (H_i) - ft.

2580

Mean Slope (S_c): 0.141 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): .037 (future)

Flood Frequency: 100 yrs

24 (24 hour): _____ in.

Areal Value: _____ in.

6 (6 hour): _____ in.

Areal Value: _____ in.

1 (1 hour): 2.87 in.

Areal Value: _____ in.

2 (2 hour): _____ in.

Areal Value: _____ in.

3 (3 hour): _____ in.

Areal Value: _____ in.

soil Group(s): 100% B Cover Type(s): _____

soil Density (pervious areas): 20% Impervious Cover: 17% (future)

N(s): 83 (curve number) CN*(s): 87.5 (adjusted curve number)

soil Loss Ratio(s), (C): _____ (pervious areas) _____ (impervious areas)

soil Supply Rate (q): .643 in./hr. (function of i)

Time of Concentration (T_c): 34 i^{-0.4} hrs./mins. (function of i)

Iterative Solution of T_c: 16 hrs./mins.

Rainfall Intensity (i) at T_c: 6.371 in./hr.

Equation for T_c:

soil Supply Rate (q) at T_c: 4.10 in./hr.

$$T_c = \frac{nh}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 3567 cfs.

Note: For impervious areas, CN* = 99 (constant).

645.33qA (square miles): _____ cfs.

Figure # E
Sheet 12 of 12

APPENDIX F

Cross-Section Ratings

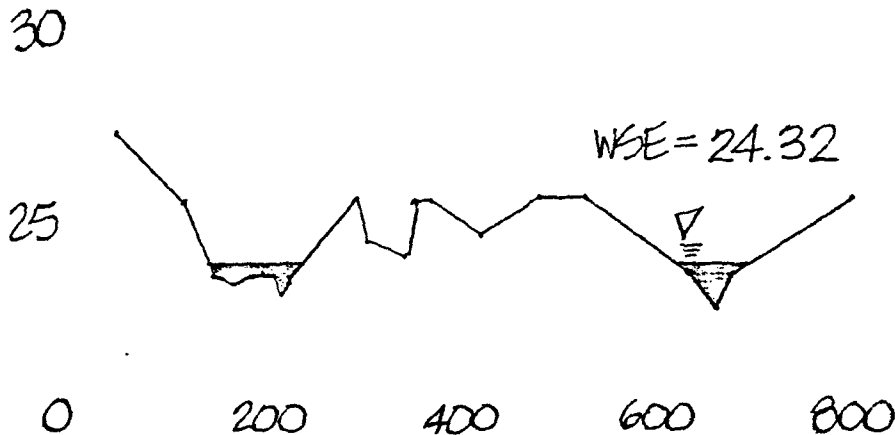
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 8

JOB NO.:

CROSS-SECTION 8D



| | | | |
|--------------------------------|------------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION 5 +00 | WATER SURFACE ELEVATION 24.32 ft | CHANNEL SLOPE .50% |
|--------------------------------|------------------|--|--------------------------|

SUBSECTIONS FROM LEFT TO RIGHT
WETTED

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-------------------|--------------------|----------------------|------------------|
| 149.40 | 228.76 | 79.36 | .040 | 30.1 | 79.43 | 41 | 1.38 | .394 |
| 633.19 | 715.01 | 81.81 | .040 | 38.3 | 81.85 | 61 | 1.58 | .408 |
| | | | | | | 102 | | |

PREPARED BY:

LL

DATE:

5/3

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SHEET NO.:

OF 41 41



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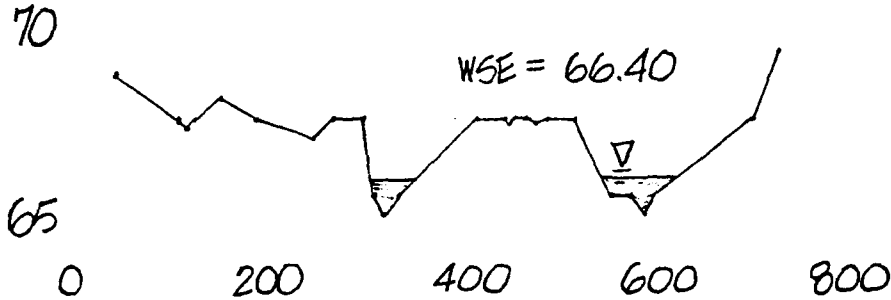
APPENDIX F

DESIGN NOTES AND COMPUTATIONS

SUBJECT: SOUTHWEST BASIN - AREA 1

JOB NO.:

CROSS-SECTION 1A



| | | |
|---------------|---------------|---------|
| CROSS-SECTION | WATER SURFACE | CHANNEL |
| TYPE | ELEVATION | SLOPE |
| EXIST | 66.40 ft | .90% |
| STATION | | |
| 2 +00 | | |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|--------|-------|-------|--------|-----------|-----------|----------|--------|
| LEFT | RIGHT | TOP | n | AREA | WETTED | DISCHARGE | VELOCITY | FROUDE |
| OFFSET | OFFSET | WIDTH | VALUE | (sqft) | PERIMETER | (cfs) | (ft/sec) | NUMBER |
| (ft) | (ft) | (ft) | | | (ft) | | | |
| 315.00 | 357.00 | 42.00 | .040 | 18.8 | 42.06 | 39 | 2.06 | .542 |
| 520.60 | 536.20 | 15.61 | .040 | 3.1 | 15.63 | 4 | 1.20 | .475 |
| 589.00 | 628.41 | 39.42 | .040 | 13.1 | 39.46 | 22 | 1.69 | .516 |
| | | | | | | 64 | | |

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DATE: 4/30 CHECKED BY:

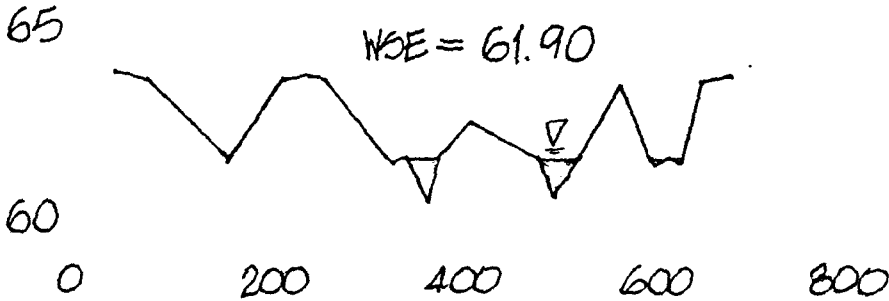
SHEET NO.: 1 OF 4

DESIGN NOTES AND COMPUTATIONS

SUBJECT: SOUTHWEST BASIN - AREA 1

JOB NO.:

CROSS-SECTION 1B



| | | | |
|--------------------------------|------------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION 3 +00 | WATER SURFACE ELEVATION 61.90 ft | CHANNEL SLOPE .50% |
|--------------------------------|------------------|--|--------------------------|

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| 162.67 | 166.00 | 3.33 | .040 | .3 | 3.36 | 0 | .56 | .314 |
| 353.58 | 385.67 | 32.09 | .040 | 17.6 | 32.16 | 31 | 1.76 | .418 |
| 491.70 | 531.30 | 39.61 | .040 | 17.8 | 39.65 | 27 | 1.54 | .405 |
| 605.50 | 615.51 | 10.01 | .040 | .5 | 10.02 | 0 | .36 | .281 |
| | | | | | | 59 | | |

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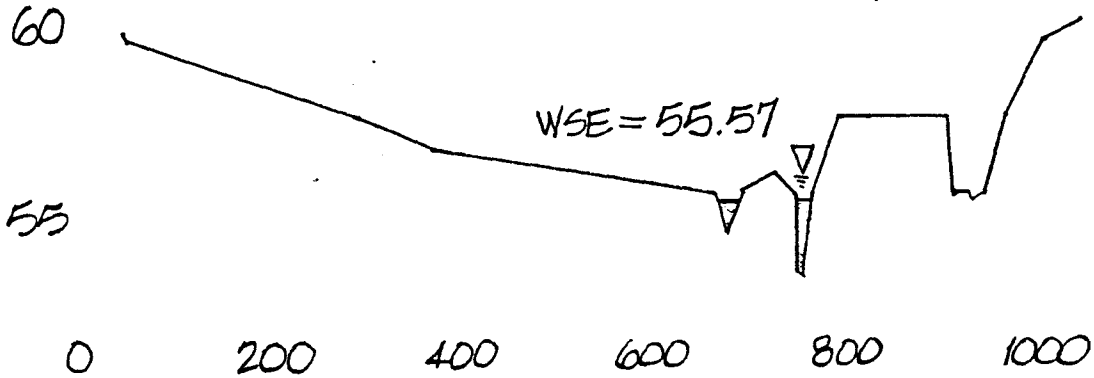
APPENDIX #

DESIGN NOTES AND COMPUTATIONS

SUBJECT: SOUTHWEST BASIN - AREA 1

JOB NO.:

CROSS-SECTION 1C



| | | | |
|--------------------------------|------------------|--|---------------------------|
| CROSS-SECTION TYPE EXIST | STATION 5 +00 | WATER SURFACE ELEVATION 55.57 ft | CHANNEL SLOPE 1.40% |
|--------------------------------|------------------|--|---------------------------|

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| 671.02 | 688.69 | 17.68 | .040 | 5.0 | 17.71 | 10 | 1.90 | .628 |
| 748.36 | 778.63 | 30.26 | .040 | 25.4 | 30.48 | 99 | 3.90 | .749 |
| | | | | | | 109 | | |

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APPENDIX F

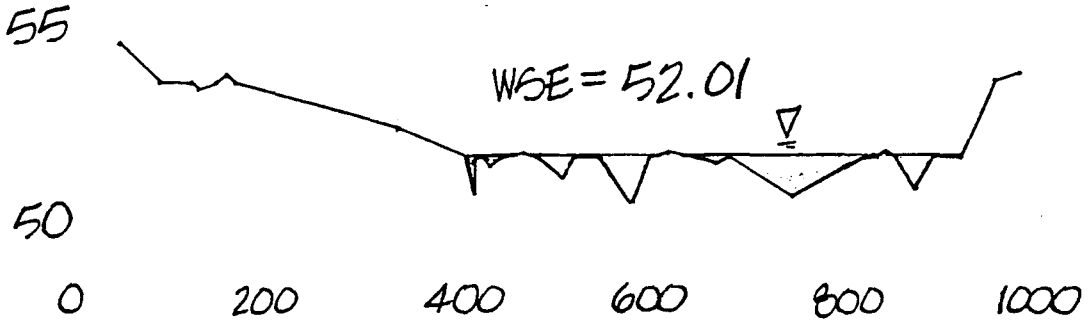
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 1

JOB NO.:

CROSS-SECTION 1D



| | | | |
|--------------------|---------|-------------------------|---------------|
| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
| EXIST | 6 +00 | 52.01 ft | .50% |

| | | SUBSECTIONS FROM LEFT TO RIGHT | | | | | | |
|-------------|-------------|--------------------------------|-------|--------|-----------|-----------|----------|--------|
| LEFT | RIGHT | TOP | n | AREA | PERIMETER | DISCHARGE | VELOCITY | FROUDE |
| OFFSET (ft) | OFFSET (ft) | WIDTH (ft) | VALUE | (sqft) | (ft) | (cfs) | (ft/sec) | NUMBER |
| 410.02 | 447.31 | 37.28 | .040 | 8.0 | 37.44 | 8 | .94 | .357 |
| 488.15 | 600.84 | 112.70 | .040 | 37.6 | 112.78 | 47 | 1.26 | .385 |
| 653.99 | 843.55 | 189.56 | .040 | 76.0 | 189.58 | 109 | 1.43 | .398 |
| 862.55 | 900.31 | 37.76 | .040 | 13.3 | 37.79 | 17 | 1.31 | .389 |
| | | | | | | 181 | | |

PREPARED BY: *ll*

DATE: 4/30

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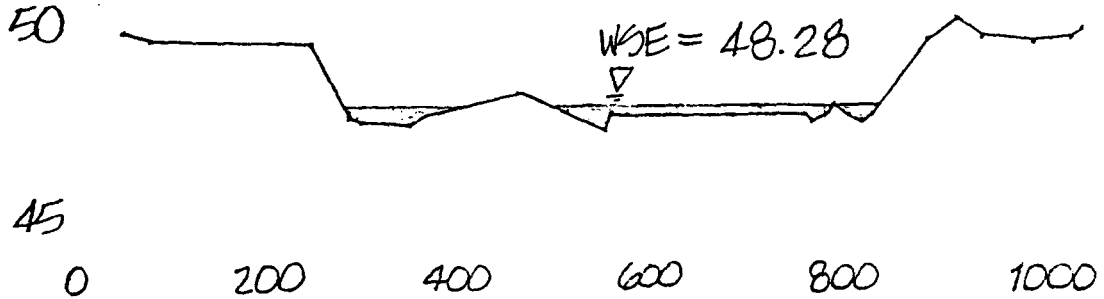
APPENDIX #

DESIGN NOTES AND COMPUTATIONS

SUBJECT: **SOUTHWEST BASIN - AREA 1**

JOB NO.:

CROSS-SECTION 1 E



| | | | |
|--------------------|---------|-------------------------|---------------|
| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
| EXIST | 7 +00 | 48.28 ft | .90% |

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| 71.82 | 77.65 | 5.84 | .040 | 1.4 | 6.02 | 2 | 1.33 | .480 |
| 281.62 | 409.67 | 128.05 | .040 | 45.7 | 128.07 | 81 | 1.77 | .523 |
| 510.45 | 793.27 | 282.82 | .040 | 74.0 | 282.86 | 107 | 1.44 | .497 |
| 794.92 | 843.12 | 48.20 | .040 | 11.9 | 48.21 | 16 | 1.39 | .492 |
| | | | | | | 206 | | |

PREPARED BY: *DL*

DATE: *4/30*

CHECKED BY:

SHEET NO.: *5* OF *41*



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APPENDIX F

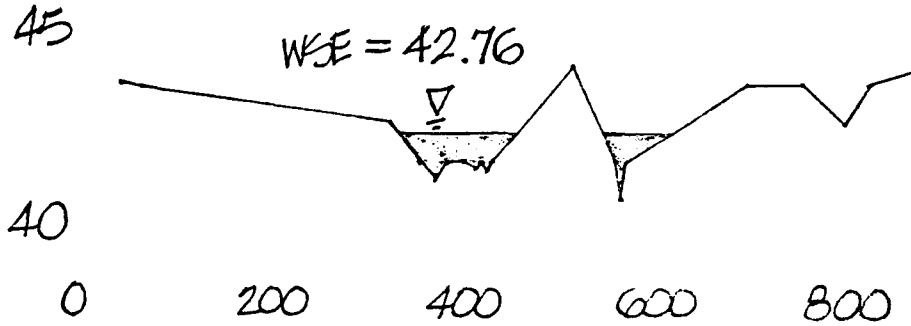
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 1

JOB NO.:

CROSS-SECTION 1F



| | | | |
|--------------------------------|------------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION 8 +00 | WATER SURFACE ELEVATION 42.76 ft | CHANNEL SLOPE .70% |
|--------------------------------|------------------|--|--------------------------|

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| 339.96 | 463.76 | 123.80 | .040 | 78.9 | 123.85 | 182 | 2.30 | .508 |
| 554.93 | 623.51 | 68.58 | .040 | 32.7 | 68.81 | 62 | 1.89 | .483 |
| | | | | | | 243 | | |

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DATE:

5/2

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6 41



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APPENDIX F

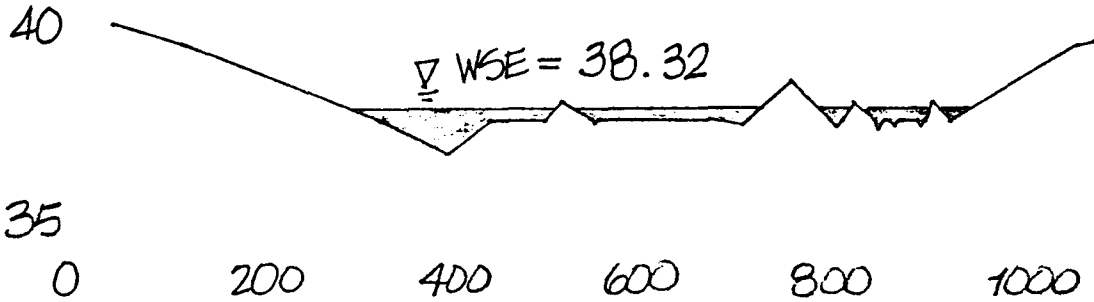
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 1

JOB NO.:

CROSS-SECTION 1G



| | | | |
|--------------------------------|------------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION 9 +00 | WATER SURFACE ELEVATION 38.32 ft | CHANNEL SLOPE .50% |
|--------------------------------|------------------|--|--------------------------|

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
| 297.19 | 518.80 | 221.61 | .040 | 111.2 | 221.63 | 185 | 1.66 | .413 |
| 536.07 | 731.01 | 194.94 | .040 | 59.1 | 194.95 | 70 | 1.19 | .379 |
| 792.19 | 829.00 | 36.81 | .040 | 8.0 | 36.83 | 8 | .95 | .359 |
| 836.40 | 909.32 | 72.92 | .040 | 21.7 | 72.95 | 25 | 1.17 | .378 |
| | | | | | | 288 | | |

PREPARED BY: DL

DATE: 5/2

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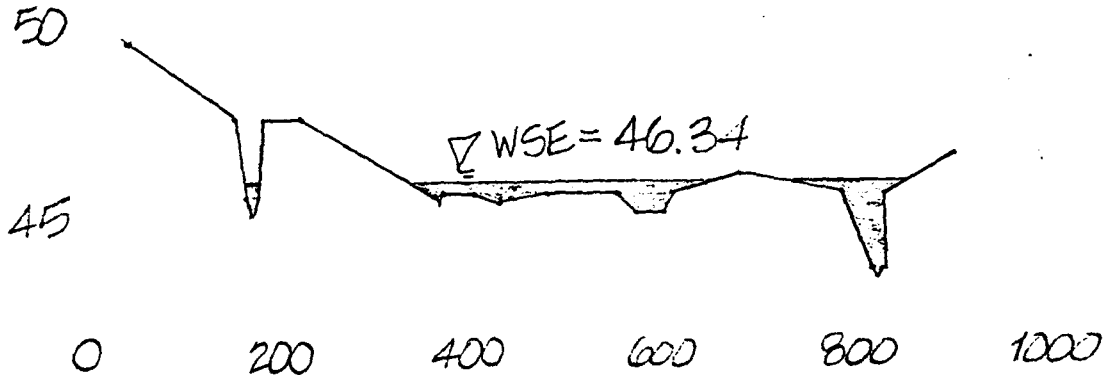
SHEET NO.: 7 OF 41

DESIGN NOTES AND COMPUTATIONS

SUBJECT: SOUTHWEST BASIN - AREA 5

JOB NO.:

CROSS-SECTION 5A



| | | | |
|--------------------|---------|-------------------------|---------------|
| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
| EXIST | 2 +00 | 46.34 ft | 1.00% |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
| 169.98 | 181.51 | 11.53 | .040 | 6.2 | 11.74 | 15 | 2.42 | .583 |
| 351.05 | 661.58 | 310.54 | .040 | 132.5 | 310.63 | 279 | 2.11 | .568 |
| 735.64 | 866.21 | 130.58 | .040 | 73.6 | 131.94 | 185 | 2.52 | .591 |
| | | | | | | 479 | | |

PREPARED BY:

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5/2

CHECKED BY:

SHEET NO.:

8 OF 41

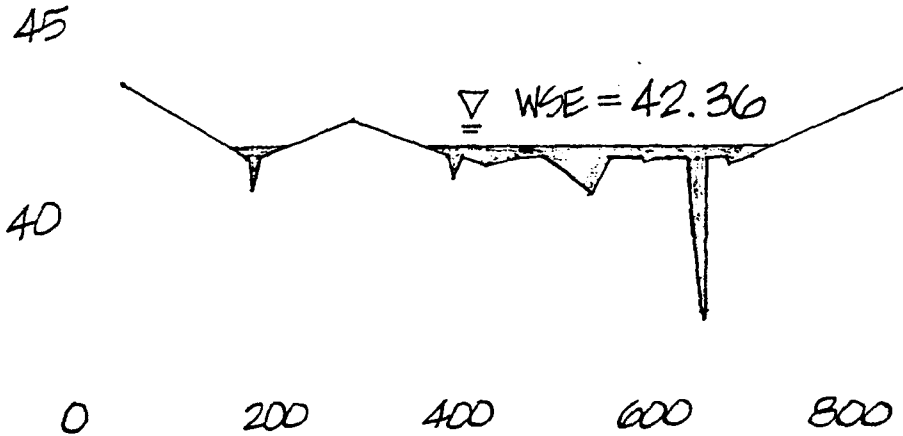
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 5

JOB NO.:

CROSS-SECTION 5B



| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
|--------------------|---------|-------------------------|---------------|
| EXIST | 3 +00 | 42.36 ft | .90% |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
| 156.60 | 226.01 | 69.41 | .040 | 17.8 | 69.51 | 25 | 1.42 | .495 |
| 353.99 | 749.01 | 395.02 | .040 | 201.1 | 398.35 | 449 | 2.23 | .552 |
| | | | | | | 475 | | |

PREPARED BY:

LL

DATE:

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SHEET NO.:

9 OF 41



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16021 750-7474
FAX 16021 750-7470

APPENDIX F

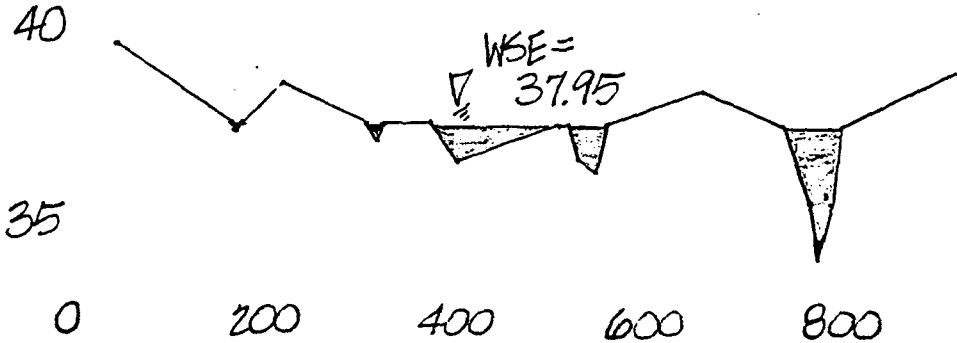
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 5

JOB NO.:

CROSS-SECTION 5C



| | | | |
|--------------------------------|---------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION +0 | WATER SURFACE ELEVATION 37.95 ft | CHANNEL SLOPE .60% |
|--------------------------------|---------------|--|--------------------------|

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| 172.50 | 175.50 | 3.00 | .040 | .1 | 3.00 | 0 | .25 | .274 |
| 315.75 | 326.25 | 10.50 | .040 | 1.8 | 10.53 | 2 | .90 | .379 |
| 380.30 | 504.76 | 124.46 | .040 | 59.1 | 124.48 | 104 | 1.75 | .448 |
| 519.60 | 563.69 | 44.09 | .040 | 37.7 | 44.24 | 98 | 2.59 | .493 |
| 748.75 | 812.43 | 63.68 | .040 | 82.2 | 64.15 | 279 | 3.39 | .527 |
| | | | | | | 482 | | |

PREPARED BY:

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DATE: 5/2

CHECKED BY:

SHEET NO.: OF

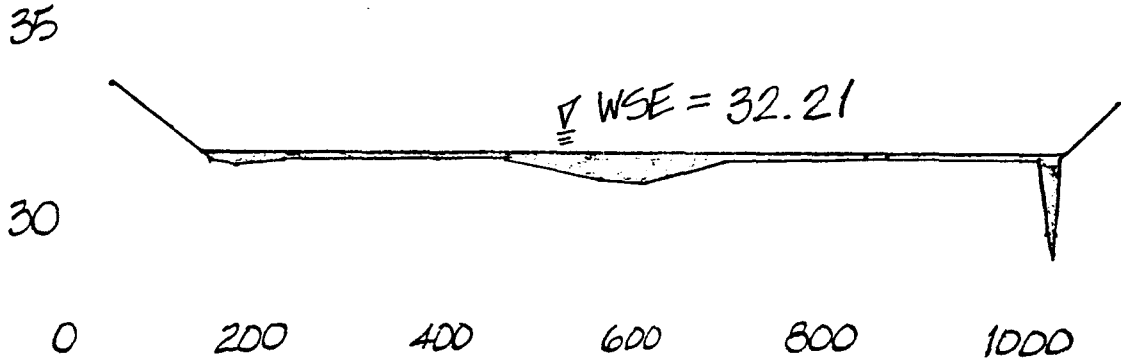
10 41

SUBJECT:

SOUTHWEST BASIN - AREA 5

JOB NO.:

CROSS-SECTION 5 D



| | | | |
|--------------------|---------|-------------------------|---------------|
| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
| EXIST | 5 +00 | 32.21 ft | .80% |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
| 147.55 | 1047.11 | 899.55 | .040 | 300.6 | 900.61 | 481 481 | 1.60 | .487 |

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DATE: 5/2

CHECKED BY:

SHEET NO.: OF

11 41



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[602] 750-7474
FAX [602] 750-7470

APPENDIX F

DESIGN NOTES AND COMPUTATIONS

SUBJECT:

