Isaacson & Arfman, P.A.

Consulting Engineering Associates

Letter of Transmittal

To HYDROLOGY

Date 1-5-84

Job No.

Attn: FRED AGUIRRE

Reference NATURAL HISTORY MUSEUM J 13-06

Gentlemen:

We transmit to you 2 copy(ies) of the following

- ☐ _____ Plats
- ☐ _____ Plans
- ☐ Specifications
- ☐ _____ Report
- ☐ Shop Drawings
- ☐ Submittals
- ☐ Material Specifications
- ☐ Copy of Letter
- ☒ REVISED POND 'B' (ALONG MTN. RD.)
- ☐ _____

This information is transmitted:

- ☐ As per your request
- ☒ For your review & approval
- ☐ For your information
- ☒ For your attention
- ☐ For your signature
- ☐ _____
- ☐ _____
- ☒ For your files
- ☒ For your use
- ☐ Please review & return
- ☐ For return to you files
- ☒ Please advise

RECEIVED JAN 05 1984 ENGINEERING

Remarks: FRED — THIS IS NOT PART OF THE SETTLEMENT BUT IS DUE TO THE REQ'D CHANGES IN THE POND FROM WET TO DRY.

By: FRED ARFMAN

Copies To FILE

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CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE

August 10, 1983

REF. NO.

TO: Gary O'Dowd

FROM: Anita Miller

SUBJECT: Georgia Pacific Corporation v. State of New Mexico, et al.

MEMORANDUM BRIEF OF CITY'S DEFENSES

This Brief sets forth Defendant City of Albuquerque's defenses to the Complaint filed by Georgia Pacific Corporation on July 6, 1983. It assumes that the Complaint has not been amended, even though the City recognizes that Elvin Kanter is in the process of amending his Complaint to add a claim for inverse condemnation.

The Complaint alleges that the regular and natural flow of precipitation (surface water) on to and off of Plaintiff's property was from north to south and that prior to certain grading and construction activities, surface waters flowing across Georgia Pacific's land naturally drained off of it and naturally emptied onto the land immediately to the south. The property to the south was originally owned by Santa Fe Industries, but was sold to the City of Albuquerque in June, 1980, and then conveyed to the State of New Mexico in September, 1980, for the purpose of building a museum of natural history. The Complaint alleges that during 1979, 1980, 1981 and 1982, the City of Albuquerque disturbed the natural

grade on the State's land by increasing its elevation in order to provide parking facilities for various functions held under the auspices of the City of Albuquerque. The Complaint then states that as the result of raising of the elevation of the property now controlled by the State, the natural drainage of surface water off of Georgia Pacific's land was impeded and that portions of Georgia Pacific's land were flooded for the first time during the month of August, 1981, and intermittently thereafter during the winters of 1981, 1982 and 1982-83 and August of 1982. The Complaint states that as a result of the flooding of Georgia Pacific's land, several inches of water stands on the asphalt covering the southwest portion of Georgia Pacific's land for an extended period of time undermining the asphalt and causing it to crack and pit, and depriving Georgia Pacific of the use of its land. The Complaint further states that when a drainage plan for the museum was designed by Isaacman and Arfman, the City and Isaacman and Arfman devised a plan which Georgia Pacific believes will not accommodate storms which occur from time to time, because of the raised elevation of the land and the obstruction which will be created by a cutoff wall to be constructed on the boundary of the property. The Complaint is concerned that storms which occur on a statistical frequency of once every two years will lead to several inches of flooding, and a storm which occurs on the statistical frequency of once every five years will result in

seven and one-half inches of flooding on the site.

Count I against the City of Albuquerque alleges that the City of Albuquerque knew or by the exercise of ordinary care should have known that the direct, proximate, natural and probable consequence of precipitation "and the raising of the elevation of the land" would cause water to accumulate and damage Plaintiff's property, and seeks compensatory damages.

Count II states that the City of Albuquerque was willful, grossly negligent and reckless, and that the Plaintiff is entitled to exemplary and punitive damages in the amount of $500,000.

Count III states that the conduct of the City of Albuquerque constituted a nuisance and asks for the same damages.

County IV states that the City's activities constituted a trespass, and once again seeks the same damages.

All the claims against the City of Albuquerque sound in tort, unlike the allegations against the State of New Mexico and other defendants, which also seek injunctive relief. The City of Albuquerque will raise two distinct areas of defense to this lawsuit. These are (1) procedural defenses; and (2) defenses on the merits.

PROCEDURAL DEFENSES

Leaving aside the total inaccuracy of the factual contention that the City raised the elevation of the property,

both when it was under its control, and after it had transferred title to the property to the State, by "grading" it, the initial obvious defense to the claims against the City is that the Tort Claims Act, Section 41-4-1, et seq., N.M.S.A. 1978, grants the City "immunity for liability for any tort except as [that immunity] is waived by Sections 41-4-5 through 41-4-12, N.M.S.A. 1978. Section 41-4-4. None of the cited sections waives immunity for the tort of "raising the elevation of the [State's] land", or for the torts of trespass and/or nuisance. The State, in its Brief, states that the only waiver which even arguably applies to the factual situation is Section 41-4-6, which waives immunity for liability "resulting from ... property damage caused by the negligence of public employees while acting within the scope of their duties and the operation or maintenance of any building, public park, machinery, equipment or furnishings. Elvin Kanter has also referred to that section in meetings with defendants. Neither the State nor Kanter cite the remainder of that section, which states that "nothing in the section shall be construed as granting waiver of immunity for any damages arising out of the operation or maintenance of works used for the diversion of water." Since Georgia Pacific appears to allege that the City, by its activities, diverted water, then the City would be immune from suit under this section. Under the New Mexico case law regarding drainage, anything which diverts water could be

considered a "work", and there would be no need for an actual drainage structure, such as a culvert, to bring the City under the immunity retained in this section. See Groff vs. Circle K Corporation, 86 N.M. 529, 525 P.2d 889 (1974).

Section 41-4-11A of the Tort Claims Act waives immunity for the maintenance of or existence of any bridge, culvert, highway, roadway, street, sidewalk, or parking area. The Complaint does not allege a claim under this section. Georgia Pacific alleges in the common allegations that the City approved the state museum's drainage plan which would further damage Georgia Pacific's property. There is no waiver of immunity for approval of a design by a municipal official if the designed structure has not yet come into existence, pursuant to Section 41-4-11B. See Moore v. State, 95 N.M. 300, 621 P.2d 517 (Ct. App. 1980).

If Georgia Pacific's claim were not barred by the Tort Claims Act, the City's maximum liability may not exceed $100,000 "for damages to or destruction of property arising out of a single occurrence." In addition, "no judgment against a government entity... for any tort for which immunity has been waived... shall include an award for... punitive damages...", Section 41-4-19. Therefore, Georgia Pacific's collective actual damages would be limited to $100,000, and the punitive damages claim would be precluded.

The City would also state in defense that Georgia Pacific

did not give notice of its claim against the City within 90 days after the occurrence, pursuant to Section 44-1-16. The Plaintiff, in its Complaint, alleges that the City first "graded" the property in 1979. However, it did not make a claim against the City until August, 1981, virtually alleging that it did not rain between August, 1979, and August, 1981. Elvin Kanter, in a meeting with defendants, stated that since the occurrence was a continuing one, this notice was adequate. Local climatological data for 1981, prepared by the Natural Oceanic and Atmospheric Administration (NOAA) indicates that annual precipitation for 1979 was 10.39 inches, and for 1980 was 8.87 inches, and for 1981 was 7.66 inches. Given the pattern of weather in Albuquerque, it would seem very difficult to believe that none of the storms during 1979 and 1980 would have resulted in damages to Plaintiff's property. The City concludes that the Plaintiff did not specifically pinpoint the "occurrence" date in its 1981 claim.

As stated above, notice was not received by the City of Albuquerque until October 2, 1981. Evidently this notice was received by telephone, rather than in writing, and did not state the time, place, and circumstances of a loss or injury. Written notice was not received by City Attorney Pat Bryan until September 16, 1982. There was no pinpointing of the date of the actual occurrence of flooding on that occasion, either. The City should be able to prove that there were storms of the

same variety as those which caused the alleged flooding in 1981 well before that date, and that therefore, neither the notice requirement nor the two year statute of limitations requirement of Section 41-4-15 of the Tort Claims Act have been met. This proof also goes to the merits of the Complaint.

If a claim is made under Section 42A-1-31, N.M.S.A. 1978, New Mexico's "inverse condemnation" statute, which has a three year statute of limitations, the above factual proof would also support a statute of limitations defense.

MERITS

The law as it relates to drainage in New Mexico has been clearly set forth by the State in its Brief. Under the New Mexico civil law rule, "a land owner does not have the right to collect surface water in an artificial channel and discharge it upon his neighbors' lands to his injury, in a different manner or in a greater volume or at a greater rate than it would have flowed naturally." Budagher vs. Amrep Corp., 97 N.M. 116, 637 P.2d 547 (1981). It is the City's position that it has never allowed water to collect in a different manner or in a greater volume or at a greater rate than it would have flowed naturally, and that it is the actual depression of the area, plus the raising of the grade of its own property by Georgia Pacific and the paving of its lot, that has caused water to collect where it does. Both the City and the State contend that it is Georgia Pacific that is liable under the Budagher

rule, and not the City and State. The law which should apply in this case is that which is set forth in Martinez vs. Cook, 56 N.M. 343, 244 P.2d 134 (1952). In that case, it was agreed by all parties that so long as surface waters are in a diffused state and have not reached a natural drainage way or water course, an upper land owner may not by artificial means collect and throw them on his lower neighbor in a manner in which they would not flow except for such action. Id at 348. This is exactly what Georgia Pacific has done. In that case, citing Soules vs. Northern P.R. Co., 34 ND 7, 157 N.W. 823, L.R.A. 1917 A, 501, the Court stated that "it was the duty of a lower land owner who builds a structure across a natural drainage way to provide for the natural passage through such obstruction of all of the water which may be reasonably anticipated to drain therein and that this was a continuing duty." It is the City's position that it has never obstructed water which may be reasonably anticipated to drain from Georgia Pacific's property. Furthermore, in the Martinez case, there was also an issue of an inadequate drainage system which had been constructed by the municipality. Although that does not appear to be an issue in this case, it should be interesting to note that the court, citing cases from other jurisdictions, found that the only time municipalities were found liable for inadequate drainage was when waters were cast upon Plaintiffs' lands from the streets or other properties, and not when the

town failed to provide Plaintiff with a drainage system into which they could drain the waters which fell upon their lands and were trapped in natural depositories on the Plaintiffs' property. Id at 354. There is no allegation that water other than that which would have naturally collected on Georgia Pacific's property has ever collected there.

If this case should turn on the question of which party impeded the natural flow of surface water, then it will be necessary to join the Santa Fe Railroad as an indispensable party, because both parties agree that when the Railroad built its spur along the western boundaries of both properties, it raised the level of the land, impeding the natural flow of water, and increasing the flow to the south. Santa Fe Industries, as the prior owner of both the Georgia Pacific and the state museum site, as well as the railroad spur, can probably give valuable information concerning original drainage of all of the property concerned.

Georgia Pacific, in its Brief, states that the City and State took the property subject to the situation that existed when it purchased the property, subsequent to changes made by the railroad and Georgia Pacific, and should have accommodated their plans to meet the changed situation. As stated above, there is no duty to do more than provide for the natural passage of surface water. Neither the City nor the State has ever been under any duty to cure Georgia Pacific's problems.

The solutions discussed prior to filing of this lawsuit by Georgia Pacific by Fred Arfman, Brian Burnett, who was then City Engineer, and Rod Peterson of Matotan Associates adequately achieve the required standard of duty as set forth in the Martinez case, in that they enable the flow which naturally develops on Georgia Pacific's land to drain into the City's pond at the same rate as the City's pond drains into the City of Albuquerque drainage system.

The facts will show that the City never changed the grade of the museum site. Weeds were cut and dirt was not moved. Georgia Pacific uses heavy equipment on the lot which could contribute to the cracking of the pavement.

It should be noted that since the City never changed the grade on its property between 1979 and 1982, it would have no liability under a tort claim cause of action, if the court should find that it had not waived immunity, nor would there be any liability under an inverse condemnation claim. The State and other defendants have not changed the grade of the southwest corner of the museum site since construction of the museum has been underway. Thus Georgia Pacific will have a tough burden to prove that either the City or the State has damaged its property, given the evidence to the contrary.

It is interesting that the complete City Planning file concerning this matter, Z-81-127, contains no reference to Georgia Pacific ever attending any public meetings, or raising

any objections to the design of the drainage plan when it was in the process of being developed for the property. Considering Georgia Pacific's concern during that period of 1982, one would think that its representatives, having been noticed as neighboring property owners, would have given the time and energy to reviewing these plans, and to attending public hearings concerning them. It is the City's contention that, having not raised any objections to the plans for the museum as they were developed, Georgia Pacific is barred by the defenses of waiver and estoppel from bringing this action at this time.

Furthermore, Georgia Pacific failed to exhaust the administrative remedies which are provided in Section 3-21-8, N.M.S.A. 1978, and Section 45 of the City of Albuquerque Comprehensive City Zoning Code, Article 14, Chapter 7 of the Revised Ordinances of Albuquerque, 1974. The statute and the ordinance provide a procedure for appeal from decisions of the Environmental Planning Commission to the City Council, and then, to the District Court, by means of a certiorari proceeding. The District Court proceeding must be brought within 30 days of the final decision of the City Council.

The museum site development plan was approved by the Environmental Planning Commission on February 18, 1982, after the City Council had reviewed prior findings of that body, and suggested that the City Landmarks and Urban Conservation

Commission review the plans for the building, giving attention to neighboring Old Town residents' opposition to the design which had been submitted by the architects. After that the Landmarks and Urban Conservation Commission reviewed the plans, the EPC recommended that the copper roofing material which had been selected for the building be changed so that it be more compatible with the surrounding area. This change was made in the final plans which were approved for the museum, EPC minutes, February 18, 1982, as found in planning file of Z-81-127. The public hearing process received publicity in local newspapers and also had television coverage. Georgia Pacific had at least three opportunities to express its opposition to the drainage plan during public hearing, and also could have reviewed these plans prior to the public hearings.

In addition to Georgia Pacific being barred by waiver and estoppel and failure to exhaust administrative remedies, it is also guilty of laches for not having taken action sooner. It also failed to mitigate its losses by becoming involved in the plan review process.

