

Appendix 8.5-2

Drainage Design and Criteria Calculations



County of Fresno

DEPARTMENT OF PUBLIC WORKS AND PLANNING
ALAN WEAVER, DIRECTOR

February 28, 2007

Provost & Pritchard, Inc.
Engineering Group
Attention: Adams Claes
286 W. Cromwell Avenue
Fresno, CA 93711

Subject: Fresno County Drainage Design Standards

Dear Mr. Adams:

Responses to your inquiries in your letter dated February 21, 2007 are written below in order:

1. Yes, it is the current Fresno County Drainage Design Standards (October 1966).
2. Yes, for all other unincorporated areas within the County and outside the boundaries of the Fresno Metropolitan Flood Control District Master Storm Drainage Plan, surface facilities shall be designed for the five year storm. The lines on Chart H-4 refer to the rainfall intensity in in/hr for 60 min (1hr).
3. Yes but enough freeboard shall be provided.
4. There should be a retention basin on-site during construction to capture storm water runoff in case of unexpected heavy rain but not required. No runoff will be allowed offsite.

Calculations received with the fax have not been reviewed pending a formal submittal of plans, soil report and stamped and signed calculations.

Sincerely,

Daniel Gibbs, Senior Engineer
Development Engineering Section

DG: LN: Isk
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WATER & WASTEWATER
MUNICIPAL INFRASTRUCTURE
LAND DEVELOPMENT
AGRICULTURAL SERVICES
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FAX TRANSMITTAL

To: Mr. Dan Gibbs

Fax: (559) 262-4166

262-4106

CC:

Fax:

From: Adam Claes

No. of pages: 12
(including this page)

Subject: Fresno County Retention Basin Design

Date: February 21, 2007

Original to follow by mail: N

COMMENTS:

Dan,

I spoke to you over the phone approximately two weeks ago regarding the current Fresno County drainage design standards. I am working on the planning stages of a proposed power plant outside Parlier within Fresno County. We are currently trying to design the retention basins and other drainage facilities for the 30-acre power plant site. The site is isolated with no outside flows coming into the property and no on-site flows leaving the property (ideally). There will be a temporary construction lay-down area.

I have included with this fax what I believe to be the current Fresno County drainage design standards and associated charts and tables. From the standards, it appears that we are to design the "surface" retention basins for the 5-year storm using the rational method. Based on this, I have the following questions:

1. Are the included Fresno County standards the current and complete drainage design standards the County is using today, including that for retention basin design?
2. The included charts only show isopluvials for the 60-minute storm. Does this mean that all surface facilities should be designed for the 5-year 60-minute precipitation event?
3. The county standards state that flow shall be determined using the Rational Method. This method only determines peak discharge. Based on this, am I correct to assume that the county would like us to size the volume of the retention basins by simply multiplying the peak discharge by the storm duration? I know this would give a conservative volume.
4. Must there be a retention basin on-site during construction if the main permanent retention basins are not constructed until later on in the construction process?

Our goal is to correctly size facilities throughout the project so that permits can be obtained in the future. I would like to call you next week to discuss these issues, or feel free to call me if you have the opportunity.

Thank you,
Adam Claes

Should you not receive all the pages, please call us as soon as possible at (559) 449-2700.

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IMPROVEMENT

STANDARDS



FOR

FRESNO COUNTY

OCTOBER, 1966

IMPROVEMENT

STANDARDS

for

Fresno County

October, 1966

Price: \$1.50

prepared by:

Fresno County Department
of Public Works
4499 E. Kings Canyon Road
Fresno, California 93702

adopted by:

Fresno County Board of Supervisors
November 22, 1966
Division IV, Part VII, Chapter 11
Ordinance Code of the County of Fresno

SECTION II
DESIGN

8. DRAINAGE

1. General - All drainage designs shall be done in accordance with the accepted principles of Civil Engineering, these improvement standards and the latest edition of the Highway Design Manual issued by the California Department of Transportation.
2. Hydrology and System Design - For all areas within the boundaries of the Fresno Metropolitan Flood Control District Master Storm Drainage Plan the procedures and design criteria for all drainage facilities shall be in accordance with the Fresno Metropolitan Flood Control District requirements. For all other unincorporated areas within the County the following criteria shall be used:

- a. All surface facilities shall be designed for the five year storm. All underground storm sewers shall be designed for a ten year storm. All roadway culverts shall be designed for the peak flow from a ten-year storm without static head at the entrance. In addition, the culvert sizing shall be designed such that the total head generated from a 100 year storm, at the entrance, is not more than one foot below the edge of the road pavement.

