HYDROLOGY F23/D1 SEVEN PLAN

F23-D1

7 PLANS

Tierra Amada

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO

ALVARADO SQUARE ALBUQUERQUE, NEW MEXICO 87158

July 30, 1981

Mr. Jim Blackwell
Academy Engineering
5353 Wyoming, N.E.
Suite 3
Albuquerque, NM 87109

Dear Jim:

The encroachment for the run-off water holding pond for the Tierra Amada Townhouse Project has been agreed to by the Public Service Company. I will prepare the encroachment papers for signature and give you a call.

Sincerely,

Doug Hendren

Doug Hendren
Right-of-Way Agent

DH:pb

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR
David Rusk

F23-D1

August 20, 1981

Mr. James Blackwell
Academy Engineering, Inc.
5353 Wyoming Boulevard N.E.
Albuquerque, New Mexico 87109

RE: TIERRA AMADA TOWNHOUSES DRAINAGE REPORT

Dear Mr. Blackwell:

For the past several weeks this office has investigated the situation surrounding construction plan approval for the Tierra Amada site. Findings have indicated that a complete review of the drainage report has not been made. Therefore, before final approval is granted to proceed with construction, the following items must be addressed satisfactorily.

1. Cross-sections of the proposed grading and existing channel be provided at discharge points along the Embudito Drainage Easement. This is required to evaluate the need for erosion protection along the channel sideslope.

2. A written agreement be obtained from the adjacent property owners concurring with:

   a. the utility easement being used as outfall for the pond discharge pipe.

   b. the proposed off-site grading.

   c. the proposed manner in which runoff is discharged from Lots 1 through 9 (Area A-5 on Drainage Plan).

   This type of agreement is always necessary when regrading on the adjacent property is required and the natural flowpath is altered.

3. Appendix II detail of the piping connections (Sheet 7 of 10; Drainage Report) indicates that the Single "D" Catch Basin inlet is 1.5 ft. above the bottom of the pond. How will runoff drain from the pond once the water surface elevation drops below this 1.5 ft. depth? For this type of situation a perferated pipe system has worked well and could be a possible solution.

4. The following items should be included on the Drainage and Grading Plan. The referenced numbers are taken from the Drainage Report (DR) and Construction Plan (CP) Checklists:

   a. Legend provided (DR #17C, CP #6).

   b. Indication of all existing easements and right-of-ways on, or adjacent to ther site with dimensions and purpose shown (DR #21G, CP #20).

   c. Notes which increase clarity of the drainage and grading scheme should always be included (DR #21H, CP #18). Therefore, please include the following Notes defining:

      1. RCP culverts
      2. Outlet pipes on Larchmont Drive
      3. Double "C" Catch Basins
      4. Concrete overflow channel
      5. 24" RCP
      6. Single "D" Catch Basin
      7. 18" RCP

   d. Pad elevations be indicated to a five digit Mean Sea Level Designation and the word MINIMUM placed under each elevation (DR #21I, CP #12).

   e. Retaining wall locations identified (DR #21L, CP #21).

   f. A cross-section of the pond including elevations on Tramway Boulevard. This detail should be drawn to a standard engineering scale (DR #21M, CP #22).

In light of the sensitive drainage problems in the project area, we feel that requesting the above items is not unreasonable. Our primary objective is to achieve a workable solution that is beneficial to the Community.

If I can answer any questions concerning this letter, please call.

Sincerely,

Charles M. Easterling
Principal Assistant City Engineer/Hydrology

CME:BGB:gc
8033A
cc Drainage Files
f/Reading

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

F23-D1

September 9, 1981

Mr. James Blackwell
Academy Engineering, Inc.
5353 Wyoming Blvd. N.E.
Albuquerque, New Mexico 87109

Re: TIERRA AMADA TOWNHOUSES DRAINAGE REPORT

Dear Jim:

The referenced drainage report is hereby approved based on your submittal of September 4, 1981. For final sign-off of the construction set, however, this office requests that the perferated drain system be changed to include several slotted drain pipes. I have included a copy of an example that has worked well in the past.

Please supply this office with a copy of the sheet containing this detail. We will proceed with final signature once this change has been made.

Thank you for your cooperation throughout the course of this project. If I can be of further help, please call.

Very truly yours,

Brian G. Burnett
Civil Engineer/Hydrology

BGB/fs
Enclosure

Academy Engineering, Inc.

February 24, 1982

F23-D1

Mr. Brian G. Burnett
Civil Engineer/Hydrology
City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

RE: Tierra Amada Townhomes

Dear Brian:

This letter is in reference to our conversation on February 23, 1982. Due to over excavation of approximately 5300 ft.^{2} of dirt on the pond and laying the storm sewer to the proposed grade, it is necessary to lower the grate elevation of the single catch basin at STA 0+90.00 from 45.00 to 43.36. Please see attached sheet for all revisions affected by this change marked △.

If you have any questions, please call me.

Sincerely,

ACADEMY ENGINEERING, INC.

Ted X. Witek

Ted X. Witek
Designer

ms

Attachment

I concur with the proposed change.

Brian G Burnett 2/24/82

Brian G. Burnett
Civil Engineer/Hydrology

Date

(505) 821-8008
ALBUQUERQUE, N.M. 87109
5353 WYOMING BLVD. NE. SUITE 3

DRAINAGE REPORT

TIERRA AMADA TOWNHOUSES

ALBUQUERQUE, NEW MEXICO

JANUARY 1981

PREPARED FOR:

DIVERSIFIED DEVELOPMENT & INVESTMENTS, INC.

PREPARED BY:

ACADEMY ENGINEERING INC.

5353 WYOMING BLVD. N.E.

ALBUQUERQUE, NEW MEXICO 87109

(505) 821-8008

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TIERRA AMADA

SCOPE

The scope of this report is to present the data, analysis, calculations, and a proposed plan for drainage management.

SITE LOCATION

The project site is located north of Elena Gallegos Grant Boundary and east of Tramway Blvd. The site is bound by an existing alley on the south, Tramway Blvd. on the west, the Embudito Diversion on the east, and undeveloped lands on the north. (See site location map, Exhibit A)

NATURAL DRAINAGE

The site, in its natural state, slopes at less than 6.0% ti the southwest, and contains a few small swales. (See topo, Exhibit B). There are no offsite flows intercepted by the site. Check -

The soil on the sire is generally comprised of Embudo and Tijeras sand and gravel. Map symbols associated with these types are EmB and EtC. (See soils map, Exhibit C). A copy of the portion of the soil survey of Bernalillo County by Soil Conservation Service that applies to this site is included in Appendix I. Both the Embudo and Tijeras series have a hydrologic classification of "B". This signifies moderate infiltration and transmission rates when the soil is thoroughly wetted. An explanation of the hydrologic soils groups is also included in Appendix I.

ESTIMATED RUNOFF UNDEVELOPED STATE

Drainage within the boundary of the site is basically overland flow with some small swales. The drainage naturally exits the area from the southwest corner of the property. The historic 5-year discharge from the site is 11.7-cfs. This is the maximum discharge allowed by the City of Albuquerque after development occurs.

ESTIMATED RUNOFF DEVELOPED STATE

As development occurs, the impervious area increases and thereby the amount of runoff also increases. To offset this increase, onsite restrictions of flow must be incorporated into the development. While this can take different forms, the most practical solution for this type of development is to utilize detention ponding.

