HYDROLOGY H12/D11 1 PLAN

H12/D11

1 PLAN

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Chlorination Facilities Modifications-1955 (Duranes) ZONE ATLAS/DRNG. FILE #: H-12-Z D4 Update

LEGAL DESCRIPTION: Lots 24-30 and 16-21 of the Rio Grande Gardens Addition

CITY ADDRESS: Between Apple and Cherry Lanes, North of Zickert Road

ENGINEERING FIRM: Leedshill-Herkenhoff CONTACT: Sandra E Orton

ADDRESS: Copper Square PHONE: 247-0294

OWNER: City of Albuquerque CONTACT: Art Stuart

ADDRESS: P.O Box 1293 PHONE: 823-4052

ARCHITECT: Leedshill-Herkenhoff CONTACT:

ADDRESS: Copper Square PHONE: 247-0294

SURVEYOR: Leedshill-Herkenhoff CONTACT: Kim Stelzer

ADDRESS: Copper Square PHONE: 247-0294

CONTRACTOR: Not known as yet CONTACT:

ADDRESS: PHONE:

RECEIVED
MAY 09 1985
HYDROLOGY SECTION

PRE-DESIGN MEETING:

X YES

___ NO

X COPY OF CONFERENCE RECAP SHEET PROVIDED

DRB NO. —

EPC NO.

PROJ. NO.

TYPE OF SUBMITTAL:

___ DRAINAGE REPORT

X DRAINAGE PLAN

___ CONCEPTUAL GRADING & DRAINAGE PLAN

___ GRADING PLAN

___ EROSION CONTROL PLAN

___ ENGINEER'S CERTIFICATION

CHECK TYPE OF APPROVAL SOUGHT:

___ SKETCH PLAT APPROVAL

___ PRELIMINARY PLAT APPROVAL

___ SITE DEVELOPMENT PLAN APPROVAL

___ FINAL PLAT APPROVAL

X BUILDING PERMIT APPROVAL

___ FOUNDATION PERMIT APPROVAL

___ CERTIFICATE OF OCCUPANCY APPROVAL

___ ROUGH GRADING PERMIT APPROVAL

___ GRADING/PAVING PERMIT APPROVAL

___ OTHER _____ (SPECIFY)

DATE SUBMITTED: May 9, 1985

BY: Sandra E. Orton

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

DESIGN HYDROLOGY SECTION
123 Central NW, Albuquerque, NM 87102
(505) 766-7644

May 30, 1985

Sandra Orton
Leedshill-Herkenhoff, Inc.
500 Copper Avenue NW
P.O. Box 1217
Albuquerque, NM 87103

REF: DRAINAGE PLAN FOR CHLORINATION FACILITIES DURANES SITE (H12-D4)
RECEIVED MAY 9, 1985

Dear Ms. Orton:

The above referenced plan, received May 9, 1985, is approved.

Please attach a copy of this approved plan to the construction set prior to Hydrology sign-off.

If I can be of further assistance, please contact me at 766-7644.

Sincerely,

Carlos A. Montoya
City/County Flood Plain Admin.

CAM:mrk

LEEDSHILL-HERKENHOFF, INC.
500 Copper Avenue N.W.
P. O. Box 1217
Albuquerque, New Mexico 87103
(505) 247-0294

712-2034.11-85

RECEIVED
MAY 09 1985
HYDROLOGY SECTION

May 8, 1985

Mr. Billy Goolsby
Design Hydrology
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

RE: DURANES CHLORINATION FACILITY
DRAINAGE PLAN

Transmitted with this package is the drainage plan for the above referenced project. I have also included one set of my calculations and the assumptions made to determine the behavior of the storm water on the site.

I examined (per your suggestions) grading the site such that all runoff created by site modifications made under this contract is discharged along the newly installed paving into an onsite bar ditch and finally out the drivepad into Apple Lane. Grading the site in this manner requires that a massive amount of imported fill be brought to the site. The extra fill results in a construction cost increase of approximately $10,000 which is unacceptable to the Owner (the City of Albuquerque); therefore, the enclosed alternative plan is submitted for your approval. The end result of this plan is the same, hydraulically, as the plan that you suggested.

1. Runoff is directed away from buildings.
2. Runoff discharges into an onsite bar ditch.
3. Final discharge is out the drive pad into Apple Lane.

Please review the information that I have sent and let me know as soon as possible if there is anything else that you require in order to issue a building permit.

Sandra Orton

SANDRA ORTON

bz

Enc.

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION/DESIGN HYDROLOGY SECTION

PRE-DESIGN CONFERENCE RECAP

HYDROLOGY SECTION PROJECT NO.: H-12 DATE: 4/12/85

PLANNING DIVISION NOS. EPC: _____ DRB: _____

SUBJECT: Chlorination Facilities Med. Durames Site.

LEGAL DESCRIP.: Area bounded by Bickert Rd on the south, Apple & Cherry Lanes on the east & west & Durames ditch on the North

APPROVAL REQUESTED

_____ PRELIMINARY PLAT
_____ SITE DEVELOPMENT PLAN
_____ ROUGH GRADING
X FINAL PLAT
X BUILDING PERMIT

ATTENDANCE:	WHO:	REPRESENTING:
	Sandi Orton	L & H
	Billy Godsby	City

_____ Conceptual Drainage Plan/Report required for Preliminary Plat and/or Site Development Plan sign-off.

X Approved Drainage Plan/~~Report~~ required for Final Plat and/or Building Permit sign-off.

_____ Subdivision Improvements Agreement or Financial Security required.

FINDINGS: ① Replatting required to remove lotlines for drainage across same. ② Site is not located in a flood hazard zone ③ Discharge to be determined by analysis of downstream capacity. ④ Direct discharge into existing SD is recommended.

The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED: [illegible] SIGNED: _____
TITLE: City Drainage Hydrologist TITLE: _____
DATE: 4/12/85 DATE: _____

NOTE PLEASE PROVIDE A COPY OF THIS RECAP WITH THE DRAINAGE SUBMITTAL

SUMMARY OF FINDINGS - DRAINAGE PLAN FOR DURANES CHLORINATION FACILITY

RECEIVED
MAY 09 1985
HYDROLOGY SECTION

GENERAL INFORMATION:

1. Information Sheet: attached.

2. Planning History: Present zoning RA-2, proposed zoning RA-2 (See Figure 1).

3. Professional Engineer's Stamp: On drainage plan drawing. Survey of site performed by Leedshill-Herkenhoff, Inc.

4. Flood Hazard: Site is in a 500 year flood hazard area which is shown on the attached map (Figure 2).

5. Watershed Soils: The watershed is SCS soil type B (Gila Clay Loam series Ge). Site is defined on attached soil survey map (Figure 3).

6. Watershed Area: Site and contributing watershed area are defined on a City of Albuquerque Orthophoto-topo map (Scale 1" = 200'). See Figure 4.