The headwater surface elevation at the upstream side of the culvert created by the peak flow of a 100-year design storm shall be projected upstream as well as laterally to determine the extent of flooding caused by the culvert. In the event any properties, public and private, will be flooded or flooded to a greater extent than the pre-culvert condition, additional culverts, larger culverts or other facilities or solution must be provided acceptable to the director in order to limit the flooding beyond the development boundaries to the prior existing condition.

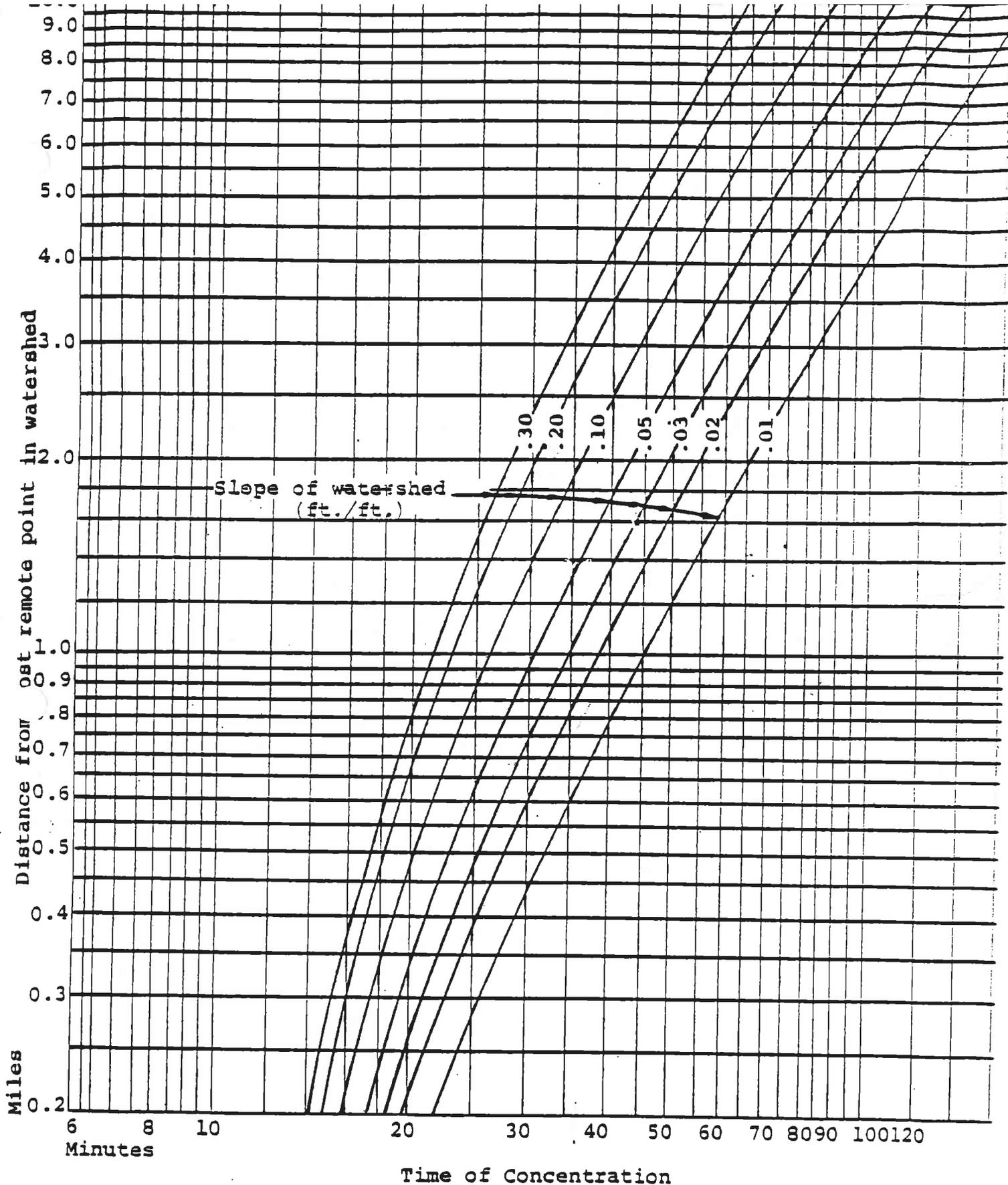
Flooding limits determined above shall be delineated on the subdivision map.

