CITY OF ALBUQUERQUE

Planning Department
Brennon Williams, Director

Mayor Timothy M. Keller

November 26, 2019

Genny Donart, P.E.
Isaacson & Arfman, P.A.
128 Monroe St. N.E
Albuquerque, NM 87108

RE: **Explora STEM Expansion**
1701 Mountain NW
Grading Plan Stamp Date: 11/22/19
Drainage Supplemental Stamp Date: 11/22/19
Hydrology File: J13D070

Dear Ms. Donart:

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

Based on the submittal received on 11/25/19 the above-referenced submittal is approved for Building Permit and SO-19.

Prior to Certificate of Occupancy (For Information):

1. Engineer's Certification, per the DPM Chapter 22.7: *Engineer's Certification Checklist For Non-Subdivision* is required.
2. The sidewalk culverts must be inspected and approved by Storm Drain Maintenance (Augie Armijo at (505) 857-8607).

If you have any questions, please contact me at 924-3695 or dpeterson@cabq.gov.

Sincerely,

Dana Peterson, P.E.
Senior Engineer, Planning Dept.
Development Review Services

City of Albuquerque

Planning Department

Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET (REV 11/2018)

CITY OF ALBUQUERQUE PROJECT

Project Title: Explora STEM Building Permit #: _____ Hydrology File #: J-13 D070

DRB#: _____ EPC#: _____ Work Order#: _____

Legal Description: Tract B-3-A, Freeway-Old Town Limited

City Address: 1701 Mountain Road NW - Albuquerque, NM 87104

Applicant: Isaacson & Arfman, PA Contact: Genny Donart

Address: 128 Monroe Street NE - Albuquerque, NM 87108

Phone#: (505) 268-8828 Fax#: _____ E-mail: gennyd@iacivil.com

Owner: City of Albuquerque Contact: _____

Address: P.O. Box 1293 - Albuquerque, NM 87103

Phone#: _____ Fax#: _____ E-mail: _____

TYPE OF SUBMITTAL: ____ PLAT (___# OF LOTS) ____ RESIDENCE ____ DRB SITE _X_ ADMIN SITE

IS THIS A RESUBMITTAL?: _____ Yes _X_ No

DEPARTMENT: ____ TRAFFIC/ TRANSPORTATION _X_ HYDROLOGY/ DRAINAGE

Check all that Apply:

TYPE OF SUBMITTAL:

____ ENGINEER/ARCHITECT CERTIFICATION
____ PAD CERTIFICATION
____ CONCEPTUAL G & D PLAN
_X_ GRADING PLAN
____ DRAINAGE MASTER PLAN
____ DRAINAGE REPORT
____ FLOODPLAIN DEVELOPMENT PERMIT APPLIC
____ ELEVATION CERTIFICATE
____ CLOMR/LOMR
____ TRAFFIC CIRCULATION LAYOUT (TCL)
____ TRAFFIC IMPACT STUDY (TIS)
_X_ OTHER (SPECIFY) Supplemental Information
____ PRE-DESIGN MEETING?

TYPE OF APPROVAL/ACCEPTANCE SOUGHT:

_X_ BUILDING PERMIT APPROVAL
____ CERTIFICATE OF OCCUPANCY
____ PRELIMINARY PLAT APPROVAL
____ SITE PLAN FOR SUB'D APPROVAL
____ SITE PLAN FOR BLDG. PERMIT APPROVAL
____ FINAL PLAT APPROVAL
____ SIA/ RELEASE OF FINANCIAL GUARANTEE
FOUNDATION PERMIT APPROVAL
_X_ GRADING PERMIT APPROVAL
_X_ SO-19 APPROVAL
____ PAVING PERMIT APPROVAL
____ GRADING/ PAD CERTIFICATION
____ WORK ORDER APPROVAL
____ CLOMR/LOMR
____ FLOODPLAIN DEVELOPMENT PERMIT
____ OTHER (SPECIFY) _____

DATE SUBMITTED: November 22, 2019 By: Genny Donart

COA STAFF: ELECTRONIC SUBMITTAL RECEIVED: _____

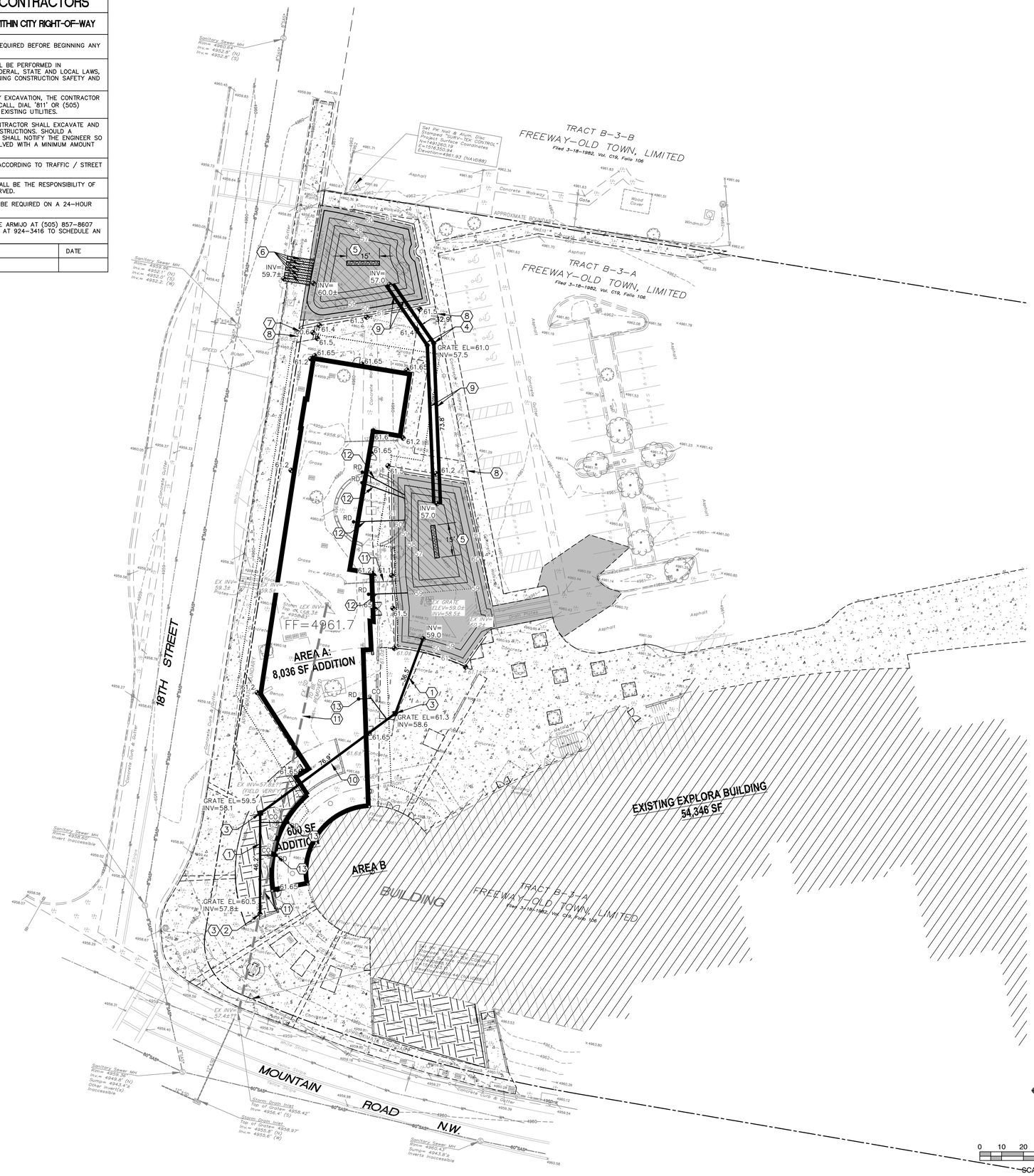
FEE PAID: _____

S.O.19 : NOTICE TO CONTRACTORS

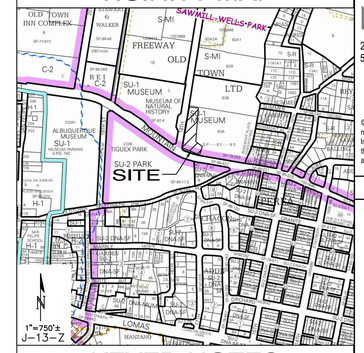
PRIVATE DRAINAGE FACILITES WITHIN CITY RIGHT-OF-WAY

1	AN EXCAVATION PERMIT WILL BE REQUIRED BEFORE BEGINNING ANY WORK WITHIN CITY RIGHT-OF-WAY.
2	ALL WORK ON THIS PROJECT SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL LAWS, RULES AND REGULATIONS CONCERNING CONSTRUCTION SAFETY AND HEALTH.
3	TWO WORKING DAYS PRIOR TO ANY EXCAVATION, THE CONTRACTOR MUST CONTACT NEW MEXICO ONE CALL, DIAL '811' OR (505) 260-1990, FOR THE LOCATION OF EXISTING UTILITIES.
4	PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL EXCAVATE AND VERIFY THE LOCATIONS OF ALL OBSTRUCTIONS. SHOULD A CONFLICT EXIST, THE CONTRACTOR SHALL NOTIFY THE ENGINEER SO THAT THE CONFLICT CAN BE RESOLVED WITH A MINIMUM AMOUNT OF DELAY.
5	BACKFILL COMPACTION SHALL BE ACCORDING TO TRAFFIC / STREET USE.
6	MAINTENANCE OF THE FACILITY SHALL BE THE RESPONSIBILITY OF THE OWNER OF THE PROPERTY SERVED.
7	WORK ON ARTERIAL STREETS MAY BE REQUIRED ON A 24-HOUR BASIS.
8	CONTRACTOR MUST CONTACT AUGIE ARMIJO AT (505) 857-8607 AND CONSTRUCTION COORDINATION AT 924-3416 TO SCHEDULE AN INSPECTION.