7. Soils Investigation Report: One copy attached.

8. Drainage Plan: Two copies attached.

9. Erosion Control Plan: The proposed construction involves grading an area less than one acre and also less than 500 CY of material. In addition, construction is not intended during July, August or September at this time. Therefore, an erosion control plan is not required.

OFF SITE CONDITIONS:

10. Watershed Area: There are no off site contribution watershed areas. The proposed site for the Duranes Chlorination Facility is bounded by the Duranes ditch on the north, Cherry Lane on the east, Apple Lane on the west and a residential area on the south. Because of the curb and gutter on Cherry and Apple Lanes, there can be no contributing watershed areas to the east or west of the site. The contours on the COA Orthophoto-topo map indicate that water flows from the site into the residential area, thus eliminating the possibility of a contributing watershed area to the south. Finally, the site is bounded by the Duranes ditch on the north so there is no possibility of a contributing watershed from that direction.

ON SITE CONDITIONS:

11. Watershed Areas: Due to the topographical features discussed in the previous section, the site itself composes the contributing watershed area. There is a high contour line that runs through the site, cutting it approximately in half, which divides the site into two watershed areas. The runoff from the north half of the site (Area B on Figure 4)

is directed away from the construction location into the Duranes ditch; therefore this area cannot be considered a contributing watershed. Area A (Figure 4) is the single contributing watershed for the Duranes site.

12. Flow Volumes and Rates: The City of Albuquerque DPM criteria were used to arrive at the following runoff results for undeveloped and developed conditions. (See attached calculations and assumptions.)

Condition	Flow Rate	Flow Volume
Undeveloped		
100 year storm	4.80 cfs	.19 ac-ft
10 year storm	3.15 cfs	.12 ac-ft
Developed		
100 year storm	4.92 cfs	
10 year storm	3.23 cfs	

13. Flow Depths and Velocities: The estimated depth of flow from the on site and off site contributions in the developed condition is .04 feet with a velocity of approximately .42 fps based upon the slope of the developed site (approximately .005 foot/foot).

14. Proposed Treatment: The site will be graded so that runoff is directed away from the buildings and the paving, across the site into a bar ditch that runs along the access road. The bar ditch will discharge into the curb and gutter alongside the drivepad into Apple Lane. It will then flow along Apple Lane into Zickert Road and finally into the existing storm drain system. This treatment allows for several improvements as follows:

    a. Runoff is no longer directed across property lines into the residential area (as it had been historically). It is intercepted by the bar ditch before it can reach the property line.

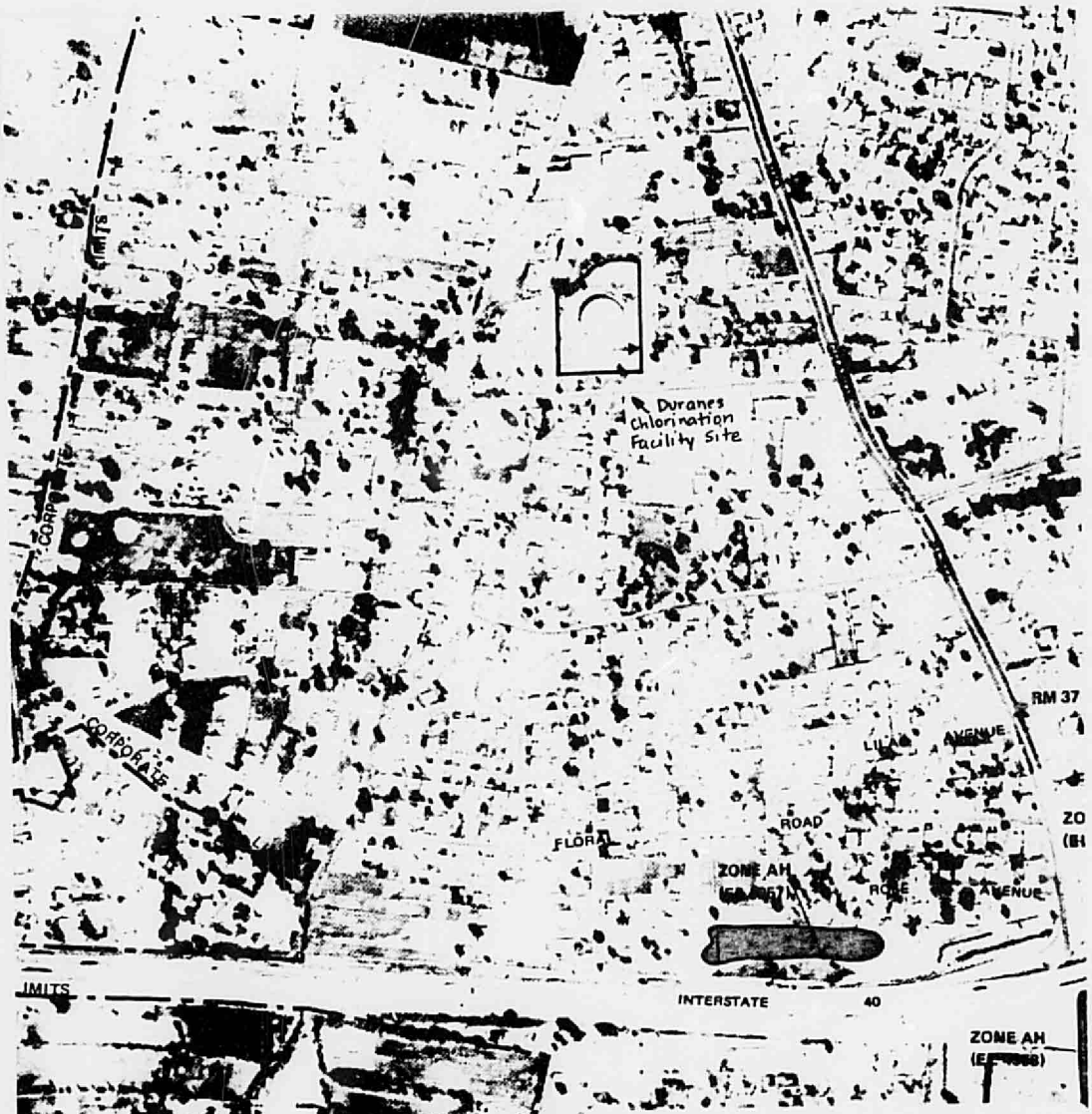
    b. The runoff from the proposed construction is discharged across property lines at a single point (the drivepad) into Apple Lane.

    The street capacity is limited to 60 cfs in both Apple and Zickert. The existing storm drain system is limited by grate capacity to 20.4 cfs. As the scope of this project does not include a drainage study of the area, runoff rates into the storm drain system and Zickert Road are not known; however, the possibility of an additional .12 cfs of runoff creating serious problems in the existing system seems highly unlikely. The street capacity of Apple Lane is more than adequate to carry the additional runoff.

