HYDROLOGY

A12/D1

ST. Joseph Hospital
West

A-12-D1

3 PLANS

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

February 11, 1982

Mr . Bill Ragsdale
HBE Corporation
717 Office Parkway
St. Louis, Missouri 63141

Re: PARADISE HILLS HOSPITAL SITE

Dear Bill:

This letter is a follow-up to our meeting of February 8, 1982 concerning the reference site. The Items discussed were:

1. Due to the flooding potential north of the site, on-site retention will be required. ?

2. In an effort to mitigate the frequency in which runoff leaves the site we request that the ponding areas be design to detain the runnoff value generated by a 2-year storm. A 2-year rainfall value of 1.1 inches should be used for design purposes. I have enclosed a pond detail which incorporates this type of storage. A value of 1/3 is recommended for the fractions of voids in the rock bed.

3. A controlled release from the ponding area(s) is allowed for runnoff generated by storm greater than the 2-year frequency. The appropriate manner in which runnoff leaves the site will be determined after the flow rate is established. We will be glad to work with you on this item.

4. We suggest that the ponding area be incorporated with landscaping requirements to create an amenity.

5. Due to the variable nature of the soils on-site, care should be taken when selecting C values for computing flowrates. (A value of 0.25 is a "ball-Park" figure).

6. Any future development (i.e., structures and parking areas) should be analyzed at this time for thier effect on the overall drainage scheme.

MUNICIPAL DEVELOPMENT DEPARTMENT
Richard S. Heller, P.E., City Engineer ENGINEERING DIVISION Telephone (505) 766-7467

7. An erosion control plan (also enclosed) should be implemented for areas that are graded but not immediately developed.

8. All items listed in the Drainage Report Checklist should be addressed.

I hope the above items lend some guidence for designing the drainage plan. We enjoyed meeting with you and Tom and are looking foward to working together in the furture. Please feel free to call if you have any quetsions.

Very Truly Yours,

Brian G. Burnett

Brian G. Burnett
Civil Engineer/Hydrology

BGB/bes
Enclosure
cc: Mr. Dan Sabo

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

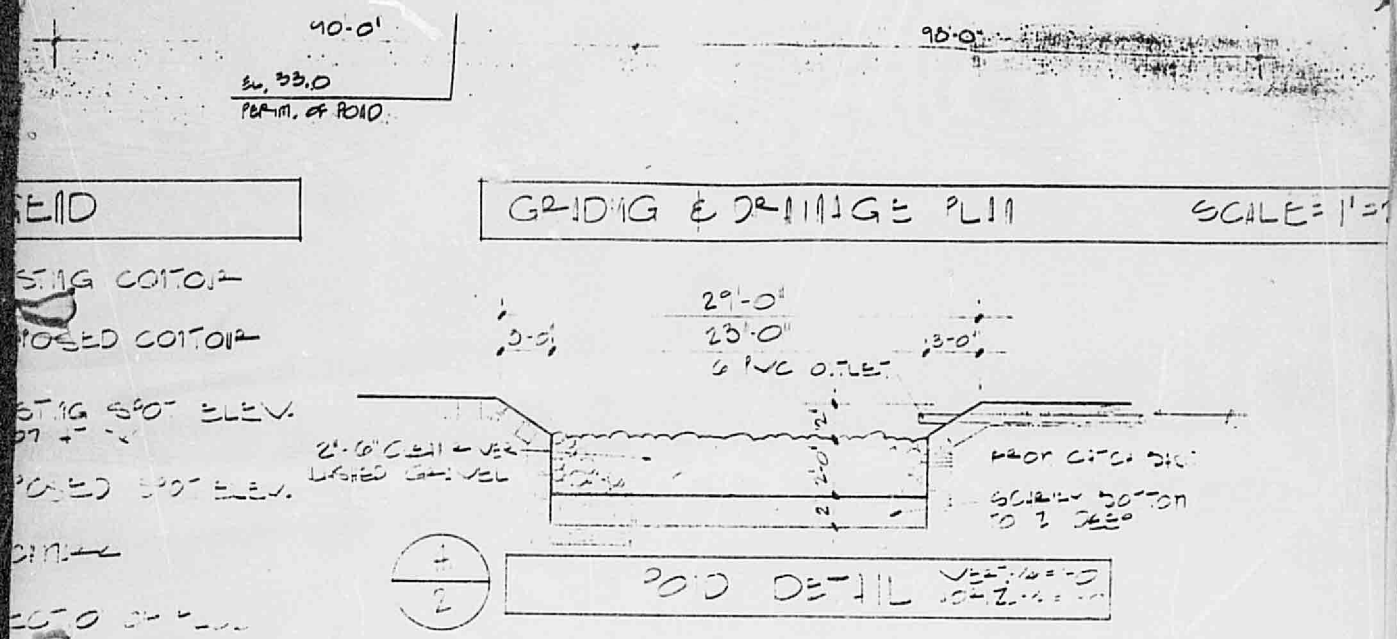
EROSION CONTROL PLAN

We propose that the erosion control requirements be satisfied by seeding the disturbed areas (except paved areas) with the following grass mixture:

Species	Variety or Origin	Pure Live Seed Lbs/Acre
Annual Rye Grass	New Mexico, Colorado, Arizona	8.0
Giant dropseed	New Mexico	2.0
Sand dropseed	New Mexico	1.0
Indian ricegrass	Paloma	4.0
Sideoats grama	Vaughn	6.0
	Total	21.0

The seeded area shall be fertilized and irrigated as necessary to insure the grasses become established. This work shall be performed within 15 days after completion of the site grading.

MUNICIPAL DEVELOPMENT DEPARTMENT
Richard S. Heller, P.E., City Engineer ENGINEERING DIVISION Telephone (505) 766-7467


40'-0"
Ex. 33.0
PERIM. OF POND
90'-0"
GRADING & DRAINAGE PLAN
SCALE = 1" =
29'-0"
23'-0"
3'-0"
6" PVC OUTLET
2'-0" CLAY VEG
LAYED GRAVEL
SCREW BOTTOM
TO 2 DEEP
POND DETAIL

P.O. BOX 829 - 600 JOHN ST., S.E. - 505/242-5265
ALBUQUERQUE, NEW MEXICO 87103

February 24, 1983

H. B. E.
10501 Golf Course Road
Albuquerque, New Mexico 87114

Attention: Dutch Abraham

Reference: St. Joseph's Hospital, Paradise Hills

Dear Mr. Abraham:

The materials we propose to furnish to the subject project will be within the following specifications:

6" Sieve	90-100 % Passing
1½" Sieve	0-10 % Passing.

This material gradation has been verbally approved by Mr. Andre Houle as per telephone conversation on this date.

Very truly yours,

ALBUQUERQUE GRAVEL PRODUCTS CO.

Bill R. Alexander

Bill R. Alexander
Sales Representative

HOSPITAL BUILDING & EQUIPMENT COMPANY
Division of HBE Corporation

- ☐ APPROVED
- ☒ APPROVED AS NOTED
- ☐ REVISE AND RESUBMIT
- ☐ DISAPPROVED

Send this letter to Andre Houle for a written approval

Approval, if noted, applies to DESIGN ONLY and DOES NOT apply to DIMENSIONS nor QUANTITIES. Contractor is responsible for coordination with other trades.

By: W.C.R. Date: 3/11/83

Architect
FREDERICK S. SCOTT / HARRY J. VARWIG Architects

Drainage Computations:

St. Josephs Hospital Site (A12-D1)
By: Brian Burnett

Existing Conditions:

- Area = 21.0 acres (on-site)
  6.0 acres (off-site)
  27.0 acres
- 100-year, 6-hr rainfall = 2.2"
- 100-year rainfall intensity = $\frac{189}{t_c + 25}$ } Imperical Equation Derived for Albuquerque area.
  where t_c = time of concentration in minutes
- t_c = 15 minutes (estimated)
- Rainfall Intensity = $\frac{189}{15+25}$ = 4.73 in/hr
- Runoff Coefficient ("C" value) = 0.25
- 100-year runoff rate = "C" x Intensity x Area
  $= (0.25)(4.73)(27.0) = 31.0$ cfs
- 100-year runoff volume = "C" x Rainfall x Area
  $= (0.25) \times \left(\frac{2.2}{12}\right) \times (27) \times (43{,}560) = 53{,}900$ cu.ft.