The City will also raise the defense of Georgia Pacific's unclean hands in this matter, because Georgia Pacific itself raised the grade of its property to the detriment of neighboring land.

Budagher vs. Amrep Corp., supra, Little v. Pierce, 74 N.M. 626, 397 P.2d 15 (1964), and Groff vs. Circle K Corporation,

supra, make it clear that where an intrusion of diverted waters onto the land of another party takes place, the party responsible for the diversion should not be liable in the absence of proof of damages. A suit brought by the land owner, upon whose land the water was diverted, must be based on negligence. The elements of such a suit are that a land owner must have: (1) collected surface water in an artificial channel; (2) discharged upon another's land, (3) in a different manner or in a greater volume or at a greater rate than that of which it would have flowed naturally, and (4) to the injury of the neighbor. (Budagher vs. Amrep, supra, Little vs. Pierce, supra). There is no proof of damages arising from the design of the drainage system for the museum site. It has not yet been constructed. Plaintiff can only base its claim on a disputed computation made by Rodney Peterson, who is not even a certified engineer, and William Matotan. As stated above, the City certainly has no liability for any part that it may have played in the plans for drainage of the museum site.

It is interesting that in the complaint which has been filed, and in all prior discussions held between the City Engineers, Fred Arfman and Rod Peterson of M totan Associates, solutions to the drainage of both sites have been limited to drainage methods which would alleviate flooding during those storms which occur at the statistical frequency of one every five years. It has always been acknowledged by the parties

that since this property lies in the "100 year flood plain", when storms of the statistical frequency of one in 100 years occur, both sites would most likely be inundated. See Topographical Map J13 and Floodway Map of the City of Albuquerque. This type of flooding did not have to be addressed in the context of construction of the museum site. However, Matotan, in its report, now asks the State to address the 100 year flood problem by increasing the depth of its ponding and enabling water to freely flow from Georgia Pacific's property through any retaining wall constructed on the boundary of the museum site, into the pond constructed on the museum property. It thus denies any responsibility for flooding which would have occurred had the Santa Fe Railroad, Georgia Pacific, the City of Albuquerque, and the State of New Mexico never come on the scene, because of the natural depression of the entire area. Such a solution is clearly beyond any duty that the City or the State may, under any circumstances, be found to have to Georgia Pacific. The City's position is that an engineering solution to this problem can be found which would take into account the natural ponding areas which occur on both sides of the boundary line, and which would accommodate the flow in such a way that water would not be retained on Georgia Pacific's property for an undue period of time. If Georgia Pacific wishes to accommodate the 100 year flood, Georgia Pacific should be a party to the solution. It is certainly not entitled to anything more than it had before.

Georgia Pacific has failed to state a claim upon which relief can be granted, both under the Tort Claims Act, and under the inverse condemnation statute claims act. It has not given proper notice under the Tort Claims Act and has acted after every possible statute of limitations has passed. It has no claim for punitive damages, and its actual damages far exceed the amount set as the maximum under the Tort Claims Act. Furthermore, it has no claim against the City of Albuquerque on the merits, since evidence will show that the City never regraded the property, and thus is not the proximate cause of any damage which Georgia Pacific may have suffered. Furthermore, Georgia Pacific, by changing the grade of its own property and paving its own property with asphalt, created its own problem. The asphalt cannot sustain the heavy abuse which it receives from heavy equipment. Georgia Pacific cannot prove damages from a drainage structure which has not yet been built. If the Court should find the City of Albuquerque liable for any act when the property was under its brief ownership, or even under its "control", that liability should be no more than damages estimated for 1982. This matter should be settled at the drawing boards of qualified engineers. It has already been blown far out of proportion.

CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE July 7, 1983 REF. NO._____

TO: Carl P. Rodolph, Director, MDD

FROM: C. Dwayne Sheppard, Acting City Engineer

SUBJECT: NEW MEXICO NATURAL HISTORY MUSEUM - GEORGIA-PACIFIC CONTROVERSY

Attached are copies of summaries of the situation as presented by Fred Arfman of the Isaacson & Arfman firm, who are the engineering consultants for the site work at the Natural History Museum. As you can see the December 1982 summary explains the circumstances that led to the controversy and also indicates substantial effort to resolve the problem. The May 1983 summary, directed to the constructors of the Museum, summarizes action that had been taken to the date of that letter and also includes a January 1983 grant of right to convey storm water from the Georgia-Pacific property through the Museum property. This was issued by Charles Easterling who was the Principal Assistant City Engineer for Hydrology at the time. Subsequent developments have all been directed to the amicable resolving of the problem.

The most recent action has been a review of the circumstances and a view of the site by Fred Aguirre, Fred Arfman and Anita Miller of our Legal Department yesterday (7/6/83). The results of that review were that Anita Miller was going to attempt to establish contact with the Georgia-Pacific attorneys and seek the resolution that had been indicated in the May '83 letter by Arfman. It is my understanding that the corporate attorneys are based in Georgia and that Anita was going to attempt to contact them at their home office while on a trip to Georgia in the immediate future.

Will keep you posted.

CDS/dw
Attachments

WILLIAM MATOTAN & ASSOCIATES • ENGINEERS

230 Truman Street, N.E. Albuquerque, New Mexico 87108 Phone (505) 265-8467

May 12, 1983

Law Department
Georgia Pacific Corporation
133 Peachtree Street, N.E.
Atlanta, Georgia 30303

Attention: Mr. Keith Borman,
Staff Attorney, Distribution Division

Re: Georgia Pacific Corporation Distribution Center in Albuquerque, New Mexico. Site Drainage and Pavement Repair Project.

Gentlemen:

As requested by Mr. Borman during our phone conversation May 5, 1983, I am enclosing herewith one (1) copy each of the following documents relative to subject project:

1. Letter dated January 4, 1983 from City of Albuquerque to Mr. Fred Arfman, P.E.

2. Letter dated December 16, 1982 from Mr. Fred Arfman, P.E. to Mr. Brian Burnett, Hydrologist, City of Albuquerque.

3. Drainage Study for the New Mexico Natural History Museum, September 1981, prepared by Isaacson & Arfman, P.A.

4. Drainage Criteria Manual, City of Albuquerque, Draft of July 1979, containing "Summary of New Mexico Drainage Law" and "Flood Hazard Area Zoning Ordinance".

5. Storm Drainage Ordinance, City of Albuquerque.

6. "General Principles of Drainage Law", from the Denver, Colorado Urban Storm Drainage Manual, Vol. 1, 1969.

7. Excerpts from the City of Albuquerque "Development Procedures Manual", Vol. 1, "Procedures", March 1982.

8. Excerpts from the City of Albuquerque "Development Procedures Manual", Vol. 2, "Design Criteria", March 1982, Section 7. Procedures for Drainage Submittals. (Contains instructions for Drainage Covenant, Indemnification and Hold Harmless clauses).

As I mentioned to Mr. Borman during our recent phone conversation, the site on which the New Mexico Natural History Museum is now being constructed was formally a vacant parcel of land which acted as a ponding basin for storm water runoff from the Georgia Pacific Property. Both properties are in the historic flood plain of the Rio Grande River and the natural direction of surface storm water runoff is from north to south (parallel to the river flow). The Georgia Pacific site is situate immediately north of the museum site. The south property line of the Georgia Pacific site is contiguous with the north property line of museum site and surface runoff formally drained across that common line from the Georgia Pacific property to pond, infiltrate and evaporate in the area that is now the museum site.

It is my understanding, from conversation with Mr. Grasty of your company and Mr. Fred C. Arfman, Civil Engineer, that back-up and ponding of storm water on the asphalt paved storage area of Georgia Pacific started several years ago subsequent to the City of Albuquerque grading the land to the south of Georgia Pacific for a temporary (unpaved) parking area. The natural ponding area was obliterated by the City and earth was mounded up along the common City-Georgia Pacific property line, by the City, to an elevation higher than the Georgia Pacific pavement, thus obstructing the natural flow of storm water off the Georgia Pacific site. (See above Item #2, letter from Arfman to City of Albuquerque, dated December 16, 1982).

My initial field review of the problem area was in December of 1982 at which time a large part of the pavement in the southwest corner of the Georgia Pacific site was covered with a sheet of ice. The ice was the result of snow-melt runoff being obstructed along the Georgia Pacific south property line by construction materials and mounds of earth on the museum construction site. I observed at that time, that the asphalt pavement in the inundated Georgia Pacific storage area was severely deteriorated. In my judgement, the major cause of the pavement failure can be attributed to impedence of the natural surface drainage and resultant saturation of the pavement structure (subgrade, base-course and asphalt) together with daily freezing and thawing cycles during the winter months.

As part of the museum construction project, a concrete retaining wall will be constructed along the north and west sides of the museum property. The specific purpose of that wall is to prevent adjacent surface runoff from entering the museum property. (See Item #3, Drainage Study, pages 4 and 6. References to the "cut-off" wall highlighted).

I have reviewed the construction plans for the museum property and find that the top of the cut-off wall will have a top elevation about 1½ feet above the Georgia Pacific pavement, along that part of the Georgia Pacific south property line where the Georgia Pacific pavement previously drained onto the land where the museum is now being constructed. The top of wall elevation shown on the plans is 4957.5 and the adjacent Georgia Pacific pavement (determined by our site survey) is 4956.02.

The significance of the wall is that after every summer rainstorm and during occasions of melting winter snow, surface ponding will occur on the Georgia Pacific site at potentially greater depths and amounts than before.

The only existing alternate outlet for stormwater runoff from the site is into the Santa Fe Railroad spur track rights-of-way immediately to the west. The spur track has an existing top of rail elevation of 4957.0 through the area and thus also forms an obstruction to runoff from the Georgia Pacific site. Stormwater runoff presently escapes from the site, to some degree, by infiltration under the railroad spur where it ponds in a vacant lot immediately to the west of the spur track. (Any future development on that property will further increase the flooding potential on the Georgia Pacific site by filling up a ponding area that now accepts some of the stormwater runoff from Georgia Pacific property.)

The City of Albuquerque has agreed to allow Georgia Pacific to discharge surface runoff into a system of storm water retention ponds that will be constructed as a part of the museum project. (See Item No. 1, letter from City of Albuquerque to Fred Arfman, dated January 4, 1983). The City has imposed a maximum allowable discharge from the museum retention ponds into an existing City storm sewer at a rate of 480 gallons per minute (1.07 cubic feet). This is also the maximum rate that can be discharged into the museum ponds from the Georgia Pacific site. **Existing conditions will not permit overflow from the museum ponds and the City has required that the museum Pond "A" (into which Georgia Pacific can discharge) shall contain the volume of runoff generated on the museum property from a 100-year frequency design storm.** (See Item 3, Drainage Study, Page 6.) Additionally, the City has required that the discharge pipe from the museum ponds to an existing storm sewer in Mountain Road, immediately south of the museum site, be restricted to a 6-inch diameter pipe and discharge at a maximum rate of 480 gallons per minute (1.07 cubic feet per second).

The above rate of discharge from the museum pond is the same as the City has allowed to enter the pond from the Georgia Pacific property.

We have calculated that the maximum rate of flow from the existing Georgia Pacific pavement surface to the south property line will exceed the allowable rate of flow into the museum pond as follows:

Storm Frequency	Peak Discharge from G.P. Area (Cubic Feet per Second)	% Discharge Over Permitted Flow Into Museum Pond
2 - year	3.18 c.f.s.	297%
5 - year	3.86 c.f.s.	361%
10 - year	4.68 c.f.s.	437%
50 - year	6.68 c.f.s.	624%
100 - year	7.27 c.f.s.	679%

Assuming that no change is made in the present Georgia Pacific pavement elevations and assuming surface drainage from that pavement through the cut-off wall into the museum pond at the rate permitted by the City (1.07 cubic feet per second), stormwater runoff would build up on the Georgia Pacific pavement to a maximum depth of about 7½ inches over an area of about 15,220 square feet of pavement surface for all storms of 5-year frequency and over and about 10,000 square feet for a 2-year frequency storm.

Obviously, the stormwater runoff rate allowed by the City into the museum retention pond is inadequate to properly drain the Georgia Pacific pavement which formerly drained onto the museum property.

Following are the several alternates examined in detail to date, together with rough estimates of construction cost.

ALTERNATE NO. 1

Do nothing. Existing pavement will continue to deteriorate and require frequent patching. Water will stand on the pavement up to a maximum of about 7½ inches depth over an area of about 15,220 square feet after heavy rains. Pavement surface would be covered with ice over large areas during the winter. Stormwater runoff from the Georgia Pacific site onto the Santa Fe Railroad property would increase in volume as a result of the impedance of runoff to the former ponding area on the museum property. Liability to Georgia Pacific could result from increased flows onto the Santa Fe property.

The cost of continuous pavement maintenance and loss of revenue resulting from non-usable surface storage area has not been estimated by the writer, but would be a significant amount over a prolonged period of time.

No cost has been estimated for the potential annual pavement maintenance. Such costs could be considerable and are dependent upon annual amounts of precipitation and severity of winter freeze-thaw cycles.

ALTERNATE NO. 2

Overlay existing deteriorated pavement and provide pipe drain or notch through cut-off wall to drain into the museum pond "A" at the rate allowed by the City (1.07 cubic feet per second).

To merely overlay the existing deteriorated pavement would not solve the pavement drainage problem. Approximately 14,500 square feet in the southwest corner of the site has deteriorated to the point that it has no regular slope for drainage and contains numerous local ponding areas. To overlay it would only increase the amount of "flat" or "no-grade" area and result in surface ponding over a larger area than now exists. Other considerations are that the underlying earth subgrade and base course are probably saturated over a large area and unable to sustain a surface loading without resultant cracking, settlement and subsequent failure of the new pavement overlay. Drainage into the museum pond connection would not occur until ponding of several inches depth existed on the overlayed pavement and subsequent drainage off the pavement would be partial only. Severe icing conditions would prevail and the pavement would continue to deteriorate.

Construction cost for a nominal 1½-inch asphaltic concrete overlay, covering about 14,500 square feet, has been estimated at $6,100.00. In addition to the pavement overlay, about 260 feet of concrete curb and gutter would be required along the south edge of the pavement to prevent erosion and pavement undercutting along the museum cut-off wall and to collect and direct the runoff into the museum pond inlets. Estimated cost of curb and gutter is $1,950.00. Total estimated construction cost for this alternate is $8,900.00 including 10% for contingencies. Future pavement maintenance and replacement costs have not been estimated.