- b. Flows shall be determined by using the rational formula $Q=CIA$. The determination of C shall be from Chart H-1. The determination of I shall be based on a time of concentration from Chart H-2, from a 60 minute rainfall intensity from either Charts H-4, H-5, and H-7 and from an intensity duration factor from Chart H-8.
- c. Where a natural drainage way passes through the development or requires realignment the channel shall be designed to protect the streets and structures within and adjacent to the subdivision from a 100-year storm. A minimum of 1.5 feet of freeboard shall be provided to allow for the proper flow of lateral channels and pipes.

Chart for obtaining "C" in rational drainage formula $Q=CiA$, for Rural Areas.
 C normally falls between .30 & .55, .55 to .75 is high, above .75 is extreme and below .30 is low. Add partial factors for relief, soil, cover and storage to obtain total C factor

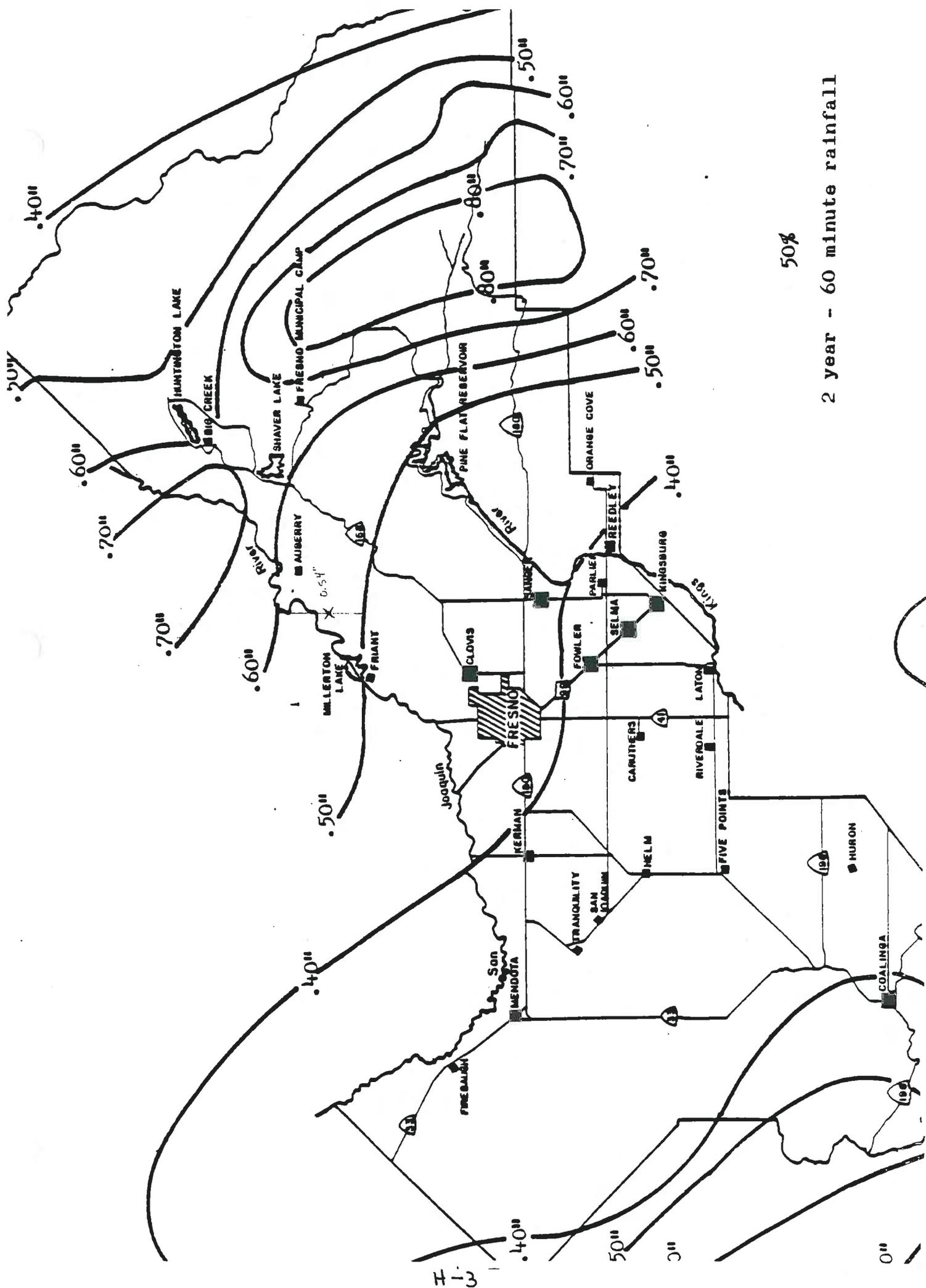
Example: Flat terrain .08 to .12
 Clay soil .11 to .15
 No cover .15 to .19
 Normal storage $\frac{.06 \text{ to } .11}{.40 \text{ to } .57}$
 C=