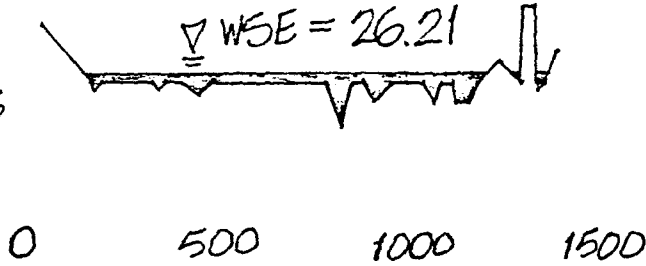
SOUTHWEST BASIN - AREA 5

JOB NO.:

CROSS-SECTION 5E

30

25



| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
|--------------------|---------|-------------------------|---------------|
| EXIST | 6 +00 | 26.21 ft | .90% |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | | |
|--------------------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|--|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER | |
| 161.80 | 1210.29 | 1048.49 | .040 | 304.7 | 1048.70 | 471 | 1.55 | .505 | |
| 1292.75 | 1311.11 | 18.35 | .040 | 1.9 | 18.48 | 2 | .78 | .425 | |
| 1334.68 | 1353.77 | 19.09 | .040 | 4.3 | 20.18 | 5 | 1.25 | .466 | |
| | | | | | | 478 | | | |

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W

DATE: 5/2

CHECKED BY:

SHEET NO. OF

12 41



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APPENDIX F

SUBJECT:

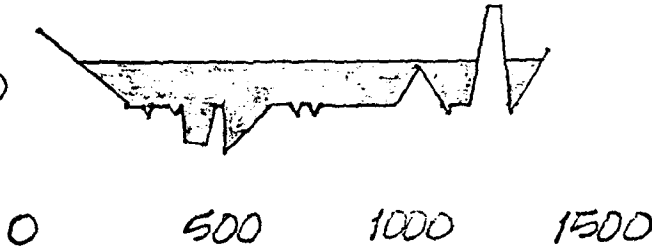
SOUTHWEST BASIN - AREA 5

JOB NO.:

CROSS-SECTION 5F

25

20



| | | | |
|--------------------|---------|-------------------------|---------------|
| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
| EXIST | 7 +00 | 20.18 ft | .90% |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | | |
|--------------------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|--|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER | |
| 262.02 | 994.71 | 732.69 | .040 | 261.2 | 732.89 | 463 | 1.77 | .523 | |
| 1091.44 | 1185.31 | 93.87 | .040 | 15.8 | 93.91 | 17 | 1.07 | .461 | |
| 1277.01 | 1292.63 | 15.62 | .040 | 1.9 | 15.73 | 2 | .86 | .435 | |
| | | | | | | 481 | | | |

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DATE: 5/3

CHECKED BY:

SHEET NO.: 13 OF 41

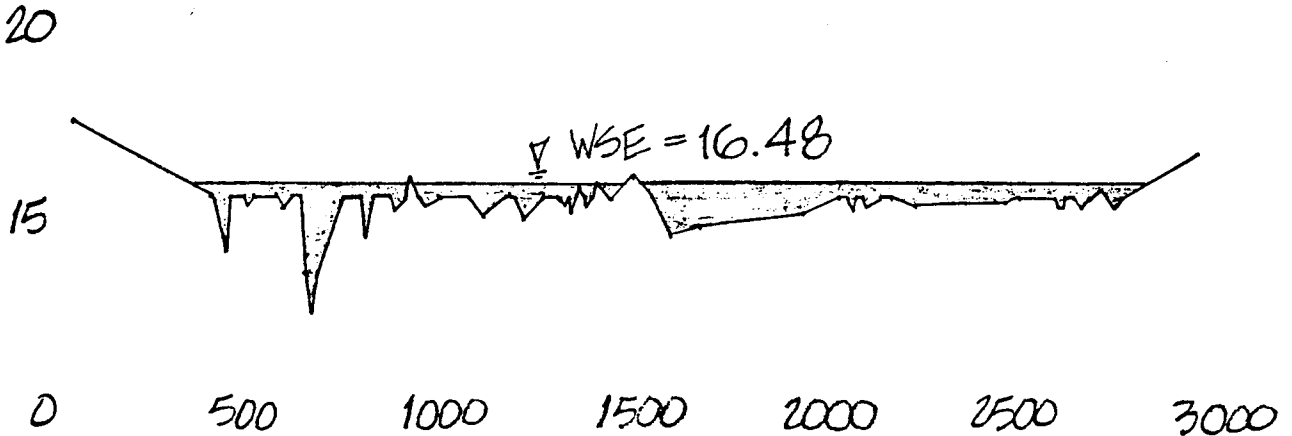
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 5

JOB NO.:

CROSS-SECTION 5G



| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
|--------------------|---------|-------------------------|---------------|
| EXIST | B +00 | 16.48 ft | .75% |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
| 350.19 | 938.02 | 587.83 | .040 | 427.7 | 588.67 | 1112 | 2.60 | .537 |
| 939.79 | 1521.04 | 581.25 | .040 | 299.1 | 581.36 | 618 | 2.07 | .507 |
| 1524.77 | 2886.87 | 1362.11 | .040 | 926.3 | 1362.15 | 2304 | 2.49 | .532 |
| | | | | | | 4034 | | |

PREPARED BY:

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DATE: 6/22

CHECKED BY:

SHEET NO.: 14 OF 41



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APPENDIX F

DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 5

JOB NO.:

CROSS-SECTION 5 H

15

10

$\Delta WSE = 12.31$

0 500 1000 1500 2000 2500 3000

| CROSS-SECTION | | | WATER SURFACE | | CHANNEL | |
|---------------|---------|--|---------------|--|---------|--|
| TYPE | STATION | | ELEVATION | | SLOPE | |
| EXIST | 9 +00 | | 12.31 ft | | .90% | |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|---------|---------|-------|--------|-----------|-----------|----------|--------|
| LEFT | RIGHT | TOP | n | AREA | WETTED | DISCHARGE | VELOCITY | FROUDE |
| OFFSET | OFFSET | WIDTH | VALUE | (sqft) | PERIMETER | (cfs) | (ft/sec) | NUMBER |
| (ft) | (ft) | (ft) | | | (ft) | | | |
| 342.94 | 3275.97 | 2933.03 | .040 | 1672.1 | 2934.42 | 4051 | 2.42 | .565 |
| | | | | | | 4051 | | |

PREPARED BY: *[Signature]*

DATE: 6/22 CHECKED BY:

SHEET NO.: 15 OF 41

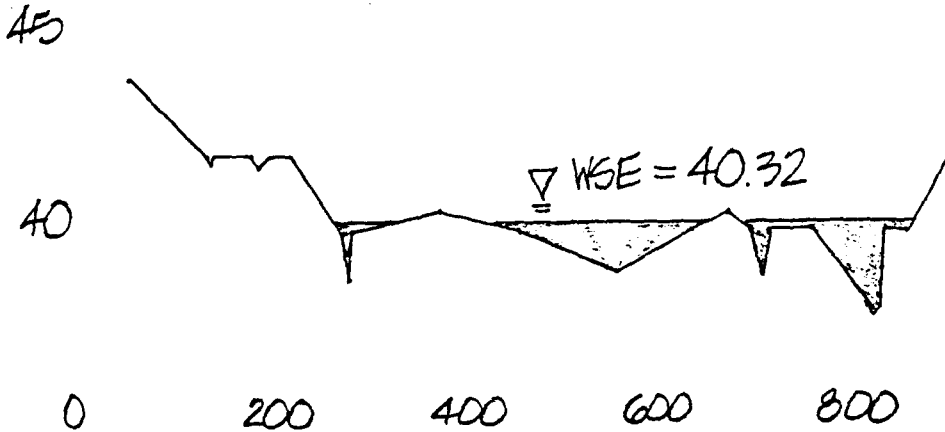
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 6

JOB NO.:

CROSS-SECTION 6 D



| | | | |
|--------------------------------|------------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION 5 +00 | WATER SURFACE ELEVATION 40.32 ft | CHANNEL SLOPE .50% |
|--------------------------------|------------------|--|--------------------------|

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-------------------|--------------------|----------------------|------------------|
| 264.36 | 340.02 | 75.66 | .040 | 14.4 | 76.56 | 12 | .86 | .348 |
| 405.14 | 661.41 | 256.27 | .040 | 170.3 | 256.29 | 340 | 2.00 | .432 |
| 672.99 | 867.48 | 194.50 | .040 | 145.4 | 194.88 | 314 | 2.16 | .440 |
| | | | | | | 667 | | |

PREPARED BY:

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DATE: 5/3

CHECKED BY:

SHEET NO.: OF

16 41



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CELLA BARR [602] 750-7474
ASSOCIATES FAX [602] 750-7470

APPENDIX F

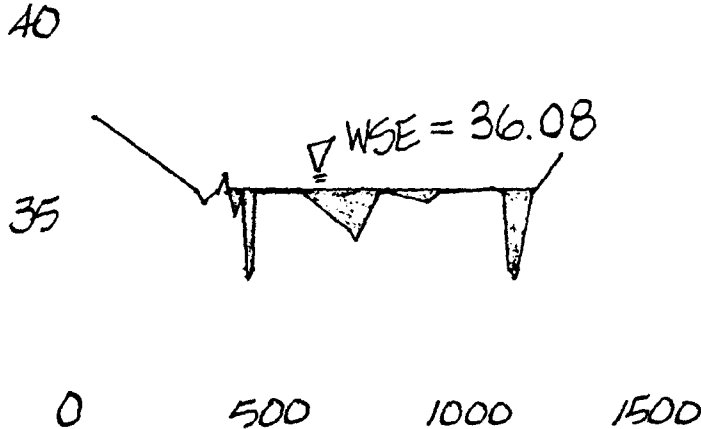
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 6

JOB NO.:

CROSS-SECTION 6E



| | | | |
|--------------------|---------|-------------------------|---------------|
| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
| EXIST | 6 +00 | 36.08 ft | .50% |

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| 313.42 | 344.00 | 30.58 | .040 | 3.5 | 30.60 | 2 | .62 | .323 |
| 380.00 | 1078.02 | 698.02 | .040 | 322.6 | 699.15 | 506 | 1.57 | .407 |
| 1115.73 | 1195.00 | 79.27 | .040 | 78.2 | 79.54 | 203 | 2.60 | .461 |
| | | | | | | 711 | | |

PREPARED BY: LL

DATE: 5/3

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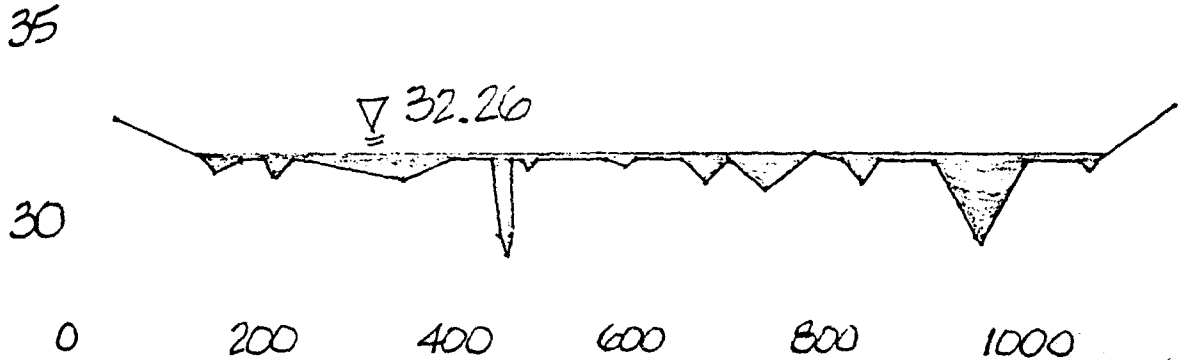
SHEET NO.: OF 17 41

SUBJECT:

SOUTHWEST BASIN - AREA 6

JOB NO.:

CROSS-SECTION 6 F



| | | | |
|--------------------------------|------------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION 7 +00 | WATER SURFACE ELEVATION 32.26 ft | CHANNEL SLOPE .50% |
|--------------------------------|------------------|--|--------------------------|

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| 122.55 | 779.02 | 656.48 | .040 | 267.6 | 658.25 | 386 | 1.44 | .398 |
| 788.99 | 1096.39 | 307.40 | .040 | 181.2 | 307.53 | 334 | 1.85 | .424 |
| | | | | | | 720 | | |

PREPARED BY:

LV

DATE: 5/3

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SHEET NO.: OF

18 41



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APPENDIX F

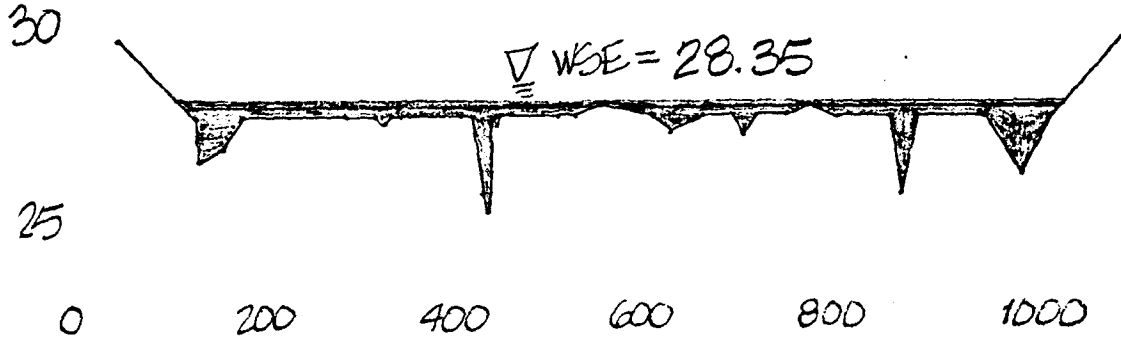
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA C

JOB NO.:

CROSS-SECTION 6 C



| | | | |
|--------------------------------|------------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION 8 +00 | WATER SURFACE ELEVATION 28.35 ft | CHANNEL SLOPE .50% |
|--------------------------------|------------------|--|--------------------------|

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | SUBSECTIONS FROM LEFT TO RIGHT | | | | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|--------------------------------|----------------|-----------------------------|------------|--------------------|----------------------|------------------|
| | | | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | | | | |
| 120.12 | 1043.48 | 923.35 | .040 | 447.1 | 924.88 | 724 724 | 1.62 | .410 | |

PREPARED BY:

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DATE: 5/3

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SHEET NO.:

OF

19 41



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CELLA BARR [602] 750-7474
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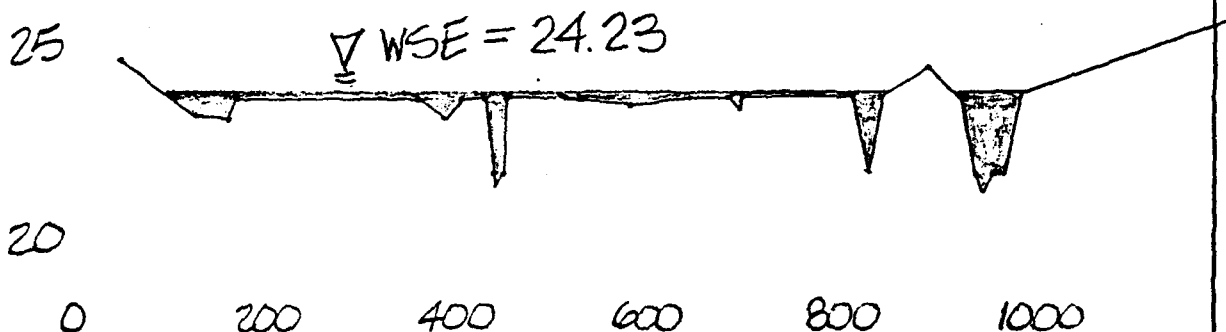
APPENDIX F

DESIGN NOTES AND COMPUTATIONS

SUBJECT: SOUTHWEST BASIN - AREA 6

JOB NO.:

CROSS-SECTION 6H



| | | | |
|--------------------|---------|-------------------------|---------------|
| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
| EXIST | 9 +00 | 24.23 ft | .60% |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
| 100.82 | 860.39 | 759.57 | .040 | 264.3 | 761.14 | 376 | 1.42 | .425 |
| 920.93 | 1017.32 | 96.39 | .040 | 106.3 | 96.64 | 326 | 3.07 | .515 |
| | | | | | | 702 | | |

PREPARED BY: *ML*

DATE: 5/3

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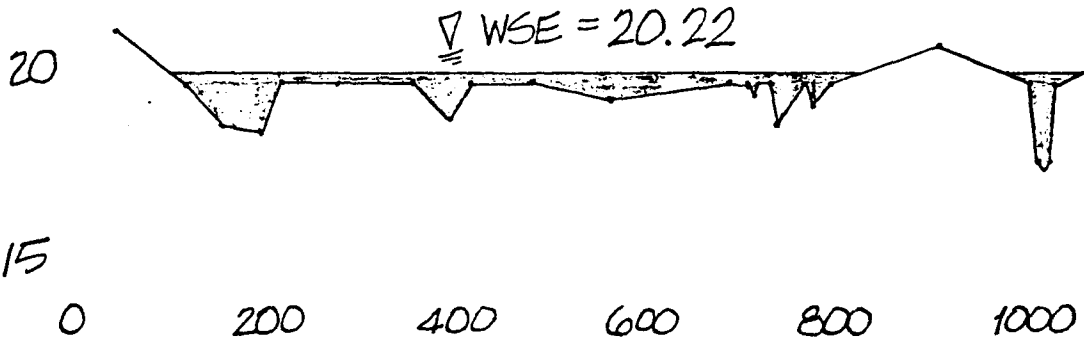
SHEET NO.: OF 20 41

DESIGN NOTES AND COMPUTATIONS

SUBJECT: SOUTHWEST BASIN - AREA 6

JOB NO.:

CROSS-SECTION 6 I



| | | | |
|--------------------|---------|-------------------------|---------------|
| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
| EXIST | 1 +000 | 20.22 ft | .78% |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
| 113.21 | 822.66 | 709.45 | .040 | 319.0 | 710.39 | 614 | 1.92 | .506 |
| 991.88 | 1050.02 | 58.14 | .040 | 36.3 | 59.23 | 86 | 2.37 | .528 |
| 1141.99 | 1162.24 | 20.25 | .040 | 4.3 | 20.28 | 5 | 1.17 | .446 |
| | | | | | | 705 | | |

PREPARED BY:

LL

DATE: 5/3

CHECKED BY:

SHEET NO.: OF

21 41



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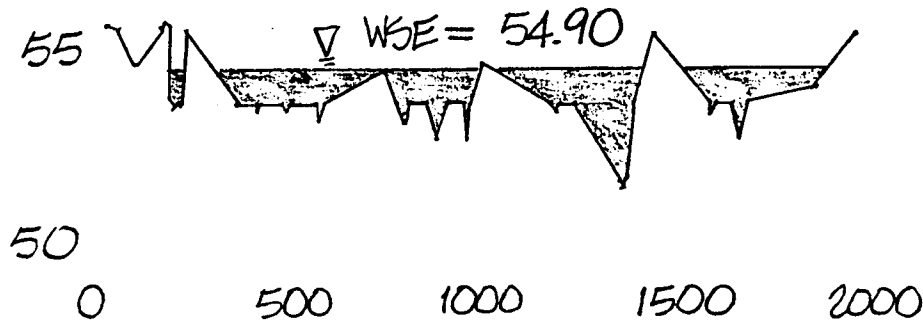
APPENDIX F

DESIGN NOTES AND COMPUTATIONS

SUBJECT: SOUTHWEST BASIN - AREA 4

JOB NO.:

CROSS-SECTION 4D



| | | |
|---------------|---------------|---------|
| CROSS-SECTION | WATER SURFACE | CHANNEL |
| TYPE | ELEVATION | SLOPE |
| EXIST | 54.90 ft | .60% |
| STATION | | |
| 3 +00 | | |

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| 205.20 | 272.05 | 66.85 | .040 | 50.3 | 67.10 | 120 | 2.38 | .482 |
| 345.21 | 1021.01 | 675.80 | .040 | 536.3 | 676.07 | 1323 | 2.47 | .486 |
| 1044.46 | 1450.13 | 405.67 | .040 | 409.9 | 405.94 | 1187 | 2.90 | .508 |
| 1554.56 | 1950.70 | 396.14 | .040 | 276.4 | 396.22 | 626 | 2.26 | .478 |
| | | | | | | 3255 | | |

PREPARED BY:

DL

DATE:

5/2

CHECKED BY:

SHEET NO.:

OF

22 41



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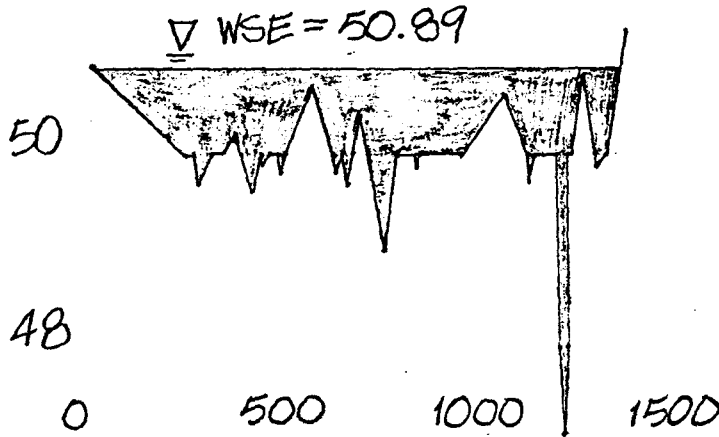
APPENDIX F

DESIGN NOTES AND COMPUTATIONS

SUBJECT: SOUTHWEST BASIN - AREA 4

JOB NO.:

CROSS-SECTION 4 E



FILE: GP. BOPP. A4

SOUTHWEST

15 STATION

DATE: 0425 1993

| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
|--------------------|---------|-------------------------|---------------|
| EXIST | 4 +00 | 50.89 ft | 1.00% |

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| 52.66 | 1422.36 | 1369.70 | .040 | 1028.0 | 1372.41 | 3150 3150 | 3.06 | .623 |

PREPARED BY:

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DATE: 5/2

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SHEET NO.: OF

23 41



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APPENDIX F

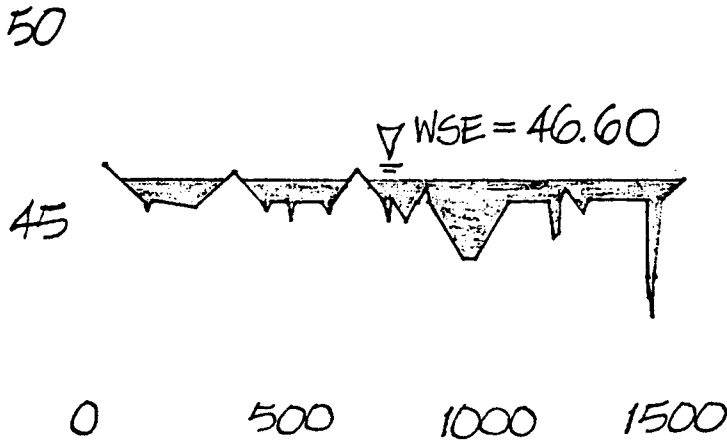
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 4

JOB NO.:

CROSS-SECTION 4 F



FILE: GP. BOPP. A4

SOUTHWEST

15 STATION

DATE: 0425 1993

CROSS-SECTION
TYPE STATION
EXIST 5 +00

WATER SURFACE
ELEVATION
46.60 ft

CHANNEL
SLOPE
.90%

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| 92.00 | 373.22 | 281.23 | .040 | 137.9 | 281.24 | 302 | 2.19 | .552 |
| 411.25 | 692.86 | 281.61 | .040 | 136.0 | 281.69 | 295 | 2.17 | .550 |
| 716.14 | 1565.00 | 848.86 | .040 | 729.3 | 850.90 | 2319 | 3.18 | .605 |
| | | | | | | 2917 | | |

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DATE:

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24 41



4911 EAST BROADWAY
TUCSON, ARIZONA 85711
CELLA BARR [602] 750-7474
ASSOCIATES FAX [602] 750-7470

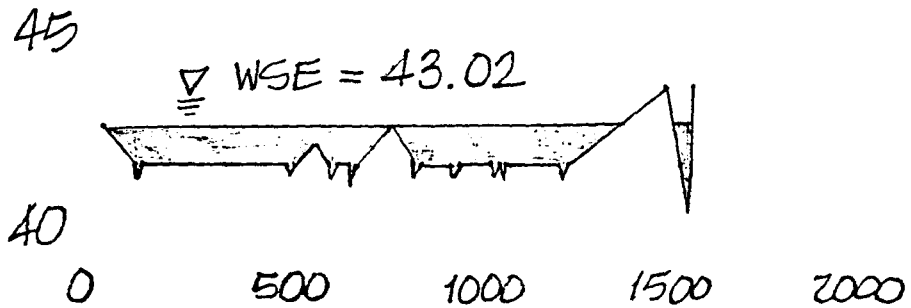
APPENDIX F

DESIGN NOTES AND COMPUTATIONS

SUBJECT: SOUTHWEST BASIN - AREA 4

JOB NO.:

CROSS-SECTION 4G



FILE: CP. BOPP. A4

SOUTHWEST

15 STATION

DATE: 0425 1993

| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
|--------------------|---------|-------------------------|---------------|
| EXIST | 6 +00 | 43.02 ft | .60% |