ALTERNATE NO. 3

Remove existing pavement, regrade and replace with new pavement for positive surface drainage; provide for drainage into museum pond at allowable rate of 1.07 cubic feet per second at the southwest corner of the Georgia Pacific property. No retention pond on Georgia Pacific property.

This alternate would require the reconstruction of about 22,730 square feet of existing pavement together with about 280 feet of concrete curb and gutter. (The curb and gutter would be required to prevent undercutting of the Georgia Pacific pavement due to the museum property cut-off wall deflecting surface water runoff from the Georgia Pacific pavement from a southerly direction of flow to a westerly direction of flow along the pavement edge).

This alternate would assure positive drainage off the pavement surface and allow continued use of the entire area for storage.

Storm water could overflow onto the pavement from the railroad spur track area during periods of heavy rainfall, but would rapidly dissipate after rainfall ceased.

The drainage connection to the museum pond would serve to convey a small part of storm water runoff from the Georgia Pacific site, the major portion would flow onto the Santa Fe Railroad spur track area.

Georgia Pacific could incur liability under this alternate due to surface runoff being diverted from the previous southerly direction to a westerly direction onto the Santa Fe Railroad property. The increased amount of storm water runoff from the Georgia Pacific property onto the Railroad property due to the construction proposed under this alternate cannot be precisely established. To do so would require a knowledge of the exact amount of runoff generated from the Georgia Pacific property which formerly ponded on that land to the south now occupied by the museum. It is a reasonable assumption, however, based on existing elevations within the immediately adjacent railroad property, that nearly all storm water runoff from the southwest quadrant of the Georgia Pacific property (about 1.79 acres) was contained on the combined properties of Georgia Pacific and the museum site, up to elevation 4956.6. Above that elevation, storm water runoff could spread along the railroad property to the south and west. The volume of ponding on the Georgia Pacific pavement below that elevation is about 4600 cubic feet, approximately one-half or 2300 cubic feet, of which would be displaced by new

pavement under this alternate. The 2300 cubic feet of displaced storm water runoff would be discharged onto the Santa Fe railroad property as diverted water.

Construction cost of this alternate, including removal and disposal of 2,525 square yards of existing deteriorated pavement, subgrade compaction, 3½-inch new asphaltic concrete base course, asphalt tack coat, 1½-inch new asphaltic concrete surface course and 280 lineal feet of concrete curb and gutter, has been estimated at $43,850.00. The estimated construction cost includes 10% for contingencies.

ALTERNATE NO. 4

Remove existing pavement, regrade and replace with 2,293 square yards of new pavement, and 280 lineal feet of concrete curb and gutter. Construct a gravel-lined retention pond 5' deep, 78' long and 38' wide in the southwest corner of Georgia Pacific open storage area to contain all surface runoff from storms up to and including the 5-year frequency storm.

Surface runoff from storms of greater intensity than the 5-year storm would drain off, in part, onto the Santa Fe Railroad property by surface flow and, in part, into the museum pond through an overflow pipe connection having a maximum allowable discharge of 1.07 cubic feet per second.

Under this alternate, storm water runoff onto the Santa Fe Railroad property would not exceed flow rates which existed prior to the impedance of flows off the Georgia Pacific property to the south; therefore, construction of this alternate should not incur liability. We have studied the topographic maps of both the Georgia Pacific property and the site on which the museum is now being constructed and calculate that previous ponding capacity of the two sites contained all runoff from those properties up to the 5-year frequency storm. Storm water previously discharged onto the railroad property for all runoff exceeding the 5-year frequency event.

The City of Albuquerque Drainage Ordinance requires that all retention ponds shall now be designed and constructed to be emptied in twenty-four (24) hours. (See page 8 of enclosure item 5.)

At a meeting held on April 29, 1983 with Mr. Brian Burnett, hydrologist with the City of Albuquerque, Mr. Burnett consented to a retention pond having a capacity to contain the runoff from the Georgia Pacific property for a 5-year frequency storm and agreed

to waive the requirement to empty the pond in 24 hours.

Mr. Burnett further stipulated that the retention pond should be provided with an overflow pipe, connected to the museum Pond "A", to permit discharge at a rate of 1.07 cubic feet per second into the museum pond for flows exceeding the 5-year frequency. The reasoning for the pond on the Georgia Pacific property to contain the 5-year frequency runoff being that the retention pond on the museum property is so shallow in depth, that to empty the Georgia Pacific pond by gravity flow into the museum pond would require an equally shallow pond, having an extremely large surface area. (The surface area required to contain the 5-year runoff being less than half that of a pond which would totally empty into the museum pond by gravity.)

Total estimated construction cost for this alternate is $46,100.00, including 10% for contingencies.

Construction of the retention pond would require permanent vacation of approximately 3,450 square feet of surface area that is now being used for open storage area.

If the connection to the museum pond were eliminated, the total estimated cost would increase approximately $400.00, but about 470 square feet of usable surface storage area would be gained due to reduction of the retention pond volume by about 1430 cubic feet.

RECOMMENDATIONS

It is our recommendation that Alternate 3 be constructed, provided that a legal determination is made that liability to Georgia Pacific will not result from such construction. Alternate 3 would assure positive pavement drainage, allow continued use of the entire reconstructed area for open storage and be the most economical long-term solution.

If it is determined that legal liability rules out Alternate 3, we recommend that Alternate 4 be constructed. This alternate would, however, convert about 3,450 square feet of existing open storage area into a permanent storm water ponding facility. If the City of Albuquerque would waive the requirement for connecting this pond to the museum pond, it would reduce the loss of surface storage area by about 470 square feet.

We are prepared to commence final engineering design and construction plans immediately upon written notice to proceed, and for whichever alternate is selected by Georgia Pacific.

If you require additional information or clarification of the various alternates proposed herein, please contact us at your earliest convenience.

Very truly yours,

WILLIAM MATOTAN & ASSOCIATES, INC.

Rodney E. Peterson, Vice-President

REP:cmj

P. S. In addition to the eight submittal items listed above, I am enclosing a preliminary plan sheet showing the area of the Georgia Pacific property subject to storm water damage and which would be reconstructed per the proposed alternates.

Enclosures: as noted herein.

cc w/enc.: Mr. Harvey Grasty, Georgia Pacific Corporation
Mr. Elvin Kanter, Attorney-at-Law

Isaacson & Arfman, P.A.

Consulting Engineering
Associates

To file

RECEIVED
MAY 06 1983
CITY ENGINEER

May 2, 1983

Mr. Bill Haney
Mimbres & Associates
205 Montezuma St.
Santa Fe, N.M. 87501

RE: New Mexico Natural History Museum

Dear Mr. Haney:

As per our telephone conversation of May 2, 1983, we are submitting to your firm this letter of information dealing with the drainage related matters of the above referenced project. Attached are two letters which provide background up to January 4, 1983. After the last correspondence, the following events have taken place.

1. The Georgia-Pacific Corporation has contracted with Matotan & Associates to oversee any drainage plans developed by our firm and to prepare a pavement repair onsite drainage plan for the affected storage yard area.

2. Various conversations and meetings between Isaacson & Arfman and Matotan.

3. Group meeting on April 29th with Harvey Grasty, Branch Manager of Georgia-Pacific; Rod Peterson of Matotan & Associates; Brian Burnett of City Hydrology and myself. Various plans were discussed and a final plan was agreed upon by all parties. This plan called for a combination onsite retention/detention facility with the outfall point located 20 feet east of the Northwest property corner of the Museum site. Outfall flows would be

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controlled by a properly sized pipe which would allow flows to discharge into the Museum's pond at the same rate that it is allowed to discharge. Also, a weir overflow notch is planned as an emergency feature.

This is basically where we are at now and paragraph no. 3 above directly affects your firm. We must have the contractor, KNC, incorporate these changes into his scope of work. The final plan will come down the line in a short while. Hopefully, we can get the Property Control Divsision of the State to release us to act on these minor changes.

Finally, we feel that all of the parties in this endeavor have cooperated in achieving a workable and practical solution to the problem. We need your input and support in order to implement the revised plan. Also, we shall be seeking compensation for our professional services rendered on behalf of Mimbres & Associates and the State of New Mexico.

Thank you for your assistance on this matter.

Very truly yours,
ISAACSON & ARFMAN, P.A.

Fred C. Arfman, P.E.

Attachments

cc: Brian Burnett, City Hydrology
Harvey Grasty, Georgia Pacific Corporation

FCA/naf

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

January 4, 1983

Mr. Fred Arfman
Isaacson & Arfman, PA
128 Monroe N.E.
Albuquerque, N.M. 87108

RE: NATURAL HISTORY MUSEUM/GEORGIA-PACIFIC DRAINAGE CONCERNS - YOUR LETTER OF DECEMBER 16, 1982

Dear Fred:

Brian Burnett has briefed me on the referenced project and I forward the following comments:

1. This office grants your request to convey storm water generated on the Georgia-Pacific property through the detention pond along the Museum's west boundary.

2. Once the details for the project have been resolved, please prepare a revised drainage plan for review and approval by this office.

3. We request that the City of Albuquerque be party to the hold harmless agreement granted by Georgia-Pacific. Preparation of this document with City Legal should be coordinated through the Hydrology Section Office.

Since we do not have addresses for the interested parties, please see that copies of this letter are forwarded. If you have any questions or if this office can be of further assistance, please call.

Very truly yours,

Charles M. Easterling
Princ. Asst./City Engineer

CME/BGB/tsl

Isaacson & Arfman, P.A.
Consulting Engineering Associates

RECEIVED
DEC 13 1983
ENGINEERING

J13-06

Letter of Transmittal

To CITY OF ALBUQUERQUE
HYDROLOGY

Date 12-12-83
Job No.

Attn: FRED AGUIRRE
Reference NATURAL HISTORY MUSEUM

Gentlemen:

We transmit to you 2 copy(ies) of the following

- ☐ _____ Plats
- ☐ _____ Plans
- ☐ Specifications
- ☐ _____ Report
- ☒ REVISED POND "A" PLAN
- ☐ _____
- ☐ Shop Drawings
- ☐ Submittals
- ☐ Material Specifications
- ☐ Copy of Letter

This information is transmitted:

- ☒ As per your request
- ☐ For your review & approval
- ☒ For your information
- ☐ For your attention
- ☐ For your signature
- ☐ _____
- ☐ _____
- ☒ For your files
- ☐ For your use
- ☐ Please review & return
- ☐ For return to your files
- ☐ Please advise

Remarks: THIS PLAN HAS BEEN SUBMITTED TO THE FOLLOWING (1) ATTY GEN. (2) MATOTAN (3) KANTER (4) PEROVICH (5) MIMBRES, INC.

By: FRED ARFMAN

Copies To JOB FILE

128 Monroe, NE • Albuquerque, NM 87108 • (505) 268-8828

Isaacson & Arfman, P.A.

Consulting Engineering Associates

December 16, 1982

Mr. Brian Burnett-City Hydrology
City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

RE: New Mexico Museum of Natural History

Dear Mr. Burnett:

This correspondence shall serve as our firm's interpretation of the events and stating of the facts surrounding the drainage problem related to the site of the referenced project. It has been brought to our attention that the current Museum's drainage plan does not allow for the acceptance of any offsite flows, thereby forcing the Georgia-Pacific property, situated along the north property line, to retain a portion of its generated onsite storm waters. This storm water volume now stands over the paved southwest corner of Georgia-Pacific's storage yard. The management of Georgia-Pacific seeks a remedy to this unwanted condition, since this problem was caused by others and their property has been adversely impacted. The following outlined chain of events was reconstructed from information contributed by all concerned parties and is correct to the best of our knowledge.

- Construction plans for the Georgia-Pacific office & warehouse were submitted to the City of Albuquerque in February of 1972 and approved for construction on April 14, 1972. Plans show a regrading of the site such that flows exit overland via the southwest corner of their property.

- Additional plans were submitted to the City in April of 1977 and approved in May of that same year. These plans were for storage facilities located east of the existing complex and west of 18th St. They incorporate the use of a piping system to carry flows to a retention pond along the right-of-way of 18th St. This drainage solution was independent from that of the original phase.

- Georgia-Pacific added approximately 350 sq. ft. to their office space situated along Bellamah in 1979. This addition had little or no effect on site drainage since it was built on what was previously an impervious area.

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- Sometime in 1979 or thereabout, City crews performed some minor grading on the future museum site, which was then City property. From all the information gathered from the concerned parties involved in this matter, it could not be determined why this grading was originally done. But, since then this parcel of land has been utilized as a designate overflow parking area associated with various City of Albuquerque functions. As a result of this grading, the storm water outfall point from the Georgia-Pacific site was blocked. The discharge point was designed at an elevation of 4956.4. A topography survey performed after the grading and being unrelated to such grading, showed a revised elevation of 4957(+) adjacent to the point of discharge.

- The change in subject's site topography and its' negative impact on the Georgia-Pacific's property was reported to City of Albuquerque officials. The City's response to Georgia-Pacific was for them to "sit-tight" and as soon as that site was developed, a drainage design would be prepared that would remedy this undesirable condition. In the meantime, City Claims offered to have a City Maintenance crew perform some minor grading to shape an outfall ditch such that the trapped flows could be relieved. The flows would have then entered into the area's flood plain. This grading operation was never performed.

- In 1980, the A/E firm of Chambers, Campbell, Isaacson & Chaplin, Inc. entered into a contract with Mimbres & Associates, the selected architectual firm for the New Mexico Museum of Natural History. CCIC would perform selected site engineering tasks, one of which was to prepare a drainage analysis and the preparation of plans suitable to the architect and the City of Albuquerque.

- CCIC survey crews performed a site topographical and utility survey. The topo-survey corresponded with the City's flood plain maps. The northwest quadrant of the site was the low portion and part of the historical (100 year) flood plain.

- With this information in hand, a pre-drainage design meeting was held with the staff of City Hydrology. Staff concurred with the recommendation of a site perimeter cut-off wall and only handling those storm waters which fell onsite. This was predicated on the fact that the volume of storm water from the 100 year flooding limits computed to be almost the same as that which would be generated by the site itself. Once these volumes were isolated, they could be gathered in site detention ponds and allowed to discharge at a controlled rate into the City storm drain system located in Mountain Rd. Thus, the final drainage and grading plans were designed accordingly. There was no mention of having to provide relief for any blocked flows to the north.