A main ponding area will be incorporated into the development in order to detain the majority of the runoff. It will be located at the southwest corner of the property within the Public Service Company of New Mexico Easement. Approximately 32,500 cubic feet of storage will be required. The required dimensions are as shown on the Drainage Plan (Exhibit F). Inflow into the pond will be conveyed by a 24" concrete pipe from a drop inlet in Calle Amado. This pipe will discharge directly into the bottom of the pond. An 18" pipe will be used to drain the detention facility and thereby conform to the maximum discharge from the site allowed by the City of Albuquerque.

On lot ponding will be incorporated on the 7 lots which are unable to drain to the front in order to handle the runoff generated by the rear ½ area of those lots. The rear half of lots in area A-3 (see Drainage Plan Exhibit F) will discharge directly offsite into the Embudito Drain without being detained. The combined discharge from these areas is 3.32 cfs. The rear half of lots in areas A-5 and A-2 will discharge directly offsite without being detained. This combined discharge is 3.88 cfs.

DESIGN CRITERIA

In analyzing the storm runoff, the rational formula, Q-CIA is used.

Where:

- Q = Runoff Quantity in cubic feet/second.
- A = Contributing Area in Acres.
- I = Intensity in inches/hour for a duration equal to the time of accumulation (duration) measured in minutes and obtained from Exhibit D, intensity duration frequency curves, Albuquerque area 1961. (Note: Where a time of concentration (Tc) is less than ten minutes from Exhibit E, the intensity value derived from the Tc equal to ten minutes is employed).
- C = Runoff coefficient (No Unit). This coefficient represents the integrated effects of infiltration detention storage, evaporation retention, flow routing and interception which all affect the time distribution and peak rate of runoff. (=0.4 pervious and 0.9 impervious)

An inflow hydrograph was developed for the purpose of routing the stormwater through the pond. The peak discharge and volume of runoff were computed by the rational method. A trapezoidal hydrograph was constructed with the volume under the hydrograph equal to the expected 100-year developed runoff volume. The 100-year developed discharge was used as the peak value. The rising and falling limbs on the hydrograph occur for a period equal to the time of concentration.

EXPLANATION OF RESULTS

5-year undeveloped runoff:
Total Flow = 11.7 cfs

100-year developed runoff:
Total Flow: 11.7 cfs

As shown above, the development of this project, including onsite ponding remains within the required runoff criteria.

DRAINAGE PLAN

The following recommendations are needed as part of the Drainage Management Plan to insure that the drainage requirements for the City of Albuquerque are satisfied.

1. On-lot ponding is necessary in areas incapable of draining to the street.

2. Walls which are to be built in areas A-3, A-5, and A-2 should not restrict flows from discharging directly offsite.

3. A double type "C" catch basin should be installed in Calle Amado; a 24" diameter pipe should be used to convey storm water to the pond.

4. Required volume for the main pond is 32,500 ft^3.

5. An 18" pipe should be used to drain the pond with a 10" orifice opening (see drainage plan for details)

6. Scour protection should be provided at the discharge points for the 18" pipe.

APPENDIX I

CHAPTER 7. HYDROLOGIC SOIL GROUPS

This chapter gives definitions of four soil groups that are used in determining hydrologic soil-cover complexes (chap. 9), which are used in a method for estimating runoff from rainfall (chap. 10). A table gives the group-classifications of more than 4,000 soils in the United States and Puerto Rico. Methods of making and using the classifications are briefly discussed.

Watershed-Soils Classification

Soil properties influence the process of generation of runoff from rainfall and they must be considered, even if only indirectly, in methods of runoff estimation. When runoff from individual storms is the major concern, as in flood prevention work, the properties can be represented by a hydrologic parameter: the minimum rate of infiltration obtained for a bare soil after prolonged wetting. The influences of both the surface and the horizons of a soil are thereby included. The influence of ground cover is treated independently, as discussed in chapters 8, 9, and 10.

The parameter, which indicates the runoff potential of a soil, is the qualitative basis of the classification in this chapter of all soils into four groups. The classification is broad but the groups can be divided into subgroups, as shown in example 7.1, whenever such a refinement is justified. Chapter 9 describes how the groups are given quantitative significance in the runoff-estimation method of chapter 10.

DEFINITIONS

In the definitions to follow, the infiltration rate is the rate at which water enters the soil at the surface and which is controlled by surface conditions, and the transmission rate is the rate at which the water moves in the soil and which is controlled by the horizons. The hydrologic soil groups, as defined by SCS soil scientists, are:

A. (Low runoff potential). Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well to excessively drained sands or gravels. These soils have a high rate of water transmission.

B. Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

C. Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of water transmission.

D. (High runoff potential). Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission.

The Soil List

The list at the end of this chapter contains the names of more than 4,000 soils in the United States and Puerto Rico. The capital letter following a name designates the hydrologic soil group classification.

The original classifications were based on the use of rainfall-runoff data from small watersheds or infiltrometer plots, but the majority are based on the judgments of soil scientists and correlators who used physical properties of the soil in making their decisions. They classified a soil in a particular group by comparing its profile with profiles of soils already classified. They assumed that the soil surfaces were bare, maximum swelling had taken place, and rainfall rates exceeded surface intake rates. Thus, most of the classifications are based on the premise that similar soils (similar in depth, organic-matter content, structure, and degree of swelling when saturated) will respond in an essentially similar manner during a rainstorm having excessive intensities.

The classification of a soil in the list can be checked by using the procedure of example 5.4. The soil in question must be the only one

TABLE 7.—*Engineering classification*

Soil series and map symbols	Depth to— Bedrock	Depth to— Seasonal high water table	Depth from surface	USDA texture of representative profile	Classification: Unified	Classification: AASHTO	Coarse fraction greater than 3 inches
	Feet	*Feet*	*Inches*				*Percent*
Brazito: Br, Bs, Bt	>5	>5	0-9	Fine sandy loam to silty clay loam.	SM, CL-ML, or CL	A-4 or A-6	----------
			9-60	Sand	SP or SP-SM	A-3	----------
Burnac: BUE	>5	>5	0-6	Gravelly loam and very gravelly loam.	GM	A-2 or A-4	5-20
			6-14	Gravelly sandy clay loam.	SC-SM or SC	A-2, A-4, or A-6	5-15
			14-60	Clay	CH	A-7	----------
Carlito: CAF	>5	>5	0-4	Stony loam	CL-ML or CL	A-4	15-45
			4-60	Clay and silty clay.	CL or CH	A-7	----------
Cut and fill land: Cu. No valid estimates; material too variable.	>5	>5					
*Embudo: EmB, EtC. For Tijeras part of EtC, see Tijeras series.	>5	>5	0-20	Gravelly fine sandy loam and gravelly sandy loam.	SM	A-2, A-4	----------
			20-60	Gravelly loamy coarse sand.	SM	A-1	----------
Escabosa. Mapped only with Laporte soils and Rock outcrop.	1.5-3.5	>5	0-15	Loam	CL-ML or ML	A-4	----------
			15-23	Gravelly loam	GM or CL-ML	A-4	0-10
			23	Bedrock.			
*Gila:							
GA, Gb, Ge, GH. For Hantz part of GH, see Hantz series.	>5	[1]>5	0-44	Stratified loam to sandy loam.	SM or ML	A-4	----------
			44-60	Sand	SP or SP-SM	A-3	----------
Gc, Gd, GF	>5	[1]3->5	0-60	Stratified loam to sandy loam.	SM or ML	A-4	----------
Glendale: Gk, Gm, Gs	>5	[1]>5	0-6	Clay loam or loam.	CL-ML or CL	A-4 or A-6	----------
			6-38	Silt loam	CL	A-6	----------
			38-60	Clay loam	CL	A-6	----------
Hantz: Ha	>5	[1]>5	0-65	Silty clay	CL or MH	A-7	----------
Ildefonso: ILC	>5	>5	0-60	Gravelly and very gravelly sandy loam.	GM or SM	A-1 or A-2	0-15
*Kim: KaB, KbB, KD. No valid estimates for Badland part of KD.	>5	>5	0-60	Loam and clay loam.	CL-ML or CL	A-4 or A-6	----------
*Kokan: KOE, KR. No valid estimates for Rock outcrop part of KR.	>5	>5	0-60	Gravelly sand and very gravelly sand.	GP, GP-GM, or GM	A-1	0-30