DESIGNATION OF WATERSHED CHARACTERISTICS		DESCRIPTION AND RANGE OF RUNOFF PRODUCING CHARACTERISTICS		
Relief	.30 to .38 Steep rugged terrain-average slopes above 40%.	.22 to .30 Hilly to mountainous terrain-average slopes between 15 and 40%.	.12 to .22 Rolling to hilly terrain-average slopes from 6 to 15%.	.08 to .12 Flat to mildy rolling terrain-average slope less than 6%.
Soil	.15 to .19 No effective soil cover-either rock or thin soil mantle of poor to negligible infiltration capacity.	.11 to .15 Slow to take up water clay or other soil with fair to poor infiltration capacity.	.06 to .11 Normal-permeable soils of good depth with good to fair infiltration capacity.	.04 to .06 Soils of good to excellent infiltration capacity-sands, loess, and other open soils.
Vegetal Cover	.15 to .19 No effective plant cover-bare to very sparse cover.	.11 to .15 Fair to sparse cover-clean cultivated crops or poor natural vegetation-less than 20% of drainage area under good cover.	.06 to .11 Good to fair cover-not more than 50% of area in clean cultivated crops or poor natural vegetation-between 20 & 65% in good grassland, woodland or equivalent cover.	.04 to .06 Good to excellent cover-65 to 85% of area in good grassland, woodland or equivalent cover.
Face Storage	.15 to .19 Negligible-surface depression few and shallow-drainage ways steep and narrow-no ponds or marshes.	.11 to .15 Low- only fair amount of surface depression storage well defined system of small drainage ways-no ponds or marshes.	.06 to .11 Normal-fair to considerable surface depression storage having a drainage system similar to that of prairie lands-small amount of storage or a large	.04 to .06 High-large amount of surface depression storage drainage system sharply defined-large flood plain storage or a large