- Final construction plans were completed in September of 1982 and the project was awarded to KNC (low bidder) in November, 1982. Once the site work commenced, it was apparent to Georgia-Pacific that the promised drainage relief was not part of the work. Subsequent inquiries by Georgia-Pacific to the City as to why this problem was not addressed were thwarted. The City position was now that the land had been deeded over to the State of New Mexico, it was now their responsibility.

- Georgia-Pacific then made contact with Mimbres and also the State Property Control Division seeking a final solution to their lingering drainage problem. A meeting was held at Property Control's office on December 7, 1982 with representatives from Georgia-Pacific, State Property Control, Mimbres & Associates and Isaacson & Arfman, P. A., the new consulting engineers for the drainage. The following conclusions were agreed upon:
  1. A drainage problem has been imposed upon Georgia-Pacific resulting in damage to their asphalt paving.
  2. A solution is apparent, but its' implementation requires the cooperation of the State and the City of Albuquerque.
  3. The State would want Georgia-Pacific to grant them a hold harmless agreement for any potential drainage liability. In return, the State would provide for a private storm water crossing easement.(In effect, the State would accept those flows generated on Georgia-Pacific's property at a controlled rate and allow them to pass through to the City storm drain system in Mountain Rd.)
  4. The City must concur with any plan that changes the drainage characteristics of this subject area.
  5. The engineer will petition City Hydrology for their concurrence.

- Subsequent discussions with City Hydrology proved successful in that they are prepared to grant this request once all matters have been agreed upon and documented to their full satisfaction.

In the spirit of cooperation in dealing with all of the various concerned parties, we request that your office grant our request for the transfer of storm water from Georgia-Pacific's property, through the detention pond along the Museum's west boundary and discharging into the City's storm drain. Hopefully you will find this correspondence as sufficient documentation in support of the above request.

Very truly yours,
ISAACSON & ARFMAN, P.A.

Fred C. Arfman

Fred C. Arfman, P.E.
FCA/naf

cc: Harvey Grasty, Georgia-Pacific
Bill Haney, Mimbres & Assoc.
Alice Herter, State of NM,
Property Control
Project File

Isaacson &
Arfman, P.A.

Consulting Engineering
Associates

513-D6

October 5, 1982

Mr. Brian Burnett
City Engineering-Hydrology
City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

RE: New Mexico Natural History Museum

Dear Brian:

The above referenced project has a final approval on the Drainage Study as well as the accompanying Special Order No. 19-construction of private facility within public right-of-way. The building's construction drawings are currently out to bid. These drawings reflect the approved plan. But, there seems to be some rumblings going on about the landscaping plan along Mountain Rd. It appears that the permanent pond will be eliminated and replaced with a grass and cobble lined detention pond. The final details have not been worked out, but our firm has been contracted by the architect, Mimbres and Associates of Santa Fe, to revise and/or review any changes that effect site drainage to insure compliance to the already accepted drainage plan.

Obviously, any alteration to the landscaping along Montano Rd. would impact the drainage scheme. Our intention is to detain the volume of storm water runoff (800 c.f.±) and release it at the controlled rate of 480 gal/min. and use the same discharge piping system that is approved for construction.

Current scheduling dictates that this job be bidded before the final revised landscaping plans are completed. There-

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fore, a change order will be issued to cover this matter. We shall endeavor to work with your department and the landscape architect to develop a plan consistent with the guidelines established by the approved study.

Sincerely,
ISAACSON & ARFMAN, P.A.

Fred C. Arfman

Fred C. Arfman, P.E.

cc: Bill Haney, Mimbres & Associates

FCA/naf

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

J13-D6

November 17, 1981

Mr. Fred Arfman
Isaacson-Arfman, P.A.
2727 San Pedro Drive N.E.
Suite 114-A
Albuquerque, New Mexico 87110

Re: NEW MEXICO NATURAL HISTORY MUSEUM DRAINAGE REPORT

Dear Fred:

The referenced drainage report is approved in concept based on your submittal of November 15, 1981.

Very truly yours,

Brian G. Burnett
Civil Engineer/Hydrology

BGB/fs

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

ISAACSON
& ARFMAN, P.A.
CONSULTING ENGINEERING ASSOCIATES

27[illegible] 12 PEDRO N.E. SUITE 114A
ALBUQUERQUE, NEW MEXICO 87110
TELEPHONE – 883-2800

November 13, 1981

Mr. Brian Burnett
P. O. Box 1293
Albuquerque, New Mexico 87103

RE: New Mexico Natural History Museum

Dear Brian:

In response to your letter of November 2, 1981, I am supplying you with this letter of information. The information requested on the answers to the questions asked are listed below in the same order as that on your November 2nd letter.

1. Yes, the firm of Isaacson & Arfman, P.A. shall furnish your office with an Engineer's Certificate of the finish floor elevations.

2. Has not gone to EPC as of this date. Refer to your November 10, 1981 Inter-Office Correspondence concerning this project.

3. The average flood depth was projected by comparing the water surface elevation to the field survey. The survey was based on spot elevations in a 50' frid pattern.

4a. The storm waters that land in the area designated as L-2 shall be allowed to overland flow to the pond. Entrance is permitted by the landscape considerations of planned keyway openings in the concrete bench/barrier and through the rock perimeter.

4b. The pond shall be concrete lined. See revised drawing attached.

4c. Attached are the pipe calculations for the 12" perforated pipe (transfer & acceptance).

The ultimate pond water surface elevation would be 56.3 based on the volume of storm water collected and detained. This maximum

W.S. elevation is with respect to the 100 year - 6 hour storm with no considerations of the discharge while the pond is filling. The volume below the 56.3 contour and above the proposed finish grade is equal to the volume of storm water runoff.

5. A design for the two private drains connecting to the 18" storm sewer has been submitted to Bob Kielick on the S.O. No. 19 format. Review comments received from the Design Section were favorable for the connection. Resubmitted for approval, November 9, 1981.

6. See "Addition to Drainage Exhibit" sheet.

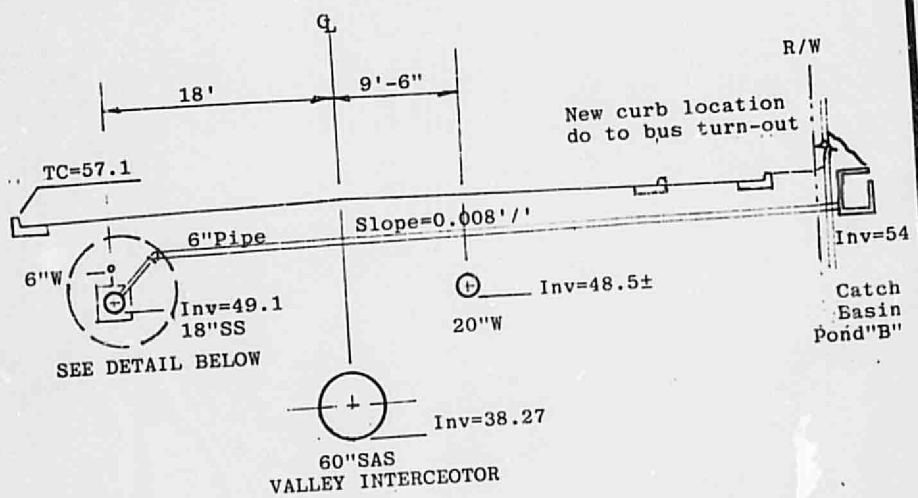
All of the minor points of clarification have been resolved and would like to go for Drainage Report Approval.

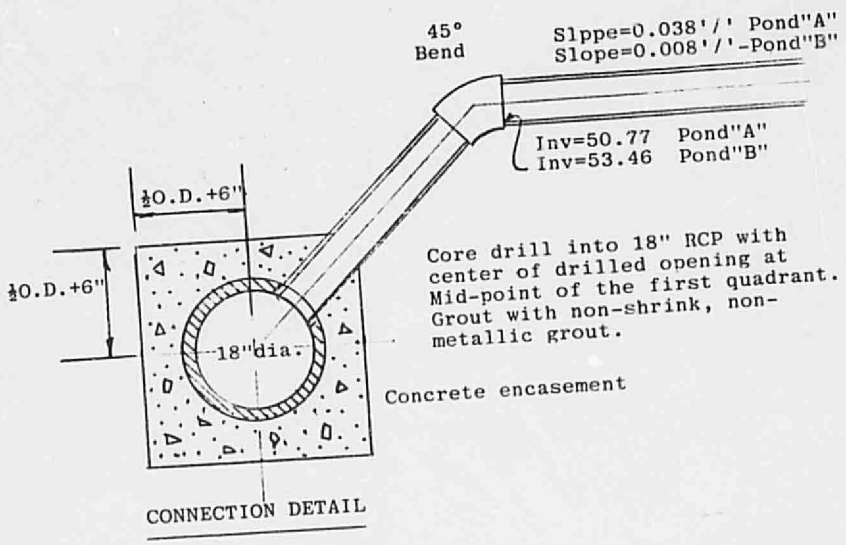
Sincerely,

ISAACSON & ARFMAN, P.A.

Fred C. Arfman, P.E.
Vice President

FCA/cvi
Attachments

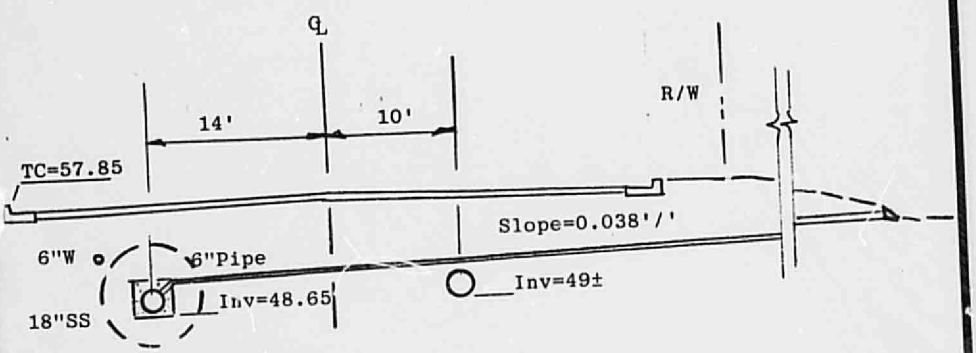




Isaacson & Arfman, P.A.
Consulting Engineering Associates

SUBJECT _____ JOB NO. ____

BY _____ DATE _____ SHEET NO. ____ OF ____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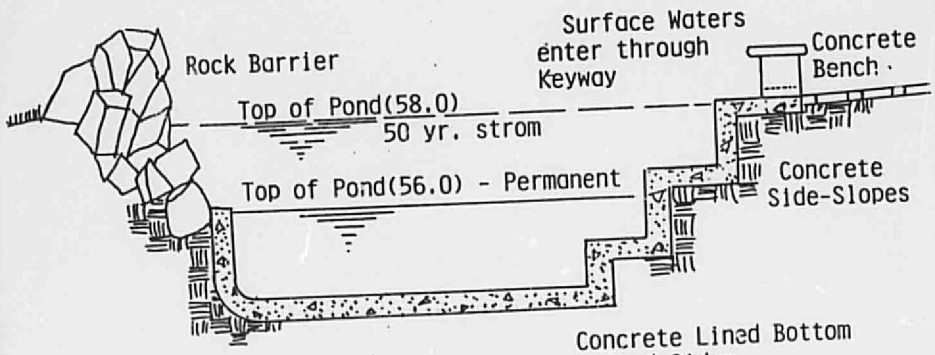
14'
10'
R/W
TC=57.85
Slope=0.038'/'
6"W
6"Pipe
Inv=48.65
18"SS
Inv=49±
SEE CONNECTION
DETAIL


Rock Barrier
Surface Waters
enter through
Keyway
Concrete
Bench
Top of Pond(58.0)
50 yr. strom
Top of Pond(56.0) - Permanent
Concrete
Side-Slopes
Concrete Lined Bottom
and Sides

POND "B"

4c. By Manning's: $Q = A\frac{1.486}{n}R^{2/3}S^{1/2}$

where $A = 0.785$
$n = 0.02$
$R = 0.25$
$R^{2/3} = 0.397$
$S = 0.005$ ft/ft ⇒ to provide for self-cleansing velocities
$S^{1/2} = 0.0707$

$Q = 1.64$ cfs

The corrugated perforated steal pipe shall fully perforated w/ 3/8 to 1/2 inch dia. holes. w/ not less than 80 perforation per sq. ft.

= 5.89 sq. in / sq. ft.

= 18.5 sq. in / lin. ft.

= 25.7 sq. ft / 200 ft. of pipe

This gross square foot entrance area is greater than what the pipe is capable of transferring; therefore the Q = 1.64 cfs governs.

CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE November 10, 1981 REF. NO._____

TO: Liz Marquez, Planning Division

FROM: Brian G. Burnett, Civil Engineer/Hydrology BGB

SUBJECT: NEW MEXICO NATURAL HISTORY MUSEUM DRAINAGE REPORT

In a recent conversation with Victoria Prince she indicated that there was some confusion concerning the EPC Hydrology comments for the referenced site. Following is an outline highlighting major dates relating to drainage considerations for this project:

1. June-August. Several pre-design conferences were held with the Consulting Engineer, Mr. Fred Arfman.

2. September 22. A drainage report for the site was submitted to this Department.

3. November 2. This office made a formal reply to the submittal. We are currently awaiting some minor clarifications.

In general, the on-site and off-site drainage have been adequately addressed by the Engineer. It would be appropriate to change the EPC comments to state that drainage concerns have been adequately addressed and that this department recommends approval of the development.

BGB/tsl

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

J13 - D6

November 2, 1981

Mr. Fred Arfman
Isaacson & Arfman, PA
2727 San Pedro Dr. N.E.
Suite 114
Albuquerque, N.M. 87110

RE: DRAINAGE STUDY FOR THE NEW MEXICO NATURAL HISTORY MUSEUM

Dear Fred:

A review of the referenced drainage report has resulted in the comments listed below. The number indicated refers to the Drainage Report (DR) and Construction Plan (CP) Checklists:

1. DR #1 & CP # 7 - Because of the flooding potential in this area we request an engineer's certification on the finished floor elevation.