APPROVAL	NAME	DATE
INSPECTOR		



VICINITY MAP



KEYED NOTES

1. INSTALL 8" ADS N-12 WATER TIGHT HDPE STORM DRAIN AT INVERTS SHOWN IN PLAN.
2. CONNECT NEW STORM PIPE TO EXISTING STORM DRAIN. REMOVE AND PROPERLY DISPOSE OF STORM DRAIN NORTH OF CONNECTION POINT.
3. INSTALL 24" NYLOPLAST BASIN WITH LOCKING BEEHIVE GRATE.
4. INSTALL 6" INLINE AREA DRAIN.
5. INSTALL INFILTRATION TRENCH PER DETAIL ON SHEET CG-501.
6. INSTALL 5-18" WDE SIDEWALK CULVERT PER DETAIL ON SHEET CG-501 AS AN EMERGENCY OVERFLOW FOR THE DETENTION POND.
7. 2-6" HIGH STEPS.
8. TIE TO EXISTING SIDEWALK.
9. INSTALL 2-18" ADS N-12 WATER TIGHT HDPE STORM DRAINS AT INVERTS SHOWN IN PLAN.
10. INSTALL 8" I.D. CAST IRON PIPE UNDER BUILDING AT INVERTS SHOWN. USE MANUFACTURER RECOMMENDED PARTS TO CONNECT TO NYLOPLAST BASIN.
11. REMOVE & DISPOSE OF EXISTING STORM DRAIN.
12. 3" PVC PIPE CONNECTED TO ROOF DRAIN AND DISCHARGING TO POND AT 1% MIN. SLOPE.
13. 3" PVC PIPE CONNECTED TO ROOF DRAIN AND DISCHARGING TO STORM DRAIN AT 1% MIN SLOPE. INSTALL A SINGLE CLEAN OUT DOWNSTREAM OF PIPE PENETRATION THROUGH FOUNDATION PER DETAIL ON SHEET CU-101.

LEGEND

- EXISTING CONTOUR
- PROPOSED CONTOUR
- EXISTING SPOT ELEVATION
- PROPOSED SPOT ELEVATION
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- FF=4961.7 PROPOSED FINISHED FLOOR ELEVATION
- PROPOSED INFILTRATION TRENCH
- PROPOSED SIDEWALK CULVERT
- PROPOSED DETENTION PONDING AREA
- PROPOSED WATER QUALITY BASIN

ISAACSON & ARFMAN, P.A.
Consulting Engineering Associates
128 Monroe Street N.E.
Albuquerque, New Mexico 87108
Ph. 505-268-8828 www.iacivil.com
2268 CG-101.dwg Nov 26,2019

STUDIO SW ARCHITECTS
2101 Mountain Road NW Suite B | Albuquerque NM 87104
505-843-9639 | www.studioswarch.com

CONSULTANTS

Architect

Engineer

GENEVIEVE L. DONATO
NEW MEXICO
15088
LICENSED PROFESSIONAL ENGINEER

EXPLORA
STEM

Project Address

Key Plan
NTS

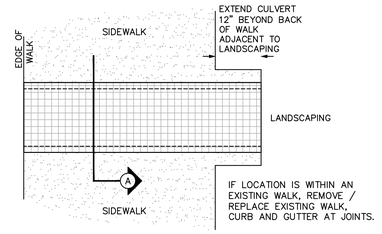
No	Date	Description
Revision Schedule		

ISSUE:	...
PROJECT NUMBER:	...
FILE:	2268 CG-101.dwg
DRAWN BY:	GLD
CHECKED BY:	GLD
DATE:	10/22/19

SHEET TITLE

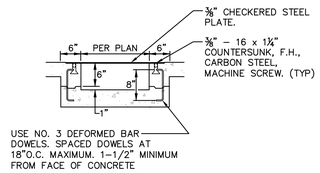
GRADING & DRAINAGE PLAN

CG-101



WELD ⅛" THICK, ⅝" MIN. DIAMETER OVER ALL SCREWS. COMPLETELY COVER SCREW HEADS. GRIND EDGES SMOOTH.

FOR SECURING PLATE USE 1"X5" S.S. ROD ANCHOR, "RED HEAD MULTI-SET II SRM-38 ANCHOR" OR APPROVED EQUAL. INSTALL PER MANUFACTURER'S INSTRUCTIONS AT MAX. 24" O.C., A MINIMUM OF 2 PER SIDE AND ONE WITHIN 6" OF EACH END.

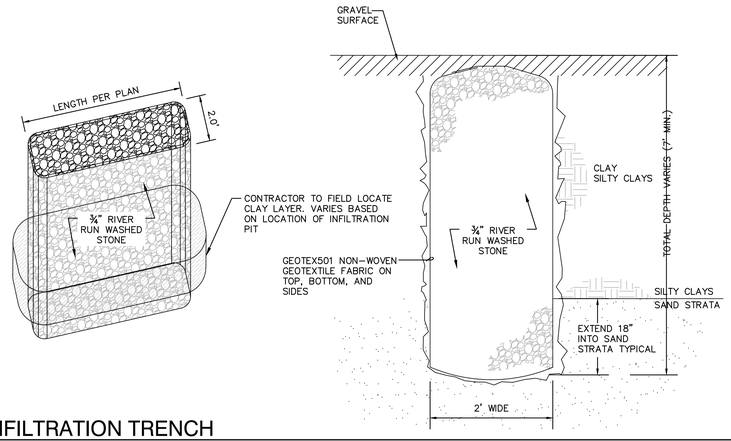


SECTION A

COVERED SIDEWALK CULVERT

CONSTRUCT PER COA STD. DWG 2236 WITH MODIFICATIONS PER THIS DETAIL

SCALE: N.T.S.



INFILTRATION TRENCH

SCALE: N.T.S.

STUDIO SW ARCHITECTS

2101 Mountain Road NW Suite B | Albuquerque NM 87104
505-843-9639 | www.studioswarch.com

CONSULTANTS

Architect

Engineer

EXPLORA
STEM

Project Address

Key Plan
NTS

No	Date	Description
Revision Schedule		

ISSUE:	...
PROJECT NUMBER:	...
FILE:	2268 CG-501.dwg
DRAWN BY:	GLD
CHECKED BY:	GLD
DATE:	10/22/19

SHEET TITLE

GRADING DETAILS

ISAACSON & ARFMAN, P.A.
Consulting Engineering Associates
128 Monroe Street N.E.
Albuquerque, New Mexico 87108
Ph. 505-268-8828 www.iacivil.com

2268 CG-501.dwg Nov 22,2019

CG-501

Isaacson & Arfman, Inc.
EST 1980
Civil Engineering Consultants

128 Monroe Street NE
Albuquerque, NM 87108
505-268-8828 | www.iacivil.com

November 22, 2019

City of Albuquerque
Planning Department
600 2nd St NW
Albuquerque, NM 87103
ATTN: Mr. Dana Peterson, PE

RE: Explora STEM Expansion (J13D070)
Response to Comments

Dear Mr. Peterson:

I have responded to your comments in the following manner:

1. *The site must demonstrate adequate downstream capacity per § 14-5-2-12(G) of the Albuquerque Code of Ordinances. The policy cited to allow free discharge on infill projects is not supported by the Drainage Ordinance and is no longer being perpetuated. However, Hydrology will honor the previously approved discharge of 8.6 cfs from basin A as the allowable discharge for this expansion.*

   The ponds were reconfigured to allow for more capacity and thereby decreased the peak discharge to 8.4 cfs.

2. *An SO-19 Permit will be required and should be included on the request. Please include the standard SO-19 notes on the grading plan. Alternatively, you could use the sidewalk as a spillway; Sidewalk culverts are only required on collector and above roads.*

   SO 19 Permit language and signature block was added to the plans.

3. *The SWQ Pond volume calcs are off by 10' (4966' instead of 4956').*

   The elevations in the pond volume calculations have been fixed. Thank you.

4. *As a reminder, if the project total area of disturbance (including the staging area and any work within the adjacent Right-of-Way) is 1 acre or more, then an Erosion and Sediment Control (ESC) Plan and Owner's certified Notice of Intent (NOI) is required to be submitted to the Stormwater Quality Engineer (Doug Hughes, PE, jhughes@cabq.gov, 924-3420) 14 days prior to any earth disturbance.*

   The contractor will provide the ESC and NOI prior to pulling a grading permit.

Sincerely,
Isaacson & Arfman, Inc.

Genevieve Donart, PE
GD/gld

attachments

NOVEMBER 22, 2019

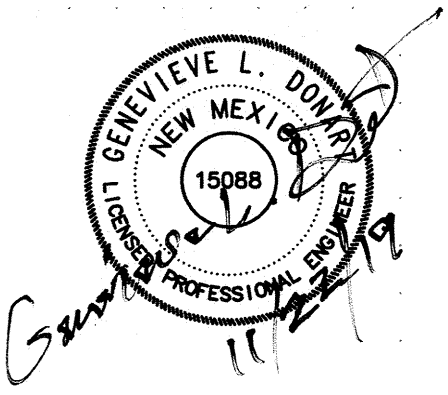
SUPPLEMENTAL INFORMATION

FOR

EXPLORA STEM
GRADING & DRAINAGE PLAN

BY

ISAACSON & ARFMAN, P.A.
Consulting Engineering Associates
128 Monroe Street N.E.
Albuquerque, New Mexico 87108
Ph. 505-268-8828 Fax. 505-268-2632



The Explora STEM project is a 8,636 sf addition to the Explora site, including new classrooms and maker spaces, and a cafe. The addition will be placed on the west side of the project within an area currently occupied by approximately 6,940 cu. ft. detention ponds.

EXISTING CONDITIONS:

This site was originally built with a grading & drainage plan by Jeff Mortensen & Associates dated 09/04/2002. (See as-builts attached.) Per the existing drainage plan, the new addition is within Basin A. This Basin drains west to the detention pond. It currently discharges a combined 8.6 cfs to a storm inlet in the bottom of the pond and 3 sidewalk culverts on 18th Street. The storm inlet drains through a 6 inch pipe towards a public inlet in Mountain Ave. Basin A includes 3.07 acres and has 21% type B and 79% type D land treatment. The original grading and drainage plan allowed for "free discharge of fully developed runoff from this site..justified because the proposed construction consists of construction with an infill area discharge directly to public right-of-way without flooding indentified in the right-of-way...detention ponding would be used to mitigate the proposed increase in runoff and to restrict discharge to the existing peak rate [of 19.8 cfs]."

PROPOSED CONDITIONS:

The proposed additions replace existing sidewalks and detention ponds with building and sidewalk and new ponds. The addition changes the land treatments within Basin A as follows:

Basin A Land Treatment Type	Exisitng Condition	Proposed Condition
B	21% (28,046 sf)	17% (22,824 sf)
D	79% (105,505 sf)	83% (110,726 sf)

See attached Land Treatment Exhibit for the limits of existing and proposed pervious areas.

Per the proposed grading & drainage plan, ponding will remain on the east side of the building, and a landscape area to the north of the building will become a detention pond for a combined detention volume of 5,987 cu. ft.

Since the new building eliminates the existing inlet at the bottom of the pond and blocks access to the exisitng sidewalk culverts, a new drainage path from the ponds to discharge locations must be established. 2-18" pipes connect the new ponds to maintain equilibrium. A new storm inlet captures water from the elevation 4959.0 within the ponds and discharges it to the existing storm drain in Mountain Ave. Five new sidewalk culverts discharge any stormwater that reaches an elevation of 4960.0 to 18th St.