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| 67.23 | 1390.76 | 1323.53 | .040 | 1137.9 | 1324.06 | 2960 | 2.60 | .494 |
| 1537.72 | 1579.02 | 41.30 | .040 | 51.2 | 41.90 | 169 | 3.29 | .521 |
| | | | | | | 3128 | | |

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APPENDIX F

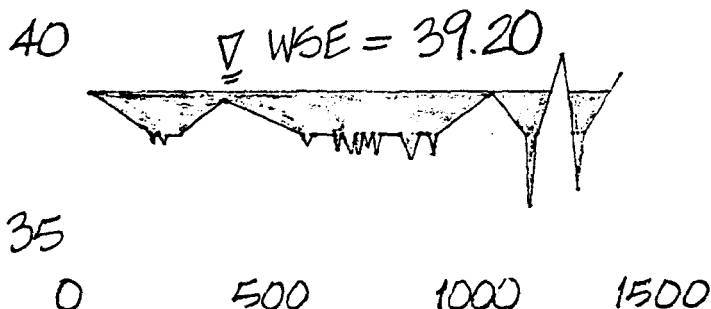
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 4

JOB NO.:

CROSS-SECTION 4H



FILE: GP. BOPP. A4

SOUTHWEST

15 STATION

DATE: 0425 1993

CROSS-SECTION
TYPE STATION
EXIST 7 +00

WATER SURFACE
ELEVATION
39.20 ft

CHANNEL
SLOPE
.50%

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | SUBSECTIONS FROM LEFT TO RIGHT | | | | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|--------------------------------|----------------|-----------------------------|------|--------------------|----------------------|------------------|
| | | | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | | | | |
| 50.00 | 1247.81 | 1197.81 | .040 | 1106.5 | 1199.18 | 2755 | 2.49 | .457 | |
| 1288.99 | 1416.01 | 127.02 | .040 | 117.8 | 127.21 | 294 | 2.50 | .457 | |
| | | | | | | 3049 | | | |

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ASSOCIATES FAX (602) 750-7470

APPENDIX F

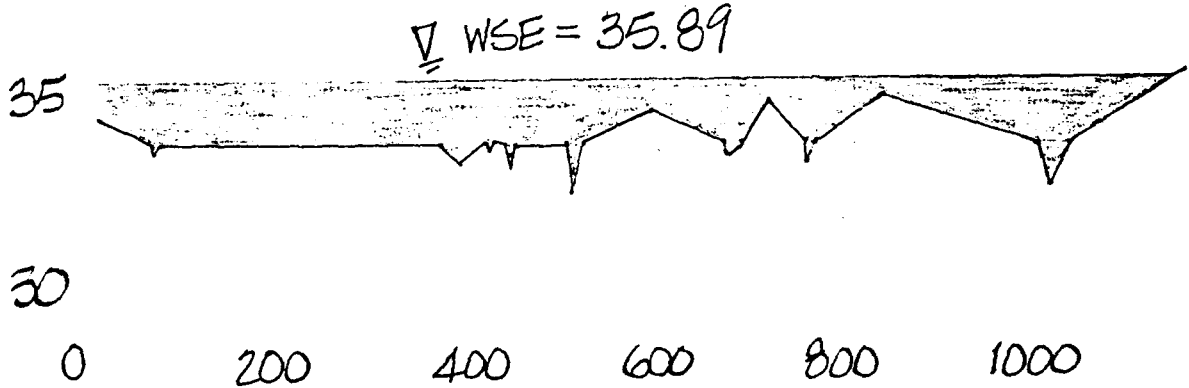
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 4

JOB NO.:

CROSS-SECTION 4 I



FILE: GP. BOPP. A4

SOUTHWEST

15 STATION

DATE: 0426 1993

CROSS-SECTION
TYPE STATION
EXIST 8 +00

WATER SURFACE
ELEVATION
35.89 ft

CHANNEL
SLOPE
.70%

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| 1013.02 | 1159.41 | 146.39 | .040 | 184.7 | 147.63 | 666 666 | 3.61 | .566 |

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DATE:

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SHEET NO.:

OF

27 41



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APPENDIX F

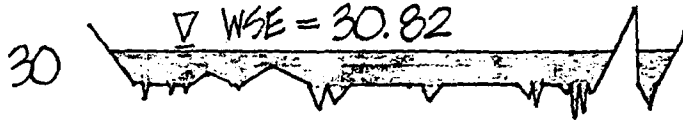
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 4

JOB NO.:

CROSS-SECTION 4 J



25

0 500 1000 1500 2000

| CROSS-SECTION NO. | TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
|-------------------|-------|---------|-------------------------|---------------|
| 9 | EXIST | 9 +00 | 30.82 ft | .80% |

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | SUBSECTIONS FROM LEFT TO RIGHT | | | | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------|-------------------|----------------|--------------------------------|-------------|-----------------------|------|-----------------|-------------------|---------------|
| | | | n | AREA (sqft) | WETTED PERIMETER (ft) | | | | |
| 102.13 | 1309.46 | 1207.32 | .040 | 1077.3 | 1209.25 | 3314 | 3.08 | .574 | |
| 1477.85 | 1552.23 | 74.38 | .040 | 74.1 | 74.59 | 245 | 3.31 | .584 | |
| | | | | | | 3559 | | | |

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DATE:

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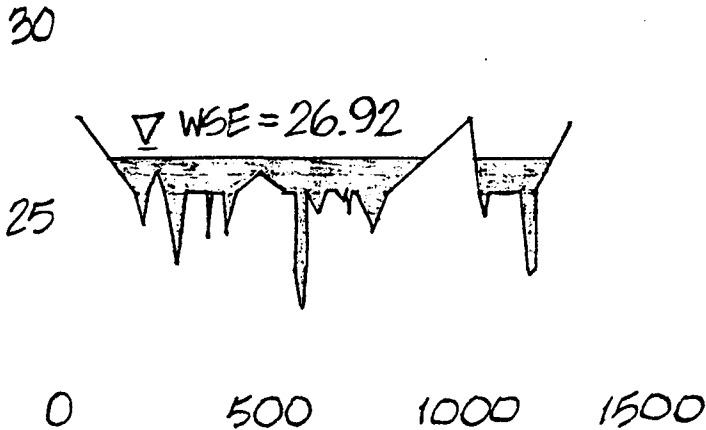
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 4

JOB NO.:

CROSS-SECTION 4K



| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
|--------------------|---------|-------------------------|---------------|
| EXIST | 1 +000 | 26.92 ft | 1.00% |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
| 136.40 | 968.46 | 832.07 | .040 | 805.3 | 834.06 | 2922 | 3.63 | .650 |
| 1075.38 | 1280.90 | 205.52 | .040 | 188.0 | 206.40 | 656 | 3.49 | .643 |
| | | | | | | 3579 | | |

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APPENDIX F

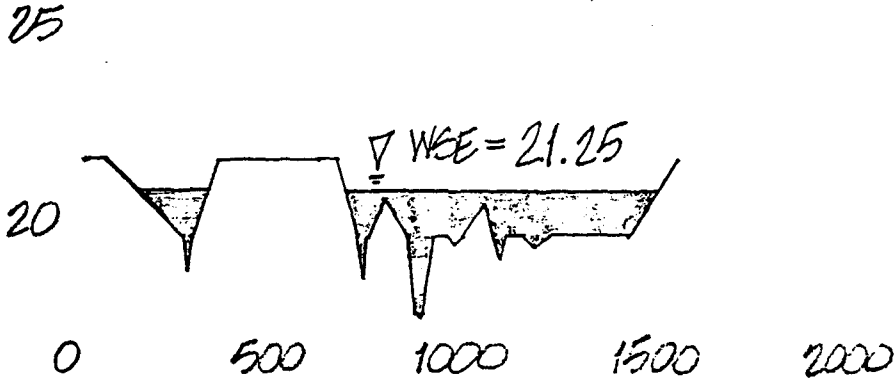
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 4

JOB NO.:

CROSS-SECTION 4L



| | | | |
|--------------------------------|------------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION 11+00 | WATER SURFACE ELEVATION 21.25 ft | CHANNEL SLOPE .70% |
|--------------------------------|------------------|--|--------------------------|

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
| 185.62 | 371.88 | 186.26 | .040 | 121.3 | 186.48 | 283 | 2.33 | .510 |
| 741.12 | 1541.15 | 800.03 | .040 | 944.2 | 800.54 | 3276 | 3.47 | .563 |
| | | | | | | 3559 | | |

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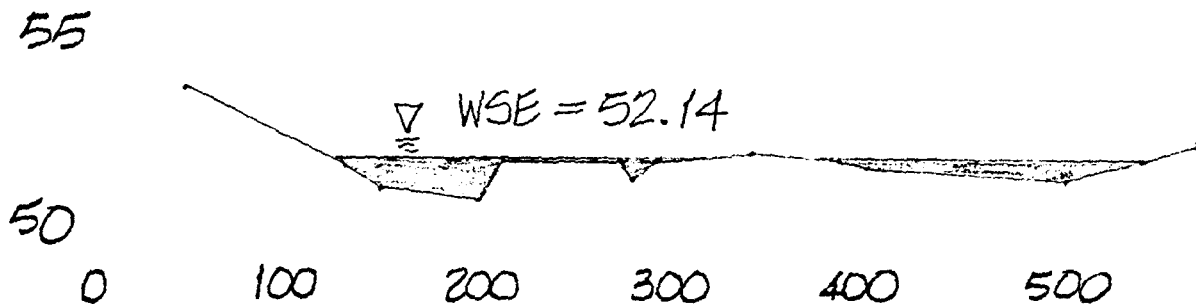
APPENDIX F

SUBJECT:

SOUTHWEST BASIN - AREA 10

JOB NO.:

CROSS-SECTION 10A



| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
|--------------------|---------|-------------------------|---------------|
| EXIST | 2 +00 | 52.14 ft | .90% |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
| 127.19 | 318.34 | 191.16 | .040 | 78.6 | 191.22 | 153 | 1.95 | .535 |
| 368.99 | 561.51 | 192.52 | .040 | 71.6 | 192.53 | 130 | 1.82 | .527 |
| | | | | | | 284 | | |

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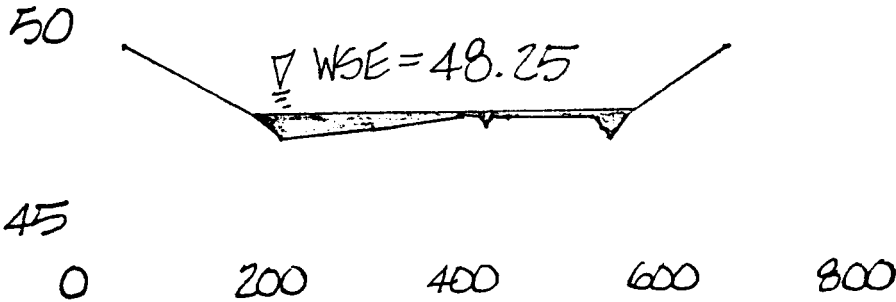
APPENDIX F

SUBJECT:

SOUTHWEST BASIN AREA 10

JOB NO.:

CROSS-SECTION 10 B



| | | | |
|--------------------------------|------------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION 3 +00 | WATER SURFACE ELEVATION 48.25 ft | CHANNEL SLOPE .70% |
|--------------------------------|------------------|--|--------------------------|

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
| 171.58 | 600.51 | 428.93 | .040 | 171.4 | 428.95 | 289 289 | 1.69 | .470 |

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32 41



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APPENDIX F

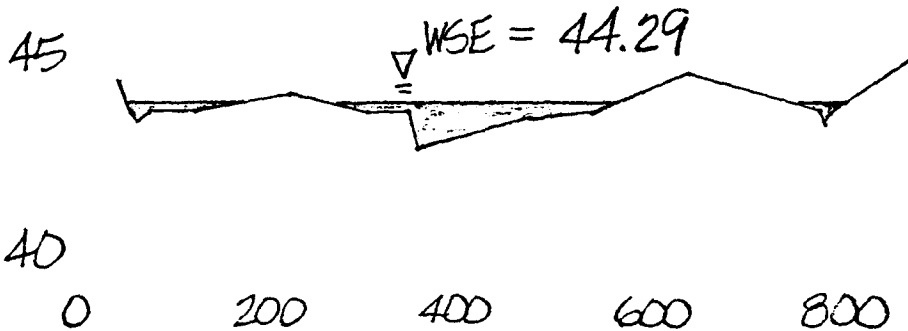
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 10

JOB NO.:

CROSS-SECTION 10 C



| | | | |
|--------------------|---------|-------------------------|---------------|
| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
| EXIST | 4 +00 | 44.29 ft | .50% |

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------|-------------------|----------------|---------|-------------|----------------|-----------------|-------------------|---------------|
| 59.56 | 193.01 | 133.44 | .040 | 30.5 | 133.45 | 30 | .98 | .362 |
| 266.49 | 577.01 | 310.52 | .040 | 151.1 | 310.57 | 245 | 1.62 | .410 |
| 748.09 | 811.23 | 63.14 | .040 | 10.3 | 63.20 | 18 283 | .79 | .342 |

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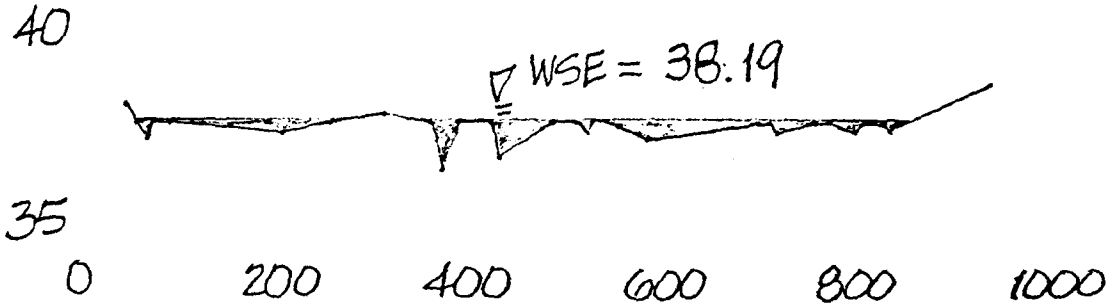
APPENDIX F

DESIGN NOTES AND COMPUTATIONS

SUBJECT: SOUTHWEST BASIN - AREA 10

JOB NO.:

CROSS-SECTION 10 D



| | | | |
|--------------------|---------|-------------------------|---------------|
| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
| EXIST | 5 +00 | 38.19 ft | .50% |

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | |
|--------------------------------|-------------------|----------------|------|-------------|----------------|-----------------|-------------------|---------------|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n | AREA (sqft) | PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
| 59.30 | 299.02 | 239.72 | .040 | 61.4 | 239.74 | 65 | 1.06 | .369 |
| 339.32 | 866.73 | 527.41 | .040 | 176.9 | 527.62 | 224 | 1.27 | .386 |
| | | | | | | 289 | | |

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34 OF *41*



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APPENDIX F

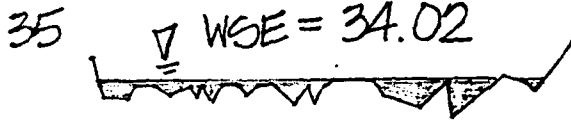
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 10

JOB NO.:

CROSS-SECTION 10 E



30

0 500 1000 1500

| | | | |
|--------------------------------|------------------|--|---------------------------|
| CROSS-SECTION TYPE EXIST | STATION 6 +00 | WATER SURFACE ELEVATION 34.02 ft | CHANNEL SLOPE 1.00% |
|--------------------------------|------------------|--|---------------------------|

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| 67.49 | 661.51 | 594.02 | .040 | 76.9 | 594.05 | 73 | .95 | .466 |
| 778.44 | 1096.76 | 318.31 | .040 | 114.4 | 318.34 | 215 | 1.88 | .552 |
| 1188.17 | 1218.52 | 30.36 | .040 | 1.7 | 30.36 | 1 | .55 | .407 |
| | | | | | | 289 | | |

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APPENDIX F

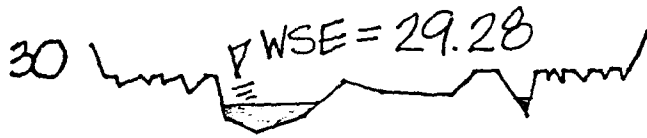
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 10

JOB NO.:

CROSS-SECTION 10 F



25

0 500 1000 1500

| | | | |
|--------------------------------|------------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION 7 +00 | WATER SURFACE ELEVATION 29.28 ft | CHANNEL SLOPE .80% |
|--------------------------------|------------------|--|--------------------------|

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | SUBSECTIONS FROM LEFT TO RIGHT | | | | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|--------------------------------|----------------|-----------------------------|-----|--------------------|----------------------|------------------|
| | | | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | | | | |
| 393.20 | 660.45 | 267.25 | .040 | 130.1 | 267.26 | 267 | 2.06 | .519 | |
| 1166.78 | 1208.01 | 41.23 | .040 | 9.9 | 41.24 | 13 | 1.28 | .462 | |
| | | | | | | 280 | | | |

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DATE: *5/2*

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36 41



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APPENDIX F

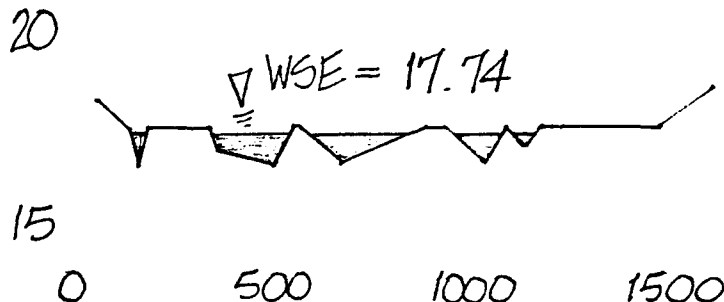
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 10

JOB NO.:

CROSS-SECTION 10 H



| | | | |
|--------------------|---------|-------------------------|---------------|
| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
| EXIST | 1 +000 | 17.74 ft | .60% |

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| 150.60 | 163.18 | 12.58 | .040 | 4.7 | 12.67 | 7 | 1.48 | .428 |
| 351.80 | 339.70 | 187.90 | .040 | 82.4 | 187.91 | 137 | 1.66 | .442 |
| 597.20 | 839.06 | 241.86 | .040 | 77.4 | 241.86 | 104 | 1.35 | .419 |
| 992.25 | 1109.09 | 116.85 | .040 | 31.6 | 116.85 | 38 | 1.20 | .408 |
| 1156.47 | 1181.04 | 24.57 | .040 | 1.7 | 24.57 | 1 | .49 | .326 |
| | | | | | | 287 | | |

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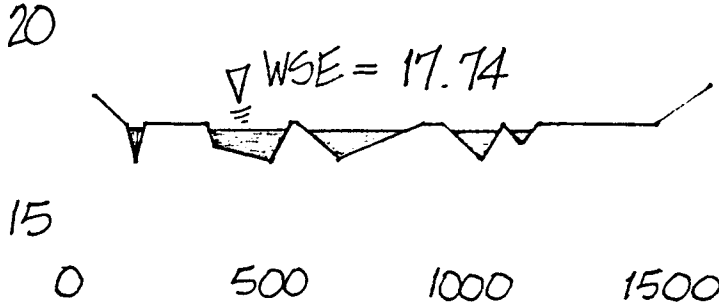
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 10

JOB NO.:

CROSS-SECTION 10 H



| | | | |
|--------------------|---------|-------------------------|---------------|
| CROSS-SECTION TYPE | STATION | WATER SURFACE ELEVATION | CHANNEL SLOPE |
| EXIST | 1 +000 | 17.74 ft | .60% |

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|
| 150.60 | 163.18 | 12.58 | .040 | 4.7 | 12.67 | 7 | 1.48 | .428 |
| 351.80 | 539.70 | 187.90 | .040 | 82.4 | 187.91 | 137 | 1.66 | .442 |
| 597.20 | 839.06 | 241.86 | .040 | 77.4 | 241.86 | 104 | 1.35 | .419 |
| 992.25 | 1109.09 | 116.85 | .040 | 31.6 | 116.85 | 38 | 1.20 | .408 |
| 1156.47 | 1181.04 | 24.57 | .040 | 1.7 | 24.57 | 1 | .49 | .326 |
| | | | | | | 287 | | |

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DATE: 5/2 CHECKED BY:

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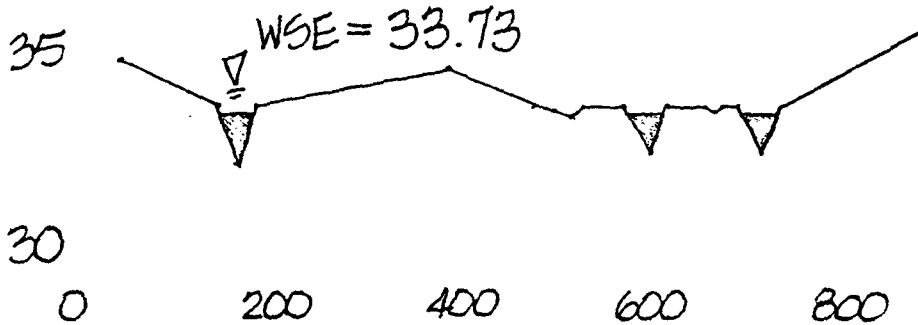
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 8

JOB NO.:

CROSS-SECTION 8B



| | | | |
|--------------------------------|------------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION 3 +00 | WATER SURFACE ELEVATION 33.73 ft | CHANNEL SLOPE .67% |
|--------------------------------|------------------|--|--------------------------|

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-----------------------------|--------------------|----------------------|------------------|
| 154.50 | 187.30 | 32.80 | .040 | 20.2 | 32.90 | 44 | 2.19 | .493 |
| 518.46 | 527.11 | 8.65 | .040 | .1 | 8.65 | 0 | .19 | .266 |
| 585.75 | 617.53 | 31.78 | .040 | 14.8 | 31.85 | 27 | 1.82 | .471 |
| 705.13 | 736.07 | 30.94 | .040 | 12.8 | 30.99 | 22 | 1.69 | .462 |
| | | | | | | 93 | | |

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DATE:

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39 41



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APPENDIX F

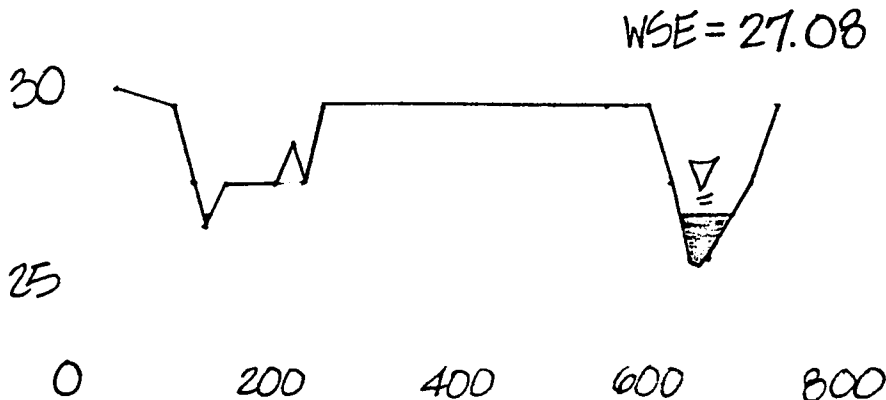
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 8

JOB NO.:

CROSS-SECTION 8C



| | | | |
|--------------------------|---------------|----------------------------------|---------------------|
| CROSS-SECTION TYPE EXIST | STATION 4 +00 | WATER SURFACE ELEVATION 27.08 ft | CHANNEL SLOPE 1.00% |
|--------------------------|---------------|----------------------------------|---------------------|

| SUBSECTIONS FROM LEFT TO RIGHT | | | | | | | | | |
|--------------------------------|-------------------|----------------|---------|-------------|-----------------------|-----------------|-------------------|---------------|--|
| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | WETTED PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER | |
| 144.50 | 151.50 | 7.00 | .040 | 1.0 | 7.02 | 1 | 1.00 | .471 | |
| 229.80 | 232.04 | 2.24 | .040 | .1 | 2.25 | 0 | .43 | .382 | |
| 643.04 | 695.01 | 51.97 | .040 | 35.1 | 52.04 | 101 | 2.86 | .513 | |
| | | | | | | 102 | | | |

PREPARED BY:

DL

DATE: 5/3

CHECKED BY:

SHEET NO.: OF

40 41



CELLA BARR ASSOCIATES

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APPENDIX F

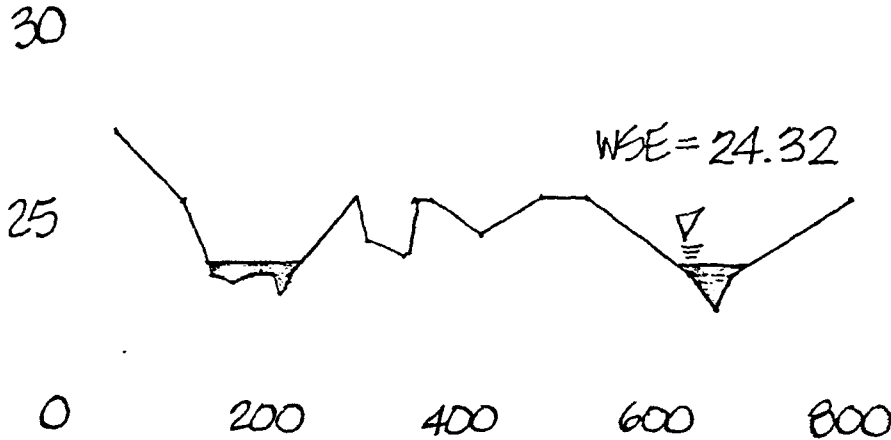
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST BASIN - AREA 8