2. DR # 2 - What were the staff comments and EPC findings for this site?

3. DR # 10 - Was the average flood depth of 3" assumed or was the figure obtained from Bohannan-Huston?

4. The following comments refer to on-site considerations (DR # 15):

   a. How does runoff from Area L-2 enter the pond (especially in the area of the rock and concrete bench barriers)?

   b. What provisions will be made to assure that water permanently stands in Pond B?

   c. I am a bit confused as to the conveyance and overflow scheme on Pond A. It appears that the center swale and perforated pipe are used entirely for feeding Pond A, then the overflow pattern is directly related to the capacity of the drain network.

      Has the capacity of the pipe network been computed? Would conveying part of the runoff directly to the pond be useful? Also, why will the ultimate water surface of the pond be 56.3?

5. DR # 21M and CP # 22 - Is it permissible to tap directly to an 18" line? Bob Kielich could best answer this question.

6. Please identify the following items on the Construction Plan:

   a. CP # 12 - The FF elevation listed to a 5 digit MSL designation.

   b. CP # 13 - Spot elevations for standard City Drivepad (in reference to your statement, "the 56 contour is the elevation of the entrance").

   c. CP # 14 - Additional spot elevations in the parking lot areas.

   d. CP # 17 - The locations of discharge pipes used in the roof drain network.

   e. CP # 18 - Location of the property cut-off wall.

   f. CP # 18 - Locations of curb cuts in lot areas.

If I can answer any questions concerning these matters, please call.

Very truly yours,

Brian G. Burnett

Brian G. Burnett
Civil Engineer/Hydrology

BGB/tsl

RECEIVED
SEP 22 1981
CITY ENGINEER

ISAACSON & ARFMAN, P.A.
Consulting Engineering Associates

LETTER OF TRANSMITTAL

To HYDROLOGY
CITY OF ALBUQUERQUE

Date 9-22-81

Job No.

Attn: BRIAN BURNETT

Reference N.M. NATURAL HISTORY MUSEUM

RECEIVED
SEP 22 1981
ENGINEERING

Gentlemen:

We transmit to you 2 copy(ies) of the following

- ☐ _____ Plats
- ☐ _____ Plans
- ☐ Specifications
- ☒ DRAINAGE Report
- ☐ Shop Drawings
- ☐ Submittals
- ☐ Material Specifications
- ☐ Copy of Letter
- ☐ _____
- ☐ _____

This information is transmitted:

- ☐ As per your request
- ☒ For your review & approval
- ☐ For your information
- ☐ For your attention
- ☐ For your signature
- ☐ For your files
- ☐ For your use
- ☐ Please review & return
- ☐ For return to your files
- ☐ Please advise
- ☐ _____
- ☐ _____

Remarks: I'M SURE WE'LL TALK, SO CALL ME.

By: F. A. Arfman

Copies To

2727 San Pedro N.E. • Suite 114A • Albuquerque, New Mexico 87110 • Telephone 883-28[illegible]

WILLIAM MATOTAN & ASSOCIATES, INC.
ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project Georgia Pacific Site Sheet 1 of 10
Subject: Hydrology Job No. 706
Comp. by REP Date 23 Nov. 83 Chk'd _____ Date _____

A. Rainfall Data

1. Rainfall Volumes (from DPM Plate 22.2 D-1)

6 Hr., 100 yr. = 2.2"
" 50 yr. = 2.02"
" 10 yr. = 1.45"
" 5 yr. = 1.19"
" 2 yr. = 0.98"

2. Rainfall Intensities (I)

from DPM Plate 22.2 D-2

I = 6 hr. 100 yr. Vol. $\times 6.84 \times t_c^{-0.51}$

where 6 hr. 100 yr Vol. = 2.2"

and t_c (from DPM 22.2 p.3) $= 0.0078 \frac{L^{0.77}}{S^{0.385}}$

L = 780 ft. and $L^{0.77} = 168.62$

$S = 2'/780' = 0.0026$ and $S^{0.385} = 0.1011$

$t_c = (0.0078)\left(\frac{168.62}{0.1011}\right) = \underline{13 \text{ min.}}$

$I_{100} = 2.2 \times 6.84 \times 13^{-0.51} = 4.06$

$I_{50} = 4.06 \times 0.92 = 3.73$

$I_{10} = 4.06 \times 0.657 = 2.67$

$I_5 = 4.06 \times 0.541 = 2.20$

$I_2 = 4.06 \times 0.445 = 1.81$

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Project Georgia Pacific Site Sheet 2 of 10
Subject: Hydrology Job No. 206
Comp. by RS Date 19 Apr. 83 Chk'd Date

B. Existing Discharge Conditions (100% developed)

Using Rational formula $Q = CIA$ (from DPM 22.2)

where Q = Peak rate of discharge in cu.ft./sec. (cfs)

I = Rainfall intensity.

C = Coefficient of Imperviousness

A = Area of runoff basin in Acres

A = 78,044 sq.ft. ÷ 43,560 sq.ft./Acre = 1.79 Acres
Entire area asphalt paved and/or roofed

C = 1.00 for entire area for 100 yr. and 50 yr.
0.98 for frequencies less than 50

$Q_{100} = 1.0 \times 4.06 \times 1.79 = 7.27$ cfs

$Q_{50} = 1.0 \times 3.73 \times 1.79 = 6.68$ cfs

$Q_{10} = 0.98 \times 2.67 \times 1.79 = 4.68$ cfs

$Q_5 = 0.98 \times 2.20 \times 1.79 = 3.86$ cfs

$Q_2 = 0.98 \times 1.81 \times 1.79 = 3.18$ cfs

C. Existing Runoff Volumes (100% developed)

Using Formula $V = CRA$

where V = Total volume of runoff in cu.ft. (cf)
or acre feet (ac-ft)
C = Coefficient of Imperviousness
A = Area of runoff basin in square feet
R = 6 Hour rainfall depth in feet

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Project Georgia Pacific Site Sheet 3 of 10
Subject: Hydrology Job No. 706
Comp. by DSP Date 19 Apr. 83 Chk'd ____ Date ____

D. Existing Runoff Volumes (Cont'd)

$V_{100} = 1.00 \times \frac{2.2}{12} \times 78,044 = 14,308 \text{ cf}$
$= 0.33 \text{ ac.ft.}$

$V_{50} = 1.00 \times \frac{2.02}{12} \times 78,044 = 13,137 \text{ cf}$
$= 0.30 \text{ ac.ft.}$

$V_{10} = 0.98 \times \frac{1.45}{12} \times 78,044 = 9,242 \text{ cf}$
$= 0.21 \text{ ac.ft.}$

$V_5 = 0.98 \times \frac{1.19}{12} \times 78,044 = 7,585 \text{ cf}$
$= 0.17 \text{ ac.ft.}$

$V_2 = 0.98 \times \frac{0.98}{12} \times 78,044 = 6,246 \text{ cf}$
$= 0.14 \text{ ac.ft.}$

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Project Georgia Pacific Site Sheet 4 of 10
Subject: Hydrology Job No. 706
Comp. by RSA Date 19 Apr. 83 Chk'd _____ Date _____

E. Total Duration of Runoff (T)

From DPM 22.2 Plate 22.2 E-1

$T = 2V/qp \div 60$

where T = total runoff time in minutes
V = total volume of runoff in cf
qp = peak discharge in cfs

T_{100} = 14,308 cf x 2 ÷ 7.27 cfs = 65.6 Min.
Use 65 Min.

T_{50} = 13,137 cf x 2 ÷ 6.68 cfs = 65.6 Min.
Use 65 Min.

T_{10} = 9,242 cf x 2 ÷ 4.68 cfs = 65.8 Min
Use 65 Min

T_5 = 7,585 x 2 ÷ 3.86 cfs = 65.5 Min
Use 65 Min.

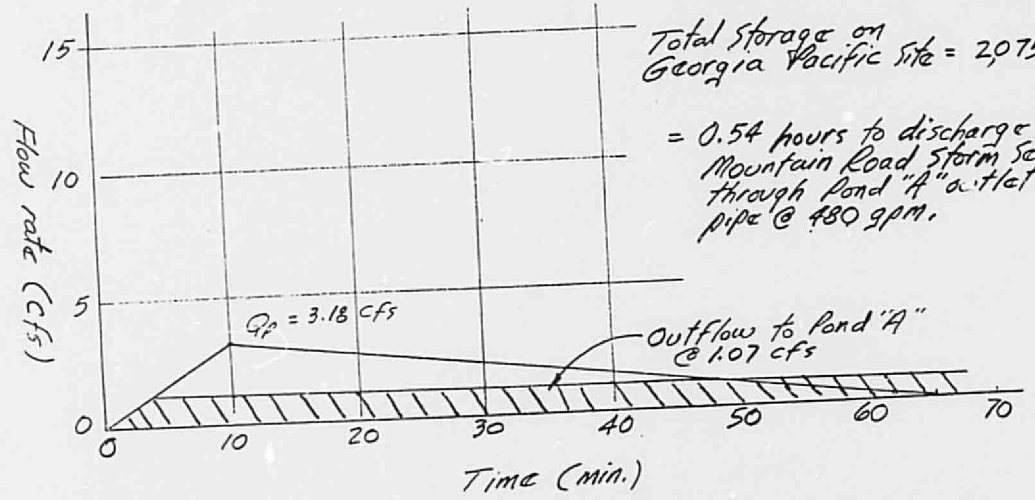
T_2 = 6,246 x 2 ÷ 3.18 cfs = 65.5 Min
Use 65 Min.

Runoff Hydrograph for 6 hr. 2 yr. Event

Outflow to Pond "A"
= 480 gpm = 1.07 cfs
for 65 min. = 4,171 cf
Total Runoff Volume = 6246 cf
4171 cf

Total Storage on Georgia Pacific Site = 2,075 cf

= 0.54 hours to discharge to Mountain Road Storm Sewer through Pond "A" outlet pipe @ 480 gpm.



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Project Georgia Pacific Site Sheet 5 of 10
Subject: Hydrology Job No. 706
Comp. by CSD Date 14 Apr 83 Chk'd ____ Date ____

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Project Georgia Pacific Site Sheet 6 of 10
Subject: Hydrology Job No. 706
Comp. by RCD Date 19 Apr 83 Chk'd ____ Date ____

Runoff Hydrograph for 6 hr. 5 yr. Event

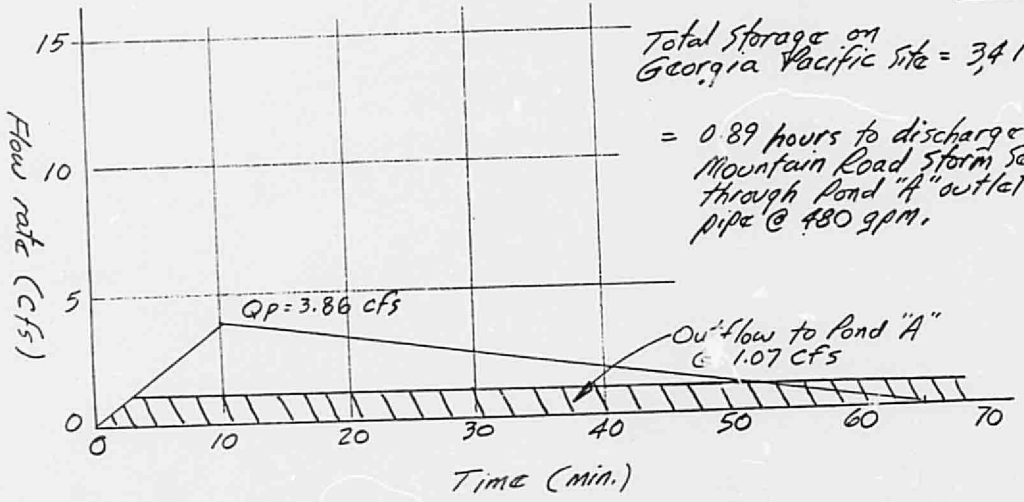
Outflow to Pond "A"
= 480 gpm = 1.07 cfs

for 65 min. = 4,171 cf

Total Runoff Volume = 7585 cf
4171 cf

Total Storage on Georgia Pacific Site = 3,414 cf

= 0.89 hours to discharge to Mountain Road Storm Sewer through Pond "A" outlet pipe @ 480 gpm.



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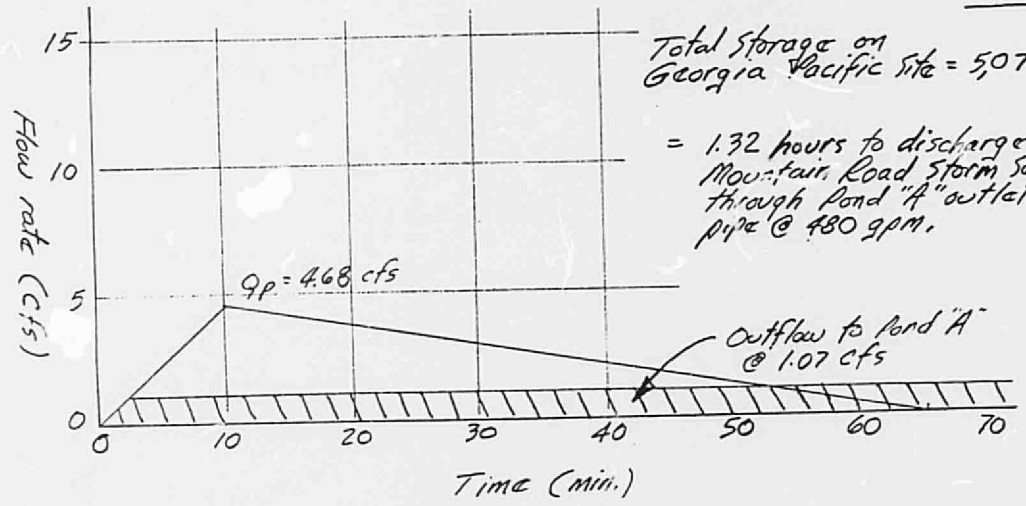
Project Georgia Pacific Site Sheet 7 of 10
Subject: Hydrology Job No. 706
Comp. by DSD Date 19 Apr 83 Chk'd Date

Runoff Hydrograph for 6 hr. 10 yr. Event



Outflow to Pond "A"
= 480 gpm. = 1.07 cfs
for 65 min. = 4,171 cf

Total Runoff Volume = 9,242 cf
4171 cf

Total Storage on
Georgia Pacific Site = 5,071 cf

= 1.32 hours to discharge to Mountain Road Storm Sewer through Pond "A" outlet pipe @ 480 gpm.