In a 100-year storm, the site will discharge 8.4 cfs from the site, which is below the previously discharged 8.6 cfs.

The bottom portion of the ponds (below 4959.0) will act as a water quality basin with a combined capacity of 3,757 cu. ft., which is more than the 3,137 cu. ft. required.

Record Drawings
November 2002

THESE RECORD DRAWINGS INCLUDE ALL KNOWN CHANGES TO THE WORK THAT OCCURRED DURING CONSTRUCTION AS A RESULT OF CHANGE ORDERS, SUPPLEMENTAL INSTRUCTIONS AND FIELD CONDITIONS. THESE DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE CONTRACTOR. MAHLMAN & MILES, ARCHITECTS WILL NOT BE RESPONSIBLE FOR ERRORS AND OMISSIONS INCORPORATED INTO THESE DOCUMENTS AS A RESULT.

SCALE: 1" = 30'

ANNEX
MUSEUM OF NATURAL HISTORY AND SCIENCE
(existing)

EXISTING BUILDING
FF=4959.9±

FUTURE ADDITION
(N.I.C.)

TRACT B-3-B

NORTH BASIN BOUNDARY= PROJECT LIMITS FOR BASIN COMPARISON

VALLEY GUTTER RE-ROUTED

NEW DRIVEPAD W/ INVERT SIMILAR TO ALLY INTERSECTION

CONSTRUCT 4' VALLEY GUTTER

MATCH EXISTING EDGE OF PAVEMENT

1-24" SIDEWALK CULVERT PER COA STD DWG 2236

APPROXIMATE LOCATION OF EXISTING 10' WIDE P.N.M EASEMENT (OVERHEAD) PER PLAT C19-106. SCALED LOCATION CONFLICTS WITH THIS DEPICTION OF EASEMENT.

BASIN D

BASIN A

BASIN B

BASIN C

SUMMER AVENUE N.W. (40' R.O.W.)

MOUNTAIN ROAD NW

18th STREET NW

OLD TOWN ROAD NW

ROSEMONT AVENUE N.W.

New Mexico Museum of Natural History and Science (existing)

EXPLORA SCIENCE CENTER & CHILDREN'S MUSEUM

DETENTION POND
MAX W.S.L.=4957.70
VOL=6,940 CF
(COMBINED)

DETENTION POND
MAX W.S.L. @ 4958.5
VOL=2850 cf

TRACT B-3-A

TRACT 1 OLD TOWN LIMITED

TRACT 2 OLD TOWN LIMITED

TRACT 3 OLD TOWN LIMITED

LOT 1 BLOCK 2 SUMMER GARDEN ADDITION
FILED 6-1-1937, BOOK D1, PAGE 106

LOT 1 BLOCK 1 SUMMER GARDEN ADDITION
FILED 3-30-1979, BOOK B16, PAGE 67

LOT 1 BLOCK 1 SUMMER GARDEN ADDITION
FILED 2-20-1987, BOOK C32, PAGE 198

LOT 1
FILED 2-20-1987, BOOK C32, PAGE 198

LOT A-1
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TIGUEX PARK

Δ = 75°41'42"
R = 25.00'
L = 33.03'
CH. BEARING = N28°44'32"W
CH. DISTANCE = 30.68'

Δ = 13°37'36"
R = 686.20'
L = 163.20'
CH. BEARING = N73°24'12"W
CH. DISTANCE = 162.82'

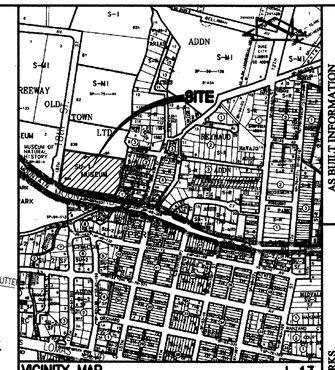
PROJECT BENCHMARK
B-J13A
ELEV.=4956.62 FEET
(SEE NOTE 7, SHEET C2.2)

THIS IS NOT A BOUNDARY SURVEY.
APPARENT PROPERTY CORNERS ARE SHOWN HEREON FOR ORIENTATION ONLY.
BOUNDARY AND TOPOGRAPHIC INFORMATION SHOWN HEREON IS FROM "TOPOGRAPHIC SURVEY AND PRELIMINARY BOUNDARY SURVEY" OF TRACT B-3-A FREEWAY-OLD TOWN LIMITED, BY JEFF MORTENSEN AND ASSOCIATES INC., DATED 5/1995. A FINAL BOUNDARY SURVEY IS PENDING RECEIPT OF TITLE INFORMATION.

2002.003.1
~~921014~~

GRADING PLAN

File Path: E:\MAHLMAN\2002\03\1\
File Name: 20031AB.DWG
Plot Date: 09-04-2002
Plot Time: 11:12 am



VICINITY MAP J-13
SCALE: 1" = 750'

LEGAL DESCRIPTION
TRACTS B-3-A (THE PROPERTY) AND A PORTION OF B-3-B, FREEWAY-OLD TOWN, LIMITED; BOOK C19, PAGE 106, FILED 3-18-1982

PROJECT BENCHMARK
STATION IS A STANDARD A.C.S. BRASS TABLET STAMPED "8-J13A, SET FLUSH WITH THE CURB. STATION IS LOCATED NEAR THE INTERSECTION OF MOUNTAIN RD. N.W. AND 18TH STREET N.W. AS SHOWN ON THE DRAWING.
ELEVATION = 4956.62 FEET (M.S.L.D.)

T.B.M.
T.B.M. #1
A BRIDGE SPIKE ON THE WEST FACE OF A WOOD POWER POLE LOCATED NEAR THE NORTHEAST CORNER OF THE PROPERTY AND OPPOSITE THE DEAD-END OF ROSEMONT ST. N.W.
ELEVATION = 4959.61 FEET (M.S.L.D.)

T.B.M. #2
A "□" CHISELED ON THE TOP OF CURB OF 18TH ST. N.W. AT THE N.W. CORNER OF THE PROPERTY.
ELEVATION = 4957.60 FEET (M.S.L.D.)

LEGEND

TC	TOP OF CURB
FL	FLOWLINE
TA	TOP OF ASPHALT
EA; E/A	EDGE OF ASPHALT
W.V.	WATER VALVE
W.M.	WATER METER
TO	TOP OF CONCRETE
T.R.	TELEPHONE RISER
E.C.	ELECTRIC CONDUIT
U/G T	UNDERGROUND TELEPHONE
W.C. RAMP	WHEELCHAIR RAMP
H.C. SIGN	HANDICAP SIGN
O.H.	OVERHEAD
S.V.B.	SPRINKLER VALVE BOX
A.S.V.	ANTI-SIPHON VALVE
RD	ROOF DRAIN
C.O.	CLEAN-OUT
DBL. C.O.	DOUBLE CLEAN-OUT
NG	NATURAL GRADE
U/G	UNDERGROUND
HVAC	HEATING/VENTILATION/AIR CONDITIONING
X-FMR	TRANSFORMER
S.G.P.	STEEL GUARD POST
P.P.	POWER POLE
CL	CENTERLINE
COV. CONC.	COVERED CONCRETE
SW	TOP OF SIDEWALK
TW	TOP OF WALL
FH	FIRE HYDRANT
L.P.	LIGHT POLE
*	STUMP
	EXISTING CONTOUR
	SMALL SHRUB
	DECIDUOUS TREE
	TREE LINE
60.70	HIGH POINT
	PROPOSED SPOT ELEV.
80	PROPOSED CONTOUR
	FLOWLINE
	SHEETFLOW
	RETAINING WALL
	ROOF DRAINAGE

RECORD INFORMATION
RECORD INFORMATION
RECORD INFORMATION
RECORD INFORMATION
= AS DESIGNED

JEFF MORTENSEN & ASSOCIATES, INC.
☐ 6600-B MIDWAY PARK BLVD. N.E.
☐ ALBUQUERQUE ☐ NEW MEXICO 87109
☐ ENGINEERS ☐ SURVEYORS (505) 345-4250

MAHLMAN & MILES ARCHITECTS

AS BUILT INFORMATION
CONTRACTOR New Mexico Som Corp. Inc.

WORK PERFORMED BY	DATE
INSPECTORS ACCEPTANCE BY	J.G.M. DATE 03-02
VERIFICATION BY	B.K.M. DATE 03-02
CONTRACTOR CERTIFICATION BY	J.M.A. DATE 08-02

MICRO-FILM INFORMATION
RECORDED BY: DATE:
NO.:

BENCH MARKS

SURVEY INFORMATION
FIELD NOTES

NO.	BY	DATE
921012	JMA	03-95
921012	JMA	12-98
	Mc Clintock Surveying and Drafting Inc.	1-14-02
		1-21-02
		9-03-02

SEAL
NEW MEXICO JEFFREY S. MORTENSEN 8547 REGISTERED PROFESSIONAL ENGINEER
03-26-2002
09-04-2002
09-27-99

NO.	DESIGN	DATE	REMARKS	BY
	DRAINAGE CERTIFICATION FOR PERMANENT C.O.	09-1999		C.J.S.
	DRAINAGE CERT. FOR TEMPORARY C.O.	09-1999		C.J.S.
1		08/02	RECORD INFORMATION	
2		03/03	RECORD INFORMATION	
NO.	DESIGNED BY	DATE	REMARKS	BY
	DESIGNED BY: G.M.	09-1999		
	DRAWN BY: D.L.M.	09-1999		
	CHECKED BY: J.G.M.	09-1999		

CITY OF ALBUQUERQUE
CAPITAL IMPLEMENTATION PROGRAM

EXPLORA SCIENCE CENTER & CHILDREN'S MUSEUM
MOUNTAIN ROAD & EIGHTEENTH STREET NW

GRADING PLAN

Design Review Committee	City Engineer Approval	Last Design Update	Mo./Day/Yr.	Mo./Day/Yr.