15. Nuisance Water: Nuisance waters will collect in existing low areas on the site.

Duranes Chlorination Facility Site
GABALDON & BURKE
ASSESSMENT PLAT
GABALDON
CORONADO
FREEWAY
KELLY
TRACTS
QUARTER
HORSE
ACRES
RIVERSIDE
DRAIN
GRANDE
RIO
ALBUQUERQUE
H-12-Z

Figure 1



FLOOD INSURANCE RATE MAP (FIRM)
PANEL 22 OF 50
COMMUNITY PANEL NO. 35002 0022 C

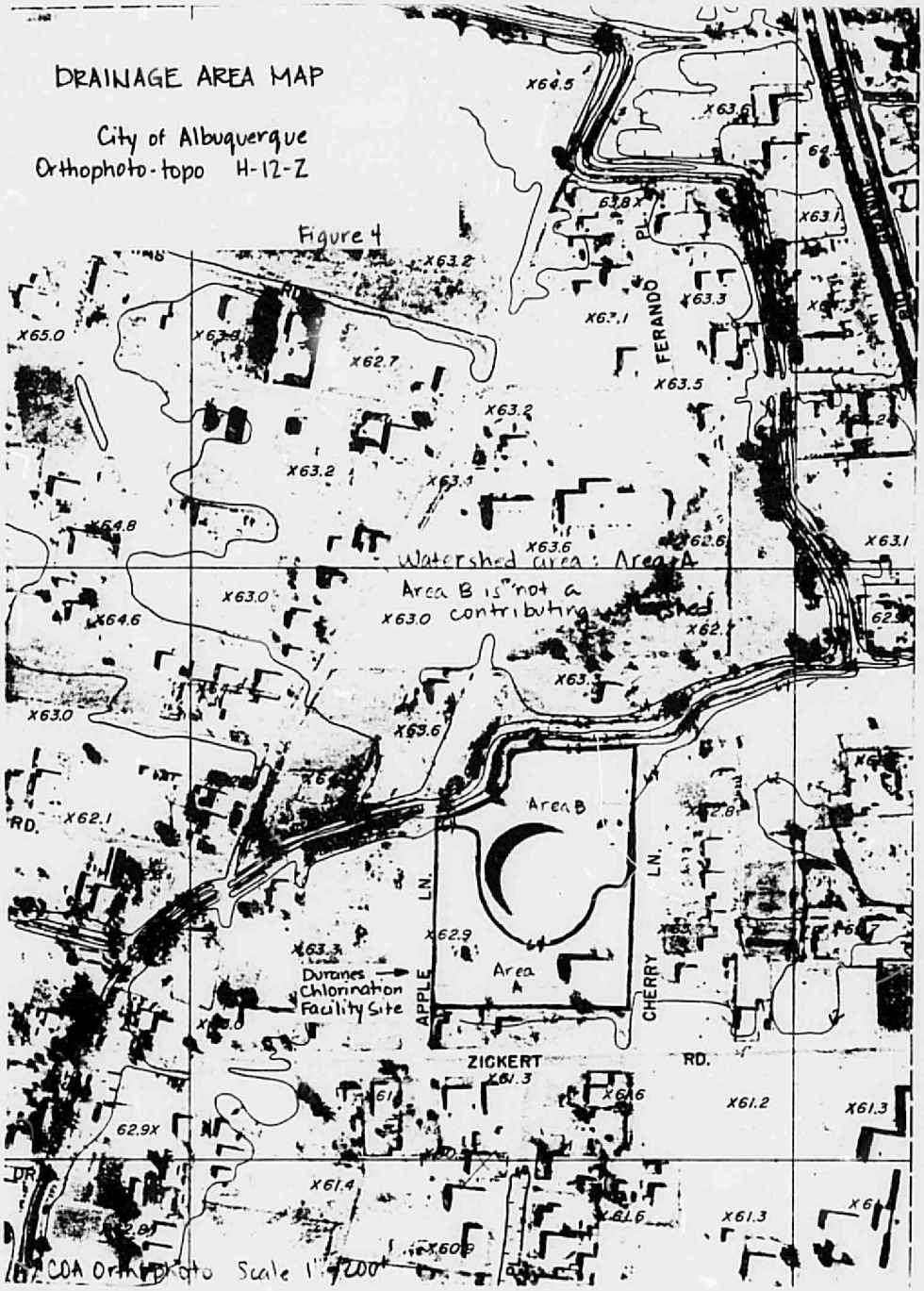
Site is located in a 500 year flood area.

Figure 2

BERNALILLO COUNTY SOIL SURVEY
MAP NO. 20

Soil Type - Ge
Soil Classification - B

Figure 3


DRAINAGE AREA MAP
City of Albuquerque
Orthophoto-topo H-12-Z
Figure 4
Watershed area: Area A
Area B is not a contributing watershed
Area B
Area A
Durones Chlorination Facility Site
APPLE LN.
CHERRY LN.
ZICKERT RD.
FERANDO PL.
RD.
X64.5
X63.6
X63.8
X63.1
X63.2
X63.3
X62.7
X63.5
X65.0
X64.8
X63.6
X62.6
X63.0
X64.6
X62.1
X62.9
X61.3
X61.2
X61.4
X61.6
X60.9
62.9X
COA Orthophoto Scale 1" = 200'

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION/DESIGN HYDROLOGY SECTION

PRE-DESIGN CONFERENCE RECAP

HYDROLOGY SECTION PROJECT NO.: H-12 DATE: 4/12/85

PLANNING DIVISION NOS. EPC: _____ DRB: _____

SUBJECT: Chlorination Facilities Mod. Duranes Site.

LEGAL DESCRIP.: Area bounded by Zickert Rd on the south, Apple & Cherry Lanes on the east & West & Duranes ditch on the North

APPROVAL REQUESTED

____ PRELIMINARY PLAT
____ SITE DEVELOPMENT PLAN
X FINAL PLAT
X BUILDING PERMIT
____ ROUGH GRADING

	WHO:	REPRESENTING:
ATTENDANCE:	Sandi Octon	L & H
	Billy Goolsby	City

____ Conceptual Drainage Plan/Report required for Preliminary Plat and/or Site Development Plan sign-off.

X Approved Drainage Plan/~~Report~~ required for Final Plat and/or Building Permit sign-off.

____ Subdivision Improvements Agreement or Financial Security required.

FINDINGS: ① Replatting required to remove lotlines for drainage across same. ② Site is not located in a flood hazard zone ③ Discharge to be determined by analysis of downstream capacity. ④ Direct discharge into existing SD is recommended.