See footnotes at end of table.

and estimated properties—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Risk of corrosion to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)								Uncoated steel	Concrete
						Inches per hour	*Inches per inch of soil*	*pH*	*Millimhos per centimeter at 25° C*			
--------	100	70-100	40-95	15-35	0-15	0.6-2.0	0.15-0.21	7.9-8.4	1-4	Low to moderate.	Moderate...	Low.
--------	100	65-85	0-10	NP	NP	6.0-20.0	0.05-0.07	7.9-8.4	0-1	Low.....	Low.....	Low.
40-70	35-65	30-60	20-50	<30	NP-5	0.6-2.0	0.09-0.11	6.6-7.3	0-1	Low.....	Low.....	Low.
70-80	65-75	55-65	20-40	20-35	5-15	0.6-2.0	0.12-0.14	6.1-6.5	0-1	Low.....	Low.....	Low.
90-100	85-95	35-90	70-85	50-65	25-35	<0.06	0.14-0.16	6.1-7.3	0-1	High.....	High.....	Low.
95-100	90-100	75-100	60-90	20-30	5-10	0.2-0.6	0.14-0.18	7.4-7.8	0-1	High.....	High.....	Low.
--------	100	90-100	75-95	40-55	20-30	0.06-0.2	0.15-0.18	7.8-8.4	0-1	High.....	High.....	Low.
85-95	70-85	40-75	25-50	NP	NP	0.6-0.2	0.07-0.09	7.9-8.4	0-1	Low.....	Low.....	Low.
80-95	50-70	20-45	10-25	NP	NP	>20	0.04-0.06	7.9-8.4	0-1	Low.....	Low.....	Low.
--------	100	85-95	60-70	20-35	5-10	0.6-2.0	0.16-0.18	7.9-8.4	0-1	Low.....	High.....	Low.
65-95	60-90	50-85	40-65	20-30	0-5	0.6-2.0	0.13-0.15	7.9-8.4	0-1	Low.....	High.....	Low.
--------	100	95-100	40-60	NP	NP	0.6-2.0	0.13-0.18	7.9-8.4	-1	Low.....	Moderate...	Low.
--------	100	50-90	0-10	NP	NP	6.0-2.0	0.05-0.07	7.9-8.4	0-1	Low.....	Low.....	Low.
--------	100	95-100	40-75	NP	NP	0.6-2.0	0.07-0.12	7.9-9.0	4-8	Low.....	High.....	Low.
--------	100	90-100	60-80	25-35	5-15	0.2-0.6	[2]0.16-0.20	7.4-7.8	[3]1-4	Moderate...	High.....	Low.
--------	100	90-100	75-90	30-40	10-15	0.2-0.6	[2]0.19-0.21	7.9-8.4	[3]1-4	Moderate...	High.....	Low.
--------	100	90-100	70-80	30-40	10-15	0.2-0.6	[2]0.19-0.21	7.4-8.4	[3]1-4	Moderate...	High.....	Low.
--------	100	95-100	90-95	40-65	20-30	<0.06	0.10-0.12	8.5-9.0	4-8	High.....	High.....	Low.
40-75	35-60	20-40	10-30	20-25	0-4	2.0-6.0	0.06-0.08	7.9-9.0	2-4	Low.....	High.....	Low.
--------	100	85-100	60-80	25-35	5-15	0.6-2.0	0.16-0.20	7.4-8.4	0-1	Moderate...	Moderate...	Low.
45-60	40-55	20-45	0-20	NP	NP	>20.0	0.03-0.05	7.4-7.8	0-1	Low.....	High.....	Low.

TABLE 7.—*Engineering classification*

Soil series and map symbols	Depth to— Bedrock	Depth to— Seasonal high water table	Depth from surface	USDA texture of representative profile	Classification Unified	Classification AASHTO	Coarse fraction greater than 3 inches
	Feet	*Feet*	*Inches*				*Percent*
*Tesajo: Te. For Millett part, see Millett series.	>5	>5	0-60	Very gravelly loam to very gravelly loamy sand.	GP-GM, GM, or SM	A-1	0-10
Tijeras: TgB	>5	>5	0-19	Gravelly fine sandy loams and sandy clay loam.	SM, CL-ML, or CL	A-4	----------
			19-60	Gravelly sandy loam and very gravelly loamy sand.	SM	A-1 or A-2	0-10
Tome: To	>5	>5	0-11	Silt loam	ML or CL-ML	A-4	----------
			11-27	Clay loam	CL-ML or CL	A-4 or A-6	----------
			27-60	Fine sandy clay loam.	CL-ML or CL	A-4 or A-6	----------
Torrifluvents: TP. No valid estimates; material too variable.	>5	[3] 1-5					
*Travessilla: TQC, TR. No valid estimates for Rock outcrop part of TR.	0.5-1.5	>5	0-10	Sandy loam	SM	A-2 or A-4	0-25
			10	Bedrock.			
Ustolls. No valid estimates; material too variable. Mapped only with Rock outcrop.	1-5	>5					
*Vinton: Va, VbA, VBB, Vc, VF. For Brazito part of VF, see Brazito series.	>5	[1] >5	0-10	Sandy loam	SM	A-2 or A-4	----------
			10-60	Loamy sand	SM	A-2	----------
*Wink: Wab, WeB, WM. For Embudo part of WeB, see Embudo series; for Madurez part of WM, see Madurez series.	>5	>5	0-35	Sandy loam	SM	A-2 or A-4	----------
			35-60	Sandy loam	SM or SM-SC	A-2, A-4, or A-6	----------
Witt. Mapped only with Silver soils.	>5	>5	0-60	Silty clay loam	CL or CL-ML	A-6	----------

[1] Protected from flooding by levees along the Rio Grande.
[2] Nonplastic.
[3] For unit Gs, available water capacity is lower and salinity is 4-8.