City Project No.	Zone Map No.	DWG.	SHEET	Of
4394-PHASE 1	J-13	C2.1	11	227

DRAINAGE PLAN

I. EXECUTIVE SUMMARY & INTRODUCTION:
THE EXPLORA SCIENCE CENTER AND CHILDREN'S MUSEUM IS A PROPOSED PUBLIC BUILDING LOCATED IN THE OLD TOWN AREA AT THE NORTHEAST CORNER OF THE INTERSECTION OF 18TH STREET NW AND MOUNTAIN ROAD NW. ONSITE DRAINAGE WILL MOSTLY BE DIRECTED TO ONSITE DETENTION PONDS THROUGH A COMBINATION OF SHEET DRAINAGE AND CONCENTRATED FLOW WITHIN GUTTERS. OFFSITE FLOWS DO NOT IMPACT THIS SITE. THE PROPOSED DETENTION PONDS WILL REDUCE THE PEAK RATE OF DISCHARGE FROM THIS SITE TO A LEVEL LESS THAN EXISTING. THE DRAINAGE CONCEPTS PRESENTED HEREIN ARE CONSISTENT WITH THOSE ESTABLISHED BY THE CONCEPTUAL GRADING AND DRAINAGE PLAN FOR THE SITE DATED 06/30/98 (J13/D70). THE PURPOSE OF THIS PLAN IS TO OBTAIN BUILDING PERMIT AND WORK ORDER APPROVALS. WORK ORDER APPROVAL IS BEING REQUESTED BECAUSE THE CONSTRUCTION CONTRACT FOR THIS PUBLIC PROJECT WILL BE A CITY WORK ORDER. A DPM DESIGN VARIANCE IS REQUESTED IN CONJUNCTION WITH THE SUBMITTAL. THIS VARIANCE IS FOR A PROPOSED CURB & GUTTER ALONG THE NORTH EDGE OF THE SITE WHICH WILL BE CONSTRUCTED AT A DESIGN GRADE OF 0.0025 WHICH IS LESS THAN THE MINIMUM SLOPE TYPICALLY REQUIRED OF 0.005 FOR FLOWLINES. THIS SLOPE IS NECESSITATED BY EXISTING GRADE CONSTRAINTS. CONSTRUCTION ON THIS SITE IS PURSUANT TO A SITE DEVELOPMENT PLAN WHICH HAS NOT BEEN APPROVED AT THE TIME OF THIS PLAN PREPARATION. THERE IS AN INFRASTRUCTURE LIST ASSOCIATED WITH THIS SITE DEVELOPMENT PLAN WHICH IDENTIFIES A PUBLIC BUSBAY WITHIN 18TH STREET NW. THERE ARE NO PLATTING OR DRAINAGE EASEMENTS PROPOSED AS PART OF THIS PROJECT.

II. PROJECT DESCRIPTION:
AS SHOWN BY THE VICINITY MAP, THE SITE IS LOCATED WITHIN OLD TOWN EAST OF THE NATURAL HISTORY MUSEUM AND NORTH OF TIGUEX PARK. THE SITE LIES WITHIN THE JURISDICTION OF THE CITY OF ALBUQUERQUE (ZONE ATLAS PAGE J-13). THE LEGAL DESCRIPTION OF THE SITE IS "TRACT B-3-A, FREEWAY-OLD TOWN, LIMITED". A PORTION OF THIS WORK WILL BE CONSTRUCTED ON TRACT B-3-B, FREEWAY-OLD TOWN, LIMITED, WHICH IS THE EXISTING MUSEUM OF NATURAL HISTORY AND SCIENCE ANNEX BUILDING. THIS SITE IS ZONED SU-1 FOR MUSEUM. THE PROPOSED CONSTRUCTION IS CONSISTENT WITH THE EXISTING ZONING AND IS PURSUANT TO A SITE DEVELOPMENT PLAN.
AS SHOWN BY PANEL 331 OF 825 OF THE NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAPS FOR BERNALILLO COUNTY, NEW MEXICO, AND INCORPORATED AREAS, DATED SEPTEMBER 20, 1996, THIS SITE DOES NOT LIE WITHIN A DESIGNATED FLOOD HAZARD ZONE. HOWEVER, IT IS RECOGNIZED THAT MOUNTAIN ROAD NW HAS LIMITED DRAINAGE CAPACITY. IN RECOGNITION OF THIS LIMITED CAPACITY, DETENTION PONDING IS PROPOSED BY THIS DEVELOPMENT. A PRE-DESIGN CONFERENCE FOR THIS SITE HELD DECEMBER 12, 1992 CONTAINED THE FINDING THAT FREE DISCHARGE WAS JUSTIFIED FOR THIS SITE. DESPITE THIS FINDING, DETENTION PONDING IS PROPOSED AS PART OF THIS DEVELOPMENT IN ORDER TO REDUCE THE PEAK RATE OF DISCHARGE LEAVING THIS SITE. THE PROPOSED DETENTION PONDS WILL BE CONTAINED WITHIN LANDSCAPED AREAS. THE SURROUNDING AREA IS FULLY DEVELOPED MAKING THIS NEW CONSTRUCTION WITHIN AN INFILL AREA.

III. BACKGROUND DOCUMENTS
THE FOLLOWING IS A SUMMARY OF RELEVANT PLANS WHICH ARE KNOWN TO THIS ENGINEER.
A. CONCEPTUAL GRADING & DRAINAGE PLAN FOR EXPLORA SCIENCE CENTER, ENGINEER'S STAMP 06/30/98, CITY OF ALBUQUERQUE HYDROLOGY FILE NO. J-13/D70. THE PURPOSE OF THIS CONCEPTUAL GRADING & DRAINAGE PLAN PREPARED BY JEFF MORTENSEN & ASSOCIATES WAS TO SUPPORT THE SITE DEVELOPMENT PLAN FOR BUILDING PERMIT FOR THE SUBJECT PROJECT. THIS PLAN WAS APPROVED BY THE CITY OF ALBUQUERQUE ON JULY 24, 1998. THIS PLAN ESTABLISHED A CONCEPT WHEREBY PROPOSED DEVELOPMENT WILL UTILIZE ONSITE DETENTION PONDING TO MITIGATE THE INCREASE IN RUNOFF GENERATED BY THE PROPOSED CONSTRUCTION. THE PLAN PROPOSED HEREIN IS CONSISTENT WITH THAT CONCEPTUAL PLAN. IN THE APPROVAL LETTER FOR THAT CONCEPTUAL PLAN, IT WAS REQUIRED THAT THE ENGINEER PRESENT THIS SUBSEQUENT PLAN USING THE "SO-19 FORMAT" FOR NOTES AND SIGNOFF BLOCK TO ADDRESS THE CONSTRUCTION OF PROPOSED SIDEWALK CULVERTS. BECAUSE THIS PROJECT IS BEING CONSTRUCTED BY WORK ORDER, THIS IS NOT NECESSARY ON THIS SUBMITTAL, AND THEREFORE THAT COMMENT HAS NOT BEEN ADDRESSED BY THIS RESUBMITTAL. THE APPROVAL LETTER FOR THE CONCEPTUAL PLAN ALSO QUESTIONED THE EROSION AND SEDIMENT CONTROLS FOR THE PONDING AREAS. AS PREVIOUSLY INDICATED, THE PONDING AREAS WILL BE LOCATED IN LANDSCAPED AREAS CONSISTING OF A COMBINATION OF VEGETATION, GRAVEL AND OTHER HARD FEATURES. SPECIAL ATTENTION WILL BE GIVEN TO THE POND INLET AND OUTLET AREAS TO ENSURE THAT THESE SUSCEPTIBLE AREAS ARE PROVIDED WITH ADEQUATE EROSION PROTECTION.
B. CITY PROJECT NO. 439490. THIS WORK ORDER PROJECT IS FOR PRELIMINARY SITE WORK TO RECONSTRUCT THE CURB RETURN AT THE SOUTHWEST CORNER OF THIS SITE. THIS PROJECT WILL ALSO CONSTRUCT WATER AND SANITARY SEWER STUBOUTS AND A BLOCK WALL ON THE EAST SIDE OF THE PROPERTY. AT THIS TIME OF PLAN PREPARATION, THIS PROJECT HAS NOT YET BEEN CONSTRUCTED. IT IS THE INTENTION THAT THIS INITIAL WORK ORDER IS COMPLETED PRIOR TO THE BUILDING CONTRACT.
C. SITE DEVELOPMENT PLAN FOR BUILDING PERMIT FOR THE EXPLORA SCIENCE CENTER AND CHILDREN'S MUSEUM PREPARED BY MAHLMAN & MILES ARCHITECTS (Z98-86, DRB 98-366). AS THE TIME OF PLAN PREPARATION, THE SITE DEVELOPMENT PLAN HAD NOT YET BEEN APPROVED.

IV. EXISTING CONDITIONS:
THIS SITE IS CURRENTLY UNDEVELOPED. THE EXISTING TERRAIN IS VERY FLAT WITH A GENERAL DRAINAGE PATTERNS TENDING FROM NORTHEAST TO SOUTHWEST TOWARD THE INTERSECTION OF 18TH STREET NW AND MOUNTAIN ROAD NW. EXISTING SITE RUNOFF DISCHARGES TO THE PUBLIC RIGHTS-OF-WAYS AT THIS INTERSECTION. OFFSITE FLOWS DO NOT ENTER THE SITE FROM THE PUBLIC STREETS TO THE WEST AND SOUTH, OR FROM THE EXISTING DEVELOPED RESIDENTIAL NEIGHBORHOOD TO THE EAST. OFFSITE FLOWS DO NOT ENTER THE SITE FROM THE NATURAL HISTORY MUSEUM PROPERTY TO THE NORTH WHICH EXHIBITS PARALLEL TOPOGRAPHY. THERE ARE NO ONSITE DRAINAGE FACILITIES. THE EXISTING ADJACENT SITES ARE DEVELOPED MAKING THIS AN INFILL AREA. THE AFOREMENTIONED PUBLIC STREETS ARE FULLY DEVELOPED PUBLIC STREETS WITH CURB AND GUTTER AND SIDEWALK. AS PREVIOUSLY MENTIONED, THERE IS NO MAPPED FLOODPLAIN WITHIN THE DOWNSTREAM PUBLIC STREETS.