JOB NO.:

CROSS-SECTION 8D



| | | | |
|--------------------------------|------------------|--|--------------------------|
| CROSS-SECTION TYPE EXIST | STATION 5 +00 | WATER SURFACE ELEVATION 24.32 ft | CHANNEL SLOPE .50% |
|--------------------------------|------------------|--|--------------------------|

SUBSECTIONS FROM LEFT TO RIGHT

| LEFT OFFSET (ft) | RIGHT OFFSET (ft) | TOP WIDTH (ft) | n VALUE | AREA (sqft) | PERIMETER (ft) | DISCHARGE (cfs) | VELOCITY (ft/sec) | FROUDE NUMBER |
|------------------------|-------------------------|----------------------|------------|----------------|-------------------|--------------------|----------------------|------------------|
| 149.40 | 228.76 | 79.36 | .040 | 30.1 | 79.43 | 41 | 1.38 | .394 |
| 633.19 | 715.01 | 81.81 | .040 | 38.3 | 81.85 | 61 | 1.58 | .408 |
| | | | | | | 102 | | |

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DATE:

5/3

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SHEET NO.:

OF

41 41



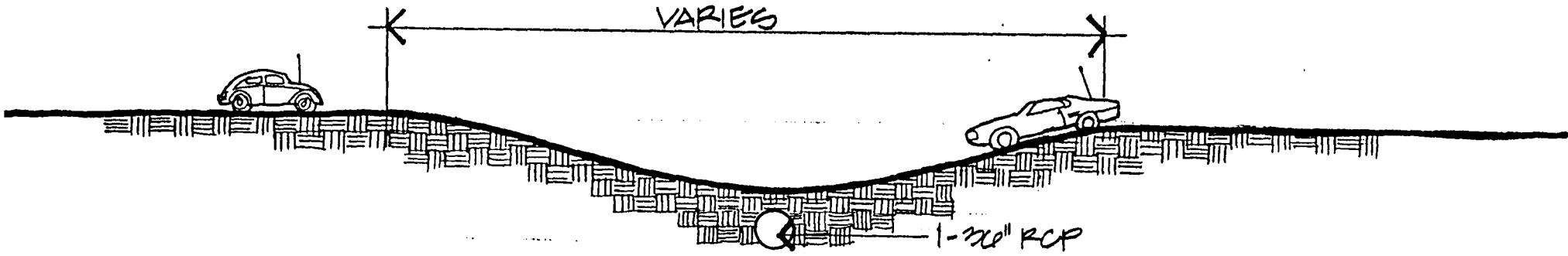
4911 EAST BROADWAY
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CELLA BARR ASSOCIATES FAX [602] 750-7470

APPENDIX F

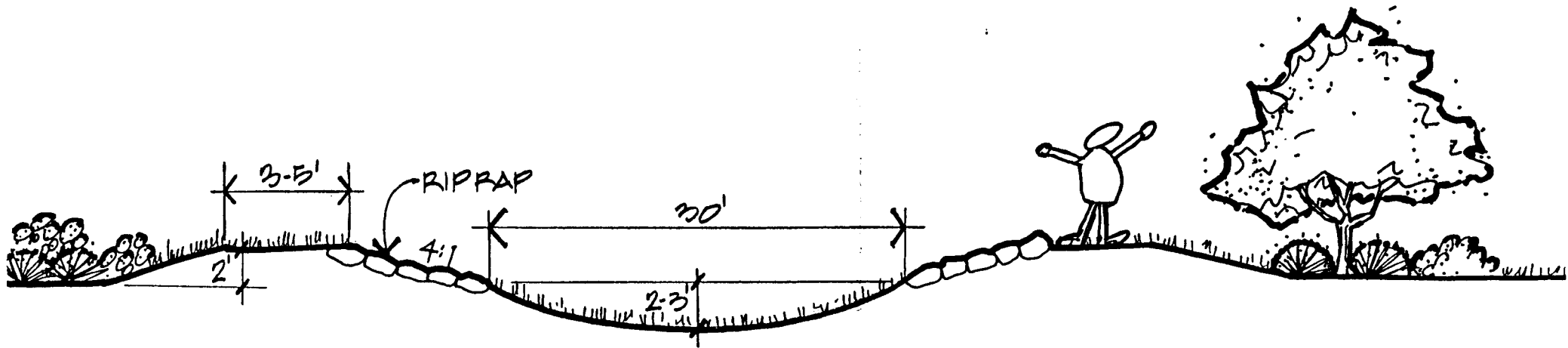
APPENDIX G

Typical Conceptual Cross-Section

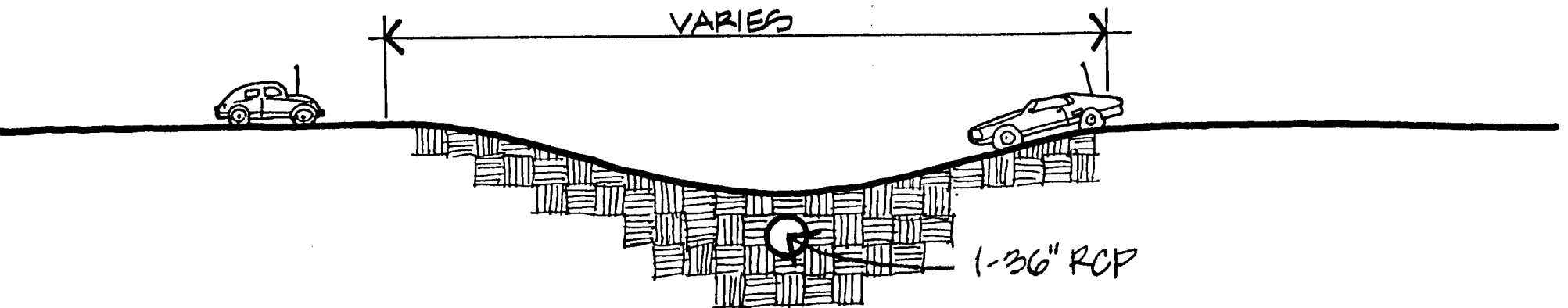
- 1. ONE 36-INCH RCP AT HUXLEY DRIVE
Q10=54CFS
DIP SECTION IS OPTIONAL
Q100=107 CFS



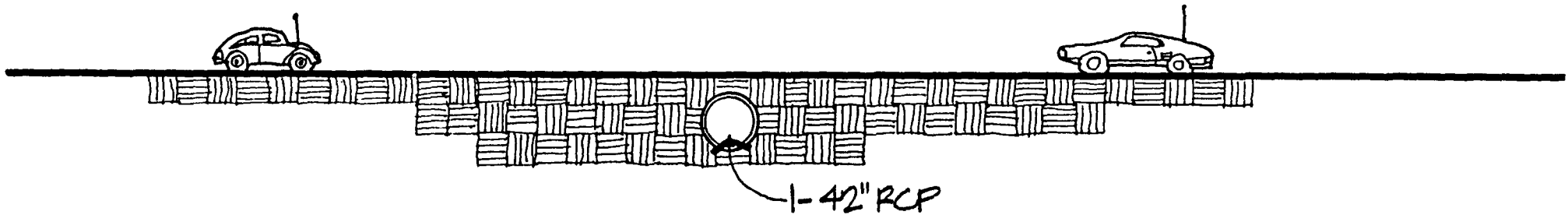
2. NATURAL DRAINAGEWAY, BEGINNING AT HUXLEY DRIVE
EXTENDING TO DONALD AVENUE. EARTHEN BERMS
WITH RIPRAP (CHANNEL SIDE ONLY)
Q100=107 CFS



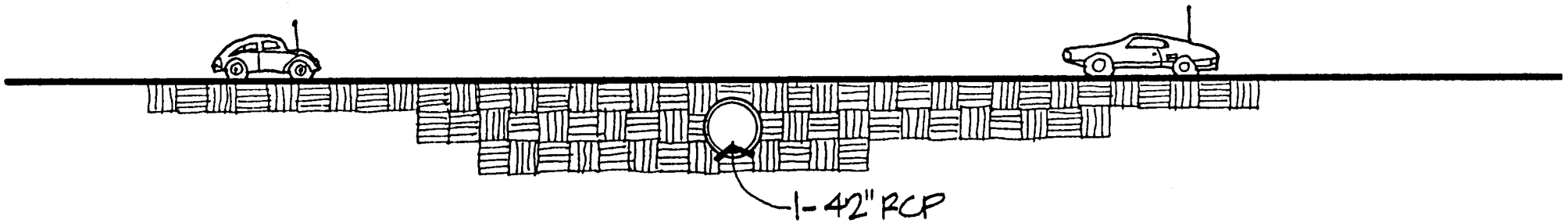
3. ONE 36-INCH RCP AT DONALD AVE.
Q10=54 CFS
DIP SECTION IS OPTIONAL
Q100=107 CFS



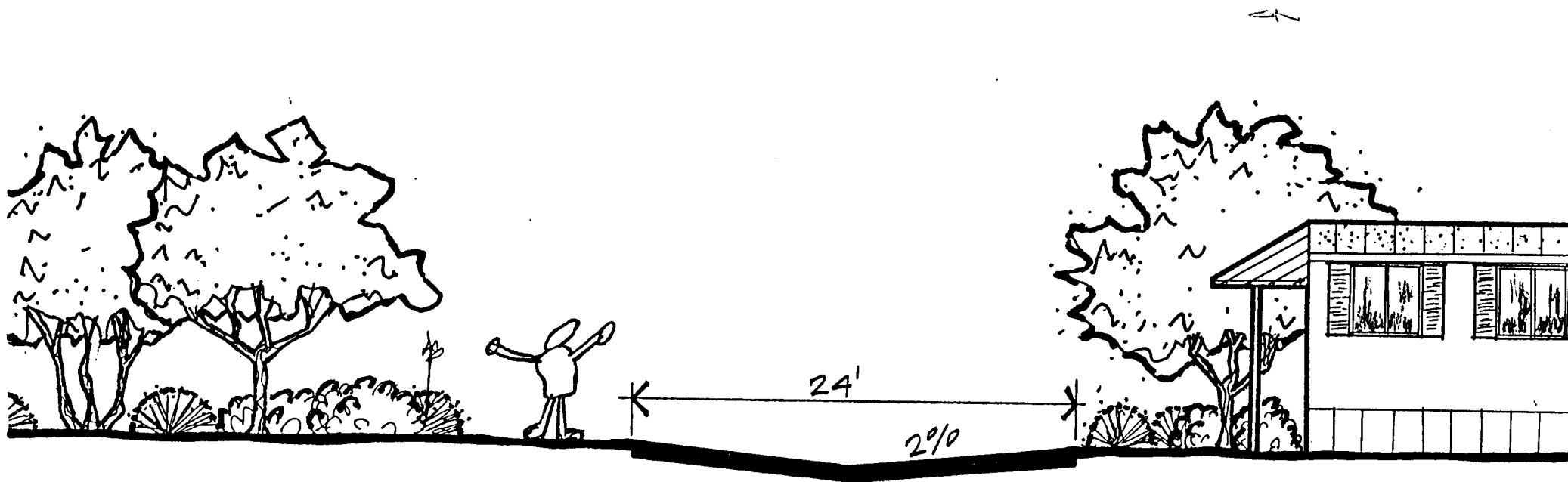
4. ONE 42-INCH RCP @ MICHIGAN STREET,
EAST OF DONALD AVENUE
Q10=62 CFS



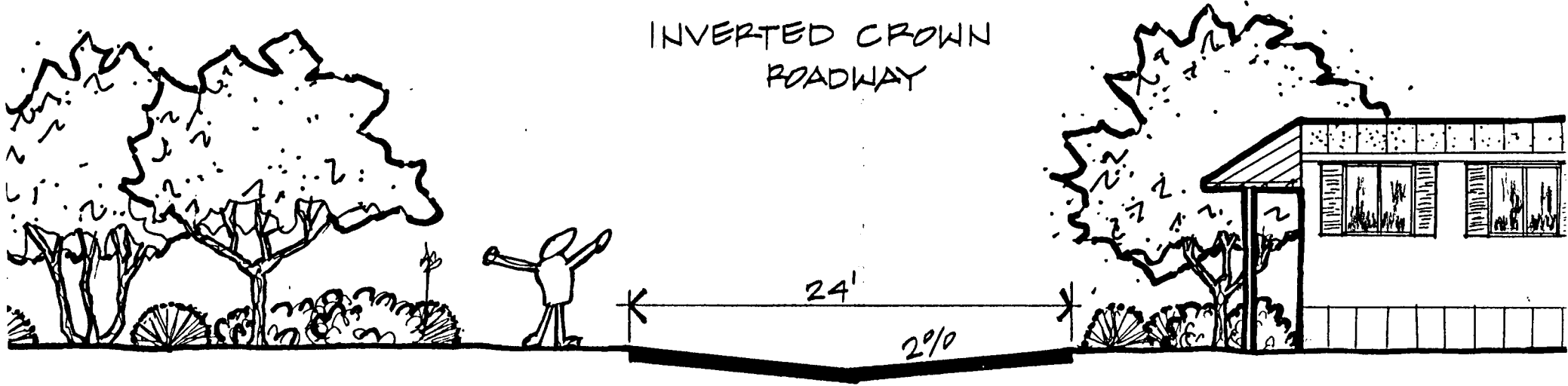
5. ONE 42-INCH RCP AT MICHIGAN STREET,
WEST OF TUCSON ESTATES PARKWAY



6. **INVERTED CROWN ROADWAY**
600 FEET ALONG MIMBRES DRIVE
400 FEET ALONG DANA DRIVE

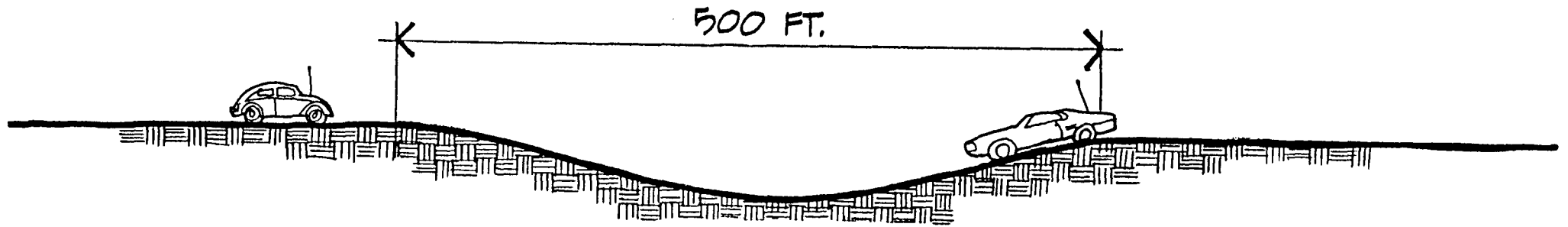


7. REGRADE CUL-DE-SAC AT WEST END OF DANA DRIVE

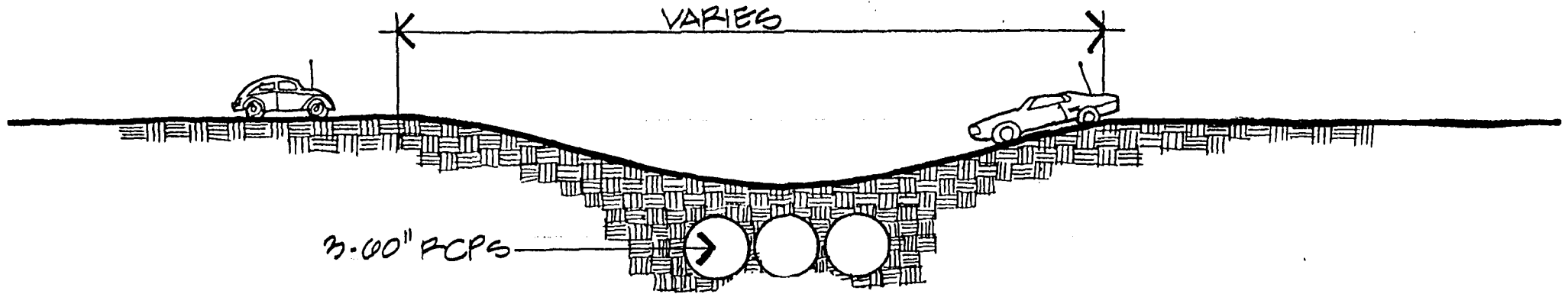


8. ROAD IMPROVEMENT ALONG CAMINO VERDE,
NORTH OF MICHIGAN STREET.

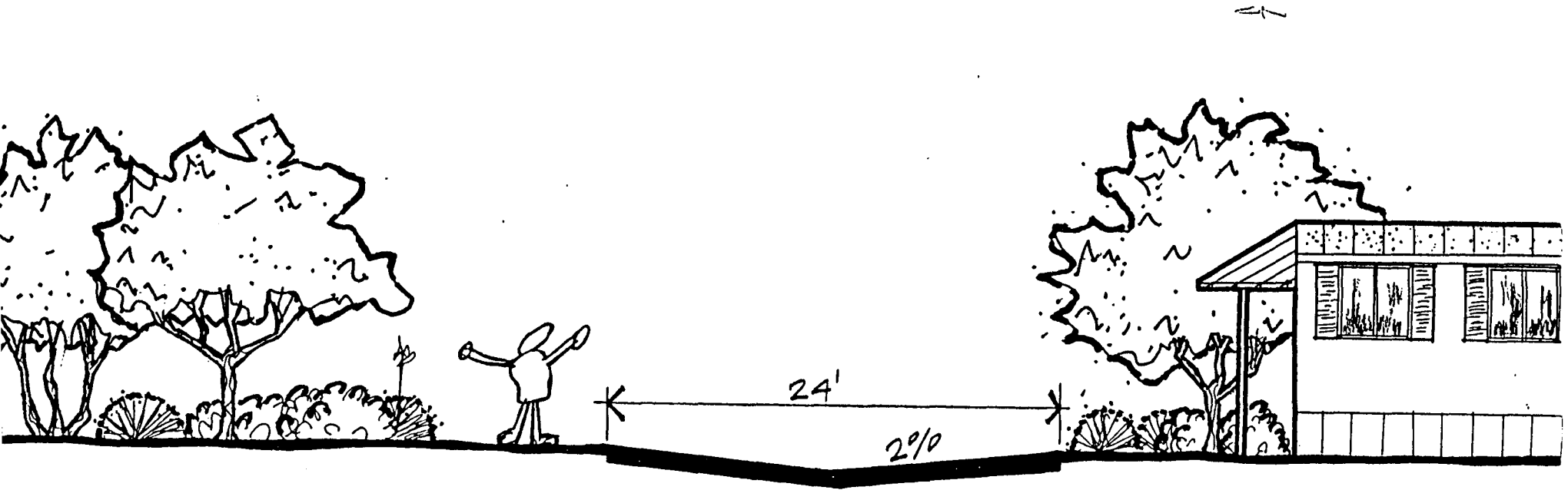
DIP CROSSING



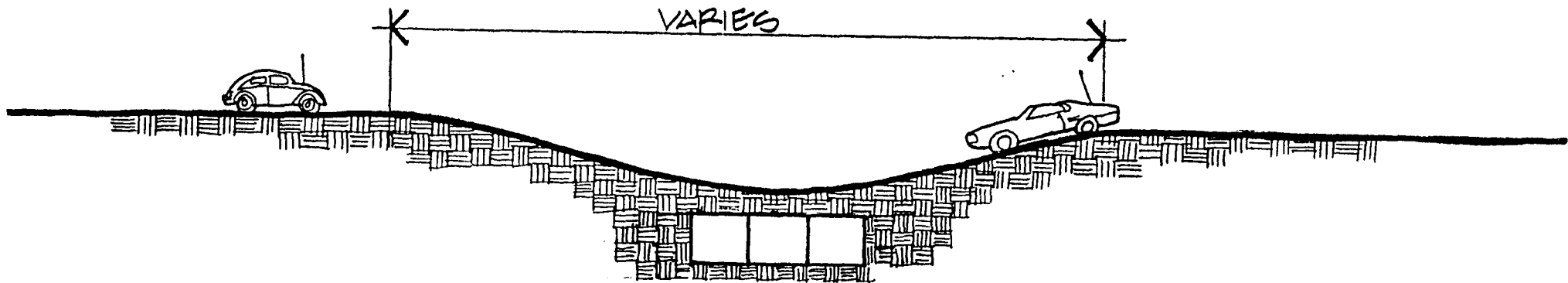
9. THREE, 60-INCH RCP'S AT ILLINOIS STREET,
APPROXIMATELY 300 FEET EAST OF CAMINO VERDE
Q10=512 CFS
WITH DIP SECTION FOR ALL WEATHER ACCESS
Q100=1024 CFS



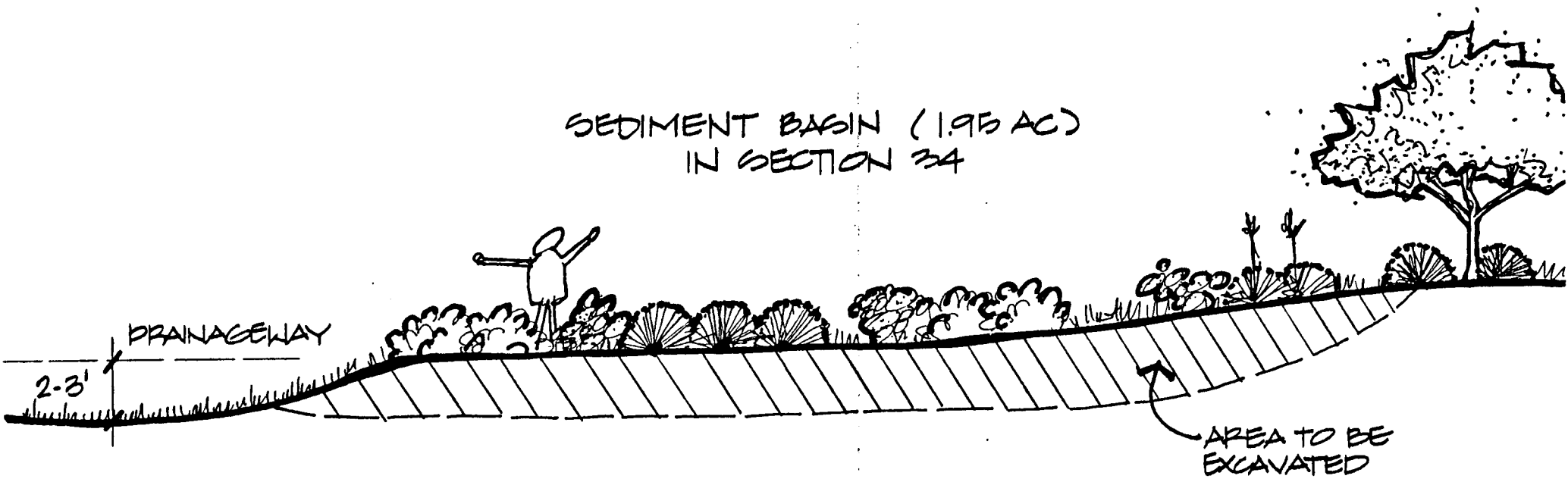
10. INVERTED CROWN ROADWAY
600 FEET ALONG DONALD AVENUE,
NORTH OF BOPP ROAD



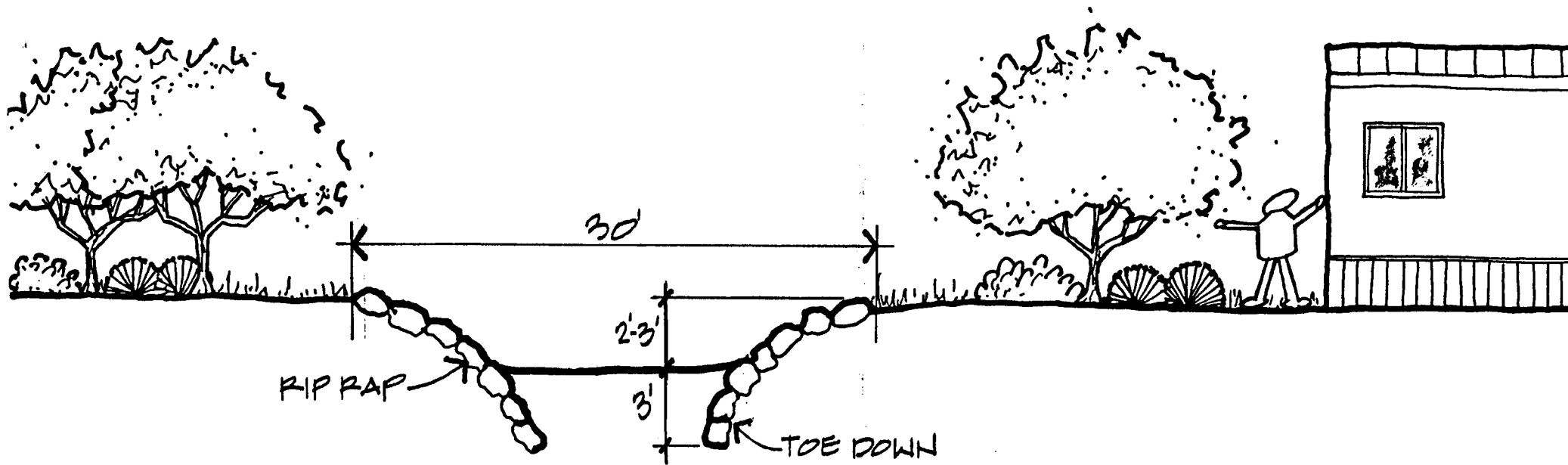
11. THREE-CELL 6FTx10FT CONCRETE BOX CULVERT
Q10=1513 cfs
WITH DIP SECTION FOR ALL WEATHER ACCESS
Q100=3913 cfs



12. EXCAVATE OPEN SPACE NORTHWEST OF DONALD AVE
AND DANA DRIVE
LOW FLOW EVENTS, Q10=285 CFS

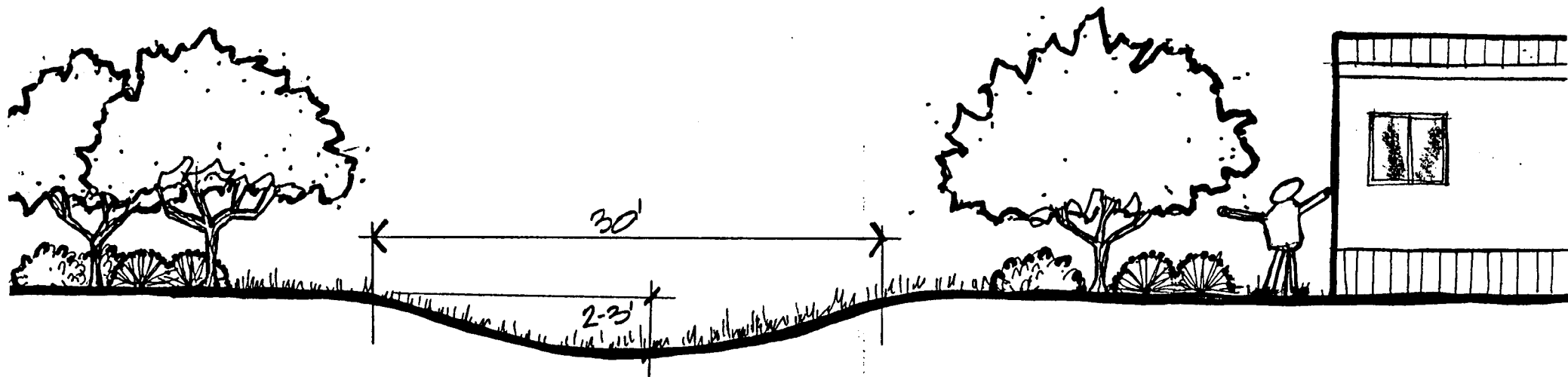


13. BANK PROTECTION ON WEST SIDE OF EXISTING CHANNEL BETWEEN DONALD AVENUE AND EMJAY AVENUE, APPROXIMATELY 400 FEET SOUTH OF BOPP ROAD, AND EXISTING CHANNEL WEST OF KAY DRIVE, NORTH OF MAT DRIVE.