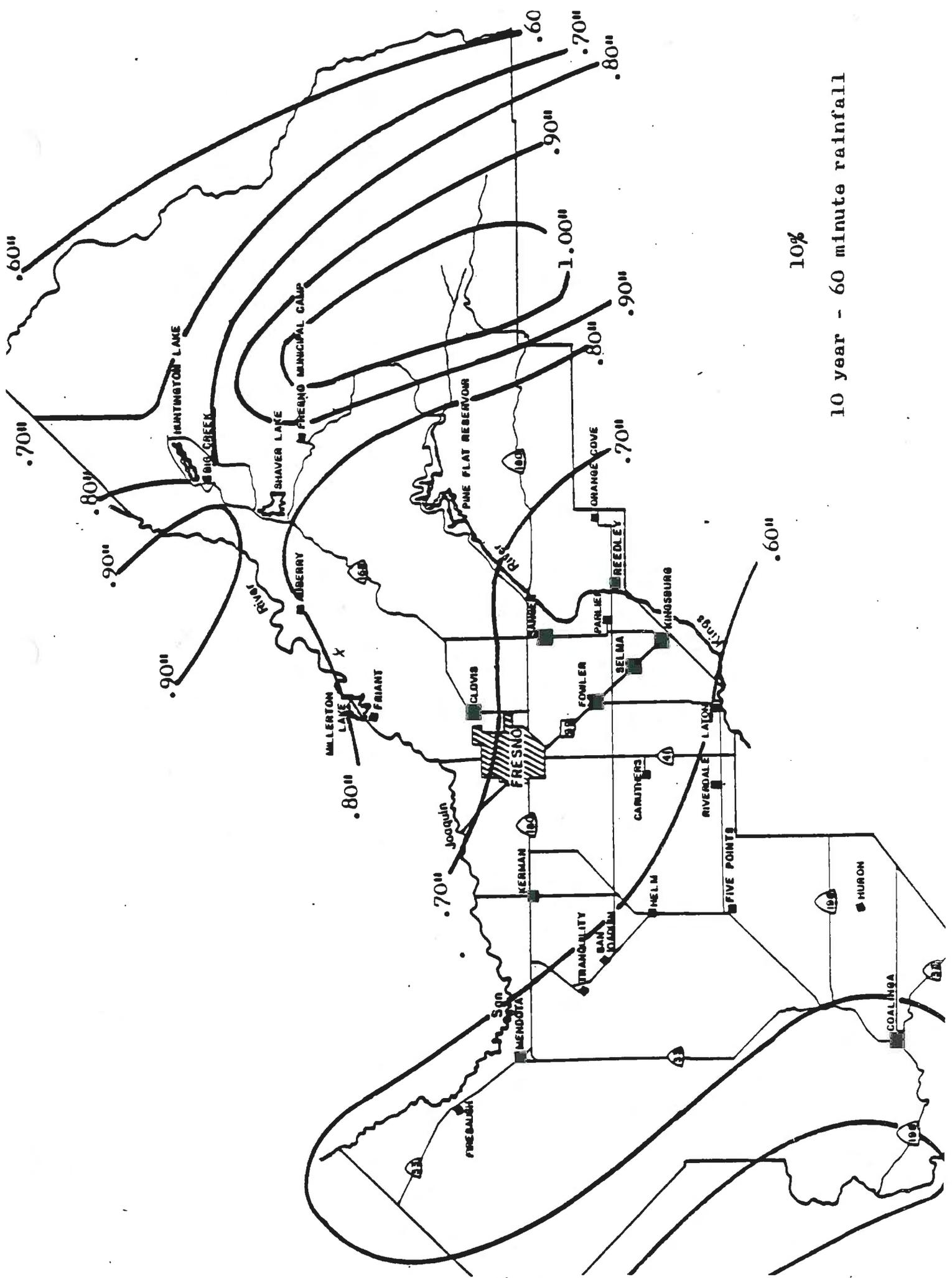
Note: Derived for rural areas where vegetal cover is light. Increase time of concentration for heavy vegetal cover or decrease for more barren area. Revision not to exceed 15 minutes.

Slope is measured by dividing the difference in elevation between the most remote point in the watershed and the culvert site by the distance between them. Slope is measured in feet per feet.