Therefore 53,900 cu.ft. of runoff is generated in the 100-year event for natural conditions

Developed Conditions:

- Area: 16 acres (Impervious)
  11 acres (Pervious)
- t_c = 10 minutes (estimated)
- Rainfall Intensity = $\frac{189}{10+25}$ = 5.4 in/hr

- Runoff Coefficient:

  Use C = .95 for impervious area

  $$\text{"C" composite} = \frac{(16)(.25) + 11(.95)}{27}$$

  $$= 0.54$$

- 100-year runoff volume

  $$= (0.54) \times \frac{2.2}{12} \times 27 \times 43560 = 116{,}435 \text{ cu. ft.}$$

Therefore, 116,435 cu.ft. of runoff is generated in the 100 year event for <u>developed</u> conditions.

<u>Required Volume</u>:

The required storage volume is equal to the <u>developed</u> volume minus the <u>natural</u> volume, or (116,435) − (53,900)

$= \boxed{62{,}535 \text{ cu.ft.}}$

<u>Required Rock Storage</u>:

- 20-year <u>volume</u>:

  $$= (.54)\left(\frac{1.1}{12}\right) \times 27 \times 43{,}560 = \boxed{58{,}200 \text{ cu.ft.}}$$

- Rock Storage = 3 × 58,200 = $\boxed{175{,}000 \text{ cu.ft.}}$

  because of 1/3 void ratio

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

A12 - D1

March 16, 1983

Mr. Tom Abernathy
HBE Corporation
717 Office Parkway
St. Louis, Missouri 63141

RE: ST. JOSEPHS HOSPITAL DRAINAGE PLAN

Dear Tom:

Per our earlier conversations, I am forwarding comments regarding the pond volume required for the St. Joseph's Hospital site.

1. Known Data:

   a. Total On-Site Drainage Area: 21 acres

   b. Total Off-Site Drainage Area: 6 acres

   c. Total Impervious Area (including future Medical Arts Building and Parking Area): Approximately 11 acres

   d. 100-year, 6-hour rainfall: 2.2 inches

   e. 2-year, 6-hour rainfall: 1.1 inches

   Items d and e were criteria forwarded in my letter of 2/11/82.

2. At our pre-design meeting in early February 1982, I believe we stated that the increased runoff created by development would need to be ponded. In other words, the runoff generated in a "natural" condition could be used to establish the release rate from the ponded area. Since the downstream system is unstable and very sensitive to the introduction of developed runoff we felt it was appropriate to mitigate this impact by providing some retention storage in the pond bottom (item #2 of my 2/11/82 letter).

3. Based on the statements and data outlined above, the required pond volume is approximately 237,000 cu. ft. This compares to your total of 253,700 cu. ft.

Although the computations were not generated in the same manner, the volumes do coincide rather closely.

I would like to comment that the amount of rock storage exceeds current guidelines. At the time we made the request we were still in the early stages of assessing what would be suitable for mitigating the impact of developed runoff on downstream systems. Since then, we have reduced the amount of rainfall that must be stored for this purpose.

Please note that the computational procedures outlined on the enclosed sheets are suitable for projects similar to the hospital. The City has recently prepared a Development Process Manual (DPM) which outlines design criteria. Also, a City Drainage Ordinance was adopted recently which defines the broad framework for drainage improvements. I have enclosed Chapter 22 from the DPM which covers items relating to drainage and flood control.

This office appreciates the effort in preparing the drainage plan and the cooperation extended by HBE staff. If your company is involved with further development in the Albuquerque area, we will assist in any way we can and request that you contact us to establish drainage guidelines for the project.

Very truly yours,

Brian G. Burnett

Brian G. Burnett
Civil Engineer/Hydrology

BGB/tsl

cc: Andre Houle, Hydrology Dept.
Dan Sabo, AMAFCA

St. Joseph Hospital

400 Walter St. N.E.
Albuquerque, New Mexico 87102
Phone (505) 848-8000

RECEIVED
APR 19 1983
CITY ENGINEER

April 14, 1983

A12-D1

Mr. Brian G. Burnett, Civil Engineer
The City of Albuquerque
Hydrology Engineering Division
Municipal Development Department
Post Office Box 1293
Albuquerque, New Mexico 87103

Subject: St. Joseph West Mesa Hospital --
Side Slope Protection for Detention Pond

Dear Mr. Burnett:

Pursuant to our telephone conversation, this is to request approval to use some of the existing rock in the bottom of the detention pond at the subject location for the purpose of protecting the side slopes of the pond from erosion. We propose to simply push rock from the bottom of the pond up the slopes to the perimeter fence line of the pond.

It is our understanding that this work poses no problems to your office. We also understand that we do not need to obtain approval from any other jurisdictional authority and that we can proceed based on your approval of this letter.

Thank you for your cooperation in this matter.

Yours very truly,

James H. Keeling
Project Manager

JHK/sm

cc: Michael L. Brown

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

April 20, 1983

Mr. James Keeling
Project Manager
St. Joseph Hospital
400 Walter St. N.E.
Albuquerque, N.M. 87102

RE: ST. JOSEPH WEST MESA HOSPITAL - SIDE SLOPE PROTECTION FOR DETENTION POND (YOUR LETTER OF APRIL 14, 1983)

Dear Jim:

This letter is to express concurrence with the proposal outlined in your letter of April 14, 1983. I am also forwarding a copy of the letter along with this reply to AMAFCA since they were an active member of the review team.

Thank you for your cooperation.

Very truly yours,

Brian G. Burnett
Civil Engineer/Hydrology

BGB/tsl

cc: Dan Sabo, AMAFCA
Andre Houle, Flood Plain Enforcement Engineer

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

DRAINAGE REPORT INFORMATION SHEET

PROJECT TITLE St. Joseph Hospital - West

ZONE ATLAS PAGE NO. A-12 CITY ADDRESS McMahon Blvd. N.W. & Golf Course Rd.

LEGAL ADDRESS The Southerly portion of tract "F" unit 1, Paradise Heights town of Alameda Grant, Bernalillo County.

Architectural and ENGINEERING FIRM Hospital Bldg. & Equipment Co. CONTACT Frederick S.Scott

ADDRESS 717 Office Parkway St. Louis Missouri 63141 PHONE 314/567/9000

OWNER St. Joseph Hospital CONTACT Sister Celestia Koebel

ADDRESS 400 Walter, N.E. Albuquerque N.M. 87102 PHONE 505/848-8000

SURVEYOR Albuquerque Surveying Co. Inc. CONTACT Fred Sanchez

ADDRESS 2119 Menaul Blvd. N. E. Albuquerque, N. M. 87107 PHONE 505/884-2036

DATE SUBMITTED November 19, 1982

BY Hospital Building & Equipment Co.

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

EROSION CONTROL PLAN

We propose that the erosion control requirements be satisfied by seeding the disturbed areas (except paved areas) with the following grass mixture:

Species	Variety or Origin	Pure Live Seed Lbs/Acre
Annual Rye Grass	New Mexico, Colorado, Arizona	8.0
Giant dropseed	New Mexico	2.0
Sand dropseed	New Mexico	1.0
Indian ricegrass	Paloma	4.0
Sideoats grama	Vaughn	6.0
	Total	21.0

The seeded area shall be fertilized and irrigated as necessary to insure the grasses become established. This work shall be performed within 15 days after completion of the site grading.