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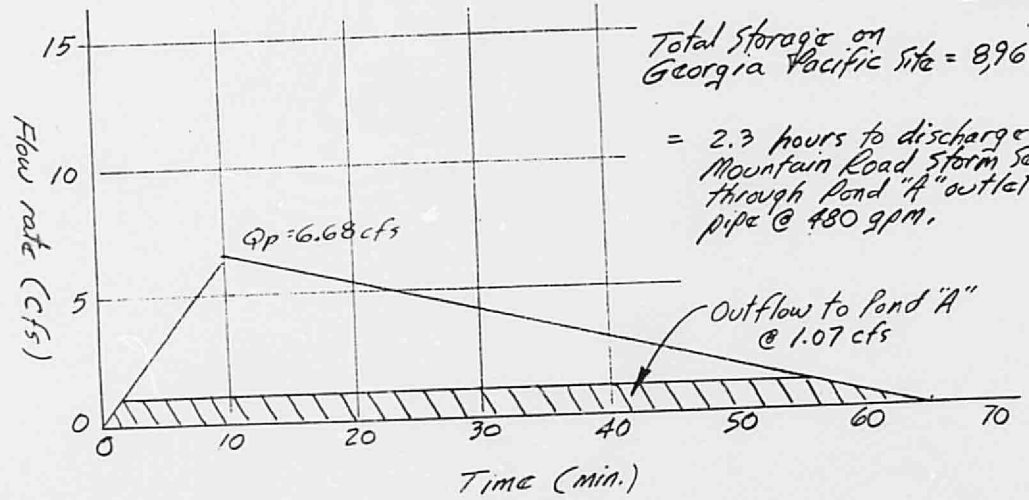
Project: Georgia Pacific Site Sheet 8 of 10
Subject: Hydrology Job No. 706
Comp. by RSD Date 19 Apr 83 Chk'd Date

Runoff Hydrograph for 6 hr. 50 yr. Event



Outflow to Pond "A"
= 480 gpm = 1.07 cfs

for 65 min. = 4,171 cf

Total Runoff Volume = 13137 cf
4171 cf

Total Storage on Georgia Pacific Site = 8,966 cf

= 2.3 hours to discharge to Mountain Road Storm Sewer through Pond "A" outlet pipe @ 480 gpm.

Runoff Hydrograph for 6 hr. 100 yr. Event

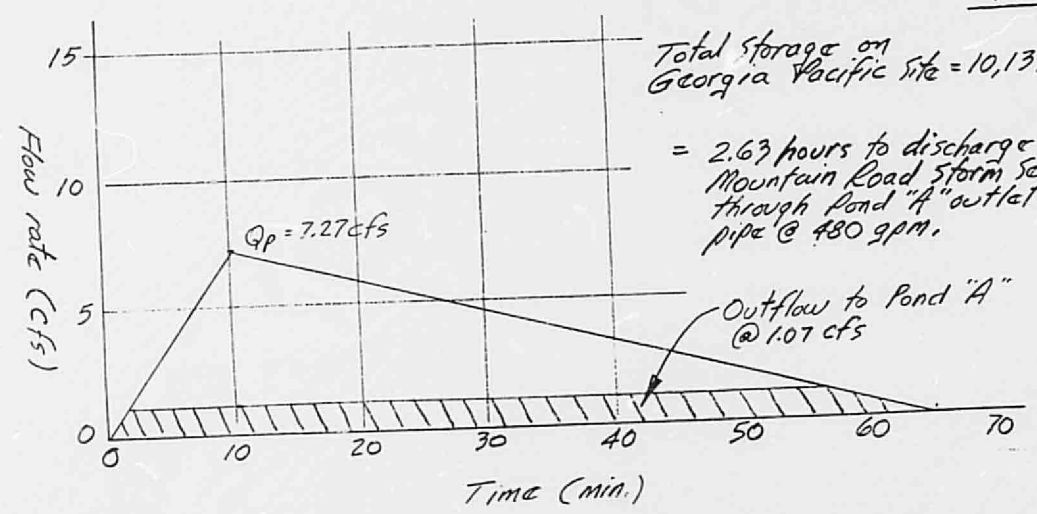
Alternate Pond Dimensions (approximate):
a) 200' x 30' x 1.7'
b) 270' x 14' x 2.68' (would not discharge by Gravity)
c) 220' x 25' x 1.8'

Outflow to Pond "A"
= 480 gpm = 1.07 cfs
for 65 min. = 4,171 cf

Total Runoff Volume = 14,308 cf
4171 cf

Total Storage on Georgia Pacific Site = 10,137 cf

= 2.63 hours to discharge to Mountain Road Storm Sewer through Pond "A" outlet pipe @ 480 gpm.



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Project Georgia Pacific Site Sheet 9 of 10
Subject: Hydrology Job No. 706
Comp. by DSD Date 14 Apr 83 Chk'd Date

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Project Georgia Pacific Site Sheet 10 of 10
Subject: Hydrology Job No. 706
Comp. by REL Date 19 Apr. 83 Chk'd _____ Date _____

Time of Concentration (t_c) for 1.79 Ac. Area.

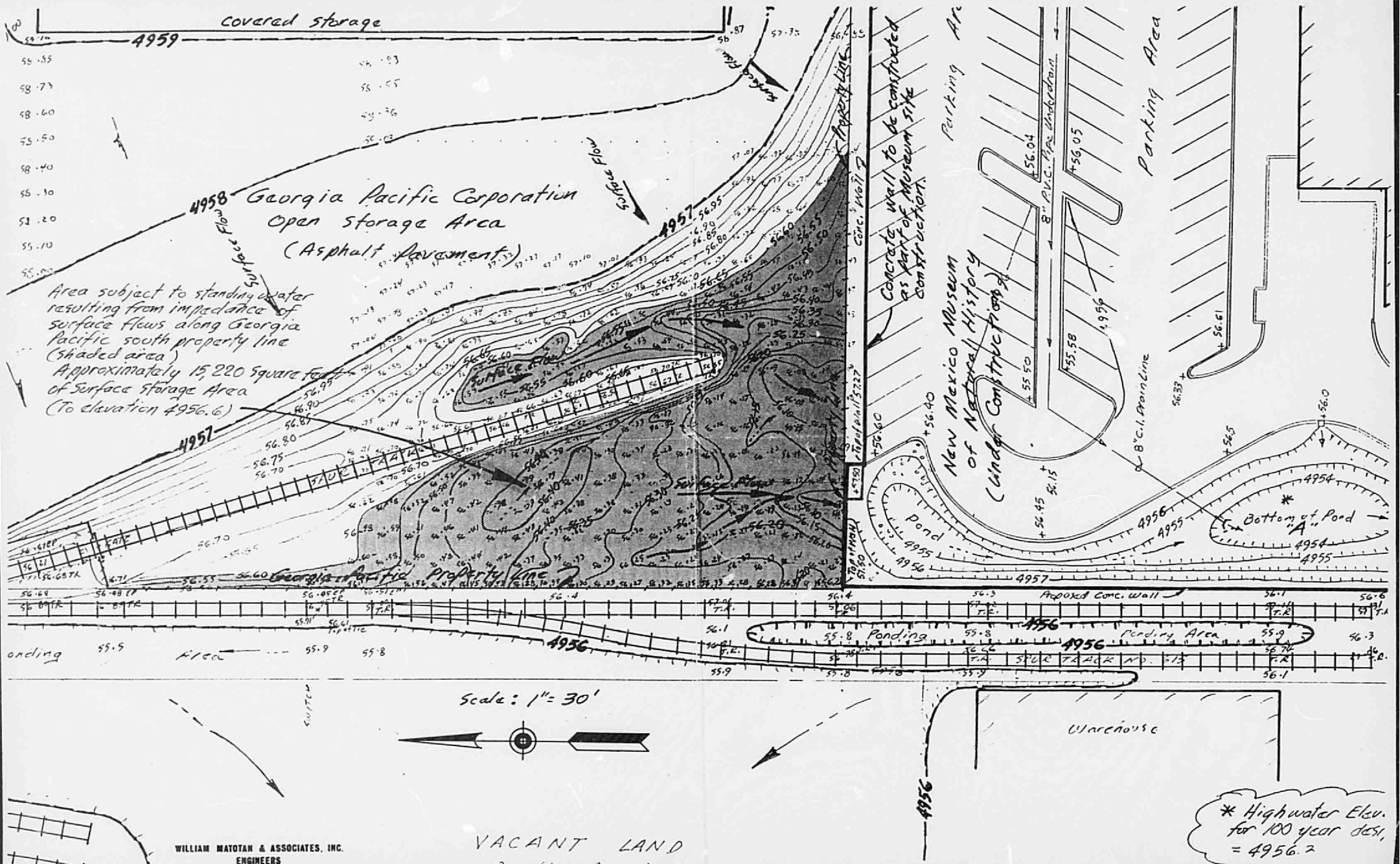
where $t_c = 0.0078 \frac{L^{0.77}}{S^{0.385}}$

and $L = 440$ ft. and $L^{0.77} = 108.5$

$S = 3'/440' = 0.0068$ and $S^{0.385} = 0.146$

$\therefore t_c = (0.0078)\left(\frac{108.5}{0.146}\right) = 5.79$ min.

Use 10 min.


Covered Storage
4959
Georgia Pacific Corporation
Open Storage Area
(Asphalt Pavement)
Surface Flow
Area subject to standing water resulting from impedance of surface flows along Georgia Pacific south property line (shaded area)
Approximately 15,220 Square Feet of Surface Storage Area (To elevation 4956.6)
Georgia Pacific Property Line
Property Line
Concrete wall to be contructed as part of Museum site construction
Parking Area
New Mexico Museum of Natural History (Under Construction)
8" PVC. Pipe Underdrain
8" C.I. Drain Line
Bottom of Pond "A"
Pond
Ponding Area
Proposed Conc. Wall
Warehouse
Scale: 1" = 30'
* Highwater Elev. for 100 year desi, = 4956.2
VACANT LAND
(Ponding Area)
WILLIAM MATOTAN & ASSOCIATES, INC.
ENGINEERS
ALBUQUERQUE, NEW MEXICO

A RESPONSE TO THE FACTS, CALCULATIONS, ASSUMPTIONS AND RECOMMENDATION OF WILLIAM MATOTAN & ASSOCIATES, INC. STUDY OF AUGUST 3, 1983

by

Isaacson & Arfman, P.A.

128 Monroe St. N.E.

Albuquerque, N.M. 87108

(505) 268-8828

August 10, 1983

1. Water must have stood over some portion of the pavement prior to the 1978 blading, since the area's low point is along the common property line of the G-P and the museum. The pavement deterioration may have been caused by various factors:

   The longitudinal slope being 0.3% is substantially flatter than that recommended

   Natural freeze-thaw action

   Temporary blockage of storm waters

   Heavy vehicular use

2. The proposed design has not been implemented. Furthermore, once it was known that storm waters were allowed to free discharge into the flood plain, engineering efforts were made to accommodate those storm water volumes. It must be understood that the water generated on Georgia-Pacific's site was allowed to free flow into the area's flood plain, which is situated on both sites (see attached flood-plain map).

3. The 56.2 water surface (w.s.) elevation has an accepted range of error of plus or minus one-half contour interval. The contour interval is 2 feet, therefore the actual real w.s. elevation may be in the range 55.2 to 57.2. The actual w.s. elevation for the 100 yr. event was determined by comparing the proximity of the limits of the 100 yr. flood plain to the same locations on the field survey performed by CCIC and Matotan. Both surveys indicate an elevation of 57.0 (±0.1').

   In response to the last sentence of Paragraph 3:
   The flood-plain limits do indeed allow for infiltration by the fact that storm water volumes were computed by either the Rational Method or SCS Method. Both equations have factors which correspond to ground surface conditions.

For example, in the case of the Rational Method, V=CDA, where A is the area in square feet, D is depth of rainfall in feet and C is a dimensionless runoff coefficient. In the case of flat natural terrain, as was the museum site, a C factor of 0.35 is reasonable. The 0.35 is the percentage of the rainfall not accepted by the ground, and therefore would be expected to runoff. The 0.65 remainder is accepted by infiltration, evaporation or ponding. Therefore, infiltration is definitely considered in the determination of the flood plain.

4. This fact is true, but it must be understood that because G-P elected to totally pave their lot, that left the Museum site as the only area capable of allowing storm waters to infiltrate. Until the flood-plain pond completely infiltrated and evaporated, storm waters will stand over both a portion of the G-P pavement and the Museum site.

In response to the second paragraph:
It should be understood that the entire pond will have the same w.s. elevation for the 100 yr. event (57.0). Therefore, storm water volumes from the west have the potential to enter onto the Georgia-Pacific site at two locations. First, there is a low point in the Railroad track (elev.= 56.8) and secondly storm water would flow northerly toward G-P's southwest property corner and parallel to the Railroad tracks (see site surveys). The assumption that water would flow off of both sites above elevation 56.6 can not be assumed.

I don't believe the last paragraph has any business being in a fact report since it can not be verified that a storm of sufficient intensity actually occurred while Mr. Grasty was observing that portion of remote paving.