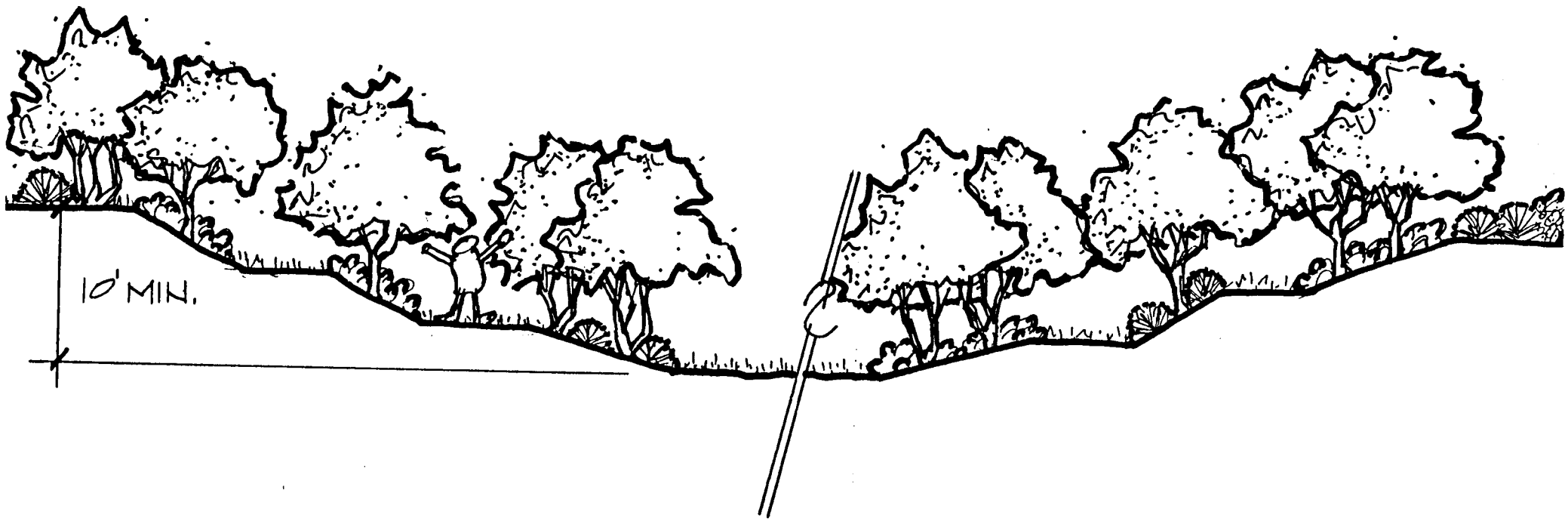


Appendix G Conceptual Cross-Section

**14. EARTHEN DRAINAGEWAYS PROPOSED
FOR SOUTHWEST PORTION OF SECTION 34
SOUTH OF KAY LYNN DRIVE**



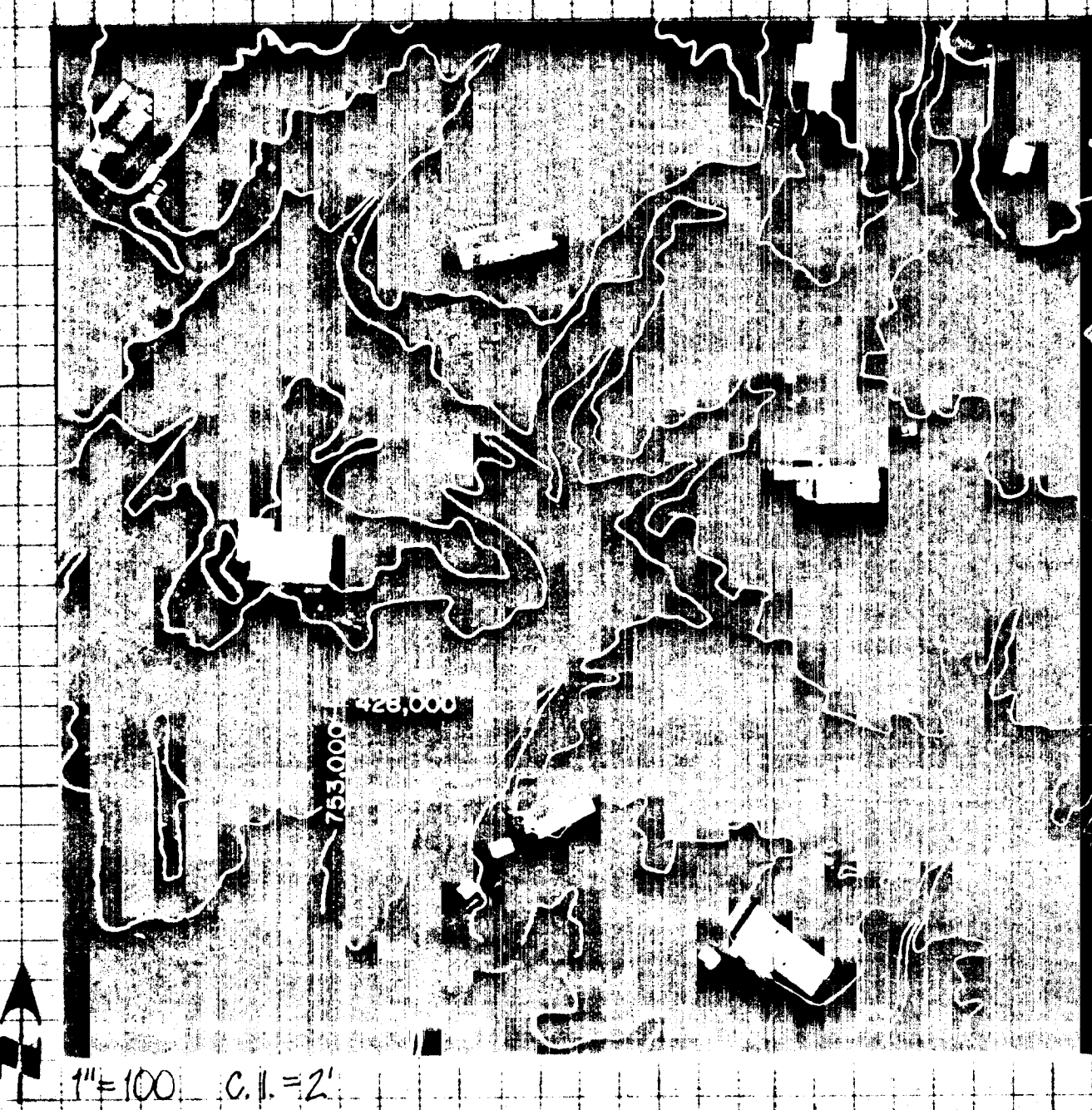
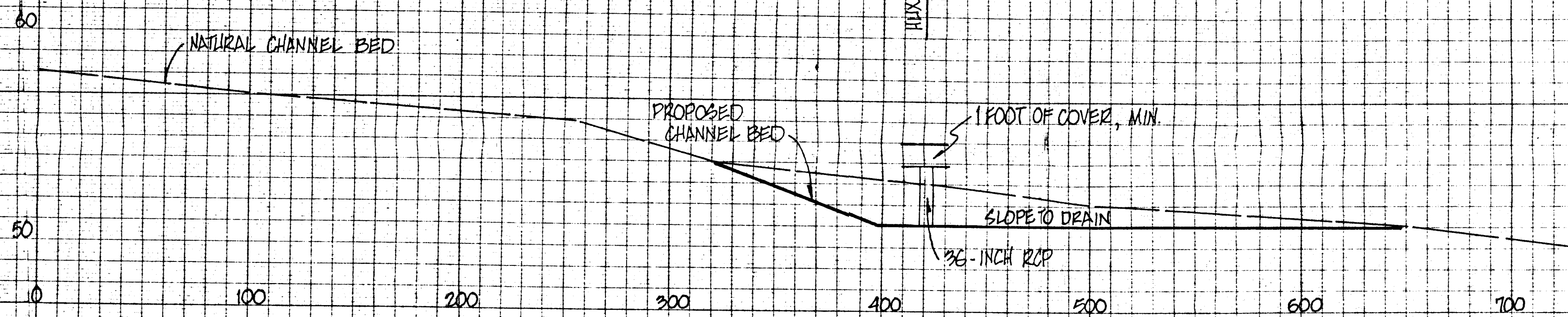
**15. DETENTION BASIN(S)
NORTH OF TUCSON ESTATES**



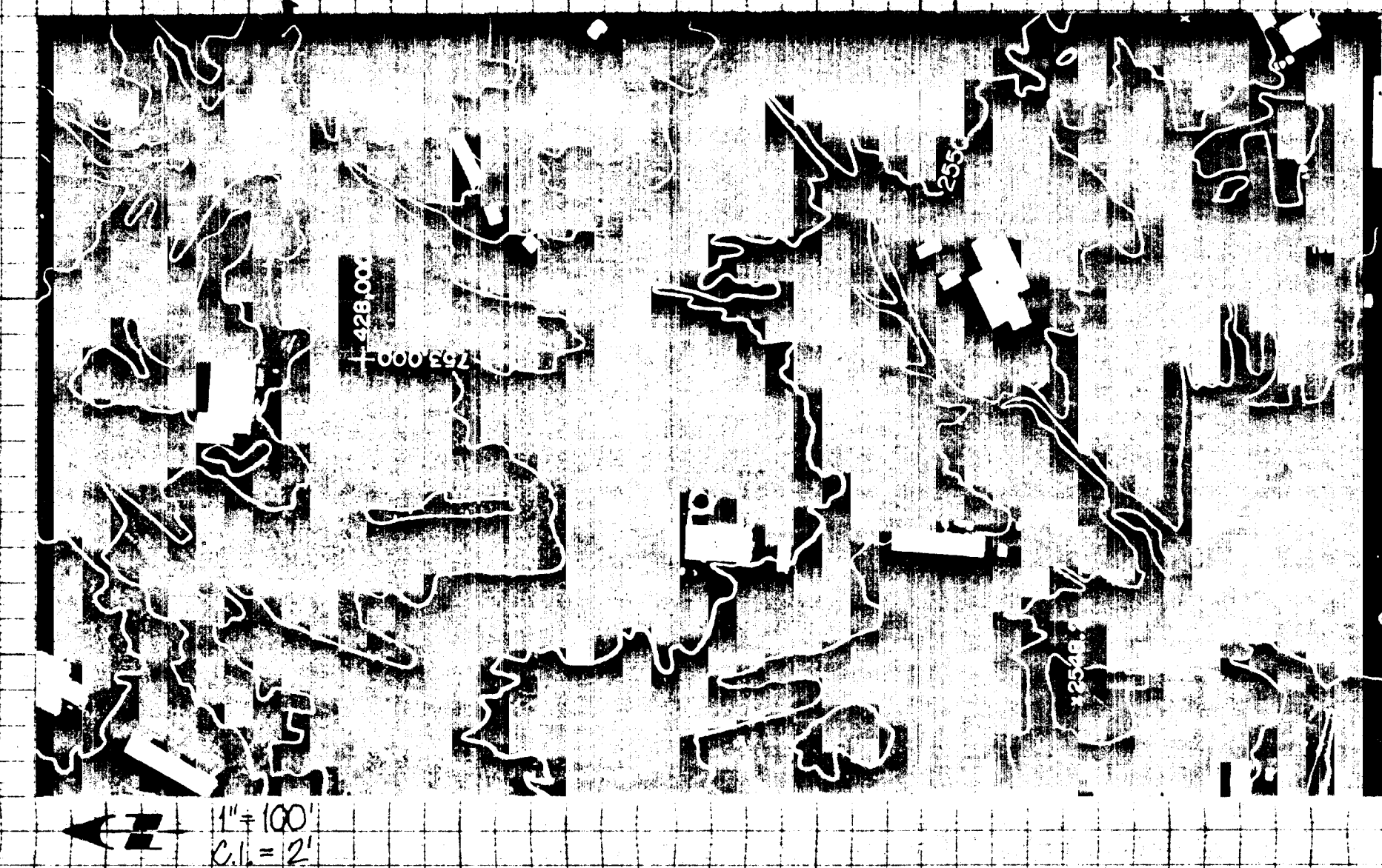
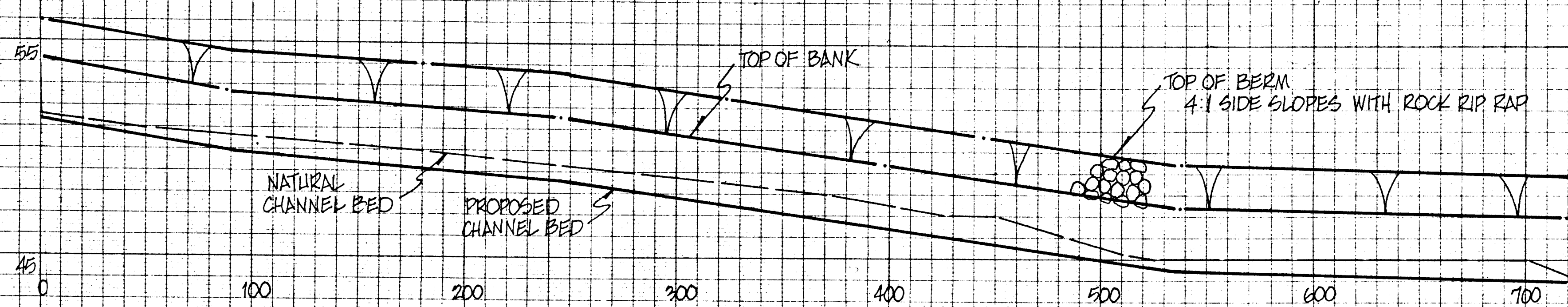
Appendix G Conceptual Cross-Section

Sheet 15 of 15

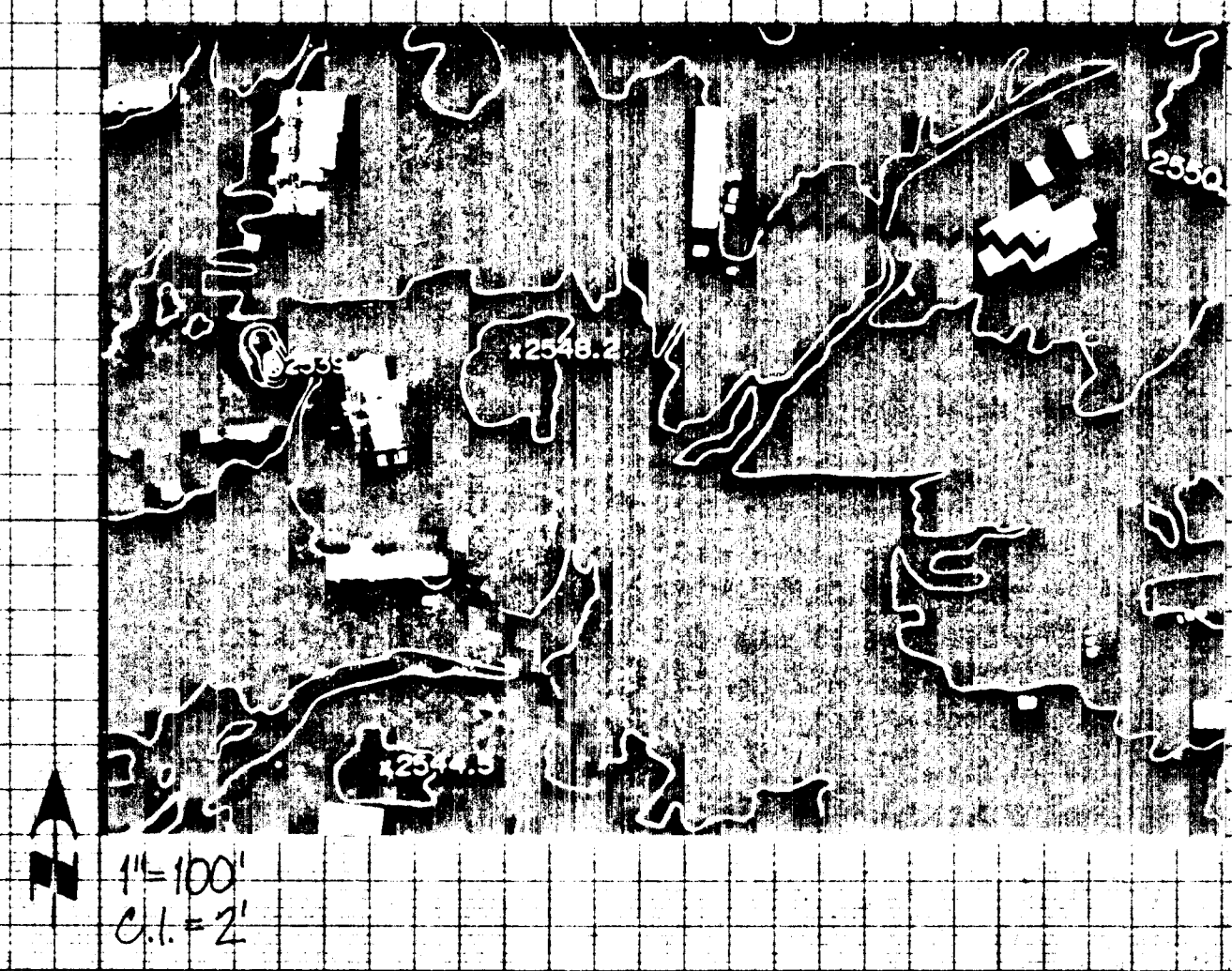
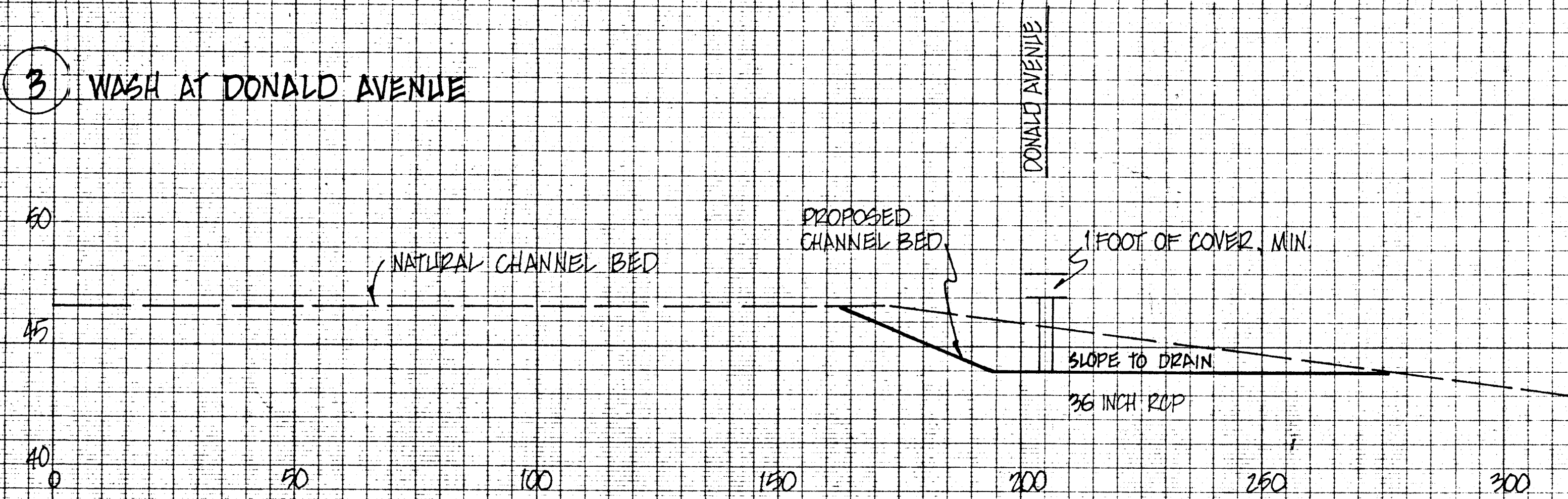
1 WASH AT HUXLEY DRIVE
NTS



2 DRAINAGEWAY AT HUXLEY DRIVE & DONALD DRIVE
NTS



3 WASH AT DONALD AVENUE



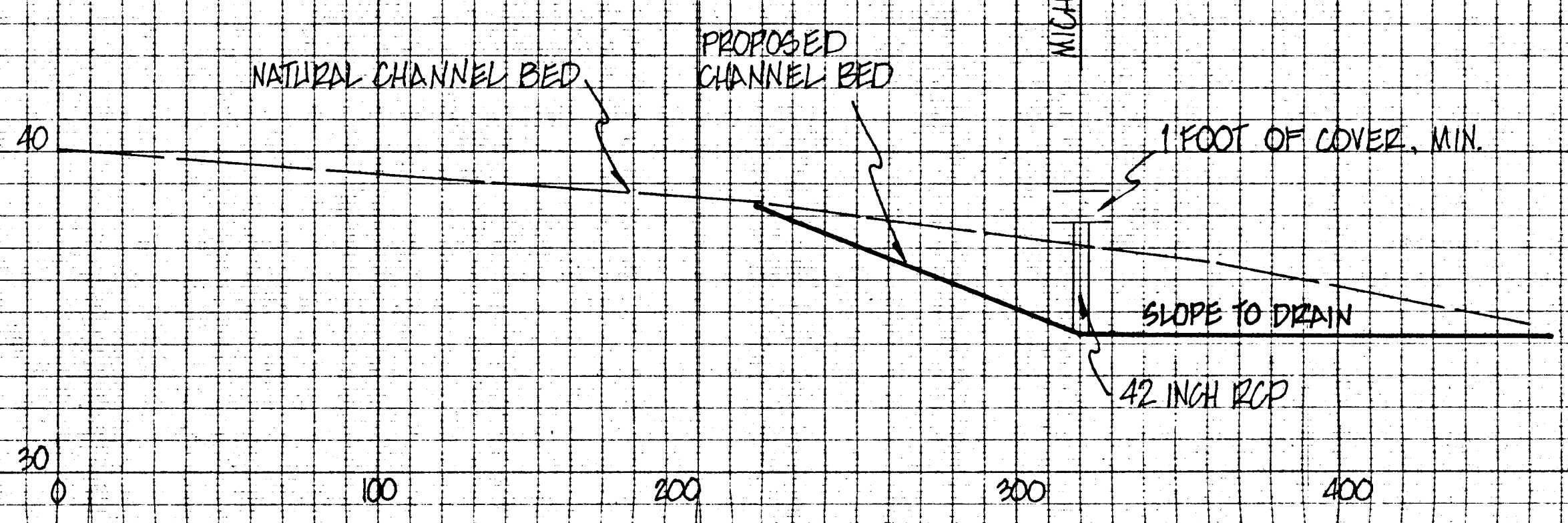
SCALES HORZ. 1" = VERT. 1" = SHEET 1 OF 5

PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT C. H. HUCKLEBERRY R.L.S., PE DIRECTOR

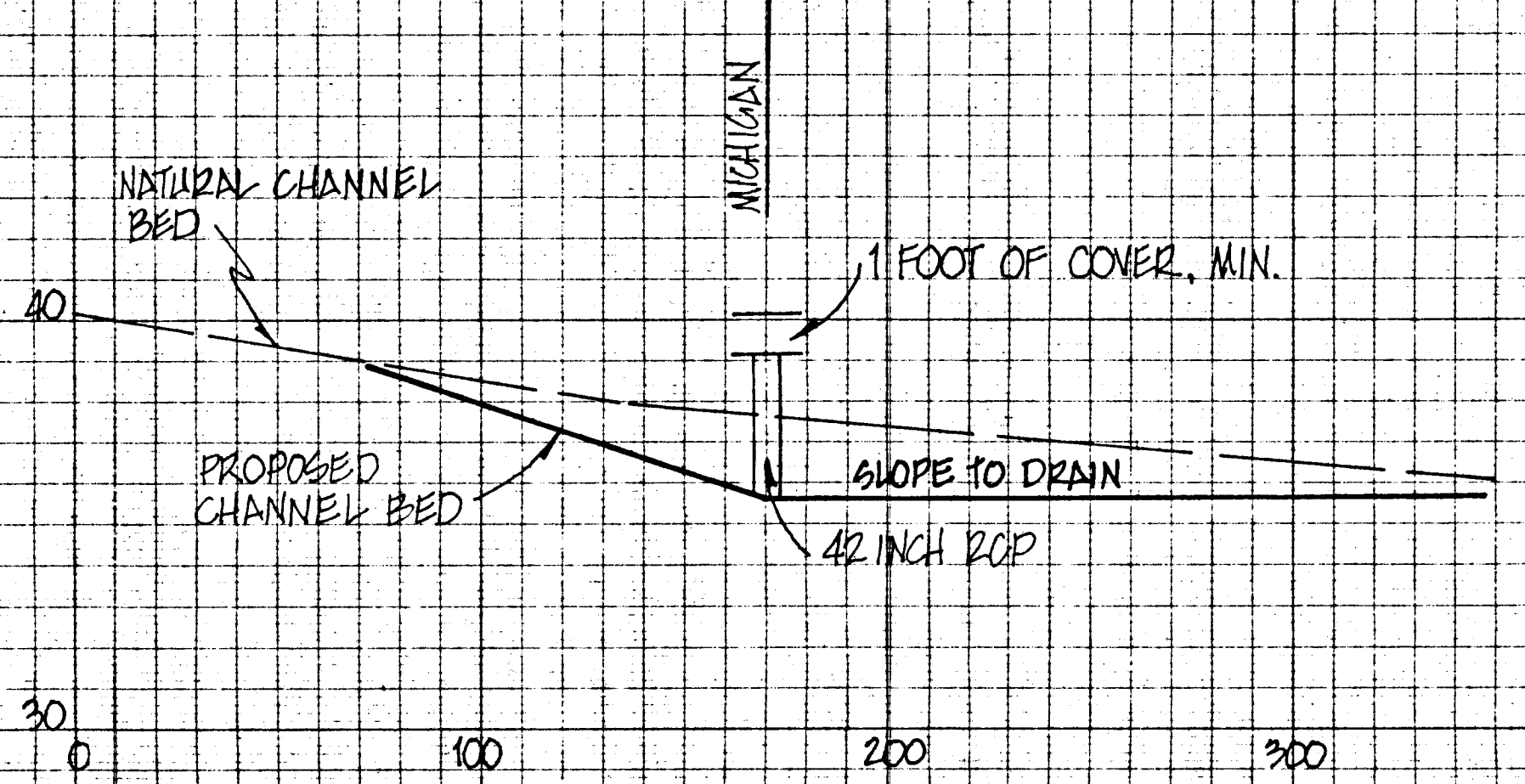
| | |
|-------------|------|
| DESIGNED | DATE |
| DRAWN | |
| CHECKED | |
| PROJ. ENGR. | |

| NO. | REVISION | DESCRIPTION | DIV./SECT. | ENGR. | DATE |
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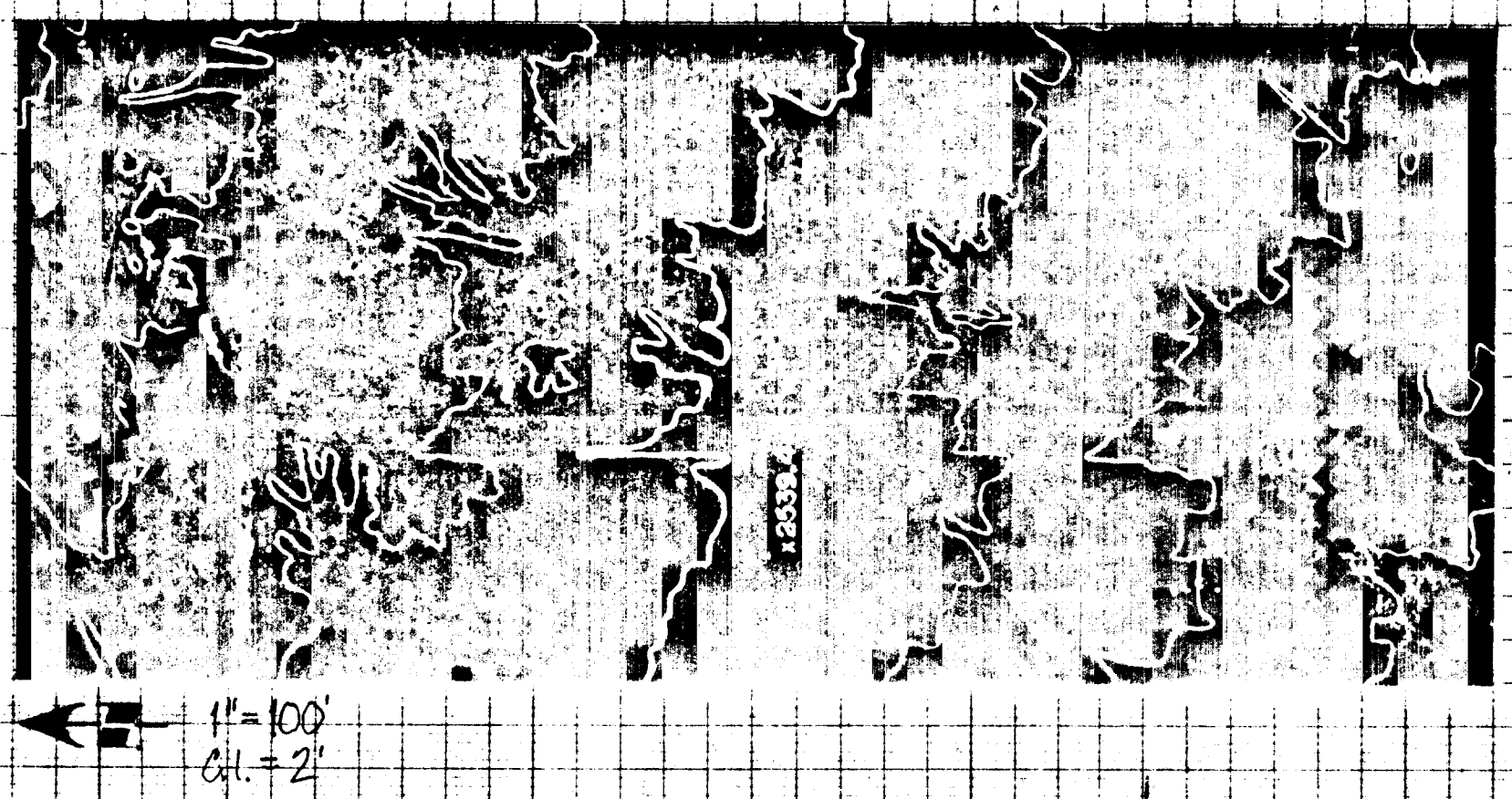
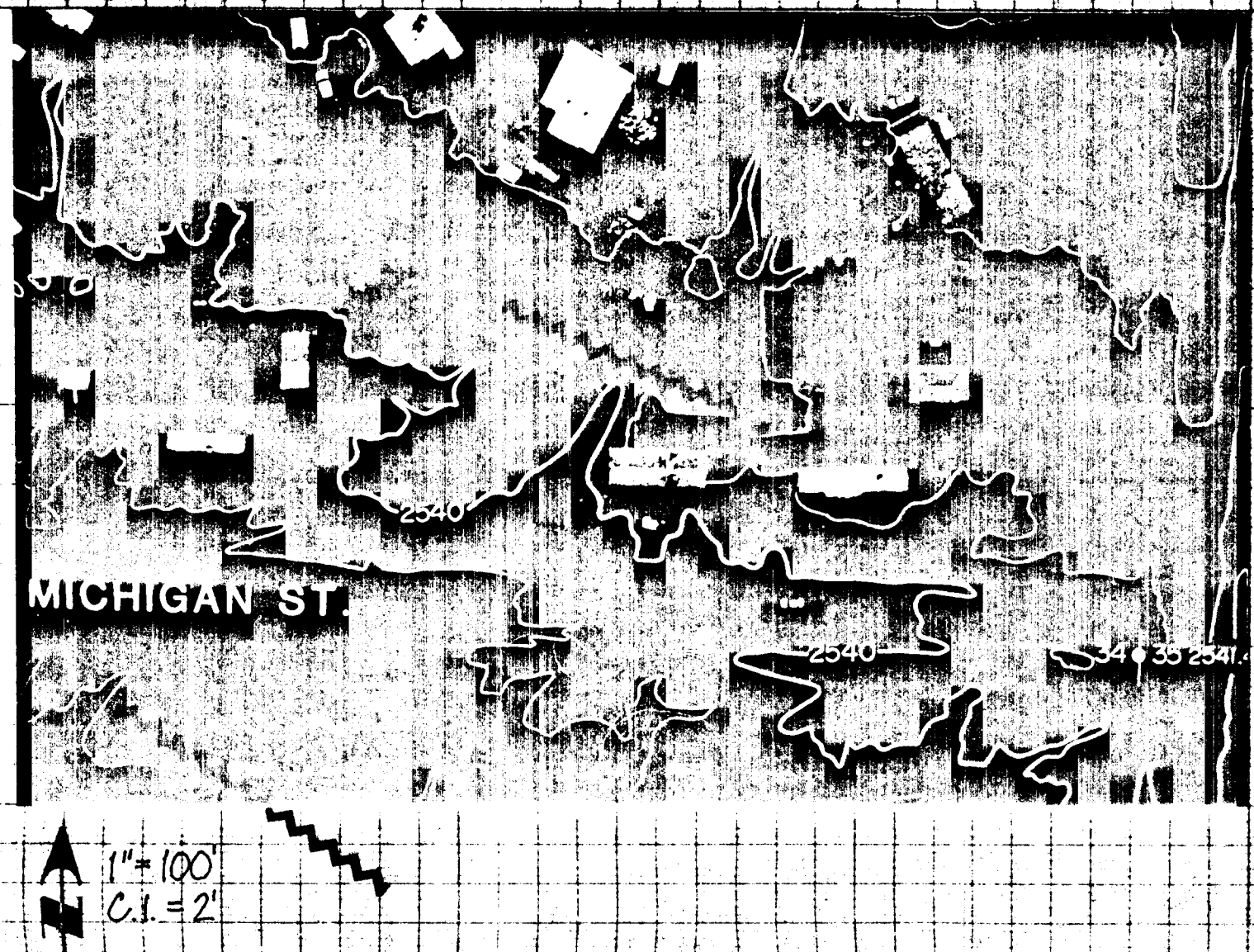
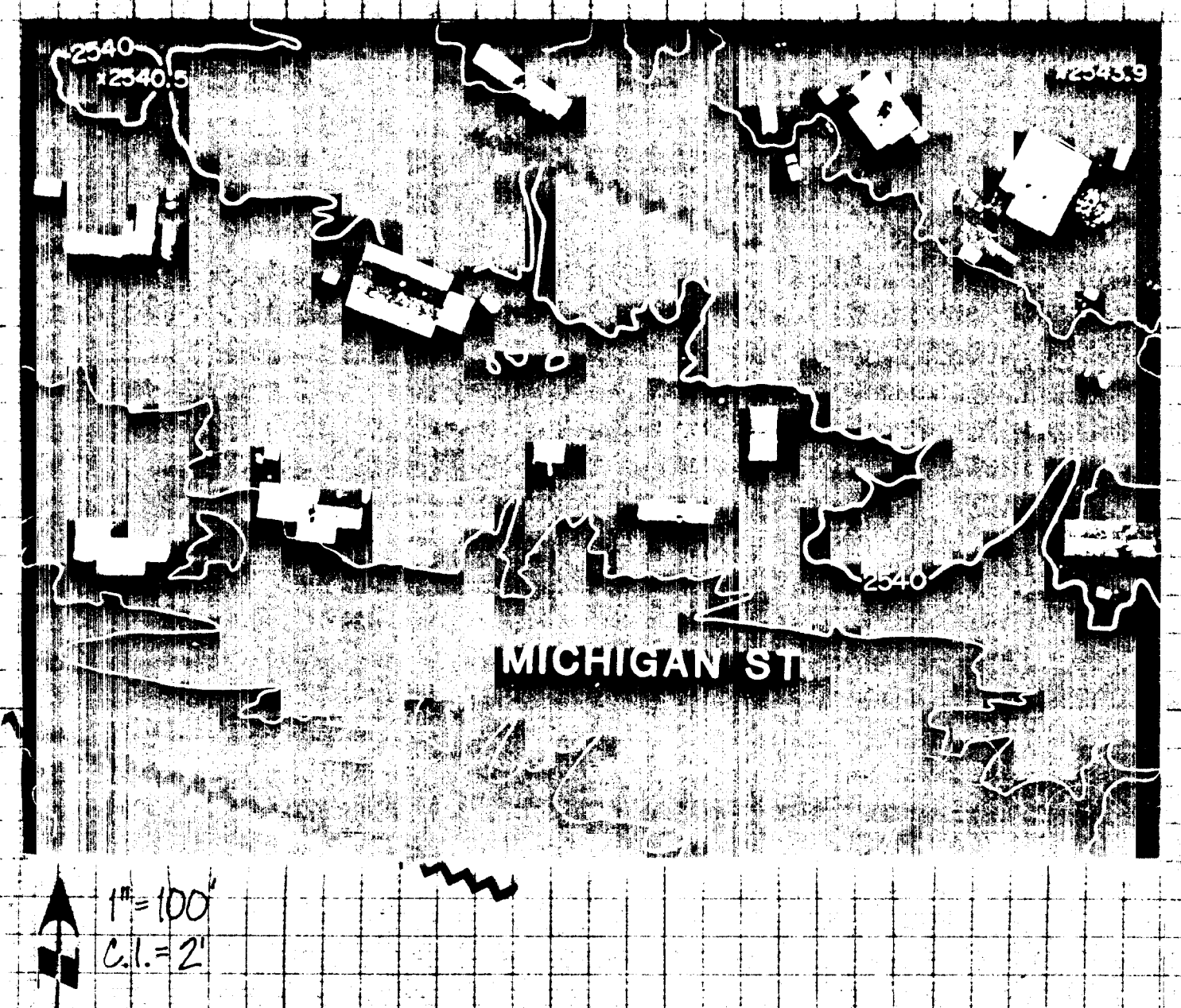
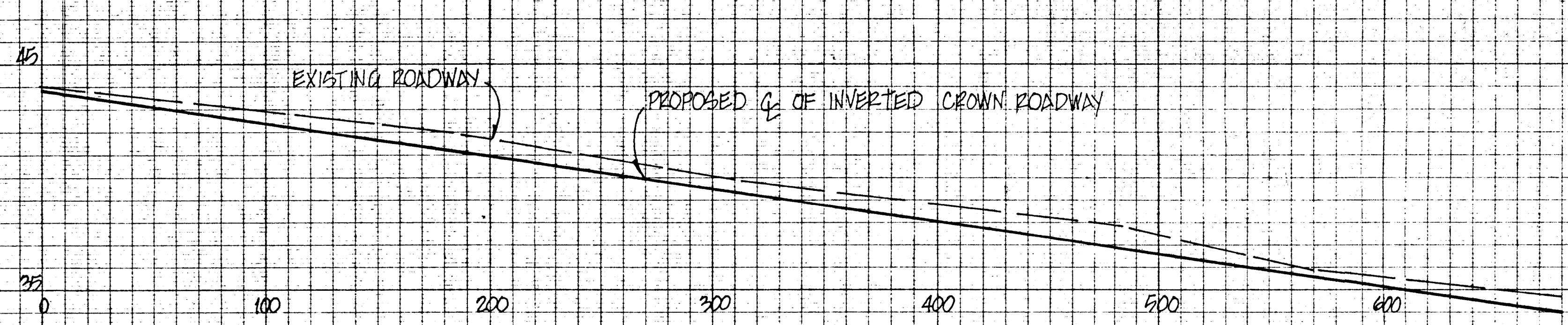
4 MICHIGAN STREET, EAST OF DONALD AVENUE



5 MICHIGAN STREET, EAST OF DONALD AVENUE



6 ROAD IMPROVEMENT - MIMBRES



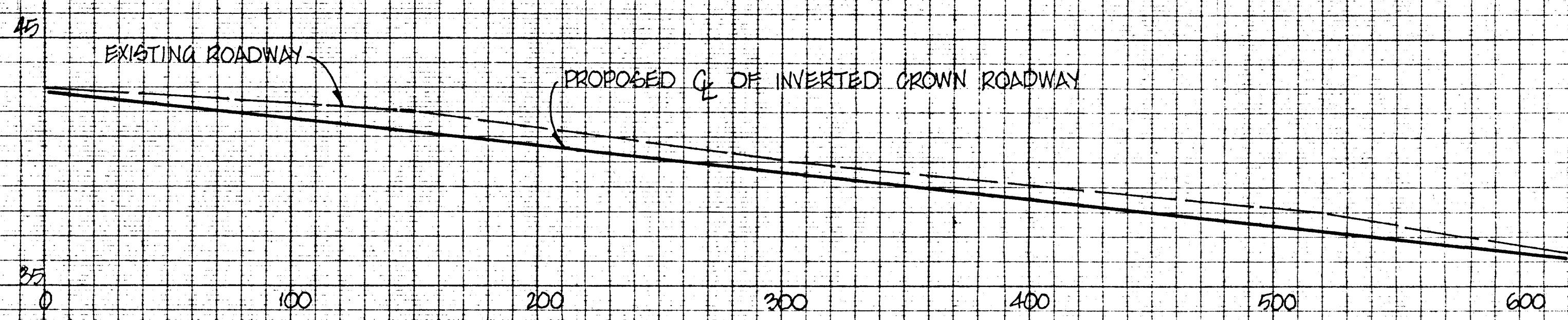
PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT

C. H. HUCKLEBERRY R.L.S., P.E. DIRECTOR

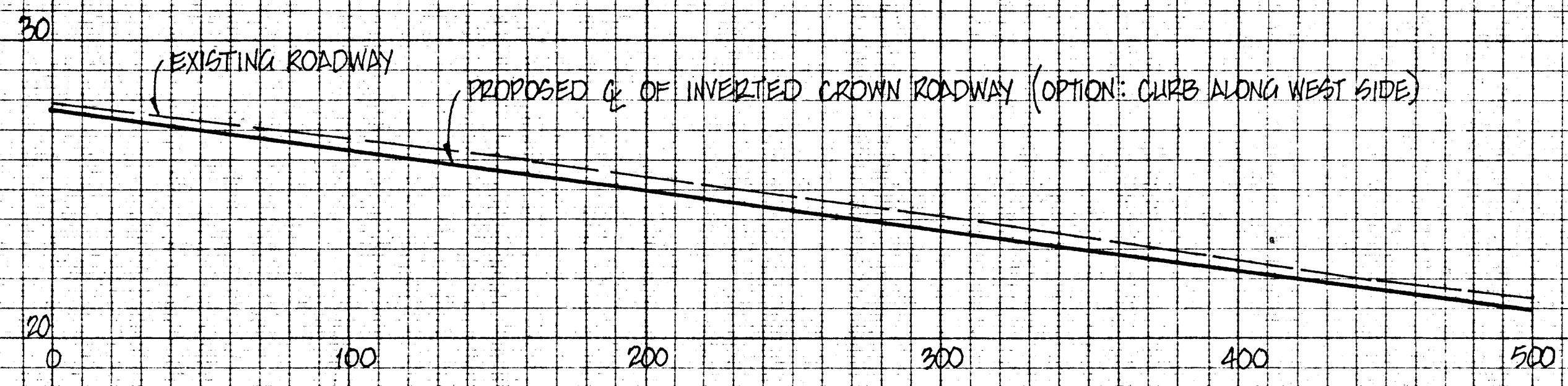
| NO. | REVISION | DESCRIPTION | DATE |
|-----|----------|-------------|------|
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| DESIGNED | DATE |
| DRAWN | |
| CHECKED | |
| PROJECT ENGR. | |

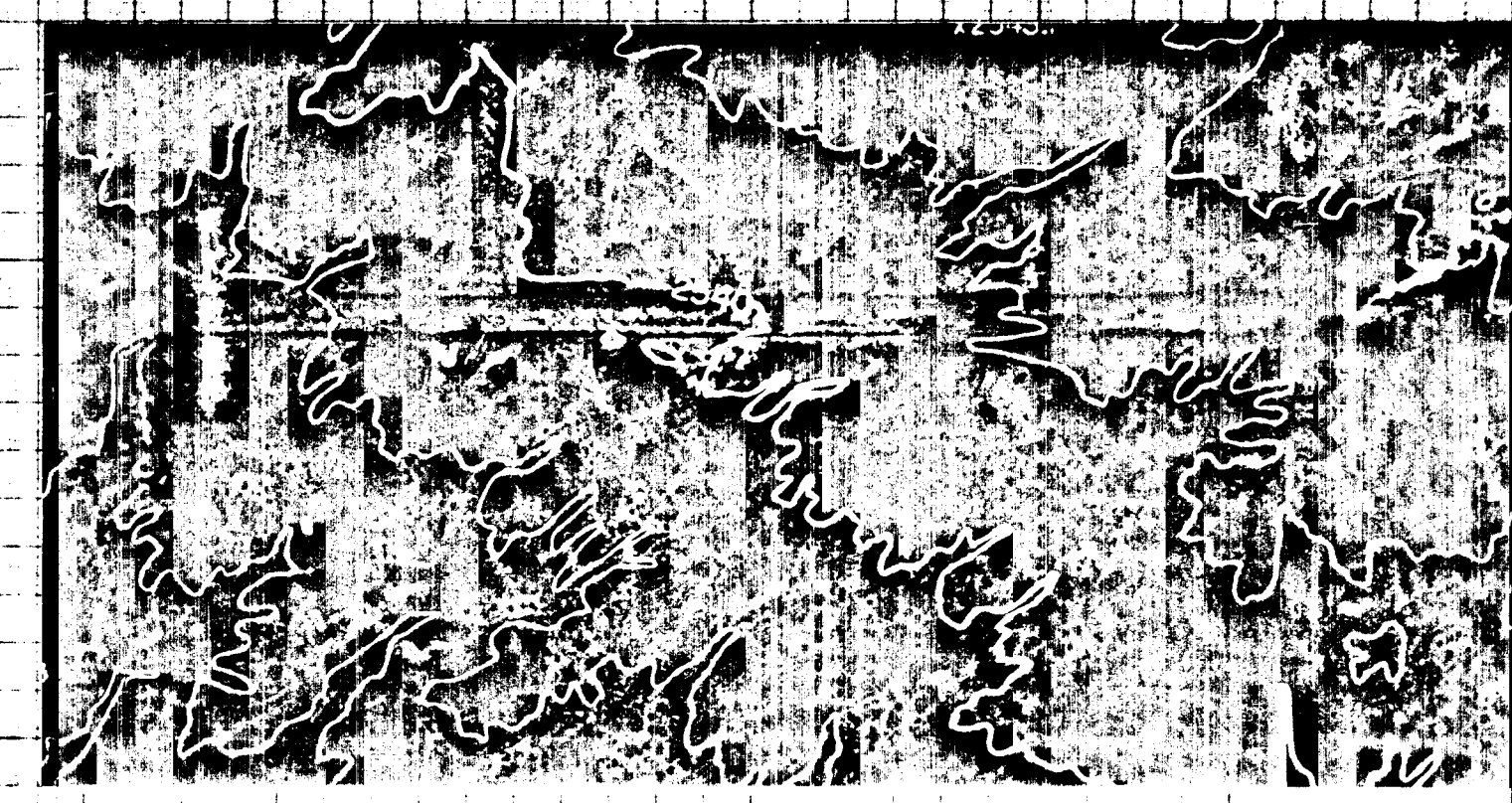
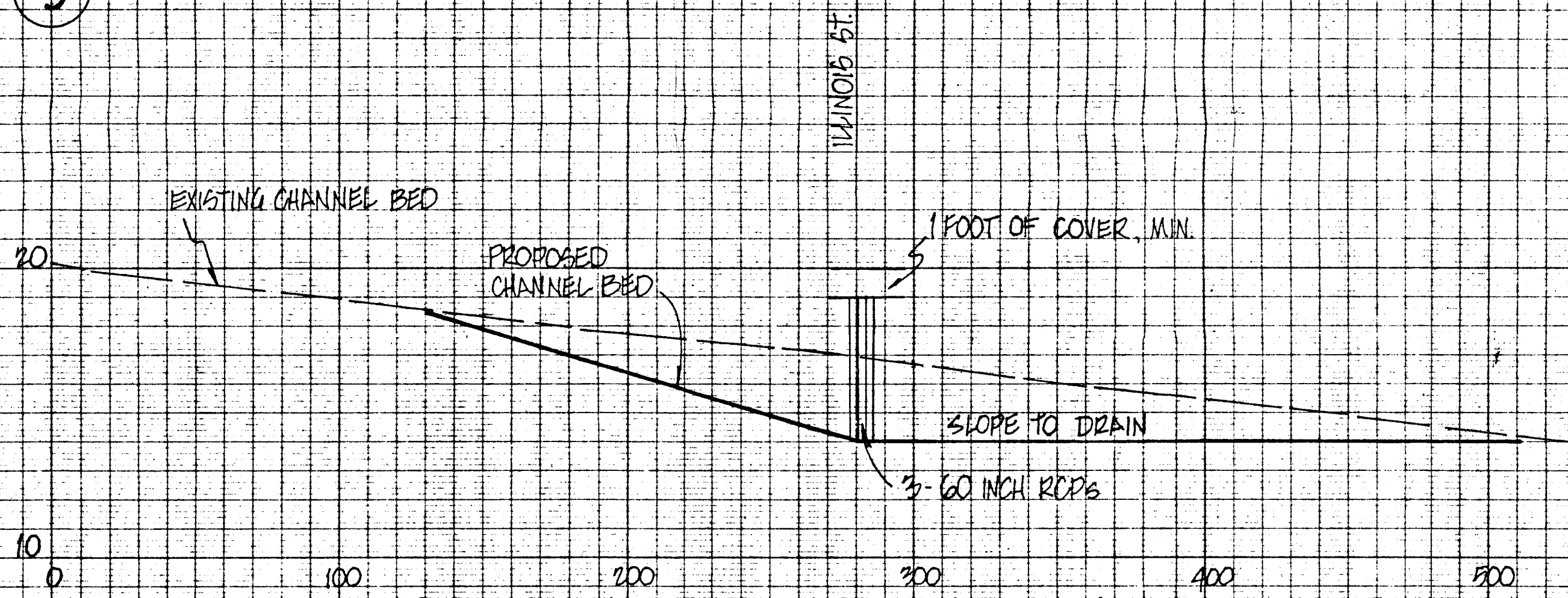
7 ROAD IMPROVEMENT - DANA AVENUE