and estimated properties—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Risk of corrosion to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)								Uncoated steel	Concrete
						Inches per hour	*Inches per inch of soil*	*pH*	*Millimhos per centimeter at 25° C*			
55-80	30-55	20-40	10-25	NP	NP	6.0-20.0	0.05-0.07	6.6-7.8	0-1	Low	Low	Low.
80-100	60-90	50-80	35-65	20-30	0-10	0.6-2.0	0.10-0.16	7.9-8.4	0-1	Low to moderate.	High	Low.
70-90	45-70	25-60	15-35	NP	NP	2.0-20.0	0.03-0.09	7.9-8.4	0-1	Low	High	Low.
--------	100	90-100	50-65	20-30	0-5	0.2-0.6	0.18-0.20	8.5-9.0	0-1	Low	High	Low.
--------	100	90-100	85-95	25-35	5-15	0.2-0.6	0.18-0.20	7.9-8.4	0-1	Moderate	High	Low.
--------	100	85-100	75-85	20-30	5-15	0.6-2.0	0.14-0.16	7.9-8.4	0-1	Moderate	High	Low.
75-100	65-95	40-80	20-50	NP	NP	2.0-6.0	0.08-0.13	7.9-8.4	0-1	Low	Low	Low.
--------	100	60-70	30-40	NP	NP	2.0-6.0	0.10-0.12	7.9-8.4	1-4	Low	High	Low.
--------	100	60-80	15-35	NP	NP	2.0-6.0	0.06-0.08	7.9-8.4	1-4	Low	High	Low.
--------	100	80-95	30-40	NP	NP	2.0-6.0	0.09-0.13	7.9-8.4	1-4	Low	High	Low.
--------	100	80-90	30-50	30-40	5-15	2.0-6.0	0.09-0.13	7.9-8.4	1-4	Low	High	Low.
--------	100	95-100	75-90	30-40	10-15	0.2-0.6	0.18-0.20	7.4-8.4	0-1	Moderate	High	Low.

[4] Subject to rare flooding.
[5] For unit SnA, reaction is 8.5-9.0 and salinity is 1-4.
[6] Subject to frequent flooding.

TABLE 8.—*Engineering*

Soil series and map symbols	Degree and kind of limitations for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill (trench type) [1]	Local road and streets
Carlito: CAF	Severe: slope; percs slowly.	Severe: slope.	Severe: slope; too clayey.	Severe: slope; shrink swell.	Severe: too clayey.	Severe: low strength; shrink swell.
Cut and fill land: Cu	Slight if slope is 1 to 8 percent, moderate if 8 to 15, severe if more than 15.	Severe: seepage.	Moderate: cutbanks cave; slope.	Slight if slope is 1 to 8 percent, moderate if 8 to 15, severe if more than 15.	Severe: seepage.	Slight if slope is 1 to 8 percent, moderate if 8 to 15, severe if more than 15.
*Embudo: EmB, EtC. For Tijeras part of EtC, see Tijeras series.	Slight [2]	Severe: seepage.	Moderate: [3] small stones.	Slight [2]	Severe: seepage.	Slight
Escabosa. Mapped only with Laporte soils and Rock outcrop.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.
*Gila: GA, Gb, Ge, GH. For Hantz part of GH, see Hantz series.	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Slight	Moderate: low strength.
Gc, Gd, GF	Severe: wet	Moderate: seepage; wet.	Moderate: wet.	Slight	Severe: wet	Moderate: low strength.
Glendale: Gk, Gm	Severe: percs slowly.	Slight	Moderate: too clayey.	Moderate: shrink swell.	Moderate: too clayey.	Moderate: shrink swell.
Gs	Severe: percs slowly.	Moderate: wet	Moderate: too clayey.	Moderate: shrink swell.	Severe: wet; too clayey.	Moderate: shrink swell
Hantz: Ha	Severe: percs slowly; floods.	Slight	Severe: too clayey; rarely floods.	Severe: shrink swell; floods.	Severe: too clayey; floods.	Severe: shrink swell; floods.
Ildefonso: ILC	Slight if slope is less than 8 percent, moderate if 8 to 15, severe if more than 15.	Severe: seepage.	Severe if slope is more than 15 percent: small stones.	Slight if slope is less than 8 percent, moderate if 8 to 15, severe if more than 15.	Severe: seepage.	Slight if slope is less than 8 percent, moderate if 8 to 15, severe if more than 15.
*Kim: KaB, KbB, KD. For Badland part of KD, see Badland.	Slight	Moderate: seepage.	Slight	Moderate: low strength; shrink swell.	Slight	Moderate: shrink swell.
*Kokan: KOE, KR. For Rock outcrop part of KR see Rock outcrop.	Moderate if slope is 10 to 15 percent, severe if more than 15.	Severe: seepage; slope.	Severe: cutbanks cave; small stones.	Moderate if slope is 10 to 15 percent, severe if more than 15.	Severe: seepage; small stones.	Moderate if slope is 10 to 15 percent, severe if more than 15.

See footnotes at end of table.

rpretations—Continued

Suitability as source of—				Soil features affecting—		Hydrologic soil group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	
oor: low strength; shrink swell.	Unsuited	Unsuited	Poor: thin layer.	Slope	Hard to pack; low strength; compressible.	C
ood if slope is less than 15 percent, fair if more than 15.	Fair: excess fines.	Unsuited	Poor: small stones.	Seepage	Hard to pack; seepage.	A
ood	Poor: excess fines.	Poor: excess fines.	Poor: small stones.	Seepage	Piping; compressible.	B
oor: thin layer.	Unsuited	Poor: excess fines.	Poor: thin layer; small stones.	Depth to rock; seepage.	Piping; compressible.	C
air: low strength.	Poor: excess fines.	Poor: excess fines.	Good	Seepage	Piping	B
air: low strength.	Poor: excess fines.	Poor: excess fines.	Poor: excess salts.	Seepage	Piping	B
air: shrink swell.	Unsuited	Unsuited	Fair: too clayey.	Favorable	Low strength; piping.	B
air: shrink swell.	Unsuited	Unsuited	Poor: excess fines.	Favorable	Low strength; piping.	B
oor: shrink swell.	Unsuited	Unsuited	Poor: too clayey.	Favorable	Compressible; low strength.	D
ood if slope is less than 15 percent, fair if 15 to 25, poor if more than 25.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.	Seepage	Favorable	B
Fair: low strength.	Unsuited	Unsuited	Good	Seepage	Piping; low strength.	B
Good if slope is 10 to 15 percent, fair if 15 to 25, poor if more than 25.	Good	Good	Poor: small stones.	Seepage	Seepage	A

TABLE 8.—*Engineering*

Soil series and map symbols	Degree and kind of limitations for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill (trench type) [1]	Local roads and streets
*Silver: SmA, SnA, SwB, SwC. For Witt part of SwB and SwC, see Witt series.	Severe: percs slowly.	Slight if slope is less than 2 percent, moderate if 2 to 7, severe if more than 7.	Moderate: too clayey.	Moderate: low strength; shrink swell.	Moderate: too clayey.	Severe: low strength.
*Tesajo: Te. For Millett part, see Millet series.	Slight if slope is less than 8 percent, [2] moderate if 8 to 15, severe if more than 15.	Severe: seepage.	Severe: small stones.	Slight if slope is less than 8 percent, [2] moderate if 8 to 15, severe if more than 15.	Severe: seepage.	Slight if slope is less than 8 percent, [2] moderate if 8 to 15, severe if more than 15.
Tijeras: TgB	Slight	Severe: seepage.	Severe: small stones; cutbanks cave.	Moderate: shrink swell.	Severe: seepage.	Moderate: shrink swell; low strength.
Tome: To	Severe: percs slowly.	Slight	Moderate: floods.	Moderate: shrink swell.	Moderate: floods.	Moderate: shrink swell.
Torrifluvents: TP	Severe: floods.	Severe: floods; seepage.	Severe: cutbanks cave; floods.	Severe: floods.	Severe: floods; seepage.	Severe: low strength.
*Travessilla: TQC, TR. For Rock outcrop part of TR, see Rock outcrop.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Ustolls. Mapped only with Rock outcrop.	Severe: slope; depth to rock.	Severe: slope.	Severe: slope.	Severe: slope; depth to rock.	Severe: depth to rock; slope.	Severe: slope; depth to rock.
*Vinton: Va, VbA, VBB, Vc, VF. For Brazito part of VF, see Brazito series.	Slight	Severe: seepage.	Severe: cutbanks cave.	Slight	Severe: seepage.	Slight
*Wink: WaB, WeB, WM. For Embudo part of WeB, see Embudo series; for Madurez part of WM, see Madurez series.	Slight	Severe: seepage.	Slight	Slight	Severe: seepage.	Slight
Witt. Mapped only with Silver soils.	Severe: percs slowly.	Slight if slope is 1 to 2 percent, moderate if 2 to 7.	Moderate: too clayey.	Moderate: shrink swell.	Moderate: too clayey.	Moderate: shrink swell; low strength.