RECEIVED
NOV 23 1982
ENGINEERING

MUNICIPAL DEVELOPMENT DEPARTMENT
Richard S. Heller, P.E., City Engineer ENGINEERING DIVISION Telephone (505) 766-7467

HYDRAULIC DATA

Drawn By:	Checked By:	Project Number	Sheet Number
W.L.R.		St Joseph Hosp.	1 of 3
Date: 4/14/82		Albuquerque, N.M.	
Revisions:			

PI: C ≈ 0.90 to 0.95 for impervious
C ≈ 0.25 to 0.30 for pervious
I = 5 mm. to 4 hr. ± 4.5

STRUCTURE UPPER	STRUCTURE LOWER	LENGTH	AREA ACRES	C	Q.	TOTAL Q.	PIPE SIZE	CONST. GRADE	V.	V_h	Q. V_h	HYD. GRADE	FRICT. LOSS	FLOW LINE UPPER ELEV.	FLOW LINE LOWER ELEV.	TOP OF STRUCTURE UPPER ELEV.	TOP OF STRUCTURE LOWER ELEV.	FREE BOARD	HYDRAULIC ELEVATION UPPER	HYDRAULIC ELEVATION LOWER	REMARKS
3	2	123'	3.03	3.825	11.60	11.60	12	0.3943	14.78	3.39	39.33	0.1057	13.00	5212.00	5163.50	5215.00	5167.5±	2.49 2.48	5212.51	5165.02	d = 0.51'
2	1	28'	—	—	—	11.60	15	0.0325	9.45	1.39	16.10	0.0323	0.90	5159.91	5159.00	5167.5±	Top of Dam 5165.00	0.88	5165.02	5164.12	
15	13	225'	2.07	4.05	8.40	8.40	15	0.0233	6.85	0.73	6.11	0.0169	3.81	5208.75	5203.50	5212.00	5207.50	2.36 2.44	5209.64	5205.06	d = 0.89
14	13	5'	0.62	4.275	2.65	2.65	10	0.0260	4.86	0.37	0.97	0.0148	0.07	5203.63	5203.50	F.F. 5208.67	5207.50	3.54 2.44	5205.13	5205.06	
13	11	117'	—	—	—	11.05	18	0.0137	6.25	0.61	6.71	0.0110	1.29	5202.75	5201.15	5207.50	5204.40	0.93	5204.76	5203.47	
12	11	46'	0.57	4.275	2.45	2.45	10	0.0511	4.50	0.31	0.77	0.0126	0.58	5203.50	5201.15	F.F. 5205.50	5204.40	1.45 0.93	5204.05	5203.47	d ≈ 0.55'
11	6	105'	—	—	—	13.50	21	0.0175	5.61	0.49	6.61	0.0073	0.76	5200.40	5198.56	5204.40	5203.25	0.81	5203.20	5202.44	
10	9	94'	0.74	3.825	2.85	2.85	10	0.0175	5.23	0.42	1.21	0.0171	1.61	5216.50	5214.85	5219.50	5220.15	2.21 4.47	5217.29	5215.68	d ≈ 0.79'
9	8	204'	0.47	4.05	1.90	4.75	12	0.0184	6.05	0.57	2.70	0.0177	3.62	5214.10	5210.35	5220.15	5220.60	9.25	5214.97	5211.35	d = 0.81'
8	6	235'	0.28	4.05	1.15	5.90	12	0.0409	7.52	0.88	5.18	0.0273	6.43	5209.60	5200.00	5220.60	5203.25	0.81	5210.29	5202.44	d = 0.69'
7	6	84'	2.61	3.825	10.00	10.00	15	0.0423	8.15	1.03	10.31	0.0240	2.01	5203.55	5200.00	5206.80	5203.25	2.35 0.81	5204.45	5202.44	d = 0.81'
6	5	87'	0.98	3.825	3.20	32.60	21	0.3668	13.56	2.85	93.01	0.0425	3.69	5197.81	5165.90	5203.25	5169.9±	2.25	5198.52	5167.65	d = 0.71'
5	4	32'	—	—	—	32.60	21	0.0425	13.56	2.85	93.01	0.0425	1.36	5160.36	5159.00	5169.9±	Top of Dam 5165.00	0.88	5165.48	5164.12	

HYDRAULIC DATA

Drawn By:	Checked By:	Project Number	Sheet Number
W.L.R.		St. Joseph Hosp.	2 of 3
Date: 4/14/82		Albuquerque, N.M.	
Revisions:			

STRUCTURE UPPER	STRUCTURE LOWER	LENGTH	AREA ACRES	P.I.	Q.	TOTAL Q.	PIPE SIZE	CONST. GRADE	V.	V_h	Q. V_h	HYD. GRADE	FRICT. LOSS	FLOW LINE UPPER ELEV.	FLOW LINE LOWER ELEV.	TOP OF STRUCTURE UPPER ELEV.	TOP OF STRUCTURE LOWER ELEV.	FREE BOARD	HYDRAULIC ELEVATION UPPER	HYDRAULIC ELEVATION LOWER	REMARKS
19	18	42.2	0.17	1.80	0.35	0.35	18	0.0267	0.20	0.0006	0.0002	0.00001	0.0005	5229.25	5228.13	Sh/dr. 5232.2±	—	2.56 —	5229.64	5229.63	d=0.15'
17	16	36.2	0.43	1.80	0.80	0.80	18	0.0229	0.45	0.0032	0.0025	0.00006	0.0021	5221.23	5220.40	Sh/dr. 5224.3±	—	2.39 —	5221.91	5221.90	d=0.23'
Detention Release Pipe:																					
B	A	39'	—	—	—	8.00	18"	0.1510	4.53	0.32	2.55	0.0059	0.23	5160.44	5154.60	5163.00	—	0.68 —	5162.32	5156.10	Inlet Control *

* Inlet Control: A head of 1.88' will allow 8.00 cfs to pass through the pipe.

HYDRAULIC DATA

DRAWN BY:	CHECKED BY:	PROJECT NUMBER	SHEET NUMBER
WLR		St. Joseph Hosp.	3 of 3
DATE: 4/14/82		Albuquerque, N.M.	
REVISIONS:			

BEND LOSS = COEFF. X V_h

JUNCTION LOSS = $\frac{Q^{V}h_1 - (Q^{V}h_2 + Q^{V}h_3) \times 1.33}{Q_T}$

#2 Bend Loss = 0
Junction Loss = 16.10 − 39.33 = 0 } 0

#5 Bend loss = 0
Junction loss = 93.01 − 93.01 = 0 } 0

#6 Bend loss: (from 7 = 67°) 0.58 × 1.03 = 0.60
(from 8 = 10°) 0.11 × 0.88 = 0.10
(from 11 = 84°) 0.67 × 0.49 = 0.33
1.03

Junction Loss = $\frac{93.01 - (10.31 + 5.18 + 6.61) \times 1.33}{32.60}$ = 2.89

Total loss @ #6 = 2.89 + 1.03 = 3.92

#8 Bend loss: (from 9 = 60°) 0.55 × 0.57 = 0.31'
Junction Loss = $\frac{(5.18 - 2.70) \times 1.33}{5.90}$ = 0.56'

Total loss @ #8 = 0.31 + 0.56 = 0.87'

#9 Bend Loss: (from 10 = 37°) 0.41 × 0.42 = 0.17'
Junction loss = $\frac{(2.70 - 1.21) \times 1.33}{4.75}$ = 0.42

Total loss @ #9 = 0.17 + 0.42 = 0.59'

#11 Bend Loss: (from 12 = 98°) 0.75 × 0.31 = 0.23'
(from 13 = 5°) 0.06 × 0.61 = 0.04'
0.27'

Junction loss: $\frac{6.61 - (0.77 + 6.71) \times 1.33}{13.50}$ = 0

Total loss @ 11 = 0.27

#13 Bend loss: (from 14 = 92.5°) 0.71 × 0.37 = 0.26
(from 15 = 4.5°) 0.05 × 0.73 = 0.04
0.30

Junction loss = 6.71 − (0.97 + 6.11) = 0

Total loss @ 13 = 0.30

GEOTECHNICAL INVESTIGATION FOR THE
PROPOSED MEDICAL OFFICE BUILDING
AT ST. JOSEPH'S HOSPITAL WEST
ATL ENGINEERING SERVICES LAB. NO. 2-00434-84
JANUARY 24, 1984

ATL ENGINEERING SERVICES

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

January 24, 1984

Hoffman Partnership, Inc.
6001 Indian School Road, N.E.
Suite 440
Albuquerque, New Mexico 87100

Attention: Mr. Don Newman

Re: ATL Engineering Services Lab. No. 2-00434-84. Geotechnical Investigation for the Proposed Medical Office Building at St. Joseph's Hospital West.

Gentlemen:

Our report for the referenced project is herewith submitted. It includes a description of the procedures and equipment utilized, results of field and laboratory tests, a description of the subsurface soils encountered and our recommendations concerning foundation design, slab support, pavements and other geotechnical considerations.

We appreciate the opportunity of working with you on this project. If any questions arise concerning this report or if we can be of further assistance, please call us.

Respectfully submitted,

ATL ENGINEERING SERVICES

Nicholas T. Korecki

Nicholas T. Korecki, P.E.