The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED: B. A. Goolsby SIGNED: Sandra D Octon
TITLE: C.E. Design Hydrology TITLE: Water Systems Engineer
DATE: 4/12/85 DATE: 4/12/85

NOTE PLEASE PROVIDE A COPY OF THIS RECAP WITH THE DRAINAGE SUBMITTAL

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

Drainage Calculations - Durones

1. Design per City DPM criteria
2. See attached Pre-Design Conference Recap for drainage requirement set by City Hydrology
3. 100 year rainfall (6 hour storm) = 2.2" reference Plate 22.2 D-1
   10 year rainfall = .657 (2.2") = 1.445"
4. Water shed areas - There are two different watershed areas that make up the Durones site. Water from Area B flows into the Durones Ditch. No improvements are planned in this area so it was excluded from the drainage analysis.
   Area A is bounded by paving on 3 sides and by the high contour line on the fourth side. This is a single watershed area. (Information from SDA Orthophoto 1" = 200')

   Area - Basin A = 60,000 ft² = 1.38 acres

   C_n = 74.8 — (12000/60,000)95 + (48000/60,000)65 = 70 Type D

   L = 300'

   ΔE = 2'

   S = .007

5. Calculate T_c (time of concentration) using

$$T_c = .0078\left(\frac{L^{.77}}{S^{0.385}}\right) \quad \text{[illegible]}$$

$$= .0078\left(\frac{300^{(.77)}}{.007^{(0.385)}}\right)$$

= 4.33 minutes = Use 10 minutes minimum

Note: Having no city calculation gives a value < 5 min/ft however, the results show that the water flows as overland sheet flow and not necessary

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

6. Using the Tc minimum value of 10 minutes, the rainfall intensity factor from Plate 22.2 D-2 is 2.114. Actual rainfall intensity can then be determined by multiplying rainfall volume from Plate D-1 by value from Plate D-2.

$$I = 2.114(2.2) = 4.65 \text{ in/hr}$$

7. Calculate 10 year and 100 year peak runoff rate using the rational formula. (Unrouted)

$$Q_p = CIA$$
$$= .748(4.65)(1.38)$$
$$= 4.80 \text{ cfs} \leftarrow \text{100 year}$$

$$Q_p = .657(4.80)$$
$$= 3.15 \text{ cfs} \leftarrow \text{10 year}$$

8. Calculate runoff volume:

$$V = (.748)(1.38)(2.2'')(1/12) = .19 \text{ ac-ft} \leftarrow \text{100 year}$$
$$V = .19 \times .657 = .12 \text{ ac-ft} \leftarrow \text{10 year}$$

9. Calculate Cu after site modifications - 3800 ft² additional impervious

$$C_u = (\text{[illegible]}/60000) + (44200/60000) = 76.6$$

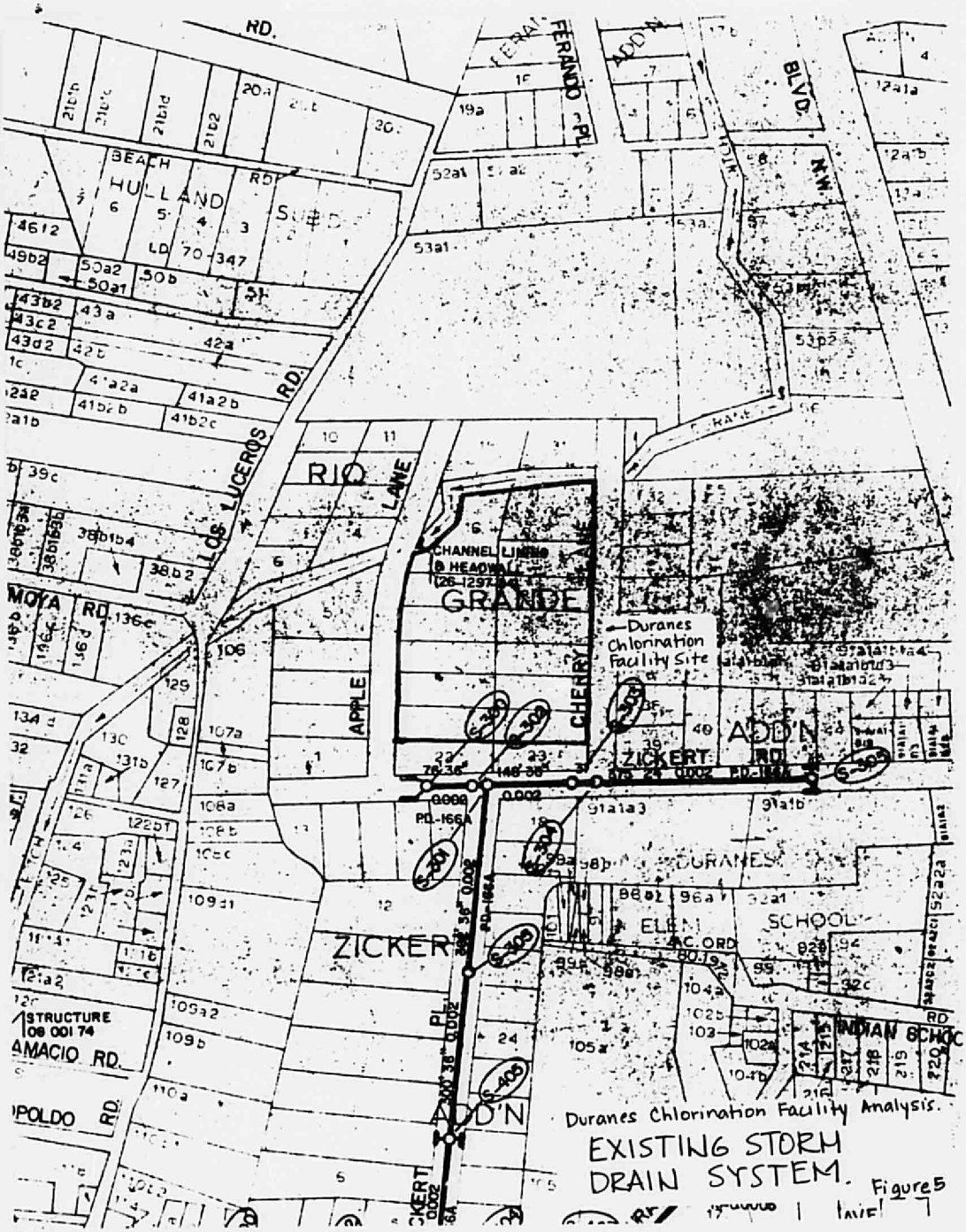
10. Calculate 10 year & 100 year peak runoff rate after site modifications using the rational formula.