[1] Onsite study of the underlying strata, the water table, and the hazards of aquifer pollution and drainage into ground water needs to be made for landfill deeper than 5 or 6 feet.

interpretations—Continued

Suitability as source of—				Soil features affecting—		Hydrologic soil group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	
Poor: low strength.	Unsuited	Unsuited	Poor: too clayey.	Slope if more than 2 percent.	Low strength; compressible.	C
Good if slope is less than 15 percent, fair if more than 15.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.	Seepage	Seepage; piping	A
Fair: shrink swell; low strength.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.	Seepage	Low strength; piping.	B
Fair: shrink swell.	Unsuited	Unsuited	Fair: too clayey.	Favorable	Low strength; compressible; piping.	B
Poor: low strength.	Poor: excess fines.	Unsuited	Poor: excess alkali; excess salts; too sandy.	Seepage	Seepage; excess salts; excess alkali.	A
Poor: thin layer; slope.	Unsuited	Unsuited	Poor: area reclaim.	Depth to rock	Thin layer	D
Poor: area reclaim; large stones.	Unsuited	Unsuited	Poor: slope; large stones; thin layer.	Slope; depth to rock.	Large stones; thin layer.	D
Good	Poor: excess fines.	Unsuited	Poor: too sandy.	Seepage	Piping; seepage	B
Fair: low strength.	Unsuited	Unsuited	Good	Seepage	Piping; erodes easily.	B
Fair: low strength; shrink swell.	Unsuited	Unsuited	Fair: thin layer.	Favorable	Compressible; piping; low strength.	B

[1] Some local areas are subject to flooding.
[2] Soil is subject to consolidation under load.

APPENDIX II

BY JEB DATE 1-9-81 SUBJECT TIERRA AMADA - DRAINAGE CALCULATIONS SHEET NO. 1 OF 10
CHKD. BY ..... DATE ..... JOB NO. 81-00-01

UNDEVELOPED CONDITIONS

TOTAL SITE AREA = 10.394 ACRES

$$Q = C i A$$

$$Q_{100} = (0.4)(5.4)(10.394) = \underline{\underline{22.45 \text{ cfs}}}$$

FOR 5 YEAR STORM - DURATION = T_c = 10 MIN

WEATHER BUREAU DATA = $0.47 \text{ in} \left(\frac{60}{10}\right) \therefore i = 2.82 \frac{\text{in}}{\text{HR}}$

$$Q_5 = (0.4)(2.82)(10.394) = \underline{\underline{11.72 \text{ cfs}}}$$

SHEET FLOW FROM PROPERTY DISCHARGING DIRECTLY OFFSITE

AREA (A-2) WEST LOTS BACKYARD & ½ ROOF

TOTAL AREA = 30,575 FT^2

IMPERVIOUS AREA = $\frac{(36)(46)}{2}(14) = 11,592 \text{ FT}^2$

PERVIOUS AREA = 18,983 FT^2

$$C = \frac{(0.4)(18,983) + (0.9)(11,592)}{30,575} = \underline{\underline{0.59}}$$

$$Q_{100} = (0.59)(5.4)\left(\frac{30,575}{43,560}\right) = \underline{\underline{2.23 \text{ cfs}}}$$

AREA (A-3) EAST LOTS BACKYARD & ½ ROOF

TOTAL AREA = 37,900 FT^2

IMPERVIOUS AREA = $\frac{(36)(46)}{2}(7) + (36)(46)(4) + (22)(20) + (18)(20)$

= 15,620 FT^2

PERVIOUS AREA = 22,280 FT^2

$$C = \frac{(0.4)(22,280) + (0.9)(15,620)}{37,900} = \underline{\underline{0.61}}$$

$$Q_{100} = (0.61)(5.4)\left(\frac{37,900}{43,560}\right) = \underline{\underline{2.87 \text{ cfs}}}$$

AREA (A-5) SOUTH LOTS BACKYARD & ½ ROOF

TOTAL AREA = 26,050 FT^2

IMPERVIOUS AREA = $\frac{(36)(46)}{2}(7)$ = 5796 FT^2

PERVIOUS AREA = 20254 FT^2

$$C = \frac{(0.4)(20,254) + (0.9)(5796)}{26,050} = \underline{\underline{0.51}}$$

$$Q_{100} = (0.51)(5.4)\left(\frac{26050}{43560}\right) = \underline{\underline{1.65 \text{ cfs}}}$$

BY JEB DATE 1-9-81 SUBJECT TIERRA AMADA - DRAINAGE CALCULATIONS SHEET NO. 3 OF 10
CHKD. BY DATE JOB NO. 81-00-01

PONDED LOTS - BACKYARD ONLY - NO ROOF DRAINAGE

AREA (A-4)

TOTAL AREA = 8975 FT^2

$$Q_{100} = (0.4)(5.4)\left(\frac{8975}{43560}\right) = 0.45 \text{ cfs}$$

$$\text{VOLUME} = \frac{2.4}{12}(.4)(8975) = 718 \text{ } FT^3$$

$$\text{VOLUME PER LOT} = \frac{718}{7} = 103 \text{ } FT^3/\text{LOT}$$

CONTRIBUTING AREA TO MAIN POND

TOTAL AREA OF SITE =	452,749	
(A-2)	- 30,575	
(A-3)	- 37,900	
(A-4)	- 8,975	
(A-5)	- 26,050	
(A-1) =	349,249	= 8.02 ACRES

AREA (A-1)

TOTAL AREA = 349,249
IMPERVIOUS AREA = 193,139
PERVIOUS AREA = 156,110

$$C = \frac{(0.4)(156,110) + (0.9)(193,139)}{349,249} = 0.68$$

$$Q_{100} = (0.68)(5.4)\left(\frac{349,249}{43,560}\right) = 29.44 \text{ cfs}$$

VOLUME OF RUNOFF

$$V_{100} = (0.68)\left(\frac{2.4}{12}\right)(349{,}249) = \underline{47{,}500 \text{ FT}^3}$$