Reviewed by:

Robert K. Lloyd

Robert K. Lloyd, P.E.

MEDICAL OFFICE BUILDING

ST. JOSEPH'S HOSPITAL WEST

INTRODUCTION

The five (5) requested test borings were drilled on January 18 and 19, 1984 using a Mobile B-61 "Pacemaker" rotary drill powered by a Ford Industrial Engine and mounted on a 1979 Ford truck. 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 performed 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 standard penetration test provides a measure of the relative density or consistency of the subsurface soils encountered and obtains soil samples for visual inspection and laboratory testing.

TEST DATA

A sketch showing the location of the test borings is on page A-1 and was made from a print of the site plan furnished to our office. Boring Log Graphs of the test holes are shown on pages A-2 through A-6 and depict the subsurface soils encountered in the holes along with the results of the standard penetration tests, natural or existing moisture content, dry densities, and grain size classifications made on typical recovered samples. Notes and Definitions pertaining to the "Boring Log Graphs" are shown on Page A-7. Consolidation test results are on pages A-8 and A-9.

SITE CONDITIONS

The site is unvegetated and relatively flat and level. Test borings 1 and 4 were drilled on the west edge of a constructed building pad. The proposed building area is apparently within a cut ground section. Subsurface soils consist of brown silty to some "clean" fine to medium grained sands (SM, some SP). The sands contain calcareous deposits and inclusions generally between the 9' and 15' depths. Some brown clays (CL-CH) were encountered in seams and veins below the 25' depth.

No water table or water bearing stratum was encountered. Surface soils were moist and soils with depth were dry.

PROPOSED CONSTRUCTION

We understand that the proposed building will be two story of steel frame and stucco construction. Maximum exterior column loads will be 100 kips. Maximum interior column loads will be 200 kips. Maximum exterior wall loads will be 700 pounds per lineal foot. Proposed finished floor elevation will be at elevation 5222.5 requiring placement of fill soils varying from about 1-1/2 to 4-1/2 feet beneath the north-east quadrant of the structure. Parking areas will be paved.

FOUNDATIONS

Consideration of the present topography of the site which will require placement of variable depth fill soils, prinicpally in the north-east quadrant of the structure, it is recommended that all foundations be based on engineered, compacted fill soils placed and compacted under strict engineering control. This will require "undercutting" beneath foundations in some areas of the site. The compacted thickness of engineered fill soils beneath foundations and extending laterally from all footing edges should be the greater of one half the width of the footing or two (2) feet. Site soils should be acceptable as engineered fill. If imported soils are required, they should consist of a relatively cohesionless sand or sand-gravel material having a Plasticity Index not exceeding 10 and should have less than 30% passing the No. 200 sieve. Prior to placement of fill soils, the exposed or cut ground areas of excavations should be scarified to a depth of 8 inches, moistened with optimum moisture (±2%) as deep as practicable and compacted to a minimum of 90% of Modified Proctor Density (ASTM D-1557). Fill soils should be moistened to optimum moisture (±2%) outside of excavations, placed in maximum 8 inch loose lifts and compacted to a minimum of 95% of Modified Proctor Density.

For Foundations based as noted above, a soil bearing pressure of 2,500 pounds per square foot may be used. This value may be increased by 1/3 for the full effect of dead, live and transitory loads. Minimum continuous footing width should be 1'-4"; minimum

least dimension of spot footings should be 2'-0". Minimum foundation depth for exterior wall footings should be 2 feet below the low, adjacent exterior finished grade; interior footings should be based a minimum fo 1-1/2 feet below finished floor slab.

ON-GRADE FLOOR SLABS

On-grade concrete floor slabs should be based on a minimum 6 inch compacted thickness of on site silty to clean cohesionless sands, or imported crushed rock, sand and gravel or similar material. Prior to placing any fill, the exposed subgrade should be scarified a minimum depth of 8 inches, moistened with optimum moisture (±2%) as necessary, and compacted to a minimum of 90 percent of Modified Proctor Density. Compacted fill beneath on-grade concrete floor slabs should be moistened with optimum moisture (±2%) outside of the building area, placed in maximum 8 inch loose lifts and compacted to a minimum of 90 percent of Modified Proctor Density.

PAVEMENTS

Support for asphaltic concrete pavement should be provided by a maximum 6 inch compacted thickness of imported crushed aggregate and fines base course, placed and compacted to a minimum of 95 percent of Modified Proctor Density. Prior to placing the base course, the subgrade and any other required fill soils should be prepared and compacted as described in the previous section.

For general parking areas a minimum 2 inch compacted thickness of asphaltic concrete is recommended. For areas subject to heavier traffic the pavement thickness should be a minimum of 3 inches.

Specifications for asphaltic concrete pavement and select base course are presented in the "New Mexico Standard Specifications for Public Works Construction", Sections 115 and 302 respectively. The asphaltic concrete pavement should also conform to the following specifications.

Marshall Stability (Modified)	1500 minimum
Marshall Flow	10 to 16
% Aggregate Voids Filled with Cement	70 to 80
% Asphalt	5 to 7
% Voids in Compacted Mix	3 to 5
Density of Compacted Mix	Minimum of 96% of Laboratory Molded Specimen

SITE DRAINAGE AND PROTECTION OF FOUNDATION SOILS

It will be very important at the site to keep the foundation soils protected from moisture intrusions. Saturation or wetting of the drier subsurface soils may cause them to consolidate with resulting settlement which could lead to structural distress. To help prevent moisture intrusions into the foundation soils, we advise that the following precautions be taken.

1. Positive surface water drainage should be provided and maintained away from all exterior walls.

2. All opened excavations should be kept dry with concreting and backfilling operations to follow in a timely manner.

3. All backfill soils placed in utility trenches and around exterior walls should be properly placed and compacted to a minimum of 90% of Modified Proctor Density.

4. Vegetation planted adjacent to exterior walls should be confined in planter boxes with underdrains to lead irrigation water away from foundations.

SUMMARY OF RECOMMENDATIONS

1. All exterior foundations should be based not less than 2 feet below the low adjacent exterior finished grade. Interior spot footings should be based at least 1-1/2 feet below finished floor slab. All footings should be founded on well compacted fill soils.

2. A soil bearing pressure of 2500 pounds per square foot may be used and may be increased by 1/3 for the full effect of dead, live and transitory loadings.

3. Concrete floor slabs may be based on a minimum 6 inch thickness of site soils compacted to a minimum of 90% of Modified Proctor Density. Pavements should be supported by a minimum 6 inch compacted thickness of select imported base course material compacted to a minimum of 95% of Modified Proctor Density.

4. Foundation soils should be protected from moisture intrusions during and after construction.

The recommendations given in this report are based on the actual subsurface soil conditions existing at the test locations and our understanding of the proposed construction. Any changes in proposed construction, building location or any other factors which could affect or alter the recommendations of this report should be brought to our attention prior to construction.

Only a fractional part of the subsurface soils at the site have been exposed and tested through the test borings. Should soil conditions be found to differ significantly from those revealed by our investigation, our office should be notified for possible revision of our recommendations. Our only guarantee concerning the project is that our engineering and geological work and judgements presented in herein meet the standard of our profession at this time.

Respectfully submitted,

ATL ENGINEERING SERVICES

Nicholas T. Korecki

Nicholas T. Korecki, P.E.