$$Q_p = CIA$$
$$= .766(4.65)(1.38)$$
$$= 4.92 \text{ cfs} \leftarrow \text{100 year}$$

$$Q_p = .657(4.92)$$
$$= 3.23 \text{ cfs} \leftarrow \text{10 year}$$

11. Historic flow (100 yr) = 4.80 cfs Δ = 4.92 - 4.80 = .12 cfs additional

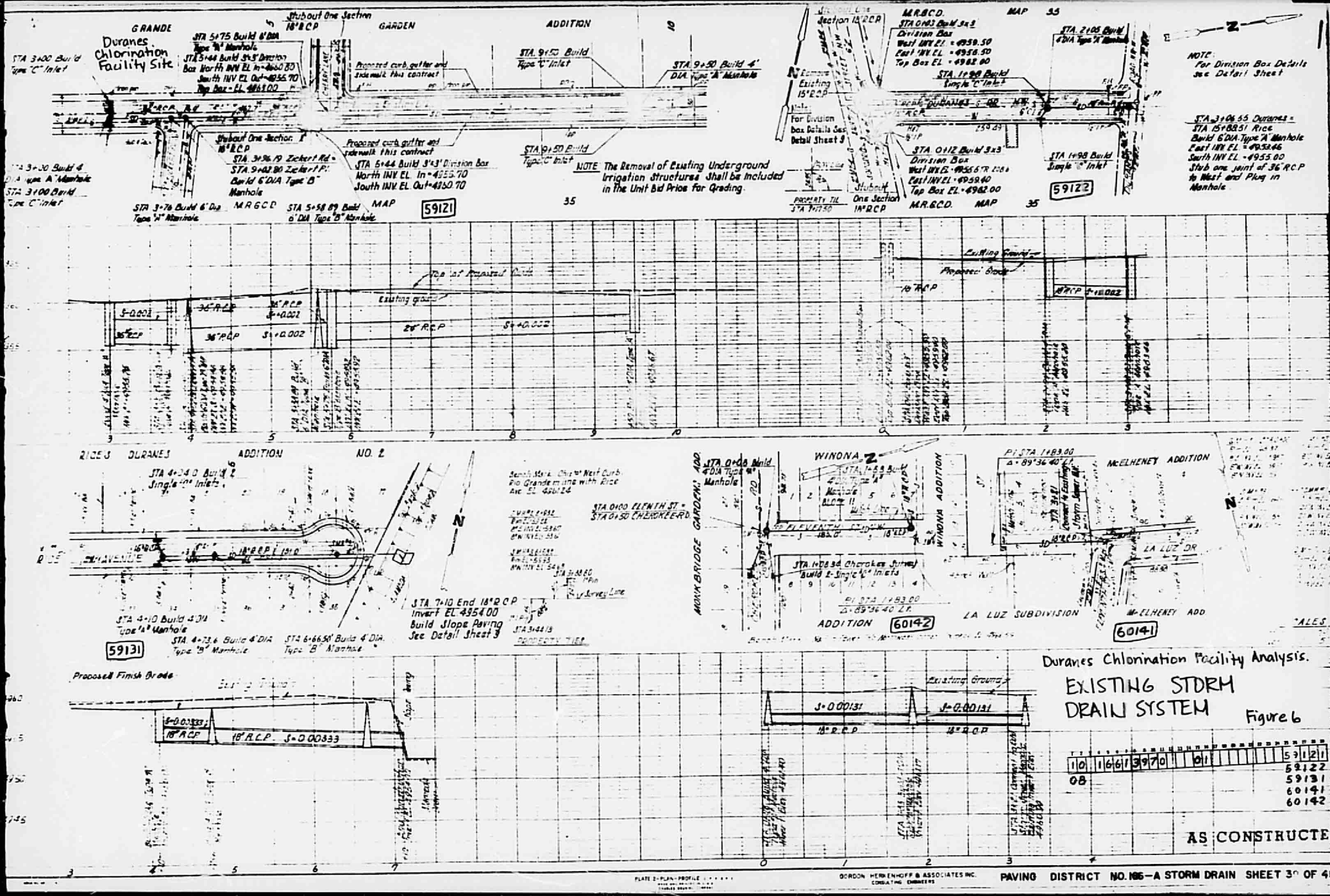
THIS MICROIMAGE IS THE BEST POSSIBLE REPRODUCTION DUE TO THE POOR QUALITY OF THE ORIGINAL DOCUMENT



Duranes Chlorination Facility Analysis.

EXISTING STORM DRAIN SYSTEM.

Figure 5


Duranes Chlorination Facility Site
GRANDE
GARDEN
ADDITION
Stubout One Section 18" RCP
STA 5+75 Build 6' DIA Type "A" Manhole
STA 5+44 Build 3'x3' Division Box North INV EL In=4960.30 South INV EL Out=4955.70 Top Box-EL 4961.00
STA 3+00 Build 4' DIA Type "A" Manhole
STA 3+00 Build Type "C" Inlet
Proposed curb, gutter and sidewalk this contract
STA 9+50 Build Type "C" Inlet
STA 9+50 Build 4' DIA Type "A" Manhole
STA 3+96.19 Zickert Rd = STA 9+02.80 Zickert P.I. Build 6' DIA Type "B" Manhole
STA 5+44 Build 3'x3' Division Box North INV EL In=4955.70 South INV EL Out=4950.70
NOTE The Removal of Existing Underground Irrigation Structures Shall be included in the Unit Bid Price for Grading.
STA 3+76 Build 6' Dia Type "A" Manhole
STA 5+58.89 Build 6' DIA Type "B" Manhole
M.R.G.C.D. MAP 35
59121
Remove Existing 15" RCP
For Division box Details See Detail Sheet 3
STA 0+12 Build 3'x3' Division Box West INV EL=4956.6 TR 2086 East INV EL=4959.40 Top Box EL=4962.00
STA 1+98 Build Single "C" Inlet
STA 2+05 Build 4' DIA Type "A" Manhole
STA 3+06.55 Duranes = STA 15+88.51 Rice Build 6' DIA Type "A" Manhole East INV EL=4958.46 South INV EL=4955.00 Stub one joint of 36" RCP to West and Plug in Manhole
NOTE: For Division Box Details see Detail Sheet
59122
Existing Ground
Proposed Slope
18" RCP
S=0.002
36" RCP
24" RCP
RICE'S DURANES ADDITION NO. 2
STA 4+24.0 Build 2 Single "C" Inlets
STA 4+10 Build 4' DIA Type "A" Manhole
STA 4+73.6 Build 4' DIA Type "B" Manhole
STA 6+66.50 Build 4' DIA Type "B" Manhole
STA 7+10 End 18" RCP Invert EL 4954.00 Build Slope Paving See Detail Sheet 3
STA 0+00 ELEVENTH ST = STA 0+50 CHEROKEE RD
59131
WINONA
STA 0+08 Build 4' DIA Type "A" Manhole
ELEVENTH STREET
STA 1+08.94 Cherokee Survey Build 2-Single "C" Inlets
ADDITION
60142
MONK BRIDGE GARDENS ADD
WINONA ADDITION
McELHENEY ADDITION
LA LUZ DR
LA LUZ SUBDIVISION
McELHENEY ADD
60141
Proposed Finish Grade
18" RCP
S=0.00333
Existing Ground
S=0.00131
18" R.C.P.
Duranes Chlorination Facility Analysis.
EXISTING STORM DRAIN SYSTEM
Figure 6
59122
59131
60141
60142
AS CONSTRUCTE
PLATE 2-PLAN-PROFILE
GORDON HERRENHOFF & ASSOCIATES INC. CONSULTING ENGINEERS
PAVING DISTRICT NO. 186—A STORM DRAIN SHEET 3 OF 4