V. DEVELOPED CONDITIONS:
THE PROPOSED DEVELOPMENT CONSISTS OF A NEW SCIENCE CENTER/MUSEUM BUILDING WITH ASSOCIATED PAVED PARKING AND LANDSCAPING IMPROVEMENTS. THE PROPOSED DRAINAGE PATTERN OF THE SITE IS CONSISTENT WITH EXISTING PATTERNS IN THAT RUNOFF WILL BE DISCHARGED TO 18TH STREET NW AND MOUNTAIN ROAD NW. THE PROPOSED DEVELOPMENT WILL DIVIDE THE SITE INTO FOUR DRAINAGE BASINS. BASIN A CONSISTS OF THE MAJORITY OF THE PARKING AREA. RUNOFF GENERATED BY THIS BASIN WILL BE DIRECTED TO THE WEST ACROSS PAVED SURFACES AND CONCRETE FLOWLINES WHERE IT WILL ENTER A PROPOSED DETENTION POND WHICH WILL OUTLET TO 18TH STREET NW AT A REDUCED FLOW RATE VIA THREE SIDEWALK CULVERTS. BASIN B COMPRISES THE SOUTHEAST PORTION OF THE SITE AND ITS RUNOFF IS DIRECTED TO A SECOND DETENTION POND. THIS POND WILL OUTLET VIA A SINGLE 24" SIDEWALK CULVERT TO MOUNTAIN ROAD NW. BASIN C IS A SMALL BASIN LOCATED AT THE SOUTHWEST CORNER OF THE SITE WHICH WILL DISCHARGE DIRECTLY TO MOUNTAIN ROAD NW. BASIN D IS ENTIRELY LOCATED ON THE ADJACENT NATURAL HISTORY MUSEUM PROPERTY. THE LIMITS OF BASIN D ARE THE LIMITS OF CONSTRUCTION UPON THE ADJACENT PROPERTY WHICH WILL DRAIN DIRECTLY TO 18TH STREET NW. THIS CONSTRUCTION ON THE ADJACENT PROPERTY WILL BE WITH THE APPROVAL OF THE MUSEUM OF NATURAL HISTORY AND WILL PROVIDE SHARED PARKING FOR THE TWO PUBLIC FACILITIES.
THESE DRAINAGE PATTERNS AND BASINS ARE CONSISTENT WITH THE PREVIOUSLY APPROVED CONCEPTUAL GRADING AND DRAINAGE PLAN FOR THE SITE. THE PREVIOUS PLAN, HOWEVER, DID NOT IDENTIFY BASIN D UPON THE NATURAL HISTORY MUSEUM BECAUSE THAT PARKING LOT EXPANSION WAS NOT A PART OF THE PROJECT AT THE TIME OF PREVIOUS PLAN PREPARATION. FLOWS WITHIN BASIN D WILL BE DIRECTED TO 18TH STREET NW VIA EXISTING DRIVEPAD. THE FLOWS WILL BE CONVEYED ON A PROPOSED VALLEY GUTTER AND CURB AND GUTTER SYSTEM WHICH IS CONSTRUCTED AT A SLOPE OF S = 0.0025. THIS MINIMAL SLOPE IS REQUIRED DUE TO EXISTING GRADE CONSTRAINTS. BY PROVIDING THIS SLOPE, THE PROPERTY EAST OF THE EXISTING MUSEUM OF NATURAL HISTORY AND SCIENCE ANNEX BUILDING WILL NOT BE BLOCKED FROM DRAINING TO 18TH STREET NW IN HISTORIC PATTERNS.
A 24" SIDEWALK CULVERT IS PROPOSED TO CONVEY EXISTING AND PROPOSED RUNOFF FROM THIS AREA TO THE PROPOSED VALLEY GUTTER.
THERE ARE NO DRAINAGE EASEMENTS REQUIRED FOR THIS PROJECT. THERE IS NO PUBLIC DRAINAGE INFRASTRUCTURE REQUIRED FOR THIS PROJECT. THIS PROJECT WILL BE CONSTRUCTED IN A SINGLE PHASE. THERE ARE FUTURE PLANS TO VACATE 18TH STREET NW AND CONSTRUCT A PEDESTRIAN MALL IN THAT AREA. THIS FUTURE CONSTRUCTION WILL BE ACCOMPANIED BY DOWNSTREAM STORM DRAIN IMPROVEMENTS WHICH MAY BE EXTENDED TO THIS SITE. THE PROPOSED ONSITE DETENTION PONDS WILL BE OWNED, OPERATED AND MAINTAINED BY THE CITY OF ALBUQUERQUE ALONG WITH THE MUSEUM. BY LIMITING DISCHARGE FROM THIS SITE TO A LEVEL LESS THAN THAT OF THE EXISTING, THIS SITE WILL NOT ADVERSELY IMPACT DOWNSTREAM PROPERTIES. THE PROPOSED CONSTRUCTION WILL NOT ALTER EXISTING DRAINAGE BASINS. THE PROPOSED IMPROVEMENTS ON THIS SITE CONSIST OF CONSTRUCTION WITHIN AN INFILL AREA. THE PROPOSED DISCHARGE OF DEVELOPED RUNOFF FROM THIS SITE INTO THE PUBLIC STREETS WAS ESTABLISHED BY THE APPROVED CONCEPTUAL GRADING AND DRAINAGE PLAN. THIS CONCEPT IS FURTHERMORE AN OVERALL IMPROVEMENT TO THE DRAINAGE BASIN BY REDUCING THE PEAK RATE OF DISCHARGE FROM THIS SITE. THE PROPOSED DISCHARGE OF RUNOFF FROM THIS SITE AT EXISTING RATES WILL NOT ADVERSELY AFFECT ADJACENT OR DOWNSTREAM PROPERTIES. BECAUSE THIS IS AN INFILL AREA, THE PROPOSED CONSTRUCTION WILL NOT RESTRICT THE ABILITY OF FUTURE SITES TO DEVELOP SIMILARLY.

VI. GRADING PLAN:
THE GRADING PLAN SHOWS: 1) EXISTING GRADES INDICATED BY SPOT ELEVATIONS AND CONTOURS AT 1'-0" INTERVALS AS TAKEN FROM TOPOGRAPHIC SURVEYS PREPARED BY JEFF MORTENSEN & ASSOCIATES, INC. 2) PROPOSED GRADES INDICATED BY SPOT ELEVATIONS AND CONTOURS AT 1?0? INTERVALS, 3) THE LIMIT AND CHARACTER OF THE EXISTING IMPROVEMENTS, 4) THE LIMIT AND CHARACTER OF THE PROPOSED IMPROVEMENTS, AND 5) CONTINUITY BETWEEN EXISTING AND PROPOSED GRADES.

VII. CALCULATIONS:
THE CALCULATIONS, WHICH APPEAR HEREON, ANALYZE BOTH THE EXISTING AND DEVELOPED CONDITIONS FOR THE 100-YEAR, 6-HOUR RAINFALL EVENT. THE PROCEDURE FOR 40-ACRE AND SMALLER BASINS, AS SET FORTH IN THE REVISION OF SECTION 22.2, HYDROLOGY OF THE DEVELOPMENT PROCESS MANUAL, VOLUME 2, DESIGN CRITERIA, DATED JANUARY, 1993, HAS BEEN USED TO QUANTIFY THE PEAK RATE OF DISCHARGE AND VOLUME OF RUNOFF GENERATED. AS SHOWN BY THESE CALCULATIONS, THERE WILL BE A GROSS INCREASE IN THE PEAK RATE OF RUNOFF GENERATED BY THIS SITE DURING THE 100-YEAR RAINFALL EVENT. THIS INCREASE WILL BE MITIGATED BY CONSTRUCTION OF NEW DETENTION PONDS. THE NET RESULT OF THIS DETENTION PONDING WILL BE TO REDUCE THE PEAK RATE OF RUNOFF DISCHARGED TO PUBLIC RIGHT-OF-WAY TO A LEVEL LESS THAN THE EXISTING. HYDROGRAPH CALCULATIONS WERE PERFORMED USING THE PROCEDURES IDENTIFIED IN THE AFOREMENTIONED DESIGN CRITERIA. SIDEWALK CULVERT CALCULATIONS WERE PERFORMED USING THE WEIR EQUATION. AS SHOWN BY THE CALCULATIONS, THE PROPOSED DETENTION PONDS HAVE MORE THAN ADEQUATE CAPACITY TO DETAIN THE 100-YEAR STORM WITHOUT OVERFLOWING. SHOULD THE PONDS OVERFLOW DUE TO CULVERT CLOGGING OR FLOW RATES EXCEEDING THE DESIGN STORM, THE POINTS OF OVERFLOW WILL BE AT THE SIDEWALK CULVERTS AND DIRECTLY TO THE PUBLIC STREETS.

VIII. CONCLUSION:
PROPOSED HEREIN IS A PUBLIC MUSEUM BUILDING WHICH WILL DRAIN TO EXISTING PUBLIC STREETS IN HISTORIC PATTERNS AT A REDUCED RATE OF DISCHARGE. THIS REDUCTION WILL BE ACCOMPLISHED VIA DETENTION PONDING. FREE DISCHARGE OF FULLY DEVELOPED RUNOFF FROM THIS SITE WAS PERMITTED PURSUANT TO FINDINGS IN THE PRE-DESIGN MEETING FOR THIS SITE. THIS FREE DISCHARGE WAS JUSTIFIED BECAUSE THE PROPOSED CONSTRUCTION CONSISTS OF CONSTRUCTION WITHIN AN INFILL AREA DISCHARGING DIRECTLY TO PUBLIC RIGHT-OF-WAY WITHOUT FLOODING IDENTIFIED WITHIN THE RIGHT-OF-WAY. THE CONCEPTUAL GRADING AND DRAINAGE PLAN FOR THIS SITE ESTABLISHED A CONCEPT IN WHICH DETENTION PONDING WOULD BE USED TO MITIGATE THE PROPOSED INCREASE IN RUNOFF AND TO RESTRICT DISCHARGE TO THE EXISTING PEAK RATE. THE PROPOSED DISCHARGE IS JUSTIFIED BY THE CONCEPTUAL GRADING AND DRAINAGE PLAN, THE FINDINGS OF THE PRE-DESIGN CONFERENCE, THE LACK OF MAPPED DOWNSTREAM FLOODING, AND THE FACT THAT THE PROPOSED DISCHARGE WILL NOT ADVERSELY AFFECT ADJACENT OR DOWNSTREAM PROPERTIES OR FUTURE DEVELOPMENT. THERE IS ONE DESIGN VARIANCE REQUESTED FOR THIS PROJECT TO ALLOW FOR THE CONSTRUCTION OF A VALLEY GUTTER AND CURB AND GUTTER AT A SLOPE OF S = 0.0025. THIS SLOPE IS REQUIRED TO ALLOW EXISTING FLOWS FROM THE ADJACENT NATURAL HISTORY MUSEUM TO PASS TO THEIR HISTORIC OUTFALL TO 18TH STREET NW. THERE ARE NO DRAINAGE EASEMENTS REQUIRED FOR THIS PROJECT. MAINTENANCE OF THIS FACILITY WILL BE BY THE CITY OF ALBUQUERQUE AS THIS IS A PUBLIC CITY-OWNED AND OPERATED MUSEUM.