Reviewed by:

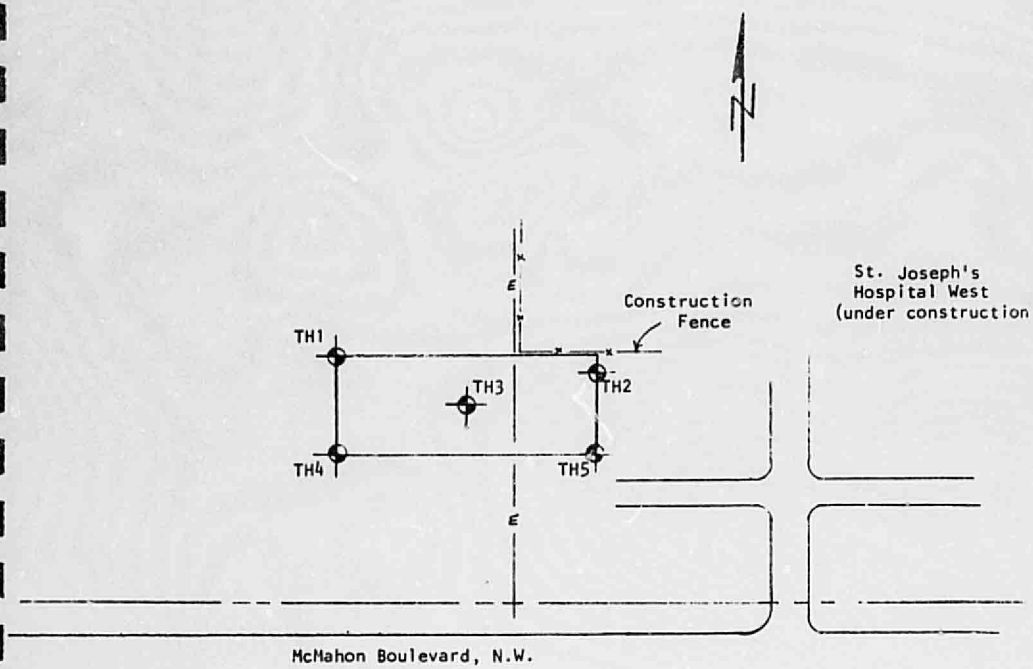
Robert K. Lloyd

Robert K. Lloyd, P.E.

APPENDIX

TEST LOCATIONS

Scale: 1" = 100'



ENGINEERING SERVICES

PAGE: A-2

PROJECT: Medical Office Building at St. Joseph's Hospital West

LAB NO.: 2-00434-84

DATE: January 24, 1984

BORING LOG GRAPH - TEST HOLE NO. 1

DEPTH - FT.	VISUAL DESCRIPTION * Ground Elevation 5221	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,	21	11 10		S	2.8		0	86	14			
2½	to some "clean" (SM-SP): fine to	24	11 13		S	2.5		0	94	6			
5	Medium grained	24	11 13		S	2.2		0	89	11			
7½	Medium Dense	23	11 12		S	2.8		0	91	9			
	9'												
10	SAND, gray-brown, calcareous, silty, (SM) fine grained	46	22 24		S	2.8		0	80	20			
15	Dense												
	15½												
	SAND, brown, silty, to "clean" (SM-SP) fine to medium	29	12 17		S	1.9		0	92	8			
20	grained. Dense	44	19 25		S	2.1		0	80	20			
	24'												
25	CLAY, red-brown, (CL-CH Very Hard	75	30 45		S	15.3		0	27	73			
	27'												
	SAND, brown, silty to "clean" (SM-SP) Very Dense												
30		53	21 32		S	1.7		0	87	13			

* Interpolated from topo sheet

ENGINEERING SERVICES

PAGE: A-3

PROJECT: Medical Office Building at St. Joseph's Hospital West

LAB NO.: 2-00434-84

DATE: January 24, 1984

BORING LOG GRAPH -TEST HOLE NO. 2

DEPTH - FT.	VISUAL DESCRIPTION * Ground Elevation 5218	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, to "clean" (SM-SP) fine to medium grained.	10	5 5		S	7.7							
2½		24	10 14		C	6.1 2.6	105 101						
5	Medium Dense 6' SAND, gray-brown, silty, calcareous, (SM) fine grained	31	13 18		S	4.2							
7½		25	12 13		S	3.8							
10	Medium Dense 14'	23	10 13		S	3.7							
15	SAND, brown, silty, to "clean" (SM-SP) Dense to Medium Dense	45	18 27		S	2.2							
20	CLAY, (CL) and SILT (ML) seams below 24' depth	24	12 12		S	2.5							
25		31	14 17		S	6.1							

* Interpolated from topo sheet

ENGINEERING SERVICES

PAGE: A-4

PROJECT: Medical Office Building at St. Joseph's Hospital West

LAB NO.: 2-00434-84

DATE: January 24, 1984

BORING LOG GRAPH -TEST HOLE NO. 3

DEPTH - FT.	VISUAL DESCRIPTION * Ground Elevation 5220	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, to some "clean" (SM-SP) fine to medium grained. Medium Dense	36	24 12		S	5.9							
2½		27	13 14		S	3.1							
5	5½' SAND, gray-brown, silty, calcareous (SM) fine grained. Medium Dense	27	11 16		S	3.9							
7½		26	12 14		S	4.6							
10		28	13 15		S	3.1							
15	15' SAND, brown, silty, to "clean" (SM-SP) fine to medium grained with CLAY (CL-CH) and SILT (ML) Lenses Medium Dense	31	12 19		S	1.8							
20		32	13 19		S	2.7							
25		25	12 13		S	2.8							

* Interpolated from topo sheet

ENGINEERING SERVICES

PAGE: A-5

PROJECT: Medical Office Building at St. Joseph's Hospital West

LAB NO.: 2-00434-84

DATE: January 24, 1984

BORING LOG GRAPH - TEST HOLE NO. 4

DEPTH - FT.	VISUAL DESCRIPTION * Ground Elevation 5221	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,	13	9 4		S	5.0							
	to "clean" (SM-SP)												
2½	fine to medium	41	9 32		C	7.7 2.1	103 99						
5	grained.	18	8 10		S	2.8							
	Medium												
7½	Dense	21	9 12		S	3.3							
10	10½	40	20 20		S	5.3							
	SAND, gray-brown,												
	silty (SM)												
15	fine grained.												
	Dense	23	11 12		S	3.5							
20	20												
	SAND, brown, silty,	54	18 36		S	3.0							
	to "clean" (SP-SM)												
	with CLAY, (CL-CH)												
	seams. Dense												
25		44	21 23		S	6.1							

* Interpolated from topo sheet.

ENGINEERING SERVICES

PAGE: A-6

PROJECT: Medical Office Building at St. Joseph's Hospital West

LAB NO.: 2-00434-84

DATE: January 24, 1984

BORING LOG GRAPH - TEST HOLE NO. 5

DEPTH - FT.	VISUAL DESCRIPTION * Ground Elevation 5222	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 to "clean" (SM-SP) Loose through 5'	7	3 4		S	6.5							
2½		8	4 4		S	4.0							
5	Medium Dense below 5'	14	7 7		S	4.1							
	7'												
7½	SAND, gray-brown, silty (SM) fine grained calcareous Dense	43	22 21		S	5.2							
10		27	12 15		S	3.2							
15		44	18 26		S	2.7							
	16'												
	SAND, brown, silty to "clean" (SM-SP) fine to medium grained. Dense												
20		37	16 21		S	3.7							
25		38	18 20		S	2.0							
30		27	13 14		S	2.8							

* Interpolated from topo sheet

NOTES 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

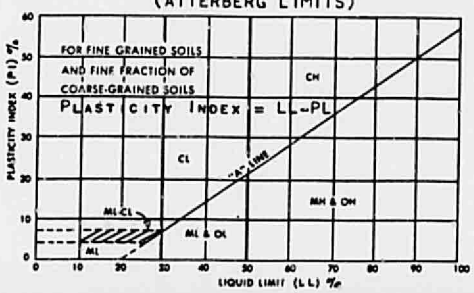
MORE THAN 50% SMALLER THAN 200 SIEVE SIZE

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)