$$Q_{100} = \underline{29.44 \text{ cfs}}$$

T_c = 10 MIN. = TIME FOR RISING AND FALLING LIMBS

VOLUME = AREA UNDER HYDROGRAPH

$$V = \frac{1}{2} Q T_c = \frac{1}{2}(29.44)(10)(60) = 8832 \text{ FT}^3$$

$$(8832)(2) = 17{,}664 \text{ FT}^3$$

VOLUME REMAINING = 47,500 − 17,664 = 29,836 FT³

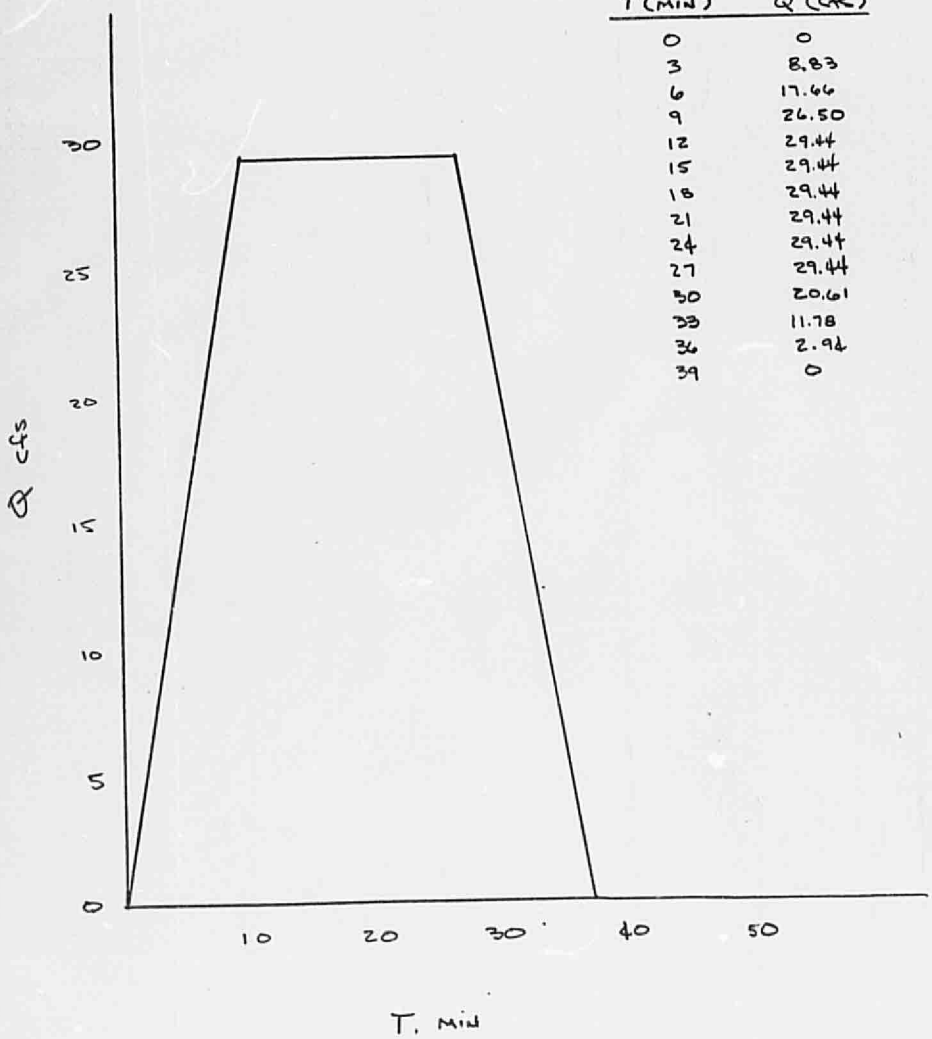
$$T_R = \frac{29{,}836}{(29.44)(60)} = 16.89 = \underline{17 \text{ MIN.}}$$

$$T_B = 10 + 10 + 17 = \underline{\underline{37 \text{ MIN.}}}$$

BY JEB DATE 1-9-81 SUBJECT TIERRA MADA - DRAINAGE CALCULATIONS SHEET NO. 5 OF 10
CHKD. BY ..... DATE ..... JOB NO. 81-00-01

INFLOW HYDROGRAPH - MAIN POND

T (MIN)	Q (cfs)
0	0
3	8.83
6	17.66
9	26.50
12	29.44
15	29.44
18	29.44
21	29.44
24	29.44
27	29.44
30	20.61
33	11.78
36	2.94
39	0



ALLOWABLE DISCHARGE FROM MAIN POND

Q_5 HISTORIC = 11.72 cfs
DISCHARGE FROM (A-2) = 2.23 cfs
DISCHARGE FROM (A-3) INTO EMBUDITO ∴ N.A.
DISCHARGE FROM (A-4) PONDED ∴ N.A.
DISCHARGE FROM (A-5 = 1.65 cfs

ALLOWABLE DISCHARGE FROM MAIN POND = 7.84 cfs

OUTFLOW FROM POND

C = 0.62 FOR SHARP EDGED FLUSH INLET

$$Q = (0.62)\, A \sqrt{2g\left(H + \frac{V_A^2}{2g}\right)}$$

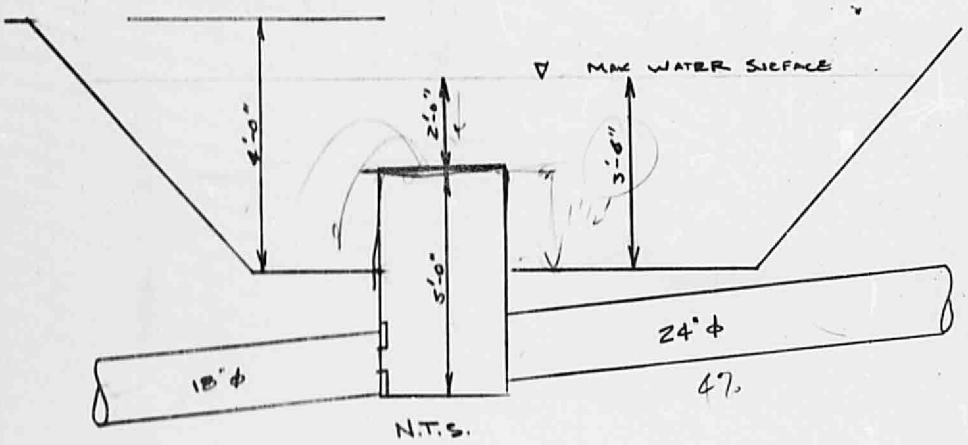
$$V_A = \frac{Q_A}{A_A}$$

FOR 24" PIPE

$$V_A = \frac{29.44}{3.141} = 9.37 \text{ FT/SEC.}$$

$$Q = 0.62\, A \sqrt{64.4\, H + 87.82}$$

BY JEB DATE 1-9-81 SUBJECT TIERRA AMADA SHEET NO. 7 OF 10
CHKD. BY DATE DRAINAGE CALCULATIONS JOB NO. 81-00-01



47.