12. Determine area of runoff that allows .12 cfs

$A = .12/(.766 \cdot 4.65) = .034$ acres

Runoff Volume Calculations

$V = (.766)(2.2\ in)(.034) = .005$ ac-ft

13. Pipe Capacity - Existing storm drain in Zickert Road & Place

calculated using Manning's Equation

$V = (1.49/n)\, R_h^{2/3}\, S^{1/2}$

$= (1.49/.013)(.25(3'))^{2/3}(.002)^{1/2}$

$= 4.23$ ft/sec

$Q_{max} = A \cdot V = \pi_4 (3)^2 (4.23) = 29.9$ cfs

14. Grate Capacity (Zickert Road)

2- Type "C" catch basins - Assume street slope = pipe slope = .002 - Assume max depth above catch basin = .87'

From Plate 22.3 D-5

Grating capacity = 10.2 cfs each

$(2 \times 10.2) = 20.4$ cfs total grate capacity

15. Street capacity (Apple Lane & Zickert Road)

Street width from scaling as-builts = 49'

Assume street slope = .002 ; max depth = .77'

From Plate 22.3 D-3

Max velocity = 2.3 ft/sec

Street flow = 60 cfs

16. Limitations - Grate Capacity (20.4 cfs) < Pipe cap. (29.9 cfs) < Street Capacity (60 cfs)

17. Conclusion: The amount by which runoff is increased because of site modifications is calculated to equal .12 cfs. Because this amount is very minimal and because the nearest storm drain is located in Zickert Road, direct discharge into the storm drain system becomes an unworkable method of taking care of the additional

runoff caused by this construction. The preferred solution is to grade the site to cause discharge of the runoff water into a bar ditch beside the existing access road to the site. The water can then be routed into Apple Lane from which it will follow its usual path into Eickert Road; the catch basins located there. As the additional runoff is limited to .12 cfs, it should create no problems in the existing drainage system. Nuisance flows will be kept on-site.

18 Flow depth calculations after finish grading. -

Estimate depth of runoff flow across site. Location - Fence line (Sta 0+00) → Pump Station (a Sta 2+0)

From Plans 22.2 ft

$V_n = .42$ ft/sec - Site graded to $S = .005$

Estimated Q across this area $2/3(4.92 \text{ cfs}) = 3.28$ cfs

$$\text{est. depth} = \frac{Q}{\text{length} \cdot V} = \frac{3.28}{22 \times .42} = .036'$$

GEOTECHNICAL INVESTIGATION FOR THE PROPOSED BUILDINGS AT BURTON PARK, LEAVITT #3, DURANES AND GRIEGOS RESERVOIRS, ALBUQUERQUE, NEW MEXICO

ATL ENGINEERING SERVICES LAB NO. 2-06782-85

April 16, 1985

ENGINEERING SERVICES

Albuquerque Testing Laboratory, Inc.
532 Jefferson N.E. (87108)
P. O. Box 4101 (87106)
Albuquerque, New Mexico
(505) 268-4537

April 16, 1985

Leedshill-Herkenhoff
P.O. Box 1217
Albuquerque, NM 87103

Attention: Mr. Bill Webster

Re: ATL Engineering Services Lab No. 2-06782-85. Geotechnical Investigation for the Proposed Buildings at Burton Park, Leavitt #3, Duranes and Griegos Reservoirs, Albuquerque, NM.

Gentlemen:

Transmitted herewith is our GEOTECHNICAL INVESTIGATION REPORT for the referenced projects.

INTRODUCTION

The test borings were drilled on April 3 and 5, 1985 using truck mounted Mobile B-61 "Pacemaker" Rotary Drills powered by Ford Industrial engines. Because of very loose surface soils, a front-end loader was used on April 5 to help the drill rig into and out of the Leavitt site. The test holes were advanced "dry" using 6-5/8" O.D. by 3-1/4" I.D., continuous flight, 5 foot sectional hollow stem augers. Standard penetration tests (ASTM D-1586) were made at 2-1/2 to 5 foot vertical intervals in the holes and through the hollow stems of the augers at the time of drilling. The purpose of the standard penetration test is to obtain a measure of the relative density or consistency of the subsurface soils encountered and to obtain samples of the soils for visual inspection and laboratory testing.

TEST RESULTS

Each test boring was drilled at the approximate center of the staked building location. "Boring Log Graphs" of the Test Holes are shown on pages 3 through 6 and depict the subsurface soils encountered in the borings along with the results of the standard penetration tests, natural or existing moisture content and grain size classification tests made on typical recovered samples.

Notes and Definitions pertaining to the "Boring Log Graphs" are shown on page 7.

If you have any questions concerning the report, please contact our office.

Respectfully submitted,

ATL ENGINEERING SERVICES

Nicholas T. Korecki

Nicholas T. Korecki, P.E.
Geotechnical Engineer

J. H. Clary

James H. Clary
Certified Professional
Geologist

NTK/vr

ENGINEERING SERVICES

PAGE: 3

PROJECT: Burton Park Reservoir

LAB NO.: 2-06782-85

Well House

DATE: April 16, 1985

BORING LOG GRAPH - TEST HOLE NO. ____

VISUAL DESCRIPTION	PENETRATION RESISTANCE Per Foot N	Per 6" or as Noted	Per Foot C	SAMPLER TYPE	MOISTURE CONTENT % M	DRY DENSITY P.C.F. D	PARTICLE SIZE DISTRIBUTION % GRAVEL	SAND	SILT & CLAY	ATTERBERG LIMITS % LIQUID LIMIT	PLASTIC LIMIT	P.I.
SAND, brown, silty to clayey (SM-SC)	11	8 6 5		S	7.2		3	60	37			
moist with some decomposed granite gravel; calcareous (SC-CL)	9	4 4 5		S	15.8		2	60	38	24	18	6
at 5 foot depth. Generally Loose	10	5 5 5		S	14.8		2	47	51			
7'												
SAND, darker brown, silty to clayey (SM-SC) with decomposed granite gravel.	9	3 4 5		S	8.0							
Loose to Medium Dense with depth.	13	6 6 7		S	10.7		0	59	41			
13'												
SILT-CLAY, red brown, (CL-ML) Firm	21	6 10 11		S	14.8							