CALCULATIONS

I. SITE CHARACTERISTICS
A. PRECIPITATION ZONE = 2
B. $P_{6,100} = P_{360} = 2.35$ IN.
C. TOTAL CONSTRUCTION AREA (A_T) = 272,100 SF/6.25 AC
D. EXISTING LAND TREATMENT

TREATMENT	AREA (SF/AC)	%
B	5,520/0.13	02
C	258,080/5.92	95
D	8,500/0.20	03

E. DEVELOPED LAND TREATMENT

TREATMENT	AREA (SF/AC)	
1. BASIN A	133,550/3.07	
B	27,880/0.64	21
D	105,670/2.43	79
2. BASIN B	66,150/1.52	
B	27,350/0.63	41
D	38,800/0.89	59
3. BASIN C	33,290/0.76	
B	12,560/0.29	38
D	20,730/0.48	62
4. BASIN D	39,110/0.90	
B	7,880/0.18	20
C	2,050/0.05	06
D	29,260/0.67	74

II. EXISTING CONDITION
A. VOLUME
$E_W = (E_{A'A}A_A + E_BA_B + E_CA_C + E_DA_D)/A_T$
$E_W = [(0.78)(0.13)+(1.13)(5.92)+(2.12)(0.20)]/6.25 = 1.15$ IN.
$V_{100} = (E_W/12)A_T$
$V_{100} = (1.15/12)(272,100) = 26,080$ CF
B. PEAK DISCHARGE
$Q_P = Q_{PA'A}A_A + Q_{PB}A_B + Q_{PC}A_C + Q_{PD}A_D$
$Q_P = Q_{100} = (2.28)(0.13)+(3.14)(5.92)+(4.70)(0.20) = 19.8$ CFS

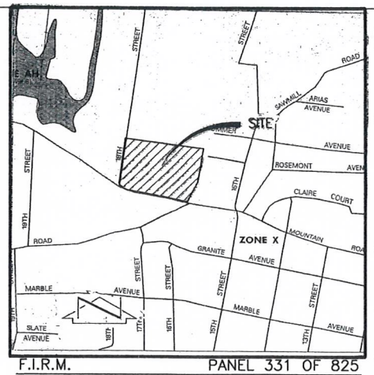
III. DEVELOPED CONDITION
A. BASIN A
1. VOLUME
$E_W = (E_{A'A}A_A + E_BA_B + E_CA_C + E_DA_D)/A_T$
$E_W = [(0.78)(0.64)+(2.12)(2.43)]/(3.07) = 1.84$ IN.
$V_{100} = (E_W/12)A_T$
$V_{100} = (1.84/12)(133,550) = 20,480$ CF
2. PEAK DISCHARGE
$Q_P = Q_{PA'A}A_A + Q_{PB}A_B + Q_{PC}A_C + Q_{PD}A_D$
$Q_P = Q_{100} = (2.28)(0.64)+(4.70)(2.43) = 12.9$ CFS
B. BASIN B
1. VOLUME
$E_W = (E_{A'A}A_A + E_BA_B + E_CA_C + E_DA_D)/A_T$
$E_W = [(0.78)(0.63)+(2.12)(0.89)]/(1.52) = 1.56$ IN.
$V_{100} = (E_W/12)A_T$
$V_{100} = (1.56/12)(66,150) = 8,600$ CF
2. PEAK DISCHARGE
$Q_P = Q_{PA'A}A_A + Q_{PB}A_B + Q_{PC}A_C + Q_{PD}A_D$
$Q_P = Q_{100} = (2.28)(0.63)+(4.70)(0.89) = 5.6$ CFS
C. BASIN C
1. VOLUME
$E_W = (E_{A'A}A_A + E_BA_B + E_CA_C + E_DA_D)/A_T$
$E_W = [(0.78)(0.29)+(2.12)(0.48)]/(0.77) = 1.62$ IN.
$V_{100} = (E_W/12)A_T$
$V_{100} = (1.62/12)(33,290) = 4,490$ CF
2. PEAK DISCHARGE
$Q_P = Q_{PA'A}A_A + Q_{PB}A_B + Q_{PC}A_C + Q_{PD}A_D$
$Q_P = Q_{100} = (2.28)(0.29)+(4.70)(0.48) = 2.9$ CFS
D. BASIN D
1. VOLUME
$E_W = (E_{A'A}A_A + E_BA_B + E_CA_C + E_DA_D)/A_T$
$E_W = [(0.78)(0.18)+(1.13)(0.05)+(2.12)(0.67)]/(0.90) = 1.80$ IN.
$V_{100} = (E_W/12)A_T$
$V_{100} = (1.80/12)(39,110) = 5,870$ CF
2. PEAK DISCHARGE
$Q_P = Q_{PA'A}A_A + Q_{PB}A_B + Q_{PC}A_C + Q_{PD}A_D$
$Q_P = Q_{100} = (2.28)(0.18)+(3.14)(0.05)+(4.70)(0.67) = 3.7$ CFS

IV. COMPARISON
$\Delta V_{100} = (20480+8600+4490+5870)-26,080 = 13,360$ CF (INCREASE)
$\Delta Q_{100} = 19.8 - (8.6+2.9+2.9+3.7) = 1.7$ CFS
(Net decrease due to detention)

BASIN A HYDROGRAPH CALCULATIONS
$Q_{100} = 12.9$ CFS
Q_{OUT} = THREE - 24" SIDEWALK CULVERTS (WEIR EQUATION)
$= 3(CLH^{3/2})$; C = 2.6, L = 2.0'; H = 0.67'
$Q_{OUT} = (3)(2.85$ CFS) = 8.6 CFS
$t_B = (2.107 * E * A_T/Q_P) - (0.25 * A_D/A_T)$
$t_B = (2.107)(1.84)(3.07)/12.9 - (0.25 * (2.43/3.07))$
$t_B = 0.72$ HR
$t_P = (0.7)(t_C) + ((1.6 - (A_D/A_T))/12$; $t_C = 12$ MINUTES (MIN.)
$t_P = 0.21$ HR
CONTINUE PEAK FOR $(0.25)(A_D/A_T) - 0.20$ HR
POND VOLUME REQUIRED = 4,410 CF

BASIN B HYDROGRAPH CALCULATIONS
$Q_{100} = 5.6$ CFS
Q_{OUT} = ONE - 24" SIDEWALK CULVERT (WEIR EQUATION)
$= 3(CLH^{3/2})$; C = 2.6, L = 2.0'; H = 0.67'
$Q_{OUT} = 2.9$ CFS
$t_B = (2.107 * E * A_T/Q_P) - (0.25 * A_D/A_T)$
$t_B = (2.107)(1.56)(1.52)/5.6 - (0.25)(0.89)/(1.52)$
$t_B = 0.75$ HR
$t_P = (0.7)(t_C) + ((1.6 - (A_D/A_T))/12$; $t_C = 12$ MINUTES (MIN.)
$t_P = 0.22$ HR
CONTINUE PEAK FOR $(0.25)(A_D/A_T) - 0.15$ HR
POND VOLUME REQUIRED = 2,670 CF

POND VOLUME CALCULATIONS
A. BASIN A - MAX W.S.L. = 4957.7
1. WEST HALF OF POND
$V = 1/2(A_{57.7} + A_{56.7})$
$V = 1/2(3400 + 2310)$
$V = 2850$ CF
2. EAST HALF OF POND
$V = 1/2(A_{57.7} + A_{56.7})$
$V = 1/2(4650 + 3530)$
$V = 4090$ CF
3. $V_{Total} = 2850 + 4090 = 6940$ CF > $V_{Required}$
B. BASIN B - MAX W.S.L. = 4958.5
$V = 1/2(A_{58} + A_{58.5})(0.5)$
$V = 1/2(5400 + 6000)(0.5)$
$V = 2850$ CF > $V_{Required}$

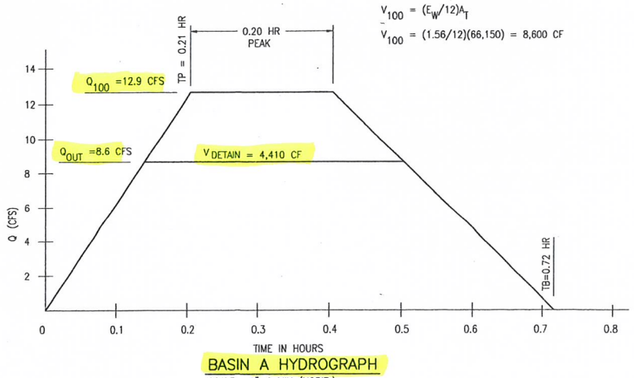


F.I.R.M. PANEL 331 OF 825
SCALE: 1"=500'

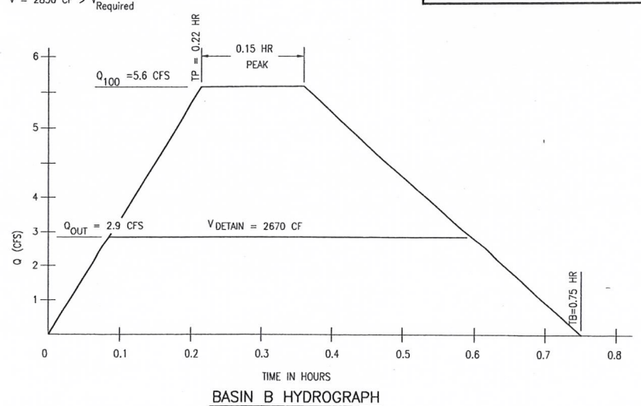
EROSION CONTROL MEASURES:
1. THE CONTRACTOR SHALL ENSURE THAT NO SOIL ERODES FROM THE SITE INTO PUBLIC RIGHT-OF-WAY OR ONTO PRIVATE PROPERTY.
2. THE CONTRACTOR SHALL PROMPTLY CLEAN UP ANY MATERIAL EXCAVATED WITHIN THE PUBLIC RIGHT-OF-WAY SO THAT THE EXCAVATED MATERIAL IS NOT SUSCEPTIBLE TO BEING WASHED DOWN THE STREET.
3. THE CONTRACTOR SHALL SECURE "TOPSOIL DISTURBANCE PERMIT" PRIOR TO BEGINNING CONSTRUCTION.