5. The "Pre-1971 Rainfall Contribution" table is very confusing. Some of the volume figures can not be verified. For example:

	5 Yr.	Actual*
Georgia Pacific site	14,020 c.f.	14,363 c.f.
Museum site	11,622**	6,652
Total	25,642 c.f.	21,015 c.f.
Diverted to east storage pond	6,435	0***

*Based on C=0.35, D=1.19"
**Can not be verified as runoff, but is computed as storage potential below the 56.6 contour by Matotan.
***East storage pond did not exist Pre-1971

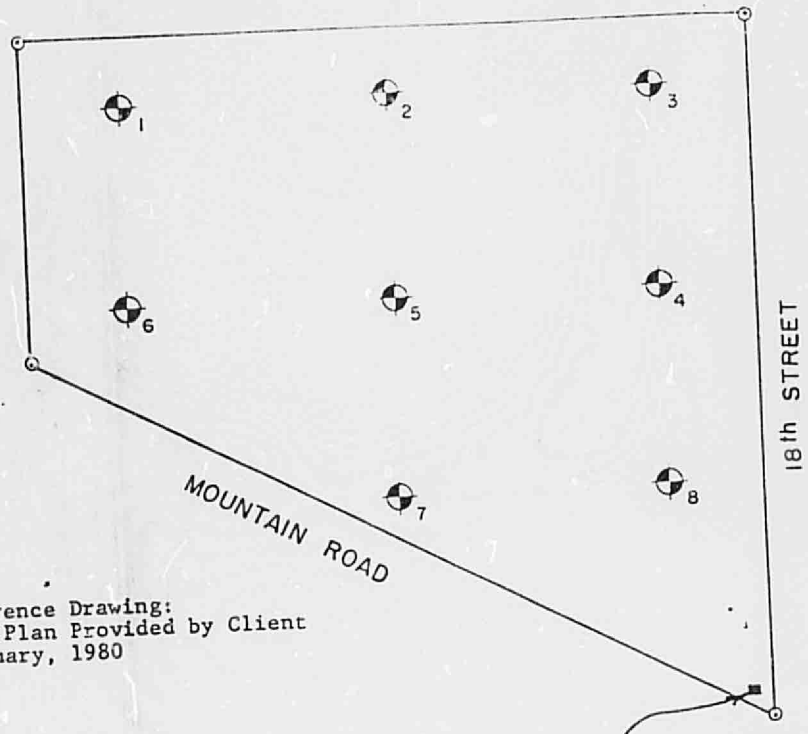
Additionally, the computation of the 5 year volume diverted to the east storage pond is very confusing. The developed 5 year volume for the west site is subtracted from the entire site's undeveloped volume. This is not understood since the development of the west site increases the runoff potential by a factor of 2.7. All of this runoff eventually makes its way into the same area flood-plain for those major event storms.

6. Computation of volume of fill placed on G-P site. The technique of deriving this volume should be the comparison of original contours versus finish contours. Using the 1972 site plan to reconstruct the originals and the Matotan 1982 site survey for the finish contours, an elevation comparison grid was used to achieve the average increased depth over the entire site (see attachment). A volume of 179,700 cu.ft. was determined as the total increase of concrete, asphalt and imported fill. The portion of the above figure that actually displaces the flood-plain (increase elevation below the 57.0± contour) is 30,750 c.f. by using the same method but holding the upper elevation at 57.0 (see attachment).

It should also be noted that the result of paving or building on the entire site caused zero infiltration, thereby necessitating the forcing of storm waters onto those lands that surround it.

SHOWING LOCATIONS OF TEST BORINGS

New Mexico Natural History Museum
Northwest Corner of Mountain
Road & 18th Street, N.W.
Albuquerque, New Mexico
SHB Job No. E80-1104



Reference Drawing:
Site Plan Provided by Client
February, 1980

BM: Base of Fire Hydrant
Assumed Elev. 100.0'

SCALE: 1" = 100'±

N

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
PHOENIX • TUCSON • ALBUQUERQUE

A

LOG OF TEST BORING NO. [illegible]

PROJECT New Mexico Natural History [illegible]

JOB NO. [illegible]-1104 DATE 10/14/80

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV. 98.87

DATUM See Site Plan

Depth In Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	Remarks	Visual Classification
0			☒	S	11		12	CL	moderately firm	SANDY CLAY, low to medium plasticity, brown
			☒	U	10	100	13	SM	moderately firm	SILTY SAND, predominantly fine, nonplastic, red brown
5			☒	S	14		5	SP	medium dense	SAND, predominantly fine to medium, nonplastic, tan
10			☒	S	11		3			
15			☒	S	11		3	SW	medium dense	GRAVELLY SAND, well graded, nonplastic, tan
20			☒	S	9		22	SW	loose to medium dense	SAND, fine to coarse, some gravel, nonplastic, tan
25			☒	S	11		19			
30			☒	S	13		13			
35										Stopped auger @ 29'6" Stopped sampler @ 31'0"

GROUND WATER

DEPTH	HOUR	DATE
18'±	12:00	10/14

SAMPLE TYPE

A - Auger cuttings. B - Block sample

S - 2" O.D. 1.38" I.D. tube sample

U - 3" O.D. 2.42" I.D. tube sample

T - 3" O.D. [illegible]

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[illegible]

PROJECT [illegible]

JOB NO. E80-1104 DATE 10/14/80

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV. 99.23
DATUM See Site Plan

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	24		8	SM-SC	firm	SILTY SAND, predominantly fine, some clay, low plasticity, brown
			☒	S	18		7			
5			☒	S	9		2		loose	SAND, predominantly fi to medium, nonplastic, tan
10			☒	S	7		2	SP		
15			☒	S	10		3			
20			☒	S	5(no recovery)			SW	loose	SAND, fine to coarse, some gravel, nonplasti gray
25			☒	S	3					Stopped auger @ 24'6" Stopped sampler @ 26'0
30										

GROUND WATER

DEPTH	HOUR	DATE
18'±		10/14

SAMPLE TYPE

A - Auger cuttings B - Block sample
S - 2" O.D. 1.38" I.D. tube sample
U - 3" O.D. 2.42" I.D. tube sample
T - 3" O.D. thin-walled Shelby tube

SERGENT, HAUSKINS & BECKWITH

8-10-83

VOLUME DISPL[illegible] (G.P.)

[illegible]	FACTOR	NEIH
	1	57.1
	2	56.5
	2	56.5
	[illegible]	5[illegible]
	2	56.1
	[illegible]	56.[illegible]
	[illegible]	5[illegible]
	[illegible]	5[illegible]
	[illegible]	56.
	[illegible]	58.
	[illegible]	57.[illegible]
	[illegible]	56.[illegible]
	[illegible]	5[illegible]
	4	57.
	1	57.
	2	56.
	2	56.
	1	58.1
	1	58.[illegible]
	2	57.0
	2	56.3
	1	58.
	1	58.1
	2	57.5
	2	56.
	[illegible]	5[illegible].1
	[illegible]	58.
	2	57.
	2	56.
	4	58.[illegible]
	[illegible]	58.1
	2	57.9

22,550

NET CU. FT. = 1797   [illegible] OF DISPLACEMENT

8-10-83

VOLUME DISPLACEMENT (G.P.)

[illegible]	FACTOR	NEW	EXT
	1	57.1	[illegible]
	2	56.[illegible]	[illegible]
	2	56.[illegible]	[illegible]
	[illegible]	5[illegible]	
	2	56.[illegible]	[illegible]
	[illegible]	5[illegible]	
	[illegible]	[illegible]	
	[illegible]	5[illegible]	
	[illegible]	56.[illegible]	
	4	5[illegible]	
	[illegible]	57.[illegible]	
	[illegible]	56.[illegible]	
	[illegible]	56.[illegible]	
	4	5[illegible]	
	1	57.[illegible]	
	2	56.[illegible]	
	2	56.[illegible]	
	1	58.1	
	1	58.1	
	2	57.0	[illegible]
	2	56.[illegible]	
	1	58.[illegible]	
	1	58.1	
	2	57.[illegible]	
	2	56.[illegible]	
	4	58.1	
	[illegible]	58.[illegible]	
	2	57.[illegible]	
	2	56.[illegible]	
	4	58.[illegible]	
	1	58.1	
	2	57.9	

22,550

NET CU.FT. = 179.7   [illegible] % OF DISPLACEMENT

VOL. DISPLACEMENT BELOW THE 57.0 CONTOUR.

GEORGIA-PACIFIC SITE (EXISTING -VS- AS-BUILT)

PT.#	FACTOR	NEW 57.0	EXT	Δ'	X1000	XF(+)	XF(-)
1	1	57.0	56.6	0.4	1000	1000	
2	2	56.85	56.45	0.4	1000	2000	
3	2	56.85	56.0	0.85	875	1750	
4	1	56.2	56.9	-0.7	-1750		1750
5	2	56.1	56.65	-0.55	-1375		2750
6	4	57.0	56.50	0.5	1250	5000	
7	4	56.75	56.2	0.55	1375	5500	
8	2	56.3	56.95	-0.65	-1625		3250
9	2	56.0	56.7	-0.70	-1750		3500
10	4	57.0	56.5	0.50	1250	5000	
11	4	57.0	56.3	0.70	1750	7000	
12	2	56.5	57.0	-0.50	-1250		2500
13	2	56.2	56.95	-0.75	-1875		3750
14	4	57.0	56.5	0.5	1250	5000	
15	4	57.0	56.35	0.65	1625	6500	
16	2	56.7	56.9	-0.2	-500		1000
17	2	56.1	57.0	-0.9	-2250		4500
18	4	57.0	56.8	0.2	500	2000	
19	4	57.0	56.75	0.25	625	2500	
20	2	57.0	56.8	0.2	500	1000	
21	2	56.3	57.0	-0.7	-1750	3500	
22	4	57.0	57.0	—	—		
23	4	57.0	56.8	0.2	500	2000	
24	2	57.0	56.9	0.1	250	500	
25	2	56.6	57.0	-0.4	-1000		2000
26	4	57.0	57.0	—	—		
27	4	57.0	56.9	0.1	250	1000	
28	2	57.0	57.0	—			
29	2	56.7	57.0	0.3	-750		1500
30	4	57.0	57.0	—			
31	4	57.0	57.0	—			
32	2	57.0	56.9	0.1	250	1000	
						58,250 cF	26,500 cF

TOTAL DISPLACEMENT OF FLOOD PLAIN
UNDER THE 57.0 CONTOUR = 58,250
− 26,500
31,750 CU. FT.

ISAACSON & ARFMAN, P.A.
Consulting Engineering Associates

SUBJECT NHA JOB NO.
BY ECA DATE 3/83 SHEET NO. OF

SURFACE STORM WATER CAPACITY DETERMINATION
FOR THE WEST [illegible]
GEORGIA-PACIFIC SITE

CONTOUR	RING	[illegible]	[illegible]	VOL. CU. FT.	Σ VOL. CU FT.
56.0	—			272	
56.2	0170	[illegible]	[illegible]	3,341	272
56.4	1222	18.33	[illegible]	11,130	3613
56.6	3415	51.23	[illegible]	20,132	14,743
56.8	5267	79.015	[illegible]	29,203	35,931
57.0	6901	103.515	[illegible]		65,134

ISAACSON & ARFMAN, P.A.
Consulting Engineering Associates

SUBJECT [illegible] JOB NO.
BY FCA DATE 8/83 SHEET NO. OF

10. INFILTRATION

'. Impact on flood-plain pond volumes

The analyses by the Corp. of Engineers method for determining runoff by use of the rational method showed a greater runoff rate than what would be derived by the conventional method. For example:

Corp. of Engineers Rational Formula

$Q=C(I-F)A$, where

C=0.64 (terrian factor)

I=3.3 (rainfall intensity based on a time of concentration of 20 min.)

F=0.60 (infiltration rate)

A=4.4 Ac. (Museum site only)

$Q=(0.64)(3.3-0.60)(4.4) = 7.60$ cfs

$Q=CIA$, where infiltration is taken into consideration in the "C" factor

$Q=(0.35)(4.73)(4.4) = 7.3$ cfs*

*This method produces a runoff value less than the Corp. of Engineers'.

Ponding-vs.-Infiltration: Pre-Museum Construction

II. Volume Contributions (100 yr. event)

A. Georgia Pacific

1. Southerly 2.05 Ac.

a. "C" = 0.95

b. I = 4.73

c. D = 2.2" = 0.183'

d. V = CDA

= (0.95)(0.183)(2.05)(43560) = 15,524 c.f.

2. North acreage (area that does not contribute to east retention pond)

a. area = 2 Ac.

b. V = (0.95)(0.183)(2)(43560) = 15,146 c.f.

3. Total runoff from G-P west lot = 30,670 c.f.

B. Museum Site

1. 4.4 of the site's 4.8 acres contribute to the flood-plain pond

a. "C" = 0.35

b. I = 4.73

c. D = 0.183'

d. V = CDA

= (0.35)(0.183)(4.4)(43560) = 12,276 c.f.

C. **Combined total**-Use only the southerly portion of G-P west lot, even though the north area's runoff contributes to the overall drainage basin's flood-plain.

COMBINED TOTAL 27,800 c.f.

D. The analysis of rainfall for the six-hour event shall be performed on an hourly basis. From the DPM, Plate 22.2, D-3 "Accumulated Rainfall", the mass-curve indicates that 85% of the rain may fall within the first hour. This equates as follows:

(0.85)(2.2")(1/12) = 0.155 ft.

When this is inserted into the rational formula

Georgia-Pacific

V = (0.95)(0.155)(2.05)(43560) = 13,149 c.f.

Museum site

V = (0.35)(0.155)(4.4)(43560) = 10,398 c.f.

23,547 c.f.

This volume is the amount of rainfall which would pond in the common low area. It should be understood that a volume of

$V=(0.65)(0.155)(4.4)(43560) = 19{,}310$ c.f.

has infiltrated or evaporated during that initial hour of the event. This ground saturation has occurred only on the pervious Museum site.

III. Infiltration

A. Georgia-Pacific site does not allow for any infiltration.

B. Museum site

1. The portion of the site where ponding occurs has been tested and soil classifications determined. From the log of test borings performed by Sergent, Hauskins and Beckwith (see attachments), it was determined that a soil with a Uniformed Soil Classification of SM was encountered for the first five (5) feet for both holes, except for hole no. 1. It indicated a one (1) foot layer of clay (CL). This soil has a very low permeability range of 0.2-0.6 inches per hour. The SM soil has a permeability range of 0.6-2.0 inches per hour. To achieve an average infiltration rate, the average of the high side will be used for this preliminary analysis, therefore:

$(0.6+2.0)/2 = 1.3$ inches per hour

$= 0.11$ feet per hour

Pond Surface Areas & Pond Volumes

CONTOUR	RDNG.	SQ.IN.	SQ.FT.	VOLUME CU.FT.	Σ VOLUME CU.FT.
56.0					
				704	
56.2	0782	11.73	10,557		704
				4,501	
56.4	2552	38.28	34,452		5,205
				9,490	
56.6	4478	67.17	60,453		14,695
				15,095	
56.8	6703	100.55	90,495		29,790
				22,662	
57.0	8602	129.03	116,127		50,452

Ground Infiltration Area

56.0			
56.2	0487	7.31	6,579
56.4	1816	27.24	24,516
56.6	3204	48.06	43,254
56.8	4660	69.90	62,910
57.0	6094	91.41	82,269

By interpolation of the pond volume contours

56.6

= 15,095 ÷ 1/6243 = .41

56.8

56.8 - (0.2 x .41) = 56.72

This 56.72 is the computed water surface elevation after the first hour of the 100 yr. event. The corresponding pervious ground area capable of accepting the pond waters by infiltration is:

Using the Ground Infiltration Area Determination:

56.72 contour equates to 54,851 sq. ft.