ENGINEERING SERVICES

PAGE: 4

PROJECT: Leavitt #3 Reservoir

LAB NO. 2-06782-85

Well House

DATE: April 16, 1985

BORING LOG GRAPH - TEST HOLE NO. 1

VISUAL DESCRIPTION	PENETRATION RESISTANCE Per Foot N	Per 6" or as Noted	Per Foot C	SAMPLER TYPE	MOISTURE CONTENT % M	DRY DENSITY P.C.F. D	PARTICLE SIZE DISTRIBUTION % GRAVEL	SAND	SILT & CLAY	ATTERBERG LIMITS % LIQUID LIMIT	PLASTIC LIMIT	P.I.
0 SAND, brown, silty (SM) fine to medium grained.	6	2 3 3		S	4.6							
2½	8	2 3 5		S	5.4		0	89	11			
5 Moist through 5½ feet to drier below.	14	4 6 8		S	2.6		0	88	12			
7½ occasional small rounded gravels. Loose through 5½ feet, Medium Dense below. 11½'	14	4 6 8		S	2.9							
10	20	4 8 12		S	2.9		7	78	15			
SAND, brown, silty to "clean" (SM-SP) with rounded gravel to 1 inch diameter Medium Dense												
15	21	4 7 14		S	2.2							

ENGINEERING SERVICES

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PROJECT: Duranes Reservoir Chlorine Building

LAB NO 2-06762-83

DATE April 16, 1983

BORING LOG GRAPH - TEST HOLE NO 1

VISUAL DESCRIPTION	PENETRATION RESISTANCE Per Foot N	Per 6" or as Noted	Per Foot C	SAMPLER TYPE	MOISTURE CONTENT % M	DRY DENSITY P.C.F. D	PARTICLE SIZE DISTRIBUTION % GRAVEL	SAND	SILT & CLAY	ATTERBERG LIMITS % LIQUID LIMIT	PLASTIC LIMIT	P.I.
CLAY, brown, dry, silty, sandy	13	5 6 7		S	12.6		0	46	51	31	20	11
(CL, some SC) generally Moderately Firm;	26	10 10 16		S	3.6		0	59	41			
Firm at 2½ foot depth. 6½'	15	5 6 9		S	11.8		0	19	81			
SAND, light brown, dry "clean" (SP); fine to	8	3 4 4		S	1.2							
medium and coarse grained with depth. Loose to Medium Dense below the 12 foot depth.	10	4 4 6		S	2.3		0	98	2			
	24	5 10 14		S	2.0							

ENGINEERING SERVICES

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PROJECT: Griegos Reservoir Chlorine Building

LAB NO 2-06781-85

DATE April 16, 1985

BORING LOG GRAPH - TEST HOLE NO 1

VISUAL DESCRIPTION	PENETRATION RESISTANCE Per Foot N	Per 6" or as Noted	Per Foot C	SAMPLER TYPE	MOISTURE CONTENT % M	DRY DENSITY P.C.F. D	PARTICLE SIZE DISTRIBUTION % GRAVEL	SAND	SILT & CLAY	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	P.I.
CLAY, brown, sandy (CL-CH) Moderately Firm	9	2 4 5		S	16.1		2	39	59			
	11	5 5 6		S	17.8		0	16	84	47	24	23
5' SAND, light brown, dry, silty to "clean" with depth. (SM-SP) fine grained to medium and coarse grained with depth. generally Medium Dense	20	5 9 11		S	2.1		2	90	8			
	11	5 5 6		S	1.6							
	10	5 5 5		S	2.6		3	95	2			
	11	6 6 5		S	5.8							

OTES AND DEFINITIONS

1. **PENETRATION RESISTANCE** - BLOWS PER FOOT USING "A" ROD, 140 LB. HAMMER WITH 30-INCH GUIDED FREE FALL UNLESS OTHERWISE NOTED.
   - N - STANDARD PENETRATION RESISTANCE (ASTM: D-1586), 2" O.D. SPLIT BARREL SAMPLER
   - C - CONTINUOUS PENETRATION RESISTANCE, 2½" O.D., CONICAL, STEEL DRIVE POINT
   - R - PENETRATION RESISTANCE, 3" O.D. MODIFIED DAMES & MOORE SPLIT RING SAMPLER

2. **SAMPLE TYPE**
   - S - STANDARD SPLIT BARREL; 2" O.D. x 1-3/8" I.D.
   - C - CALIFORNIA SAMPLER; 2-3/8" O.D. EQUIPPED WITH 2" I.D. x 4" HIGH BRASS LINERS
   - R - MODIFIED DAMES & MOORE SAMPLER; 3" O.D. EQUIPPED WITH 2.42" I.D. x 1" HIGH BRASS LINERS
   - T - SHELBY TUBE

3. **SOIL INDEX PROPERTIES**
   - M - MOISTURE CONTENT, % OF DRY SOIL WEIGHT
   - D - DENSITY, LBS PER CUBIC FOOT COMPUTED EITHER BY VOLUMETRIC OR DISPLACEMENT METHODS. SOILS CLASSIFICATIONS ARE VISUAL UNLESS ACCOMPANIED BY GRAIN SIZE ANALYSIS AND ATTERBERG LIMITS.

4. **WATER TABLE** - IF ENCOUNTERED IS NOTED ON LOG GRAPHS AS ⏚ .

UNIFIED SOIL CLASSIFICATION SYSTEM
ASTM: D2487

COARSE-GRAINED SOIL

MORE THAN 50% LARGER THAN 200 SIEVE SIZE

Symbol	Letter	DESCRIPTION	MAJOR DIVISIONS
	GW	WELL-GRADED GRAVELS OR GRAVEL SAND MIXTURES, LESS THAN 5% - 200 FINES	GRAVELS More than half of coarse fraction is larger than No 4 sieve size
	GP	POORLY GRADED GRAVELS OR GRAVEL SAND MIXTURES, LESS THAN 5% - 200 FINES	
	GM	SILTY GRAVELS, GRAVEL SAND SILT MIXTURES, MORE THAN 12% - 200 FINES	
	GC	CLAYEY GRAVELS, GRAVEL SAND CLAY MIXTURES, MORE THAN 12% - 200 FINES	
	SW	WELL-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% - 200 FINES	SANDS More than half of coarse fraction is smaller than No 4 sieve size
	SP	POORLY GRADED SANDS OR GRAVELLY SANDS LESS THAN 5% - 200 FINES	
	SM	SILTY SANDS, SAND SILT MIXTURES MORE THAN 12% - 200 FINES	
	SC	CLAYEY SANDS, SAND CLAY MIXTURES MORE THAN 12% - 200 FINES	

NOTE Soils with 5 to 12 percent minus 200 fines should be classified with dual symbols