CONSTRUCTION NOTES:
1. TWO (2) WORKING DAYS PRIOR TO ANY EXCAVATION, CONTRACTOR MUST CONTACT NEW MEXICO ONE CALL SYSTEM 260-1990 (ALBUQUERQUE AREA), 1-800-321-ALERT(2537) (STATEWIDE), FOR LOCATION OF EXISTING UTILITIES.
2. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL EXCAVATE AND VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF ALL POTENTIAL OBSTRUCTIONS. SHOULD A CONFLICT EXIST, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING SO THAT THE CONFLICT CAN BE RESOLVED WITH A MINIMUM AMOUNT OF DELAY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL INTERPRETATIONS IT MAKES WITHOUT FIRST CONTACTING THE ENGINEER AS REQUIRED ABOVE.
3. ALL WORK ON THIS PROJECT SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL LAWS, RULES AND REGULATIONS CONCERNING CONSTRUCTION SAFETY AND HEALTH.
4. ALL CONSTRUCTION WITHIN PUBLIC RIGHT-OF-WAY SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE CITY OF ALBUQUERQUE STANDARDS AND PROCEDURES.
5. IF ANY UTILITY LINES, PIPELINES, OR UNDERGROUND UTILITY LINES ARE SHOWN ON THESE DRAWINGS, THEY ARE SHOWN IN AN APPROXIMATE MANNER ONLY, AND SUCH LINES MAY EXIST WHERE NONE ARE SHOWN. IF ANY SUCH EXISTING LINES ARE SHOWN, THE LOCATION IS BASED UPON INFORMATION PROVIDED BY THE OWNER OF SAID UTILITY, AND THE INFORMATION MAY BE INCOMPLETE, OR MAY BE OBSOLETE BY THE TIME CONSTRUCTION COMMENCES. THE ENGINEER HAS CONDUCTED ONLY PRELIMINARY INVESTIGATION OF THE LOCATION, DEPTH, SIZE, OR TYPE OF EXISTING UTILITY LINES, PIPELINES, OR UNDERGROUND UTILITY LINES. THIS INVESTIGATION IS NOT CONCLUSIVE, AND MAY NOT BE COMPLETE, THEREFORE, MAKES NO REPRESENTATION PERTAINING THERETO, AND ASSUMES NO RESPONSIBILITY OR LIABILITY THEREFOR. THE CONTRACTOR SHALL INFORM ITSELF OF THE LOCATION OF ANY UTILITY LINE, PIPELINE, OR UNDERGROUND UTILITY LINE IN OR NEAR THE AREA OF THE WORK IN ADVANCE OF AND DURING EXCAVATION WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY AND ALL DAMAGE CAUSED BY ITS FAILURE TO LOCATE, IDENTIFY AND PRESERVE ANY AND ALL EXISTING UTILITIES, PIPELINES AND UNDERGROUND UTILITY LINES. IN PLANNING AND CONDUCTING EXCAVATION, THE CONTRACTOR SHALL COMPLY WITH STATE STATUTES, MUNICIPAL AND LOCAL ORDINANCES, RULES AND REGULATIONS, IF ANY, PERTAINING TO THE LOCATION OF THESE LINES AND FACILITIES.
6. THE DESIGN OF PLANTERS AND LANDSCAPED AREAS IS NOT PART OF THIS PLAN. ALL PLANTERS AND LANDSCAPED AREAS ADJACENT TO THE BUILDING(S) SHALL BE PROVIDED WITH POSITIVE DRAINAGE TO AVOID ANY PONDING ADJACENT TO THE STRUCTURE. FOR CONSTRUCTION DETAILS, REFER TO LANDSCAPING PLAN, SHEET L.1
7. THE MAINTENANCE OF ALL DRAINAGE FACILITIES SHOWN HEREON SHALL BE THE RESPONSIBILITY OF THE OWNER OF THE PROPERTY BEING SERVED.
8. CONTRACTOR SHALL NOTIFY THE CITY SURVEYOR NOT LESS THAN SEVEN (7) DAYS PRIOR TO STARTING WORK IN ORDER THAT THE CITY SURVEYOR MAY TAKE NECESSARY MEASURES TO INSURE THE PRESERVATION OF SURVEY MONUMENTS. CONTRACTOR SHALL NOT DISTURB PERMANENT SURVEY MONUMENTS WITHOUT THE CONSENT OF THE CITY SURVEYOR AND SHALL NOTIFY THE CITY SURVEYOR AND SHALL BEAR THE EXPENSE OF REPLACING ANY THAT MAY BE DISTURBED WITHOUT PERMISSION. REPLACEMENT SHALL BE DONE ONLY BY THE CITY SURVEYOR.

Record Drawings
November 2002
THESE RECORD DRAWINGS INCLUDE ALL KNOWN CHANGES TO THE WORK THAT OCCURRED DURING CONSTRUCTION AS A RESULT OF CHANGE ORDERS, SUPPLEMENTAL INSTRUCTIONS AND FIELD CONDITIONS. THESE DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED AND FURNISHED BY THE CONTRACTOR. MAHLMAN & MILES, ARCHITECTS WILL NOT BE RESPONSIBLE FOR ERRORS AND OMISSIONS INCORPORATED INTO THESE DOCUMENTS AS A RESULT.



BASIN A HYDROGRAPH
SCALE: 1"=6 MIN (HORIZ.)
1"=4 CFS (VERT.)



BASIN B HYDROGRAPH
SCALE: 1"=6 MIN (HORIZ.)
1"=2 CFS (VERT.)

921014

DRAINAGE PLAN, NOTES & CALCULATIONS

File Path: E:\MAHLMAN\921018\ | Plot Date: 08-16-1999
File Name: 921018D.DWG | Plot Time: 08:38 am

SURVEY INFORMATION
FIELD NOTES

NO.	BY	DATE
921012	JMA	03-95
921012	JMA	12-98

BENCH MARKS
A STANDARD A.C.S. BRASS TABLET STAMPED "B-13A", SET FLUSH WITH THE CURB. STATION IS LOCATED NEAR THE INTERSECTION OF MOUNTAIN RD. N.W. AND 18TH STREET N.W., AND IS 39 FEET EAST OF THE CENTERLINE OF 18TH ST AND 23.5' NORTH OF THE CENTERLINE OF MOUNTAIN ROAD N.E.
ELEVATION=4956.62 FEET (MSL0)

AS BUILT INFORMATION
CONTRACTOR
WORK PERFORMED BY / DATE
INSPECTOR'S ACCEPTANCE BY / DATE
VERIFICATION BY / DATE
DRAWINGS APPROVED BY / DATE
MICRO-FILM INFORMATION
RECORDED BY / DATE
NO.

SEAL
JEFFREY G. MORTENSEN, NEW MEXICO, 8547, REGISTERED PROFESSIONAL ENGINEER, PROFESSIONAL SURVEYOR
09-21-99

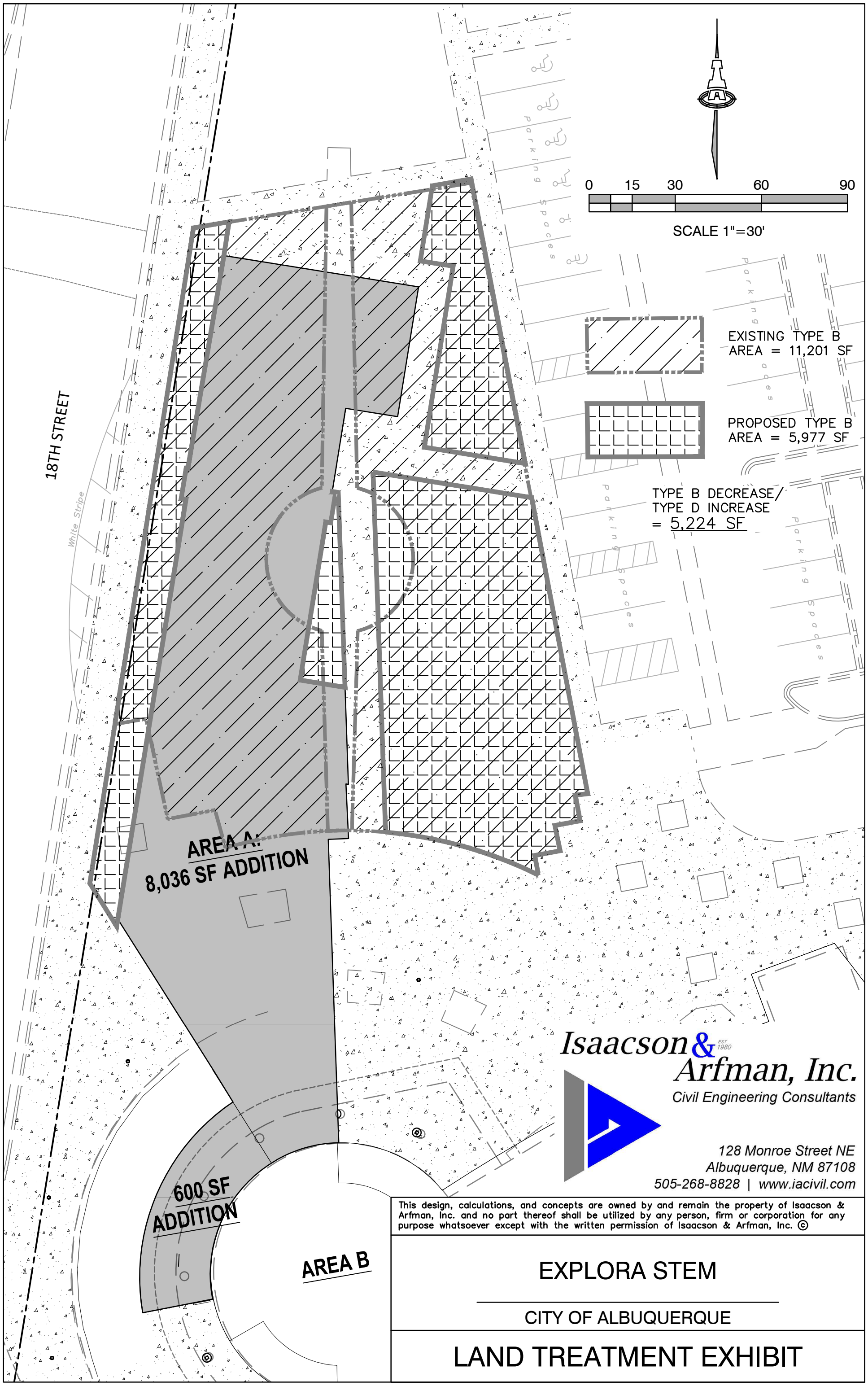
NO.	DATE	REMARKS	BY
		REVISIONS	
		DESIGN	G.M
		DRAWN BY	D.L.M./S/G.H.
		CHECKED BY	J.G.M.