FOR MAX HEAD = 7' WITH Q_{MAX} = 7.84 cfs

DETERMINE AREA OF ORIFICE

$$Q = 0.62\,A\sqrt{64.4H + 87.82}$$

$$7.84 = 0.62\,A\sqrt{(64.4)(7) + 87.82}$$

$$A = 0.545\ FT^2$$

$$A = \frac{\pi D^2}{4} = 0.545$$

$$D = 0.833' = 9.995''$$

USE 10" OPENING

FOR 10" OPENING

H	Q
0	0
1.0	4.17
2.0	4.97
3.0	5.66
4.0	6.28
5.0	6.84
5.2	6.95
5.4	7.05
5.6	7.16
5.8	7.26
6.0	7.36
6.2	7.46
6.4	7.56
6.6	7.65
6.8	7.75
7.0	7.84
7.2	7.94
7.4	8.03

MAX DISCHARGE AT Q5 HISTORIC

H VS VOLUME OF POND CALCULATIONS

$$\text{MAX POND VOLUME} = \left[\frac{(12{,}500) + (6825)}{2}\right] 4' = 38{,}650 \text{ FT}^3$$

$$12{,}500 - 6825 = 5675$$

$$\frac{5675}{4} = 1418.75$$

$$V = \left[\frac{6825 + [6825 + 1418.75\,H]}{2}\right] H$$

$$V = 6825\,H + 709.38\,H^2$$

BY JEB DATE 1-9-81 SUBJECT TIERRA AMADA SHEET NO. 9 OF 10
CHKD. BY DATE DRAINAGE CALCULATIONS JOB NO. 81-00-01

POND VOLUME VS HEAD

(H MEASURED FROM POND BOTTOM)

H	V
0	0
0.2	1393
0.4	2844
0.6	4351
0.8	5914
1.0	7535
1.2	9212
1.4	10,946
1.6	12,737
1.8	14,585
2.0	16,489
2.2	18,451
2.4	20,469
2.6	22,544
2.8	24,675
3.0	26,864
3.2	29,109
3.4	31,411
3.6	33,770
3.8	36,185
4.0	38,650

BY JEB DATE 1-9-81 SUBJECT TIERRA AMADA SHEET NO. 10 OF 10
CHKD. BY ..... DATE ..... DRAINAGE CALCULATIONS JOB NO. 81-00-01

FLOOD ROUTING TABLE FOR MAIN POND

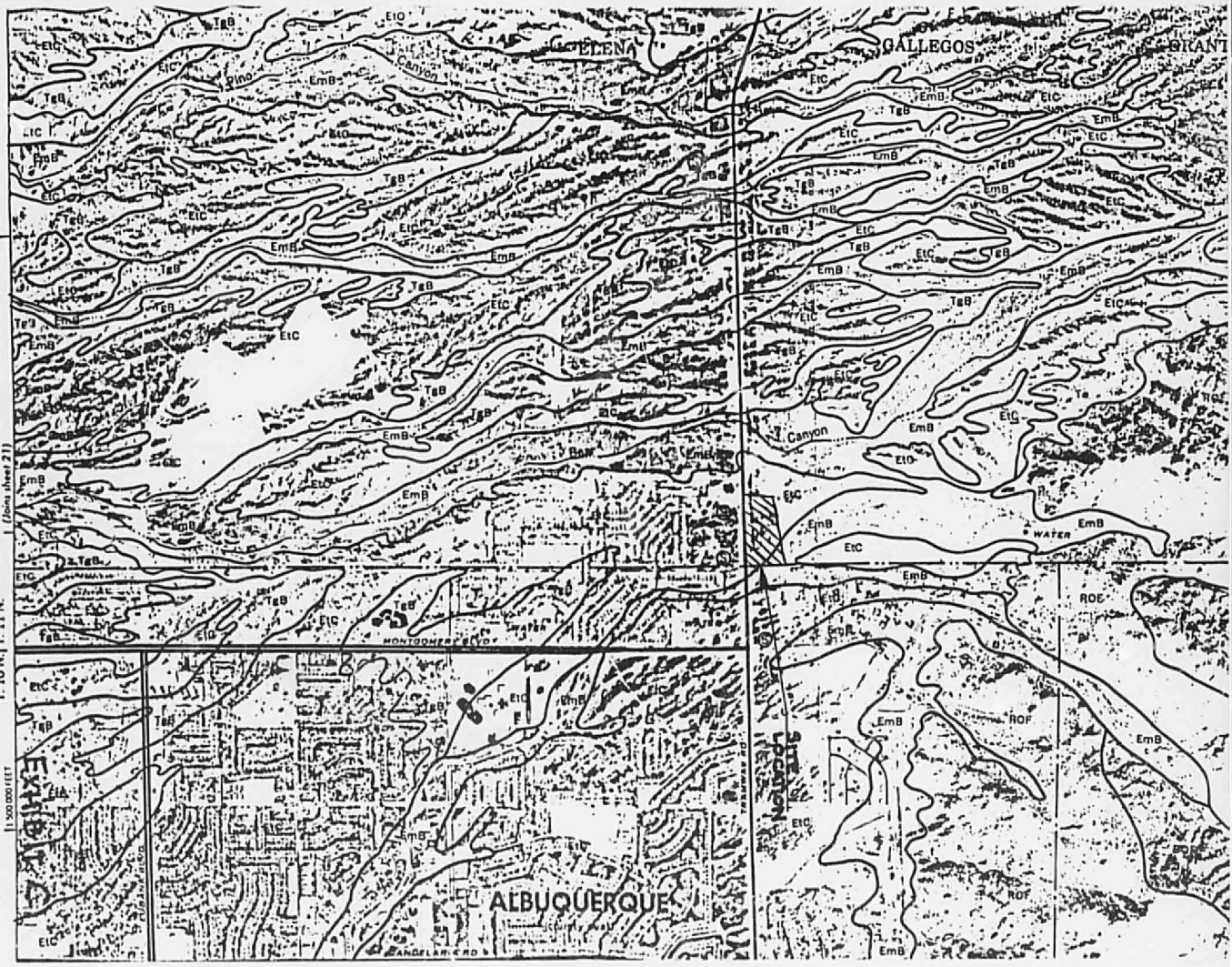
TIME	INFLOW Q_i	INFLOW V_i	OUTFLOW Q_o	OUTFLOW V_o	STORAGE	ACCUM. STORAGE	H
0	0	0	0	0	0	0	0
3	8.83	795	6.84	616	179	179	0.03
6	17.66	2384	6.84	1231	1153	1332	0.19
9	26.50	3974	6.84	1231	2743	4075	0.56
12	29.44	5035	6.84	1231	3804	7879	1.04
15	29.44	5299	6.86	1233	4066	11945	1.51
18	29.44	5299	7.11	1258	4041	15985	1.95
21	29.44	5299	7.33	1300	3999	19985	2.35
24	29.44	5299	7.53	1338	3961	23946	2.73
27	29.44	5299	7.72	1372	3927	27872	3.09
30	20.61	4505	7.88	1404	3101	30973	3.36
33	11.78	2915	8.01	1431	1484	32458	3.49
36	2.94	1325	8.07	1447	-122	32336	3.48
39	0	265	8.06	1452	-1187	31149	3.38
42	0	0	8.02	1447	-1447	29,702	3.25
45	0	0	7.96	1438	-1438	28,264	3.13
48	0	0	7.90	1427	-1427	26,836	3.00
51	0	0	7.84	1417	-1417	25,420	2.87
54	0	0	7.78	1406	-1406	24014	2.74
57	0	0	7.72	1395	-1395	22,619	2.61
60	0	0	7.66	1384	-1384	21,235	2.47
63	0	0	7.59	1372	-1372	19,863	2.34
66	0	0	7.53	1361	-1361	18,503	2.21
69	0	0	7.46	1348	-1348	17,155	2.07
72	0	0	7.39	1336	-1336	15819	1.93
75	0	0	7.32	1324	-1324	14,492	1.79
78	0	0	7.25	1312	-1312	13,181	1.65
81	0	0	7.18	1299	-1299	11,882	1.51
84	0	0	7.11	1286	-1286	10,596	1.34
87	0	0	7.03	1272	-1272	9323	1.21
90	0	0	6.95	1258	-1258	8065	1.06