FINE-GRAINED SOIL

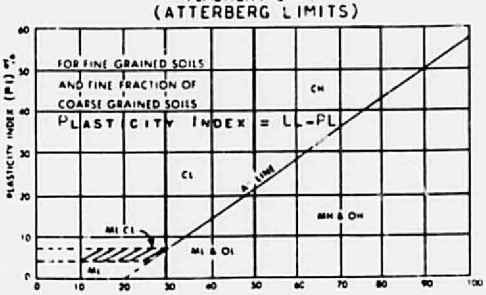
MORE THAN 50% SMALLER THAN 200 SIEVE SIZE

Symbol	Letter	DESCRIPTION	MAJOR DIVISIONS
	ML	INORGANIC SILTS AND VERY FINE SANDS ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	SILTS AND CLAYS Liquid limit less than 50
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
	OL	ORGANIC SILTS AND ORGANIC SILT CLAYS OF LOW PLASTICITY	
	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS	SILTS AND CLAYS Liquid limit greater than 50
	CH	INORGANIC CLAYS OF HIGH PLASTICITY FAT CLAYS	
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
	Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	

SOIL FRACTIONS

Component		Size Range
Boulders		Above 12 in
Cobbles		3 in. to 12 in.
Gravel		3 in. to No. 4 sieve
Coarse Gravel		3 in. to ¾ in.
Fine gravel	G	¾ in. to No. 4 sieve
Sand		No. 4 to No. 200
Coarse	CS	No. 4 to No. 10
Medium	MS	No. 10 to No. 40
Fine	FS	No. 40 to No. 200
Fines (silt or clay)	S/C	Below No. 200 sieve

PLASTICITY CHART (ATTERBERG LIMITS)



CONCLUSIONS AND RECOMMENDATIONS

Based on the subsurface soil conditions encountered in the single 15 foot depth test boring drilled at each site, the results of standard penetration tests conducted in the borings at the time of drilling and on laboratory tests made of typical recovered subsurface soils, we submit the following opinions and recommendations concerning foundation design for the contemplated construction at each site.

1. Subsurface soils at each site as depicted on the Boring Log Graphs consist essentially of the following:

   a. Burton - Moist, loose, brown, silty to clayey, calcareous SAND (SM-SC) from the ground's surface to the 7 foot depth underlain by loose to medium dense, silty to clayey SANDS (SM-SC) to the 13 foot depth and firm, red-brown, silty CLAY (CL-ML) to the 15 foot depth of the boring.

   b. Leavitt - Loose to medium dense (below 5-1/2') silty fine to medium grained SAND (SM) to the 11-1/2 foot depth underlain by medium dense, silty to "clean" SANDS with GRAVEL (SM-SP).

   c. Duranes - Dry, brown, moderately firm, silty, sandy CLAY (CL) to the 6-1/2 foot depth underlain by dry loose to medium dense (below 12'), fine to medium grained, silty to "clean" SANDS.

   d. Griegos - Brown, moderately firm, silty, sandy CLAYS (CL-CH) to the 5 foot depth underlain by dry, silty to "clean" medium dense, fine to medium coarse grained SAND (SM-SP).

No water table or water bearing strata were encountered at any of the sites.

2. It is our understanding that the structures to be built at each site will be lightly loaded, one story of masonry construction; with on-grade floor slabs and without basement.

   Minimum foundation dimensions (1'-4" continuous footings, 2'-0" square spot footings), the building uses which involve piped water, and the loose or expansive nature of the in-situ soils will determine allowable soil bearing capacity. Full dead plus reasonable live loads should be

used to proportion footing sizes so as not to exceed a soil bearing capacity of 2000 pounds per square foot. Minimum foundation depth should be 1'-6" below the exterior finished grade.

On-site soils will be suitable for use as engineered fill at the Burton and Leavitt sites. The surface and near-surface clay soils at Duranes and Griegos should not be used as engineered fill. At those sites imported soils conforming to the following gradation should be used:

Sieve	% Passing
1"	100
3/4"	90-100
No. 4	40-90
No. 200	3-15

Plasticity Index of engineered fill should not exceed 8. All foundations for each building should be based on engineered, compacted fill soils.

3. Engineered fill beneath foundations at each site should be of a vertical extent equal to the greater of one half the width of the footings but not less than two (2) feet and should extend laterally from the edges of the foundations a minimum distance of two (2) feet. Prior to placing the fill, the exposed bottom of footing excavations should be scarified to a depth of 8 inches, moistened with optimum moisture (±2%) (2 to 3% over optimum at Duranes and Griegos) and compacted to a minimum of 90 percent of Modified Proctor Density (ASTM D-1557) (85 to 90% at Duranes and Griegos). Engineered fill soils should be moistened with optimum moisture (±2%) outside of excavations, placed in maximum 8 inch loose lifts and compacted to a minimum of 95 percent of Modified Proctor Density. Consideration should be given to removing all the potentially expansive CLAY (CL-CH) soils beneath the Griegos and Duranes buildings and replacing the clays with approved engineered fill.

4. Backfill in utility trenches and as engineered fill required in site grading should be spread in thin layers (maximum 8 inch loose thickness) and compacted to minimum of 90 percent of Modified Proctor Density. Prior to placing any fill, the exposed subgrade should be prepared as recommended in paragraph 3. We recommend that a minimum compacted depth of 6 inches of select cohesionless fill

having a Plasticity Index not exceeding 6 be placed beneath all slabs. It should be placed and compacted as engineered fill to a minimum of 90 percent of Modified Proctor Density.

6. It will be very important at the sites to maintain soils at and below foundation levels in their present, relatively dry state. Clay soils at Duranes and Griegos will swell if allowed to become excessively wetted; soils at Burton and Leavitt may consolidate. To prevent moisture intrusions into these soils we recommend the following:

   (a) Compact soils around exterior walls, foundations and in utility trenches to a minimum of 90 percent of Modified Proctor Density.

   (b) Consideration should be given to enclosing water and utility lines in concrete chases.

7. Recommended allowable soil bearing pressure, foundation depth, protection of soils at and below foundation depth and all other recommendations contained herein are based on the following:

   1. Actual subsurface soil conditions encountered in the single test boring drilled at each site,

   2. the indicated, lightly loaded structures planned for construction.

   3. Our experience from similar investigations in the areas.

Any changes or deviations from the recommendations given in this report, in structure loads, foundation depths or any other factors which could affect or alter the recommendations covered herein, should be brought to our attention before finalization of plans and prior to construction.

Your attention is directed to the fact that only a very small, fractional part of the proposed sites were "opened" and subsurface soils exposed and tested through the test borings. Subsurface soils and their in-situ properties which can materially affect design considerations may change in areas not covered by the test borings. Therefore, if during construction and when excavations for footings are opened, soil foundation conditions differ from those encountered by the test borings of this report, our laboratory should be notified immediately for possible revision of our recommendations.

The Albuquerque Testing Laboratory assumes no liability for the design and structural adequacy of the foundation(s) or as the foundation affects the superstructure. Our only guarantee concerning the project is that our engineering and geological work and judgements contained herein meet the standards of our profession at this time.