DATE 09-1999
DATE 09-1999
DATE 09-1999

JEFF MORTENSEN & ASSOCIATES, INC.
6600-B MIDWAY PARK BLVD. NE
ALBUQUERQUE NEW MEXICO 87109
ENGINEERS SURVEYORS (505) 345-4250

MAHLMAN & MILES ARCHITECTS

CITY OF ALBUQUERQUE
CAPITAL IMPLEM



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EXPLORA STEM

CITY OF ALBUQUERQUE

LAND TREATMENT EXHIBIT

Job Name:	**2268 Explora - BASIN A**
Client:	Studio Southwest
Date Prepared:	9/12/2019
Date Modified:	
Precipitation Zone:	2

CALCULATIONS: 2268 Explora - BASIN A :

Based on Drainage Design Criteria for City of Albuquerque Section 22.2, DPM, Vol 2, dated Jan., 1993

100-YEAR, 6-HOUR CALCULATIONS

AREA OF SITE: 133550 SF = 3.07 ACRE

100-year, 6-hour

HISTORIC FLOWS:

		Treatment SF	%
Area A	=	0	0%
Area B	=	28046	21%
Area C	=	0	0%
Area D	=	105505	79%
Total Area	=	133550	100%

DEVELOPED FLOWS:

		Treatment SF	%
Area A	=	0	0%
Area B	=	22824	17%
Area C	=	0	0%
Area D	=	110726	83%
Total Area	=	133550	100%

EXCESS PRECIP:

Precip. Zone 2

E_A = 0.53

E_B = 0.78

E_C = 1.13

E_D = 2.12

On-Site Weighted Excess Precipitation (100-Year, 6-Hour Storm)

$$\text{Weighted E} = \frac{E_A A_A + E_B A_B + E_C A_C + E_D A_D}{A_A + A_B + A_C + A_D}$$

Historic E	=	1.84	in.	Developed E	=	1.89	in.

On-Site Volume of Runoff: V360 = E*A / 12

Historic V_{360}	=	20462	CF	Developed V_{360}	=	21045	CF

On-Site Peak Discharge Rate: $Qp = Q_{pA}A_A + Q_{pB}A_B + Q_{pC}A_C + Q_{pD}A_D / 43{,}560$

For Precipitation Zone 2

Q_{pA}	=	1.56	Q_{pC}	=	3.14
Q_{pB}	=	2.28	Q_{pD}	=	4.70

Historic Q_p	=	12.9	CFS	Developed Q_p	=	13.1	CFS

BASIN NO. A		**DESCRIPTION**		Basin A per 1999 grading plan
Area of basin flows =	133550	SF	=	3.07 Ac.

The following calculations are based on Treatment %'s as shown in table to the right

Sub-basin Weighted Excess Precipitation:

Weighted E	=	1.89	in.

Sub-basin Volume of Runoff:

V_{360}	=	21045	CF

Sub-basin Peak Discharge Rate:

Q_P	=	13.1	cfs

LAND TREATMENT	
A =	0%
B =	17%
C =	0%
D =	83%

FIRST FLUSH VOL.	
3137	CF

CALCULATIONS: 2268 Explora - BASIN A : 0 Back to Index

HYDROGRAPH FOR SMALL WATERSHED
DPM SECTION 22-2 * PAGE A-13/14

Base time, t_B, for a small watershed hydrograph is,

$tB = (2.107 * E * A / Q_P) - (0.25 * A_D / A)$

Where

E	=	1.89	inches
A	=	6.13	acres
A_D	=	4.60	acres
Q_P	=	26.3	cfs

t_B	=	0.74	hours

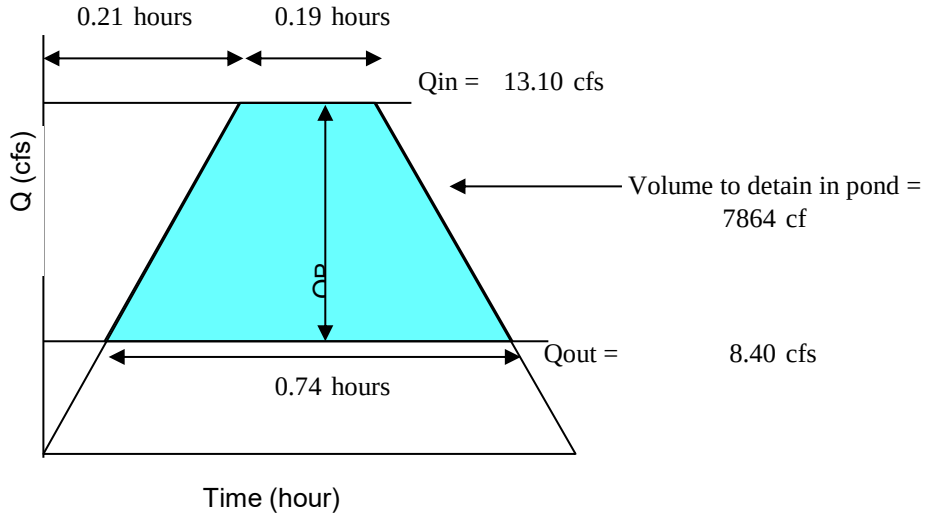
E is the excess precipitation in inches (from DPM TABLE A-8), Q_P is the peak flow, A_D is the area (acres) of treatment D, and A_T is the total area in acres. Using the time of concentration, t_C (hours), the time to peak in hours is:

$t_P = (0.7 * tC) + ((1.6 - (A_D / A)) / 12)$

Where

t_C	=	0.20	hours
t_P	=	0.21	hours

Continue the peak for $0.25 * A_D / A_T$ hours. When A_D is zero, the hydrograph will be triangular. When A_D is not zero, the hyrograph will be trapezoidal. see the graph below:



INFLOW / OUTFLOW HYDROGRAPH

NORTH DETENTION POND		
Contour	Area	Volume
4959	1391	
4960	1874	1633 CF
4960.7	2242	1441 CF
POND VOLUME =		**3073** CF

SOUTH DETENTION POND		
Contour	Area	Volume
4959	2020	
4960	2648	2334 CF
4960.7	4440	2481 CF
POND VOLUME =		**4815** CF

TOTAL VOLUME = 7888 CF

NORTH W.Q. POND			
Contour	Area	W.Q. Volume	
4959	1391		
4958	974	1183	CF
4957	626	800	CF
			CF
W.Q. VOL.		**1983**	CF
REQ'D VOL			CF

SOUTH W.Q. POND			
Contour	Area	W.Q. Volume	
4959	1280		
4958	869	1075	CF
4957	530	700	CF
			CF
			CF
W.Q. VOL.		**1774**	CF
REQ'D VOL			CF

TOTAL VOLUME = 3757 CF

EXPLORA STEM - 8" DISCHARGE PIPE

An orifice is an submerged opening with a closed perimeter through which water flows. Orifices are analyzed using the following equation: = CA * Sq.rt.of (2gh)

Q	=	Discharge in cfs
C	=	Discharge coefficient from Handbook of Hydraulics, King and Brater, 5th Edition
A	=	Area of opening in square feet
g	=	32.2 ft/sec
h	=	Depth of water measured **from the center of the opening**

ORIFICE EQUATION - GENERAL - SOLVE FOR A

Q = C*A * (2*g*h) ^ 0.5

Where	Q	=	10.1	cfs	
	C	=	0.6		
	A	=	2.4	sq.ft.	
	g	=	32.2	ft/sec^2	
	h	=	0.75	ft	depth of flow at opening from the center of culvert

ORIFICE EQUATION - SOLVE FOR Q

Q = C*A * (2*g*h) ^ 0.5

Where	Q	=	1.46	cfs	
	C	=	0.6		
	A	=	0.35	sq.ft.	8 inches
	g	=	32.2	ft/sec^2	
	h	=	0.75	ft	depth of flow at opening from the center of orifice

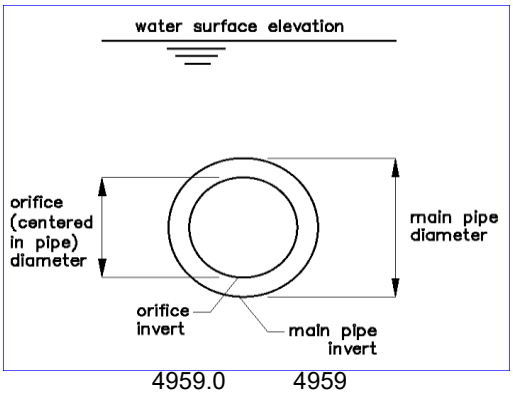
Outlet orifice invert =	4959.0
Center of orifice =	4959.75
Outlet max water elevation	4960.5
Head	0.8

Main pipe opening

8 inches	0.666667 pipe diameter
	4959.00 main pipe invert
	4959.333 center of pipe

Orifice diameter centered in opening

8 inches	0.67 orifice diameter
	4959.0 invert at orifice
	0.35 orifice area
	4959.33 center of orifice (check)



8 inches

8 inchse

4959.0 4959

EXPLORA STEM - 2 - 18" DISCHARGE PIPES

An orifice is an submerged opening with a closed perimeter through which water flows. Orifices are analyzed using the following equation: = CA * Sq.rt.of (2gh)

Q	=	Discharge in cfs
C	=	Discharge coefficient from Handbook of Hydraulics, King and Brater, 5th Edition
A	=	Area of opening in square feet
g	=	32.2 ft/sec
h	=	Depth of water measured **from the center of the opening**

ORIFICE EQUATION - GENERAL - SOLVE FOR A

Q = C*A * (2*g*h) ^ 0.5

Where	Q	=	10.1	cfs	
	C	=	0.6		
	A	=	1.2	sq.ft.	
	g	=	32.2	ft/sec^2	
	h	=	2.92	ft	depth of flow at opening from the center of culvert

ORIFICE EQUATION - SOLVE FOR Q

Q = C*A * (2*g*h) ^ 0.5

Where	Q	=	14.54	cfs	
	C	=	0.6		
	A	=	1.77	sq.ft.	18 inches
	g	=	32.2	ft/sec^2	
	h	=	2.92	ft	depth of flow at opening from the center of orifice

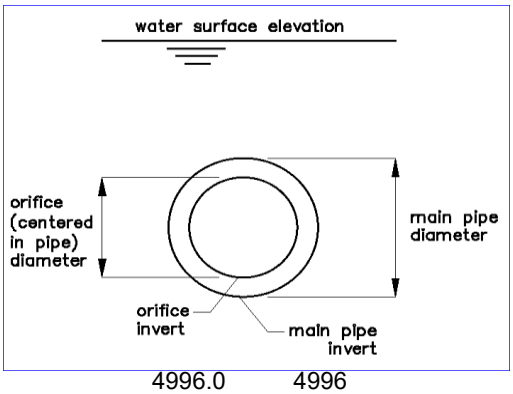
Outlet orifice invert =	4957.0
Center of orifice =	4957.75
Outlet max water elevation	4960.67
Head	2.9

Main pipe opening

18 inches	1.5 pipe diameter
	4996.00 main pipe invert
	4996.75 center of pipe

Orifice diameter centered in opening

18 inches	1.50 orifice diameter
	4996.0 invert at orifice
	1.77 orifice area
	4996.75 center of orifice (check)



18 inches

18 inchse

4996.0 4996