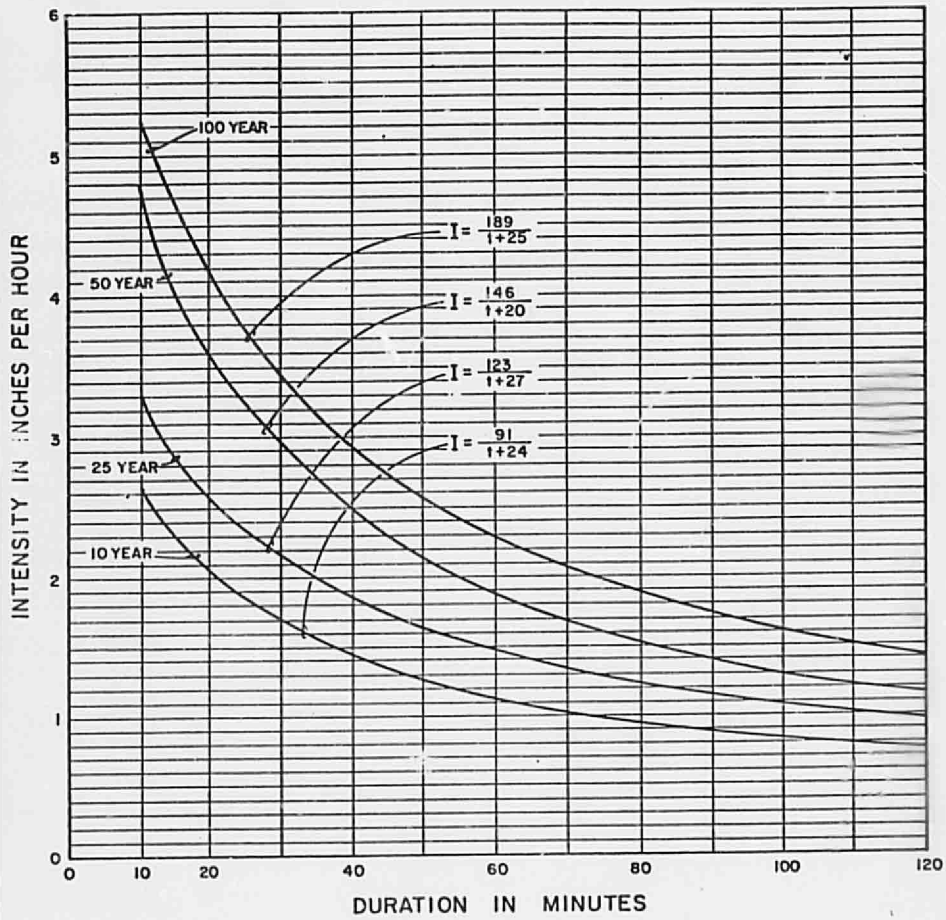
EXHIBITS

EXHIBIT A

TRAMWAY BLVD.
EMBUDITO DRAIN
P.C.
1-095
SITE LOCATION
PROPOSED DISCHARGE POINT
N
EXHIBIT B
CEDARBROO

THIS MICROIMAGE IS THE BEST POSSIBLE
REPRODUCTION DUE TO THE POOR QUALITY
OF THE ORIGINAL DOCUMENT

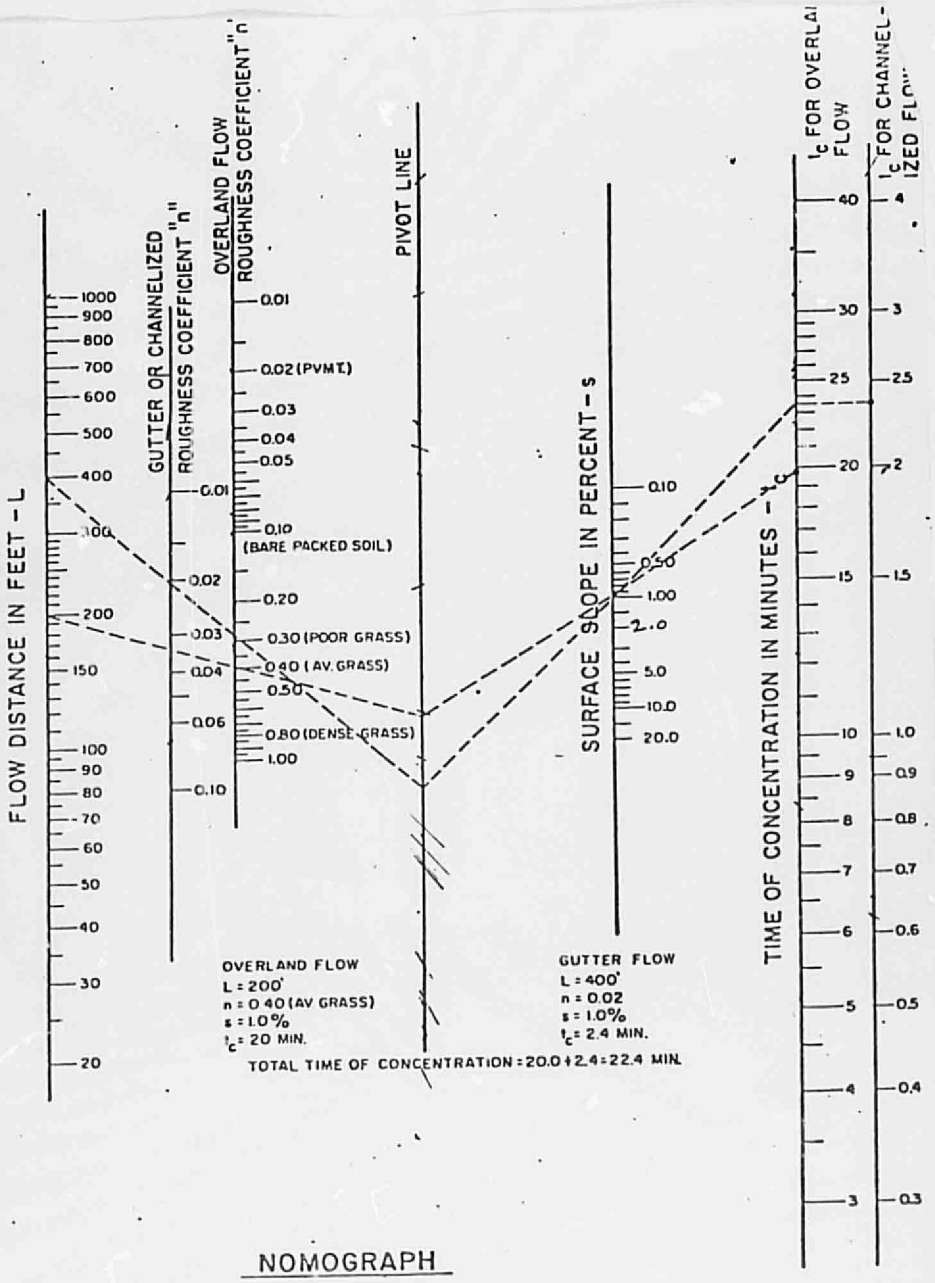




MASTER PLAN OF DRAINAGE
PREPARED BY:
GORDON HERKENHOFF & ASSOCIATES
ALBUQUERQUE, NEW MEXICO

INTENSITY DURATION
FREQUENCY CURVES
(ALBUQUERQUE AREA, 1961)

FIGURE - EXHIBIT D



NOMOGRAPH
FOR TIME OF CONCENTRATION

EXHIBIT E
FIGURE