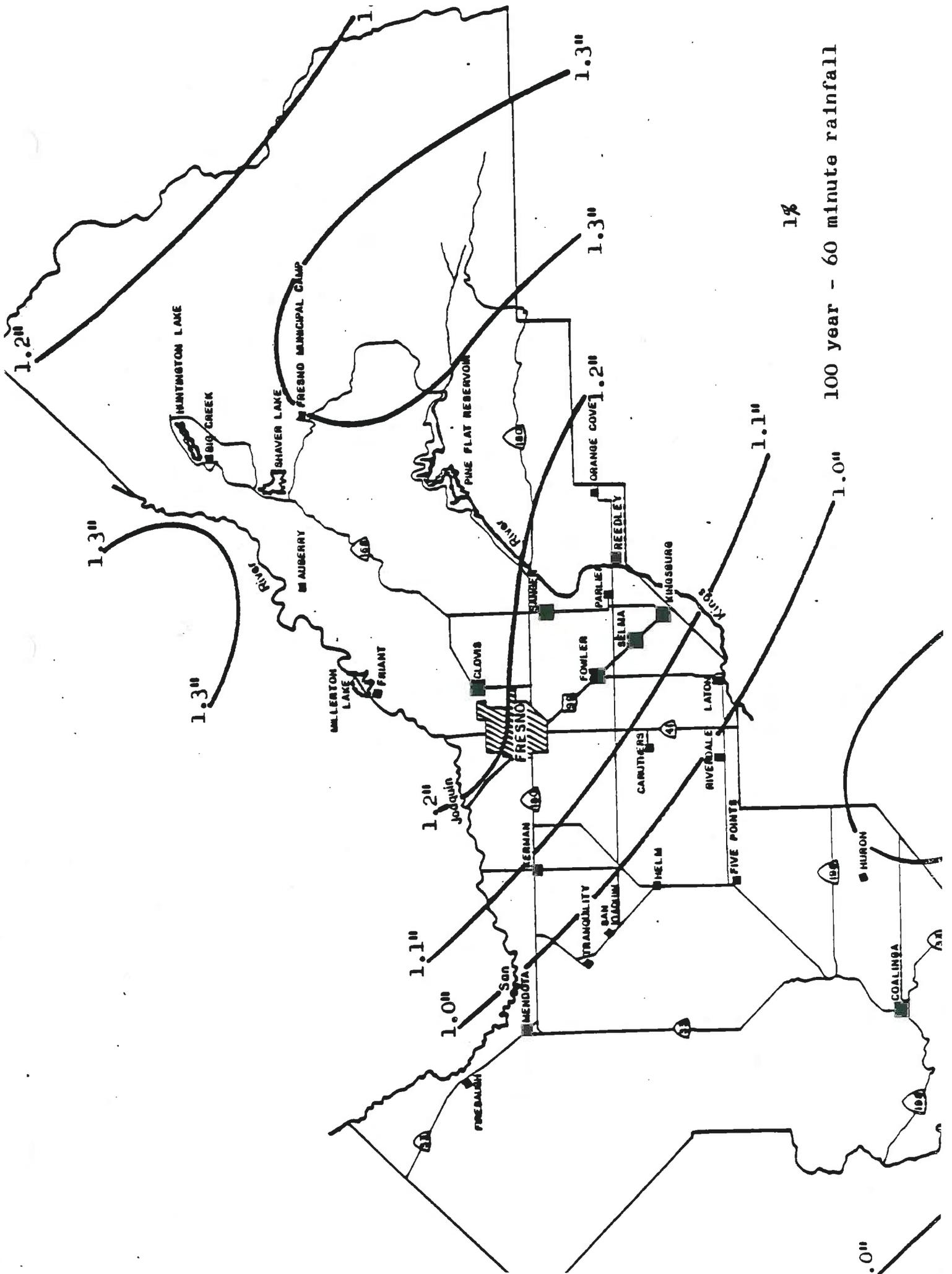


50%

2 year - 60 minute rainfall



10%
10 year - 60 minute rainfall



1%

100 year - 60 minute rainfall

INTENSITY DURATION FACTOR

Intensity Factor "I"
For Permanent Retention Facilities use an intensity factor of 1.0
(48 hr 1% storm 1-0 07 min -- area fact of atorage = 0.28 CA)