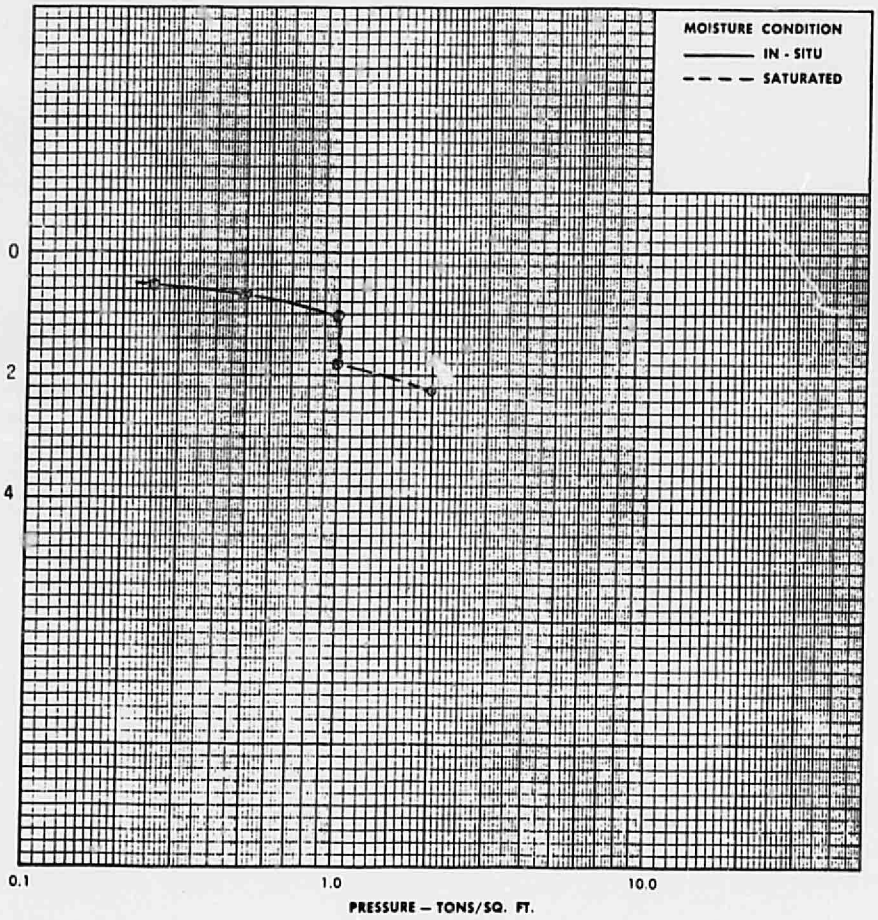
CONSOLIDATION TEST DATA

Lab. No. 2-00434-84

Project Medical Office Building Location New St. Joseph's Hospital West

Source of Sample Test Hole #4 at 2½ to 4'

Material Sand, Brown, Fine, (SP)



ALBUQUERQUE TESTING LAB., INC.

Lab. No. 2-00434-84 Page No. A-8

ATL ENGINEERING SERVICES

Project Medical Office Building
Location Near St. Joseph's Hospital West
Sample Source Test Hole #4 at 2½ - 4'
Material Sand, Brown, Fine, (SP)
Undisturbed [x] c Remolded [ ]

CONSOLIDATION TEST

Date	Time	Load T/sf	Elasped Time(min)	Dial Reading	Date	Time	Load T/sf	Elasped Time(min)	Dial Reading
1-30-84	9:20	Seating Load			1-31-84	12:58	1	0	0.0070
	9:28	¼	0	0.0000				¼	0.0090
			¼	0.0018				½	0.0091
			½	0.0018+				1	0.0092
			1	0.0018+				2	0.0093
			2	0.0019				4	0.0094
			4	0.0020+		1:30			0.0097
	10:03			0.0026		3:23			0.0100
	10:52			0.0030		4:48	*1	0	0.0102
	11:55			0.0035				1	0.0175
	12:59			0.0037				2	0.0176
	2:32			0.0041				3	0.0177
						5:27			0.0180
1-31-84	7:47am	¼	0	0.0053	2-1-84	7:41am	*2	0	0.0182
			¼	0.0062				¼	0.0205
			½	0.0062+				½	0.0207
			1	0.0063				1	0.0210
			2	0.0063+				2	0.0214
			4	0.0064				4	0.0216
	8:49			0.0066		9:52			0.0222
	9:36			0.0068		11:00			0.0223
	12:06			0.0069				-END-	

Wet Wt. Soil + Ring 107.3 gm.
Ring Wt. 25.0 gm.
Wet Soil 82.3 gm.
Dry Soil 80.6 gm.

Assumed Sp. Gr. 2.65

CONSOLIDATION RING
Dia. 1.9424 in. Area 2.9632 sq.in.
Ht. 1.0000 in. Vol. 0.00171 cu.ft.

Percent Moisture 2.1 Dry Density 103.9 pcf

$V_s = \frac{\text{Dry Density}}{(62.4)\text{Sp.Gr.}} = 0.6283$

$V_v = 1 - V_s = 0.3717$

Init.Void Ratio $(e_o) = \frac{V_v}{V_s} = 0.5916$

$e = \frac{\Delta - V_s}{V_s}$

Load T/sf	Dial Reading	1-Dial Reading (Δ)	e	Percent Consolidation
0	0	1.0000	0.5916	0
¼	0.0053	0.9947	0.5832	0.53
½	0.0070	0.9930	0.5805	0.70
1	0.0102	0.9898	0.5754	1.02
1*	0.0182	0.9818	0.5626	1.82
2*	0.0223	0.9777	0.5561	2.23
4*				
8*				
12*				
16*				

*Saturated

ENGINEERING CALCULATIONS

PROJECT: Albuquerque, N.M. SHEET NO.: 1 of 1

BY: Bill Ragsdale DATE: 4/5/82

Off-site Storm Drainage

10 year frequency storm : Rainfall ~~intensity~~ amounts = 1.45 in/hr @what time?

100 year frequency storm : Rainfall ~~intensity~~ amounts = 2.20 in/hr.

Offsite area tributary to site : 6.0 Ac. ~~10~~ 6.0

"C" factor for offsite area = 0.25

$Q = CIA$

$Q_{10} = 0.25 \times 1.45 \times 6.0$
$= 2.175$
say 2.2 cfs

$Q_{100} = 0.25 \times 2.2 \times 6.0$
$= 3.3$ cfs

Onsite Storm Drainage

Undeveloped : 20.89 Ac (onsite)
6.00 Ac (offsite)
26.89 Ac.

$Q_{10} = 0.25 \times 1.45 \times 26.89$
$= 9.75$ cfs

$Q_{100} = 0.25 \times 2.20 \times 26.89$
$= 14.79$ cfs
say 14.8 cfs

$Q_2 = 0.25 \times 1.1 \times 26.89$
$= 7.39$
say 8.0 cfs

Developed : Controlled release from detention = 8.0 cfs
(See Retention / Dentention Computations)

ENGINEERING CALCULATIONS

PROJECT: Albuquerque, N.M. SHEET NO.: 1 of 4

BY: Bill Ragsdale DATE: 4/6/82

DEPTH OF WATER OVER CATCH BASINS

Catch Basin # 3

$Q = 0.6\ A\ \sqrt{2gh}$

$Q = 11.6$ cfs
$A \approx 5.0 \sim 35'$
$g = 32.2$

$20 \times \frac{1}{2} \times \frac{36}{12} \times \frac{1}{12} =$

.13 s.f/van. x 20

$\frac{Q}{(0.6)(A)} = \sqrt{2gh}$

$\left(\frac{Q}{(0.6)(A)}\right)^2 / 2g = h$

$h = \left(\frac{11.6}{(0.6)(5.0)}\right)^2 / 64.4 = 0.2322'$

depth → $d \approx 0.24'$

Catch Basin # 6

$Q = 0.6\ A\ \sqrt{2gh}$

$Q = 3.2$ cfs
$A \approx 5.0$
$g = 32.2$

$h = \left(\frac{Q}{0.6A}\right)^2 / 2g$

$h = \left(\frac{3.2}{(0.6)(5.0)}\right)^2 / 64.4$

$h = 0.0177$

depth → $d \approx 0.02'$

ENGINEERING CALCULATIONS

PROJECT: Albuquerque, N.M.