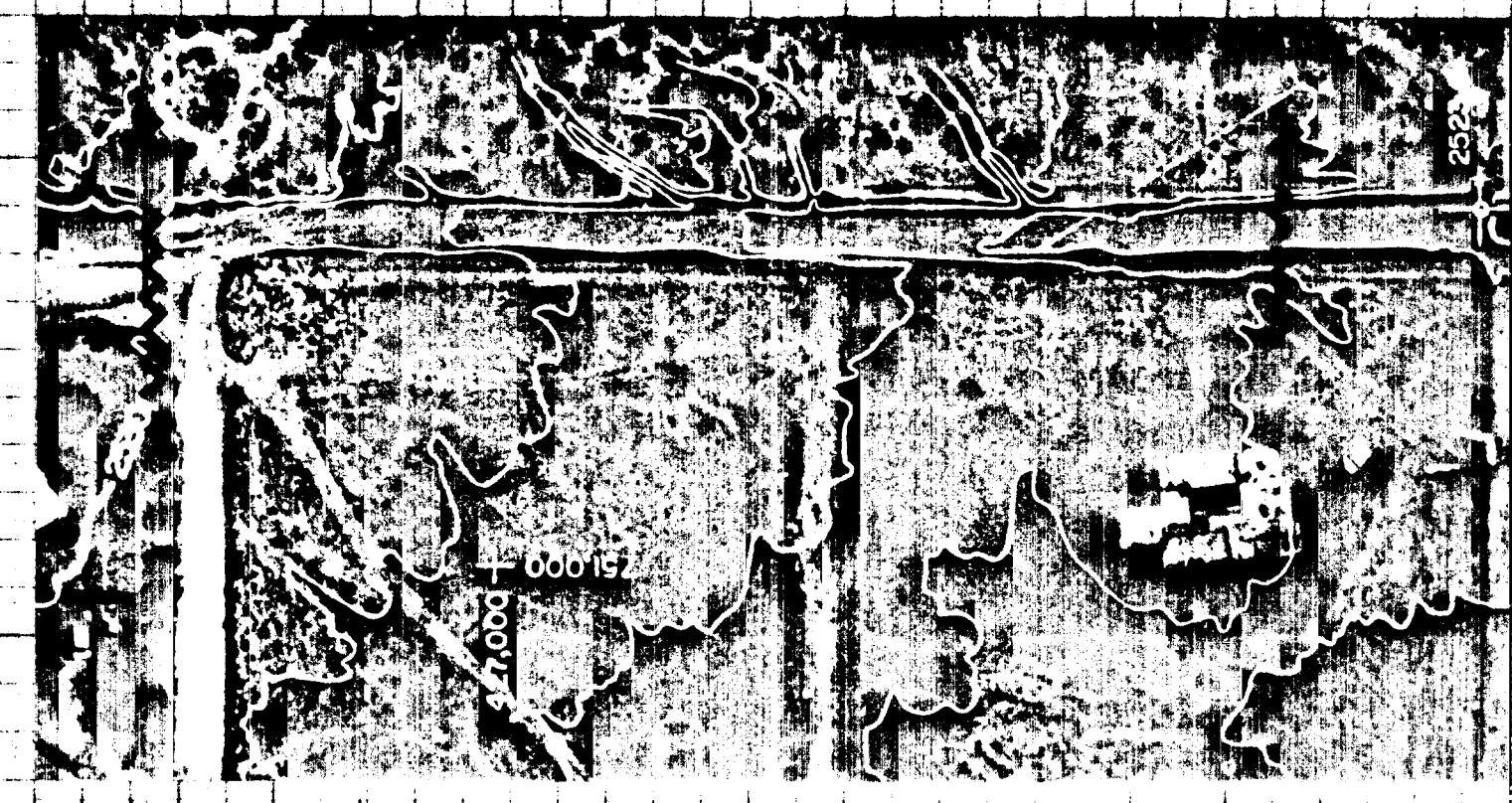
8 ROAD IMPROVEMENT ALONG CAMINO VERDE, NORTH OF MICHIGAN STREET



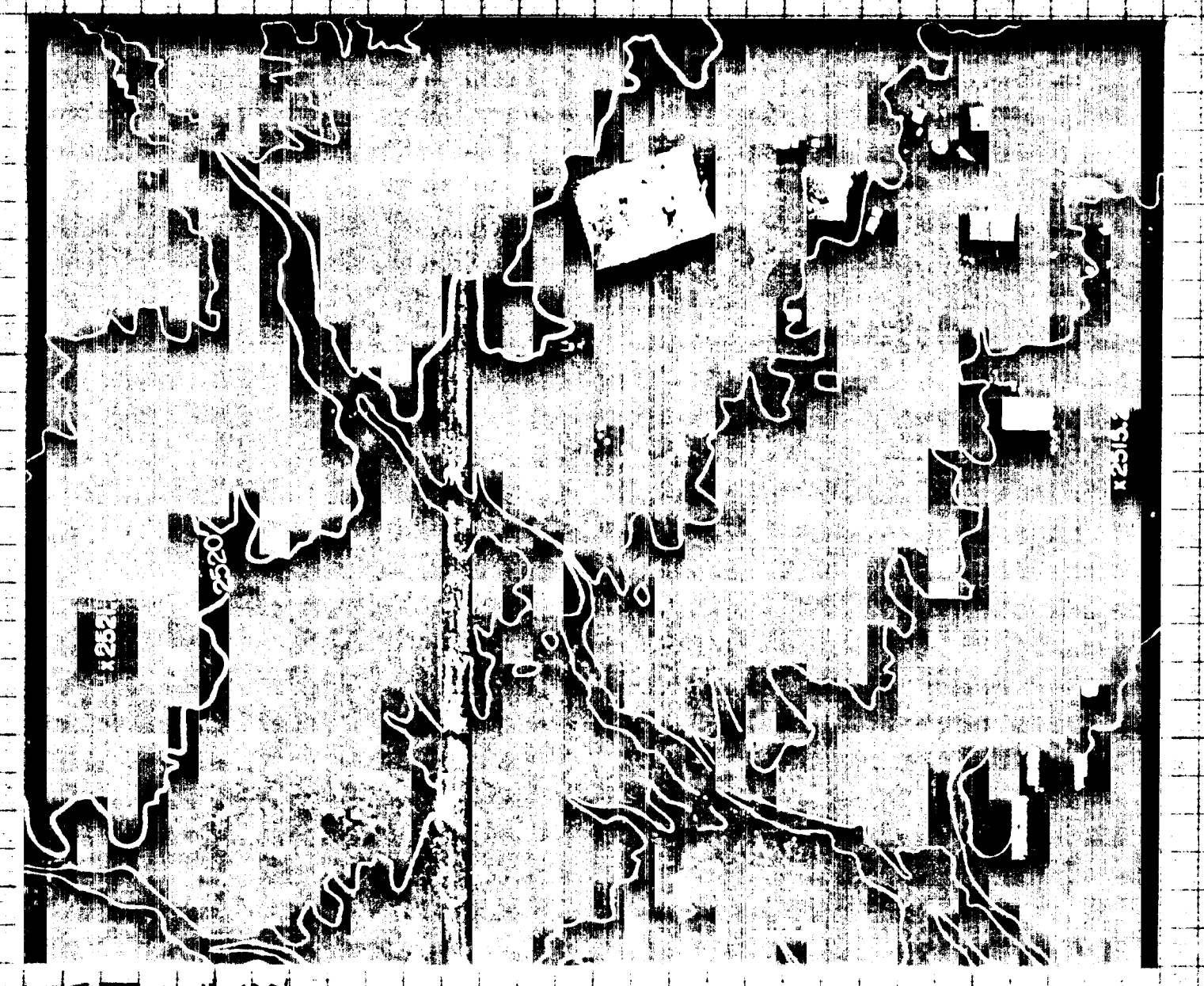
9 WASH AT ILLINOIS STREET



1"=100'
C.L.=2'



1"=100'
C.L.=2'



1"=100'
C.L.=2'

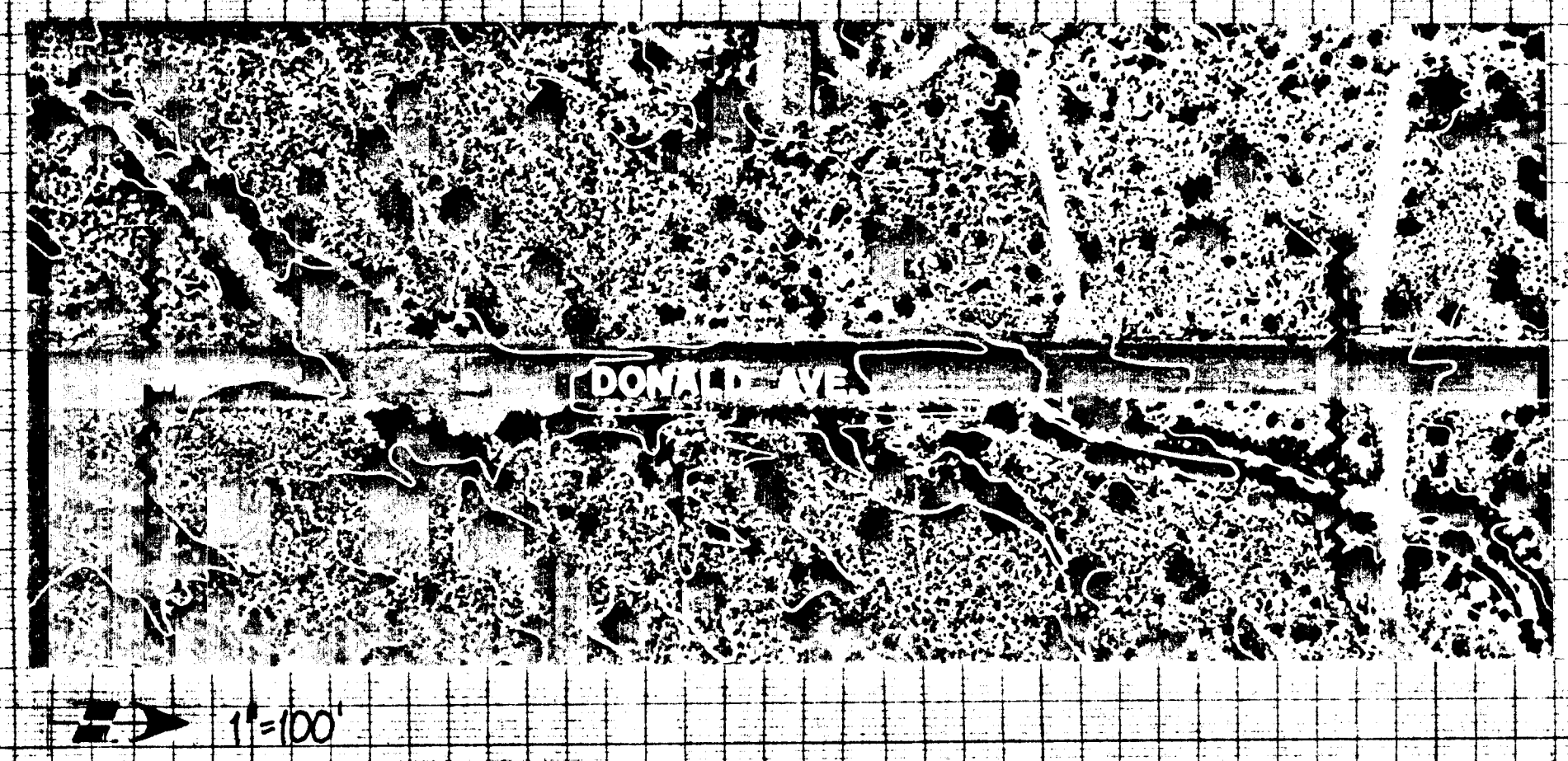
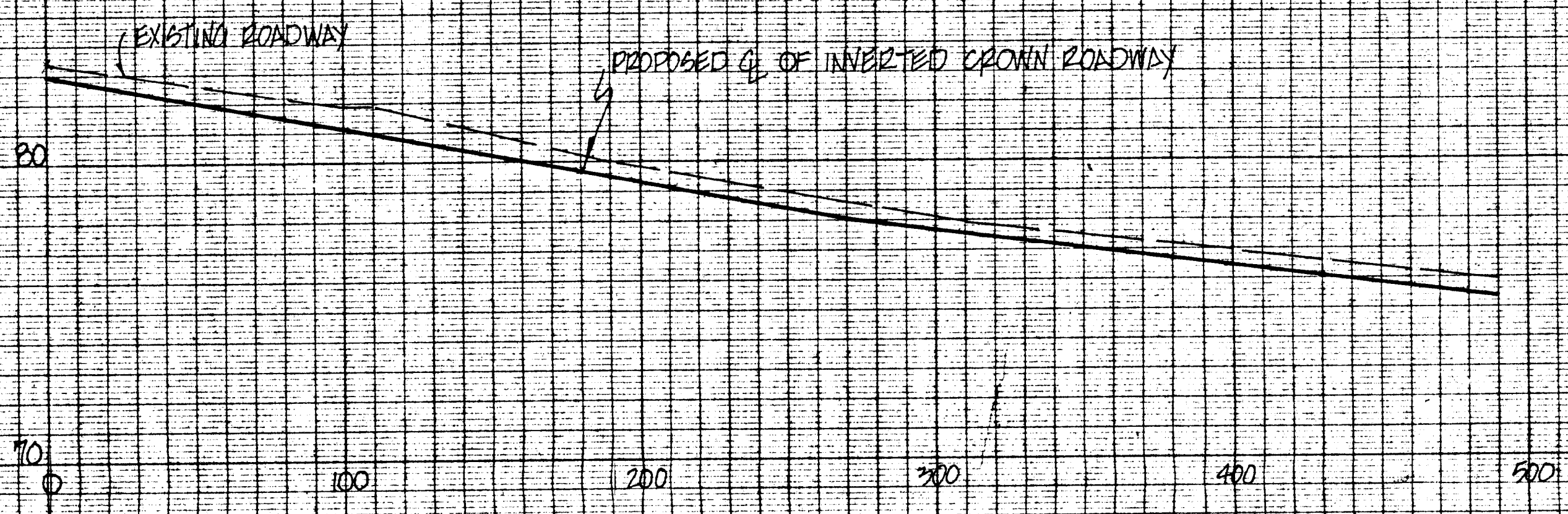
SCALES HORZ. 1" = VERT. 1" = SHEET 3 OF 5

PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT C. H. HUCKELBERRY R.L.S., P.E. DIRECTOR

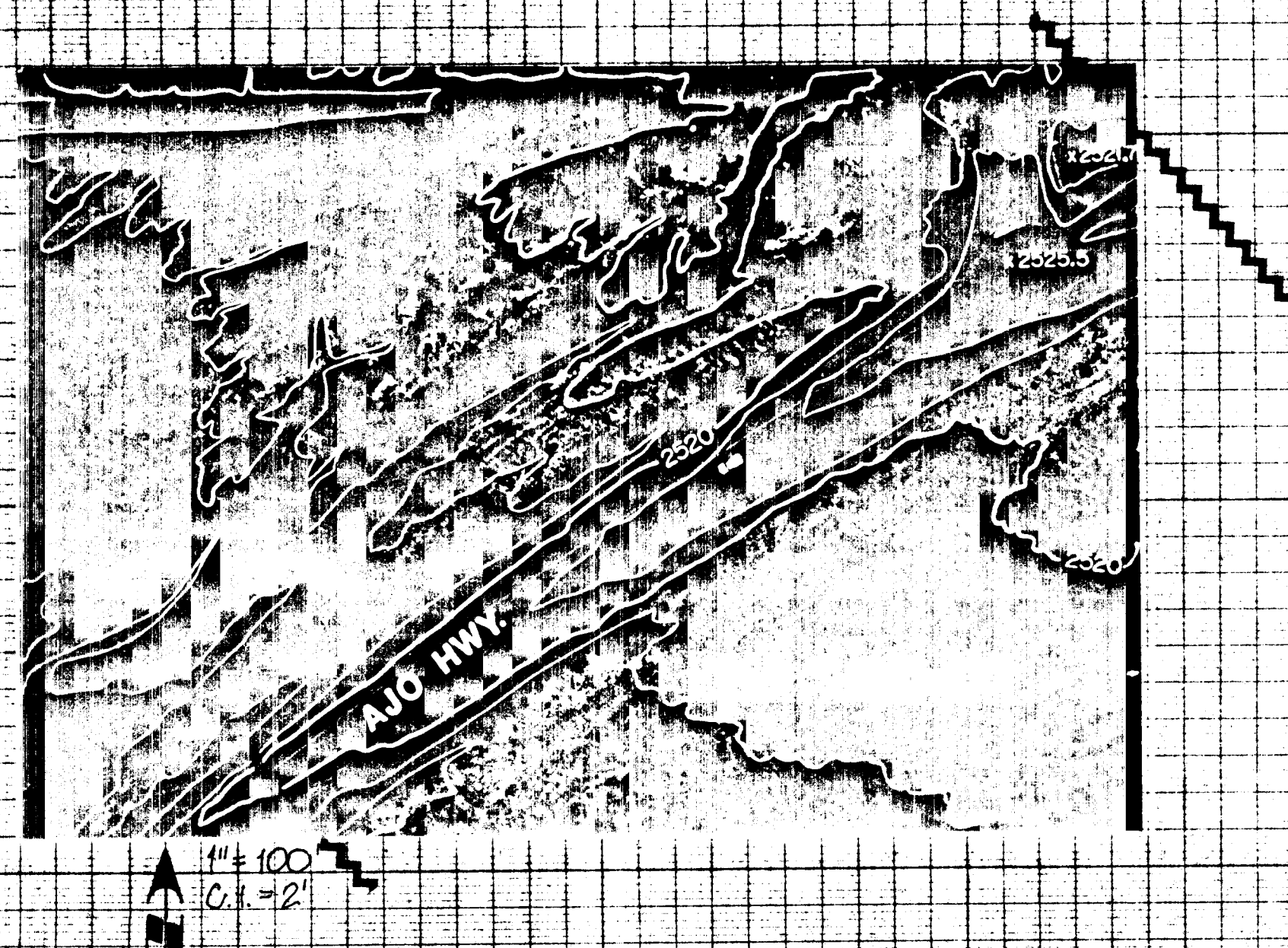
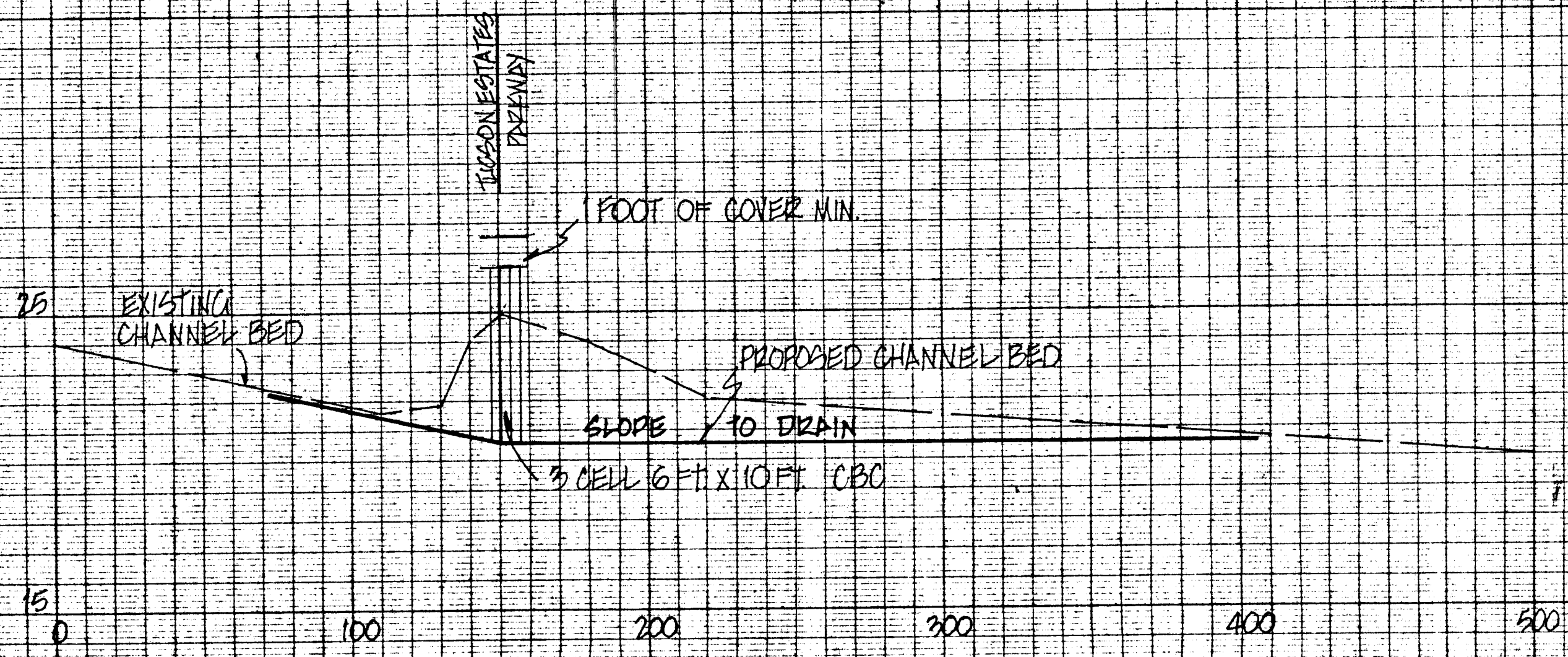
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| DESIGNED | DATE |
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| CHECKED | |
| PROJ. ENGR. | |