BY: Bill Ragsdale

SHEET NO.: 2 of 4

DATE: 4/6/82

Catch Basin # 7

$Q = 0.6\,A\sqrt{2gh}$

$h = \left(\frac{Q}{0.6\,A}\right)^2 / 2g$

$h = \left(\frac{10}{(0.6)(5.0)}\right)^2 / 64.4$

$h = 0.1725'$

depth → $d \approx 0.18'$

$Q = 10.0$ cfs
$A \approx 5.0$
$g = 32.2$

Catch Basin # 8

$Q = 0.6\,A\sqrt{2gh}$

$h = \left(\frac{Q}{0.6\,A}\right)^2 / 2g$

$h = \left(\frac{1.15}{(0.6)(5.0)}\right)^2 / 64.4$

$h = 0.0023$

depth → $d \approx 0.003'$

$Q = 1.15$ cfs
$A \approx 5.0$
$g = 32.2$

ENGINEERING CALCULATIONS

PROJECT: Albuquerque, N.M. SHEET NO.: 3 of 4

BY: Bill Ragsdale DATE: 4/6/82

Catch Basin #9

$Q = 0.6 A \sqrt{2gh}$

$h = \left(\frac{Q}{0.6A}\right)^2 / 2g$

$h = \left(\frac{1.90}{(0.6)(5.0)}\right)^2 / 64.4$

$h = 0.0062$

depth → $d \approx 0.007'$

$Q = 1.90$ cfs
$A \approx 5.0$
$g = 32.2$

Catch Basin #10

$Q = 0.6 A \sqrt{2gh}$

$h = \left(\frac{Q}{0.6A}\right)^2 / 2g$

$h = \left(\frac{2.85}{(0.6)(2.0)}\right)^2 / 64.4$

$h = 0.0876'$

depth → $d \approx 0.09'$

$Q = 2.85$
$A \approx 2.0$
$g = 32.2$

ENGINEERING CALCULATIONS

PROJECT: Albuquerque, N.M. SHEET NO.: 4 of 4

BY: Bill Raysdale. DATE: 4/6/82

Catch Basin #15

$Q = 0.6\ A\ \sqrt{2gh}$

$h = \left(\frac{Q}{0.6\ A}\right)^2 / 2g$

$h = \left(\frac{8.4}{(0.6)(5.0)}\right)^2 / 64.4$

$h = 0.1217'$

depth $\Rightarrow$ $d \approx 0.13'$

$Q = 8.40$ cfs

$A \approx 5.0$

$g = 32.2$

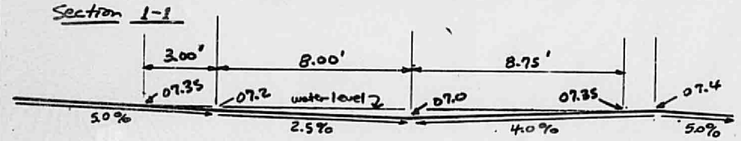
ENGINEERING CALCULATIONS

PROJECT: Albuquerque, N.M. SHEET NO.: 1 of 8

BY: Bill Ragsdale DATE: 4/6/82

Storm Flow Depth & Velocities

Section 1-1



Actual Q_A at point of section = 10.00
− 0.60
9.40 cfs

Design $Q_D = \frac{1.486}{n} \times A \times R^{2/3} \times S^{1/2}$

$Q_D = \frac{1.486}{0.013} \times 3.76 \times 0.33072 \times 0.10$

$Q_D = 14.214$ cfs

$n = 0.013$
let $d = 0.35'$
$A = 3.76$
$WP = 19.77$
$R = 0.19019$
$R^{2/3} = 0.33072$
$S = 0.01$
$S^{1/2} = 0.10$

$Q_D > Q_A$

Therefore, depth < 0.35'

$V = \frac{Q_D}{A} = \frac{14.214}{3.76} = 3.78$ fps

let $d = 0.30'$
$A = 2.825$
$WP = 17.5145$
$R = 0.161295$
$R^{2/3} = 0.29631$
$S^{1/2} = 0.10$

$Q_D = 9.57$

$Q_D > Q_A$, Therefore (depth) $d \approx 0.30'$

$V = \frac{9.57}{2.825}$, $V \approx 3.39$ fps

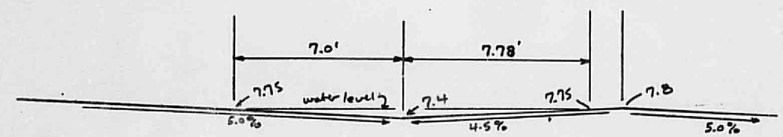
ENGINEERING CALCULATIONS

PROJECT: Albuquerque, N.M. SHEET NO.: 2 of 8

BY: Bill Ragsdale DATE: 4/6/82

Storm Flow Depth & Velocities (Con't.)

Section 2-2



Actual Q_A @ point of section = 10.00
− 1.30
8.70 cfs

Design $Q_D = \frac{1.486}{n} \times A \times R^{2/3} \times S^{1/2}$

$Q_D = \frac{1.486}{0.013} \times 2.58611 \times 0.31263 \times 0.10$

$Q_D = 9.24$ cfs

$n = 0.013$
let $d = 0.35'$
$A = 2.58611$
$WP = 14.79439$
$R = 0.17480$
$R^{2/3} = 0.31263$
$S = 0.01$
$S^{1/2} = 0.10$

$Q_D > Q_A$

Therefore, depth $d \approx 0.35'$

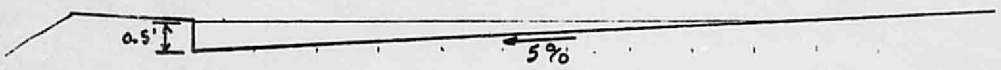
$V = \frac{Q_D}{A} = \frac{9.24}{2.58611}$ $V \approx 3.57$ fps

ENGINEERING CALCULATIONS

PROJECT: Albuquerque, N.M. SHEET NO.: 3 of 8

BY: Bill Rogsdale DATE: 4/6/82

Section 3-3



$$Q = \frac{0.56}{n} z D^{8/3} S^{1/2}$$

$$D = \left(\frac{Q n}{0.56 z S^{1/2}}\right)^{3/8}$$

$$D = \left(\frac{(11.6)(0.013)}{(0.56)(20)(0.10)}\right)^{3/8}$$

$D = 0.4715'$

Depth → $D \approx 0.48'$

Velocity = $\frac{Q}{A}$ → $A = \frac{1}{2}\left(\frac{0.48}{0.05}\right)(0.48') = 2.304$

$V \approx 5.03$ fps

Q = Channel flow = 11.6 cfs
z = Reciprocal of traverse slope = 20
D = Depth in feet = ?
S = Longitudinal slope = 0.01
n = 0.013

ENGINEERING CALCULATIONS

PROJECT: Albuquerque, N.M.

BY: Bill Ragsdale

SHEET NO.: 4 of 8

DATE: 4/7/82

Section 4-4

Actual $Q_A = 3.2$ cfs

Design $Q_D = \frac{1.486}{n} \times A \times R^{2/3} \times S^{1/2}$

$Q_D = \frac{1.486}{0.013} \times 1.35 \times 0.1778 \times 0.10$

$Q_D = 2.74$ cfs

$Q_D \not> Q_A$

$n = 0.013$
let $d = 0.15$
$A = 1.35$
$WP = 18.0045$
$R = 0.075$
$R^{2/3} = 0.1778$
$S = 0.01$
$S^{1/2} = 0.10$

let $d = 0.16$
$A = 1.536$
$WP = 19.205$
$R = 0.080$
$R^{2/3} = 0.1856$
$S^{1/2} = 0.10$

$Q_D = \frac{1.486}{0.013} \times 1.536 \times 0.1856 \times 0.10$

$Q_D = 3.26$ cfs

$Q_D > Q_A$ Therefore depth $d \approx 0.16'$

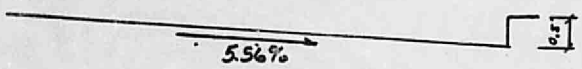
$V = \frac{Q}{A} = \frac{3.26}{1.536}$ $V = 2.12$ fps

ENGINEERING CALCULATIONS

PROJECT: Albuquerque, N.M. SHEET NO.: 5 of 8

BY: Bill Ragsdale DATE: 4/7/82

Section 5-5



$Q = \frac{0.56}{n} Z D^{8/3} S^{1/2}$

$D = \left(\frac{Qn}{0.56 Z S^{1/2}}\right)^{3/8}$

$D = \left(\frac{(1.6)(0.013)}{(0.56)(18)(0.10)}\right)^{3/8}$

$D = 0.233'$

Depth → $D = 0.24'$

$V = \frac{Q}{A}$ → $A = \frac{1}{2}\left(\frac{0.24}{0.0556}\right)(0.24) = 0.5184$

$V = 3.09$ fps

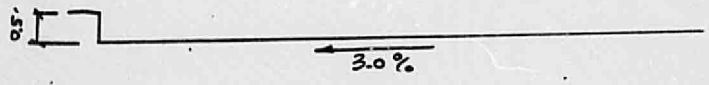
Q = Channel flow = 1.6 cfs
Z = Reciprocal of traverse slope = 18
D = Depth in feet = ?
S = Longitudinal slope = 0.01
n = 0.013