| NO. | REVISION | DESCRIPTION | DATE |
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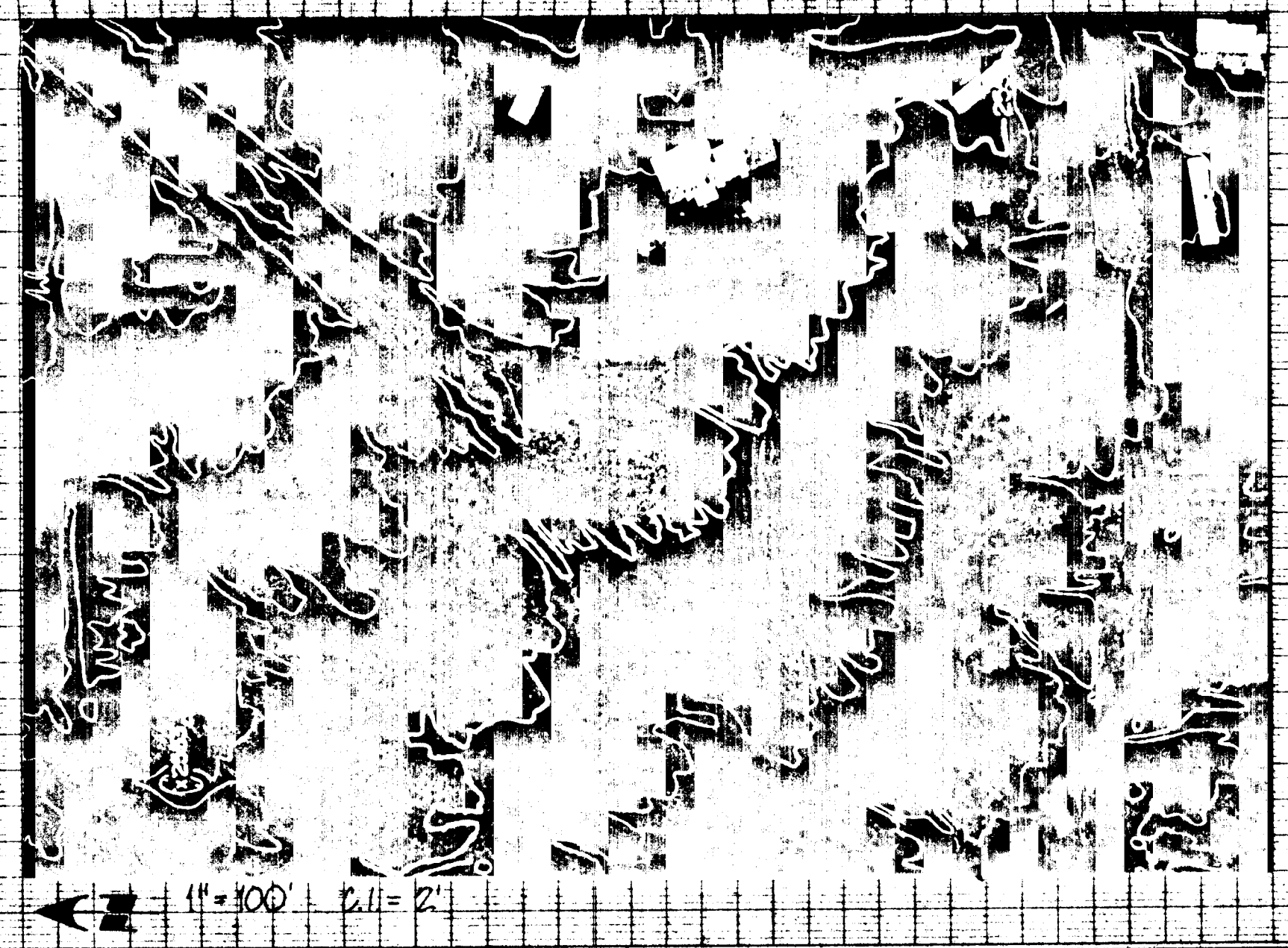
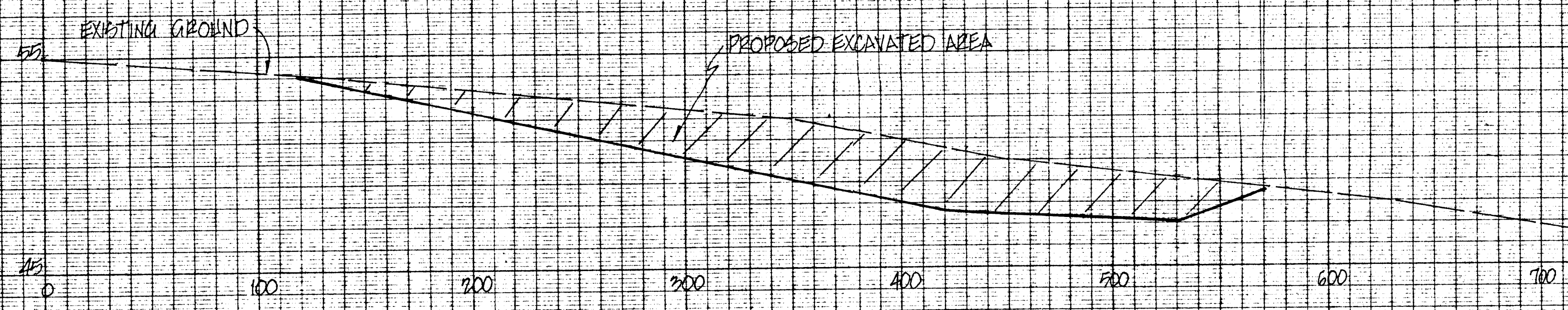
10 ALL-WEATHER ACCESS AT DONALD AVENUE, NORTH OF BOPP ROAD



11 WASH AT TUCSON ESTATES PARKWAY



12 OPEN SPACE - SEDIMENT BASIN



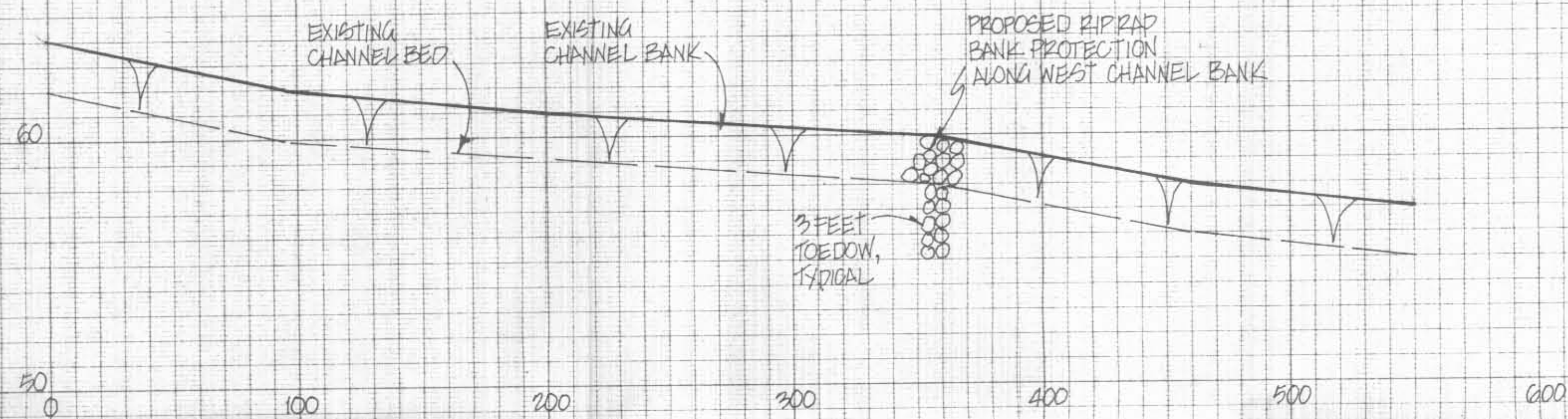
SCALES HORZ. 1" = SHEET 4 OF 5
 VERT. 1" =

PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT C. H. HUCKLEBERRY R.L.S., PE DIRECTOR

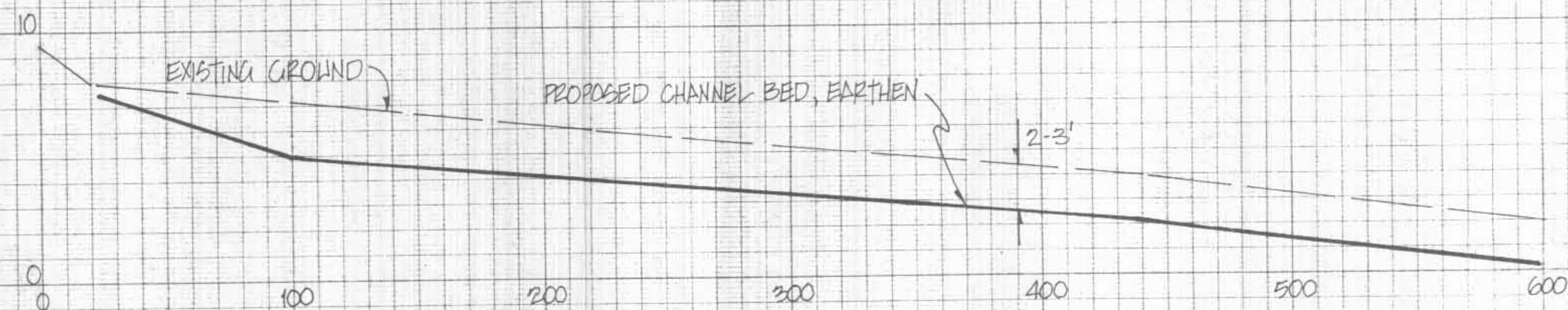
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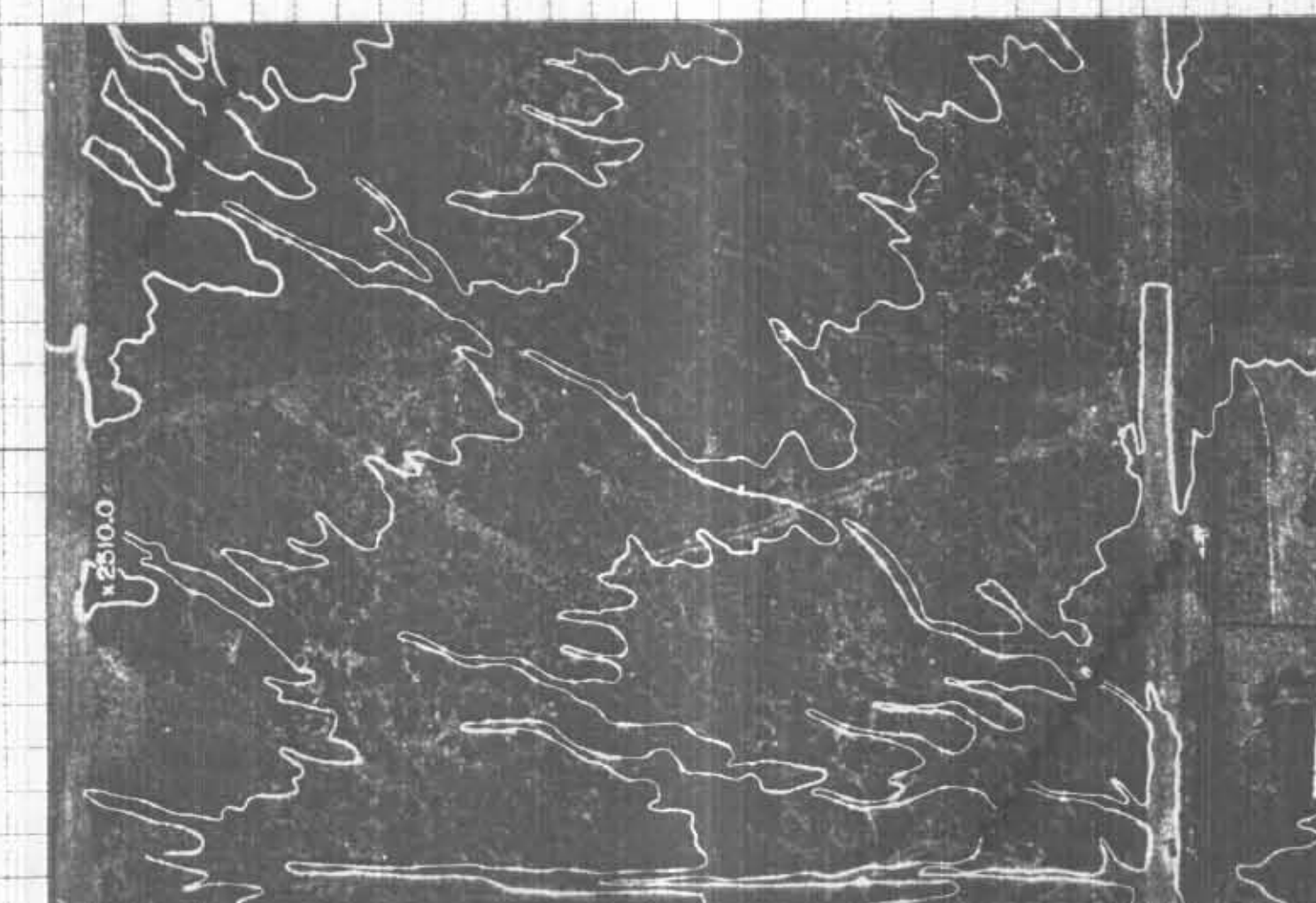
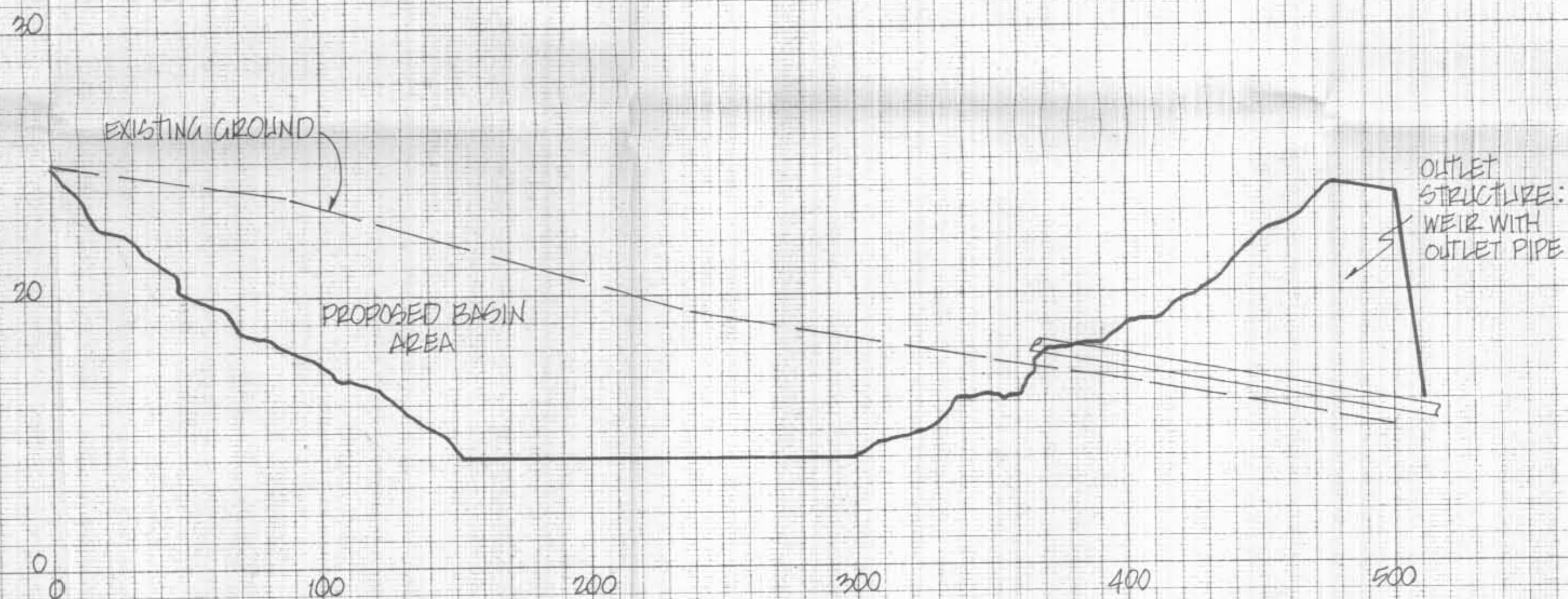
13 BANK PROTECTION



14 EARTHEN DRAINAGEWAYS



15 DETENTION BASIN(S) - SCHEMATIC



SEE FIGURE 6, SHEET 5-14

| | |
|-----------|------|
| DESIGNED | DATE |
| DRAWN | |
| CHECKED | |
| PROJ ENGR | |

| NO | REVISION | DESCRIPTION | DIV/SECT ENGR. | DATE |
|----|----------|-------------|----------------|------|
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APPENDIX H

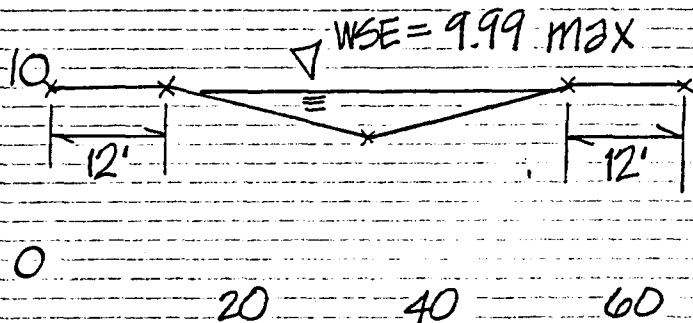
Veteran's Parcels

DESIGN NOTES AND COMPUTATIONS

SUBJECT: SOUTHWEST - VETERANS PARCEL

JOB NO.:

OPTION 1 - CROSS-SECTION 66' DRAINAGE EASEMENT



| | | | |
|---------|-------|-----------|-------|
| STATION | 0.00 | ELEVATION | 10.00 |
| STATION | 12.00 | ELEVATION | 10.00 |
| STATION | 33.00 | ELEVATION | 7.36 |
| STATION | 54.00 | ELEVATION | 10.00 |
| STATION | 66.00 | ELEVATION | 10.00 |

RESULTS

| | | |
|--------------------|--------|-------|
| Manning's 'n' | 0.035 | |
| Channel Slope | 0.0050 | ft/ft |
| W.S. Elevation | 9.99 | ft |
| Area | 55.02 | sq.ft |
| Perimeter | 42.17 | ft |
| Near Bank | 12.06 | ft |
| Left Channel Bank | 0.00 | ft |
| Right Channel Bank | 66.00 | ft |
| Far Bank | 53.92 | ft |
| Discharge | 197.23 | cfs |
| Velocity | 3.59 | fps |

PREPARED BY:

[Signature]

DATE: 4/14 CHECKED BY:

SHEET NO.: 1 OF 4



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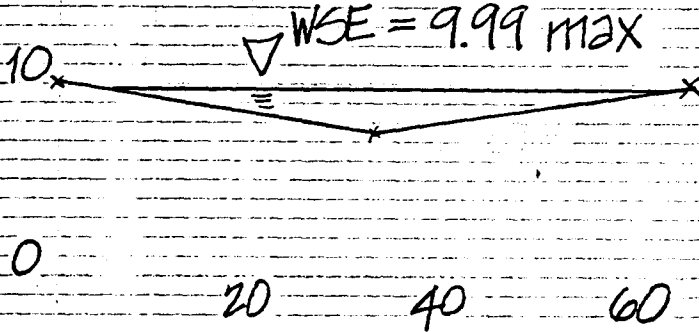
APPENDIX H

DESIGN NOTES AND COMPUTATIONS

SUBJECT: **SOUTHWEST - VETERANS PARCEL**

JOB NO.:

OPTION 2 - CROSS-SECTION 66' DRAINAGE EASEMENT



| | | | |
|---------|-------|-----------|-------|
| STATION | 0.00 | ELEVATION | 10.00 |
| STATION | 33.00 | ELEVATION | 7.36 |
| STATION | 66.00 | ELEVATION | 10.00 |

RESULTS

| | | |
|--------------------|--------|--------|
| Manning's 'n' | 0.035 | |
| Channel Slope | 0.0050 | ft/ft |
| W.S. Elevation | 9.99 | ft |
| Area | 86.46 | sq. ft |
| Perimeter | 65.76 | ft |
| Near Bank | 0.13 | ft |
| Left Channel Bank | 0.00 | ft |
| Right Channel Bank | 65.00 | ft |
| Far Bank | 65.88 | ft |
| Discharge | 310.90 | cfs |
| Velocity | 3.60 | fps |

PREPARED BY:

ll

DATE: *4/14* CHECKED BY:

SHEET NO.: *2* OF *4*



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APPENDIX H

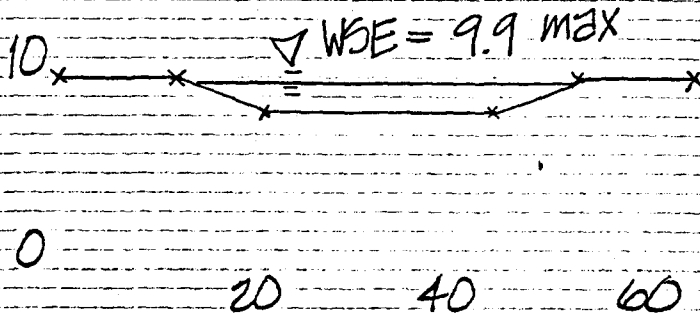
DESIGN NOTES AND COMPUTATIONS

SUBJECT:

SOUTHWEST - VETERANS PARCEL

JOB NO.:

OPTION 3 - CROSS-SECTION 60' DRAINAGE EASEMENT



| | | | |
|---------|-------|-----------|-------|
| STATION | 0.00 | ELEVATION | 10.00 |
| STATION | 12.00 | ELEVATION | 10.00 |
| STATION | 21.00 | ELEVATION | 9.20 |
| STATION | 45.00 | ELEVATION | 9.20 |
| STATION | 54.00 | ELEVATION | 10.00 |
| STATION | 66.00 | ELEVATION | 10.00 |

RESULTS

| | | |
|--------------------|--------|--------|
| Manning's 'n' | 0.035 | |
| Channel Slope | 0.0050 | ft/ft |
| W.S. Elevation | 9.88 | ft |
| Area | 21.52 | sq. ft |
| Perimeter | 39.36 | ft |
| Near Bank | 13.35 | ft |
| Left Channel Bank | 0.00 | ft |
| Right Channel Bank | 66.00 | ft |
| Far Bank | 52.65 | ft |
| Discharge | 43.21 | cfs |
| Velocity | 2.01 | fps |

PREPARED BY:

Handwritten signature

DATE: 4/14

CHECKED BY:

SHEET NO.: 3 OF 4



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APPENDIX H

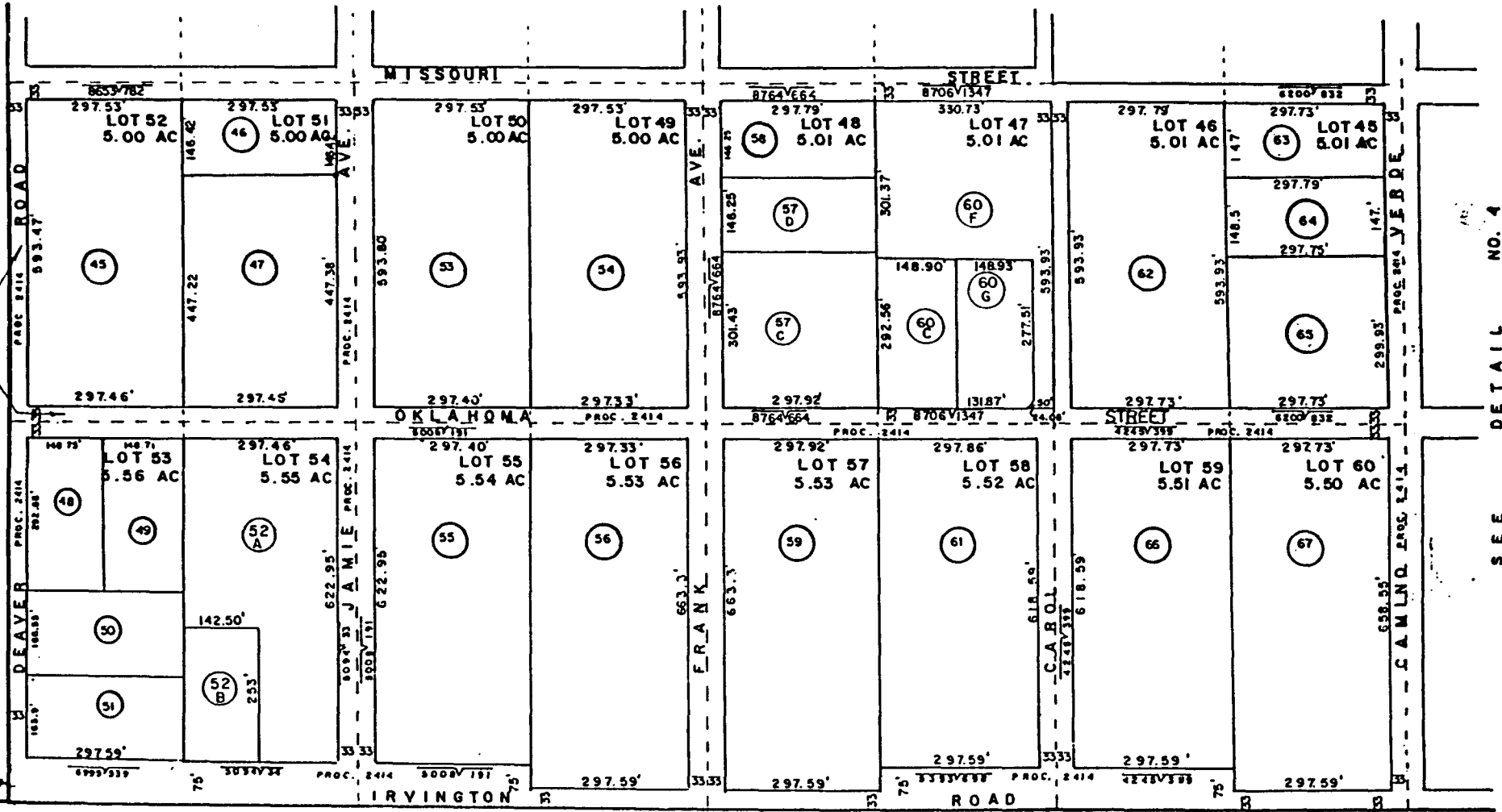
ASSESSOR'S RECORD MAP

212-45

SECTION 34, TOWNSHIP 14 SOUTH, RANGE 12 EAST

MERLY-204-56 DETAIL No. 2 (Lots 45-60)

SEE DETAIL NO. 1



SEE DETAIL NO. 4

APPENDIX H
SHEET 4 OF 4

VETERAN'S PARCELS



1993-1