ENGINEERING CALCULATIONS

PROJECT: Albuquerque, N.M. SHEET NO.: 6 of 8

BY: Bill Rossdale DATE: 4/7/82

Section 6-6



$Q = \frac{0.56}{n} z D^{8/3} S^{1/2}$

$D = \left(\frac{Qn}{0.56 z S^{1/2}}\right)^{3/8}$

$D = \left(\frac{(7.45)(0.013)}{(0.56)(33.33)(0.10)}\right)^{3/8}$

$D = 0.3297'$

Q = Channel flow = 7.45 cfs
z = Reciprocal of traverse slope = $33\frac{1}{3}$
D = Depth in feet = ?
S = Longitudinal slope = 0.01
n = 0.013

Depth → $D \approx 0.33'$

Velocity = $\frac{Q}{A}$ → $A = \frac{1}{2}\left(\frac{0.33}{0.03333}\right)(0.33) = 1.6335$

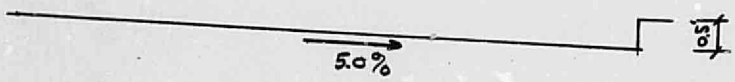
$V = \frac{7.45}{1.6335}$ $V = 4.56$ fps

ENGINEERING CALCULATIONS

PROJECT: Albuquerque, N.M. SHEET NO.: 7 of 8

BY: Bill Ragsdale DATE: 4/7/82

Section 7-7



$Q = \frac{0.56}{n} z D^{8/3} s^{1/2}$

$D = \left(\frac{Qn}{0.56 z s^{1/2}}\right)^{3/8}$

Q = Channel flow = 1.40
z = Reciprocal of traverse slope = 20
D = Depth in Feet = ?
S = Longitudinal slope = 0.01
n = 0.013

$D = \left(\frac{(1.4)(0.013)}{(0.56)(20)(0.10)}\right)^{3/8}$

$D = 0.2133'$

Depth → $D \approx 0.22'$

$V = \frac{Q}{A} \rightarrow A = \frac{1}{2}\left(\frac{0.22}{0.05}\right)(0.22) = 0.484$

$V = \frac{1.4}{0.484}$ $V = 2.89$ fps

ENGINEERING CALCULATIONS

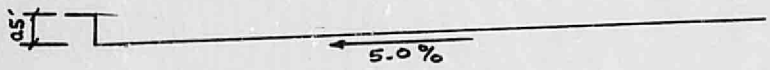
PROJECT: Albuquerque, N.M.

BY: Bill Roysdale

SHEET NO.: 8 of 8

DATE: 4/7/82

Section 8-8



$Q = \frac{0.56}{n} Z D^{8/3} S^{1/2}$

$D = \left(\frac{Qn}{0.56 Z S^{1/2}}\right)^{3/8}$

$D = \left(\frac{(0.76)(0.013)}{(0.56)(20)(0.1118)}\right)^{3/8}$

$D = 0.163'$

Q = Channel Flow = 0.76 cfs
Z = Reciprocal of traverse slope = 20
D = Depth in feet = ?
S = Longitudinal slope = 0.0125
$S^{1/2} = 0.1118$
$n = 0.013$

Depth → $D \approx 0.17'$

Velocity $= \frac{Q}{A}$ → $A = \frac{1}{2}\left(\frac{0.17}{0.05}\right)(0.17) = 0.289$

$V = \frac{0.76}{0.289}$ $V = 2.63$ fps

Retention / Detention Calculations

Area of tract : 20.89 Acres.
Area of offsite drainage tributary to tract : 6.00 Acres.
Total area to be used in design : 26.89 Acres.

Total volume of storage required (A+B):
100 yr storm = 2.2 inches
2.2 inches / 12 inches/FT × 26.89 Ac × 43,560 SF/Ac = 214,743 C.F.
say **215,000 C.F.**

"Required" volume of storage to be retained (A):
2 yr. storm = 1.1 inches
1.1 inches / 12 inches/FT. × 26.89 Ac × 43,560 SF/Ac = 107,372 C.F.
say **107,500 C.F.**

"Provided" volume of storage to be retained (A):
$(\frac{1}{3})$ 125' × 403' × 2' = 33,583 − 633 = 32,950 C.F.
129.3' × 407.3' × 1.44' = 75,836 − 1,036 = +74,800 C.F.
107,750 C.F.
say **107,500 C.F.**

"Required" volume of storage to be detained (B):
215,000 C.F. − 107,500 C.F. = **107,500 C.F.**

"Provided" volume of storage to be detained (B):
139.3' × 417.3' × 1.88' = 109,284 − 1,684 = 107,600 C.F.
say **107,500 C.F.**

Additional volume of storage provided (C):
147.9' × 425.0' × 0.68' = 42,483 − 3,783 = **38,700 C.F.**

Total volume of storage provided (A+B+C):
107,500 C.F. + 107,500 C.F. + 38,700 C.F. = **253,700 C.F.**

Low flow pipe (orifice) shall pass all water in excess of the 2 yr. storm at a rate equal to the existing. (will pass all water except that which is stored in "A")

10 yr. storm = 2.2"
2 yr. storm = - 1.1"
1.1"

1.1 x 0.25 x 26.89 = 7.39 say **8.0 cfs** existing rate

$Q = CA\sqrt{2gh}$

$h = \left(\frac{Q}{CA}\right)^2 / 2g$

$h = \left(\frac{8.0}{(0.5)(1.767)}\right)^2 / 64.4$

C = 0.50
A = 1.767 (18" pipe)
2g = 64.4
Q = 8.0
h = ?

h = 1.27" From inlet control chart h = 1.88'

Overflow (weir) = $Q = CLH^{3/2}$

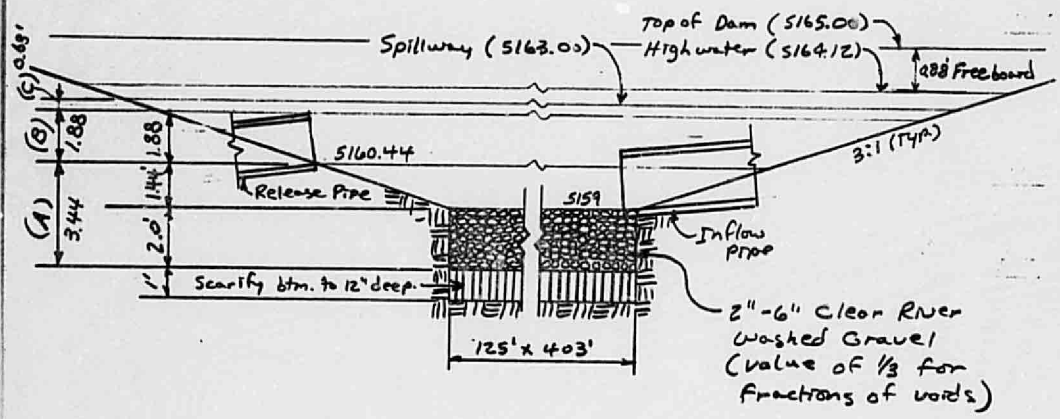
$H = \left(\frac{Q}{CL}\right)^{2/3}$

$H = \left[\frac{53.24}{(3)(15.0)}\right]^{2/3} = 1.12'$

C = 3.00
H = ?
Q = 2.2 x 0.9 x 26.89 = 53.24
L = 15.00

Bottom of Rock	=	5157.00
Rock	= +	2.00
Top of Rock (Bottom of Basin)	=	5159.00
Water Level of Retention	=	5160.44 (Release Elev.)
h (orifice, Inlet Control)	= +	1.88
		5162.32
Freeboard	= +	0.68'
Elevation of Spillway	=	5163.00
h (weir)	= +	1.12
Highwater	=	6164.12
Freeboard	= +	0.88
Top of Dam	=	5165.00

(P.3)


Top of Dam (5165.00)
Spillway (5163.00)
High water (5164.12)
.88' Freeboard
0.68'
(C)
(B)
1.88
1.88
5160.44
3:1 (TYP.)
Release Pipe
5159
(A)
3.44
1.44'
2.0'
Inflow pipe
1'
Scarify btm. to 12" deep.
2"-6" Clear River Washed Gravel (value of 1/3 for fractions of voids)
125' x 403'