This area is capable of accepting
54,851 sq. ft. x 0.11 ft./hr = 6,034 cu.ft.
Thereby reducing the ponded volume to:
23,547 - 6,034 = 17,513 cu.ft.

Plus 3% of the remaining
storm(15%/5 hours) = 831 cu.ft.
18,344 cu.ft.

INFILTRATION TABLE

Georgia-Pacific site developed
Natural History Museum undeveloped
Infiltration rate F = 0.11 ft./hr.
100 yr.-6 hr. event

TIME (hours)	RAINFALL VOLUME (cu.ft.)	INFILTRATION VOLUME (cu.ft.)	WATER SURFACE ELEVATION	GND. SUR. AREA
0	0	----	----	
1	23,547	19,310*	56.72	54,851
2	18,344	6,034	56.65	48,168
3	13,877	5,298	56.58	41,380
4	10,156	4,552	56.50	33,885
5	7,260	3,727	56.44	28,264
6	4,982	3,109	56.40	24,000
7	2,342	2,640	56.31	16,444
8	533	1,809	56.15	----
9		ASSUMED COMPLETE INFILTRATION		

CONCLUSIONS

1. Many of the facts, assumptions and calculations found in the report can not be verified.

2. The historical flood-plain does indeed encroach on the Georgia-Pacific site.

3. The lowering of the museum's west detention pond is possible, but without the proper safeguards on the G-P site, storm water volumes from the west may enter onto the museum site, causing damage to the site.

William Matotan & Associates, I
William I. Matotan, P.E.

FACTS

1. The Georgia Pacific Corporation property had no standing water on its paved area prior to City grading of the present Museum site in the late 1970's. Subsequent to that, the standing water deteriorated the pavement where the water stood to the point that replacement of that pavement is necessary.

2. The present design of the water storage facilities, the parking area water storage, and the retaining wall on the north side of the museum site is unacceptable in that the drainage for the Georgia Pacific site is altered from the original free flow.

3. The 100-year flood plain map attached to the Isaacson & Arfman Report (taken from the Bowannon-Huston study) shows a flood-plain elevation of less than 56.2. This is verified as proper datum from previous topographic maps of the present museum site before improvements. The flood-plain limits for the 100-year flood do not allow for infiltration.

4. The present museum site took all flows from the Georgia Pacific property prior to the City grading of the property.

It is assumed that water flows off of both sites into the Santa Fe RR property above elevation 56.6. This is taken from the existing map elevations.

Mr. Harvey Grasty reports that when the water flowed on to the museum property, no water was ever standing on Georgia Pacific property.

5. Pre-1971 Rainfall Contribution, Both Sites (Undeveloped state).

	5-Yr.	10-Yr.	50-Yr.	100-Yr.
Georgia Pacific Site	14,020 cf	17,020 cf	23,848 cf	25,909 cf
Museum Site	11,622	14,109	19,769	21,477
Total, Both Sites	25,642	31,129	43,617	45,386
Diverted to G.P. East Storage Pond	6,435*	7,812	10,946	11,892
Remainder	19,207 cf	23,317 cf	32,671 cf	33,494 cf

* 5-year event computation of diversion to Georgia-Pacific East Storage Pond:

Georgia Pacific Entire Site:	14,020 cf
Present 5-year Flow from Georgia-Pacific Property :	(7,585)
Diversion to E. Storage Pond:	6,435 cf

6. Computation of Volume of Fill Placed on Georgia-Pacific Site.

Total storage volume below contour 56.6 before development of either site:	9,433 cf
Pre-1981 total storage volume below contour 56.6 after paving Georgia Pacific site:	(4,566)
Difference, representing volume of fill placed on Georgia-Pacific site for paving purposes:	4,867 cf

7. The volume of water diverted to the Georgia-Pacific East storage pond for the 100-year event is 11,892 cf; whereas, the volume of fill placed on the Georgia-Pacific site was 4,867 cf. The Georgia Pacific Corporation therefore stores the difference, 7,025 cf, between the 11,892 cf and the fill, 4,867 cf, more than compensating for the difference.

8. Pre-1971 Condition.

The volume of water that was received by the Museum site from the Georgia-Pacific site prior to grading or development of that site, less the pre-1971 storage on the Georgia-Pacific site is as follows:

100-Year storm: 25,909 cf less 9,433 cf = 16,476 cf

9. Georgia-Pacific Condition of Present Improvements.

The volume of water that would remain for the museum site to take care of in the traditional manner, or a substitute manner, for this condition would be the difference between the 25,909 cf and the 11,892 cf of storage in the Georgia-Pacific East Pond, or 14,017 cf. The 11,892 cf of storage provided more than makes up for the 4,867 cf of fill placed on the Georgia-Pacific property, and this 11,892 cf deduction would accrue to the advantage of the Museum property.

Also, the storage in the East Georgia Pacific Pond would assure that the Georgia Pacific Corporation has taken care of the excess water that would otherwise bring the level to the 100-year flood level if none of the property were developed. For example, the computed rainfall contribution for the undeveloped Georgia-Pacific property is 25,909 cf for the 100-year event. A rainfall volume of 14,017 cf, described in Item 9 above, would bring the total Georgia Pacific rainfall volume to be taken care of by the Museum property to only the 5-year event in order to afford the 100-year storm protection that the museum property enjoys through their present protective design and in order to conform to the present City ordinance.

10. Infiltration.

Infiltration is a factor taken into account by all hydrology equations, including the Rational Formula which provides a basis for these computations. For example, the Rational Formula used by the U. S. Corps of Engineers (Architect-Engineer Instruction Manual for U. S. Army Engineer District, Fort Worth Corps of Engineers, Fort Worth, Texas, April 1983, Chapter II, Civil) modifies the infiltration factor "I" to a factor of "I - F", where "I" is the rainfall intensity in inches/hour and "F" is the infiltration rate in inches/hour.

The very difference in factors, for example the difference between bare ground (an "I" of 0.35) and pavement (an "I" of 0.95) is based on infiltration differences.

Prior to the time the drainage sheet flow and low point were blocked due to grading operations, all water flowed off of the Georgia-Pacific lot on to the undeveloped museum lot, where the water was ponded and where it infiltrated into the ground.

The Soil Survey of Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico, published by the United States Department of Agriculture, the SCS, the U. S. Department of the Interior, the BIA, and the Bureau of Land Management, in cooperation with the New Mexico Agricultural Experiment Station, classify the undeveloped museum site land before grading and improvements

as an approximately equal division of soil into "Ge" and "VbA" of the Gila and Vinton soil series respectively. The average infiltration rate, as listed in the Soil Survey, would be 0.6 to 2.0 inches/hr. for the "Ge" type soil and 2.0 to 6.0 inches/hr. for the "VbA" type soil. Study of the gradations completed for the eight Museum site soil borings indicates a a soil with even more permeability than these figures, inasmuch as most of the borings show a non-plastic soil, with more plus 10 material and a relatively low minus 200 content, as compared with the gradations listed in the Soil Survey for the types of soil described above.

Obviously, with only approximately 2.2 total inches in 6 hours falling in a 100-year storm, the original infiltration of from 36 inches to 12 inches in 6 hours was ample to take care of any storm runoff from both the Georgia-Pacific property and the museum property. Any improvements that change this capability should be taken care of by others, in my opinion, so that Georgia-Pacific may be able to survive at least a 100-year flood without standing water on their property in the manner they did before construction and the present design.

Documentation of the above is available upon request.

CONCLUSIONS

1. Georgia Pacific Corporation has not sent and will not send water onto the Museum property in a manner or quantity to do more harm than formerly.

2. The present City Drainage Ordinance (Enactment No. 63-1982) prohibits increasing the damage potential to upstream property from the 100-year design storm by construction, grading or paving on any lot within the jurisdiction of the City of Albuquerque.

3. The proposed improvements to the Museum property do not allow for receiving 100-year design storm water from the Georgia-Pacific property. The Museum design blocks all flow from that property, provides only for the detention of the 100-year storm flow from the Museum property, and ignores the storm drainage from the Georgia=Pacific property.

4. A large area of pavement of Georgia-Pacific property has been damaged and requires replacement due to the ponding of water as a result of grading operations and blockages by others, and the maintenance of such conditions to the present time.

5. The traditional sheet flow, combined with the more concentrated flow at the low point of the south edge of the Georgia-Pacific pavement, will have been blocked by proposed construction at the Museum site.

6. In order to provide the same degree of protection to the Georgia-Pacific site, downstream accommodation of flows should be no less than that provided for in the City of Albuquerque requirements; e.g., 100-year storm protection. Subtracting present storage provided for on Georgia-Pacific property this would mean a required accommodation of 16,476 cubic feet of additional detention on the Museum site to afford 100-year storm protection for the Georgia-Pacific property.

7. Storage of water on the Santa Fe Railroad property cannot be relied upon due to the height of the rails (57.0), the narrow area between the rails and the Museum and Georgia-Pacific west boundaries, and the possibility of creating damages to the Santa Fe Railroad, thereby creating a situation whereby a problem is merely transferred from one property to the next.

8. The proposed 6-inch drain from Pond A to the City storm sewer system was not relied upon in the detention system storage design for the Museum site and should not be relied upon, inasmuch as the pipe-plugging potential is great and such failure would merely increase the damage potential to the Georgia-Pacific Corporation. The pipe-plugging potential exists not only from trash and debris, but also from plugging due to silting of a small-diameter pipe with the inlet screen cast into the concrete and with no clean-out provisions.

RECOMMENDATIONS

1. No obstruction of any kind, including walls, be allowed along the south property line of the Georgia-Pacific property from the southwest corner easterly along the south boundary for approximately 270 feet to just beyond the high point at the drainage divide, elevation 57.2. This will allow the traditional sheet flow from the Georgia-Pacific property as well as more concentrated flow at the low point adjacent to the southwest property corner, elevation 56.0.

2. The detention pond system and parking area storage be redesigned for the Museum site to accommodate the 100-year storm contribution from the Georgia Pacific Company site in the total volume of 16,476 cubic feet, if the criteria is followed that all considerations revert to the original, undeveloped land conditions. If the criteria is followed that credit be given for on-site storage provided by the Georgia Pacific Company in the amount of 11,892 cubic feet for the 100-year storm and the drainage contribution is considered for the condition of present development for the Georgia-Pacific property and the pre-graded and pre-constructed condition for the Museum property, then the recommendation would be to provide on-site storage additional to the present Pond A and Parking Area storage on the Museum property in the amount of 14,017 cubic feet.

3. Deteriorated pavement in the southwest corner area of the Georgia-Pacific property be replaced. Along with the replacement, approximately 270 linear feet of at-grade concrete cut-off wall be constructed to protect the edge of pavement from deterioration due to sheet flow on to the Museum property in the traditional manner. The elevations of the south pavement edge for the 270-foot length be no higher than the existing elevations.

4. It is not within the scope of services for which William Matotan & Associates, Inc., was retained, but in order to demonstrate the practicality of the above recommendations, the following comments are made.

a. The existing pond could be deepened and the parking area redesigned to accommodate the additional storage recommended. For example, if original, undeveloped land criteria is followed, computations show that Pond A could be deepened, along with the redesign of the parking area, to allow more storage. Pond A could be deepened approximately 2 feet with straight side walls at the 56.0 contour level to accommodate an additional 16,476 of storage.

If it is decided to consider the present development of the Georgia-Pacific property and its 100-year storm contribution in lieu of the above-described total, undeveloped land criteria, it would only be necessary to deepen Pond A by approximately 1.7 feet to accommodate 14,017 cubic feet of additional storage.

b. The parking area would be redesigned in any event; inasmuch as the edge elevations at the south boundary of the Georgia-Pacific property would have to be maintained for free sheet-flow conditions. The balance between pond deepening and parking-lot storage would be a design problem, within the parameters mentioned above.

Recommendations (Contined)

c. An alternative would be to contact the Santa Fe Railroad by the proper parties to possibly obtain additional property for Pond A enlargement. It is understood that the easterly spur line is no longer being used.

d. Computations show that there would be no conflict with an existing 60-inch diameter sanitary sewer located under Pond A. The top of this sewer line is approximately 10 feet below the bottom of Pond A as presently designed.

e. Computations show that lowering of the bottom of Pond A as discussed would still allow sufficient pipe slope to empty detained flows well within the 24-hour evacuation requirement of the City of Albuquerque.

5. Finally, the overflow elevation of the dropped curb at Pond A, representing the overflow outlet to the North Parking Area Museum storage, should be no higher than elevation 55.6. This will allow for 0.3 ft. parking area surcharge storage to bring the 100-year storm storage elevation to slightly under elevation 56.0, the low point of the Georgia-Pacific property. If a parking area redesign creates more than 0.3 ft. additional elevation due to surcharge, the "crest" of the opening should be no greater than elevation 56.0 less the additional surcharge depth plus 0.1 ft.

6. We did not recompute the storage allowed for by the Isaacson and Arfman Report in the North Parking Area Museum storage adjacent to Pond A. Prior to finalizing any storage accommodations on the Museum site, it is proposed that detailed computations be provided not only to assure proper Museum on-site storage, but to assure that the computed 100-year storm ponding water-surface elevation will be no greater than elevation 55.9.

CITY OF ALBUQUERQUE

DRAINAGE FACILITIES WITHIN CITY RIGHT-OF-WAY

J-13-D6

Submittal of this Special Order No. 19 covers two (2) , 6" storm drain connections from Ponds that manage storm water runoff at the proposed New Mexico Natural History Museum, to be located at 1801 Mountain Road N.W.

FRED C. ARFMAN NEW MEXICO 7322 REGISTERED PROFESSIONAL ENGINEER

Fred C. Arfman — Nov 10, 1981
DESIGNED BY: DATE

NOTICE TO CONTRACTOR

1. An excavation/construction permit will be required before beginning any work within City right-of-way. An approved copy of these plans must be submitted at the time of application for this permit.
2. All work detailed on these plans to be performed, except as otherwise stated or provided hereon, shall be constructed in accordance with "Contract Documents for City-Wide Utilities and Cash Paving No. 30 "
3. Two working days prior to any excavation, contractor must contact Line Locating Service, 765-1234, for location of existing utilities.
4. Prior to construction, the contractor shall excavate and verify the horizontal and vertical 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 ~~collector~~ Arterial street use.

Southwest Mech P-2476A-21 18th & Mountain Rd N.W.

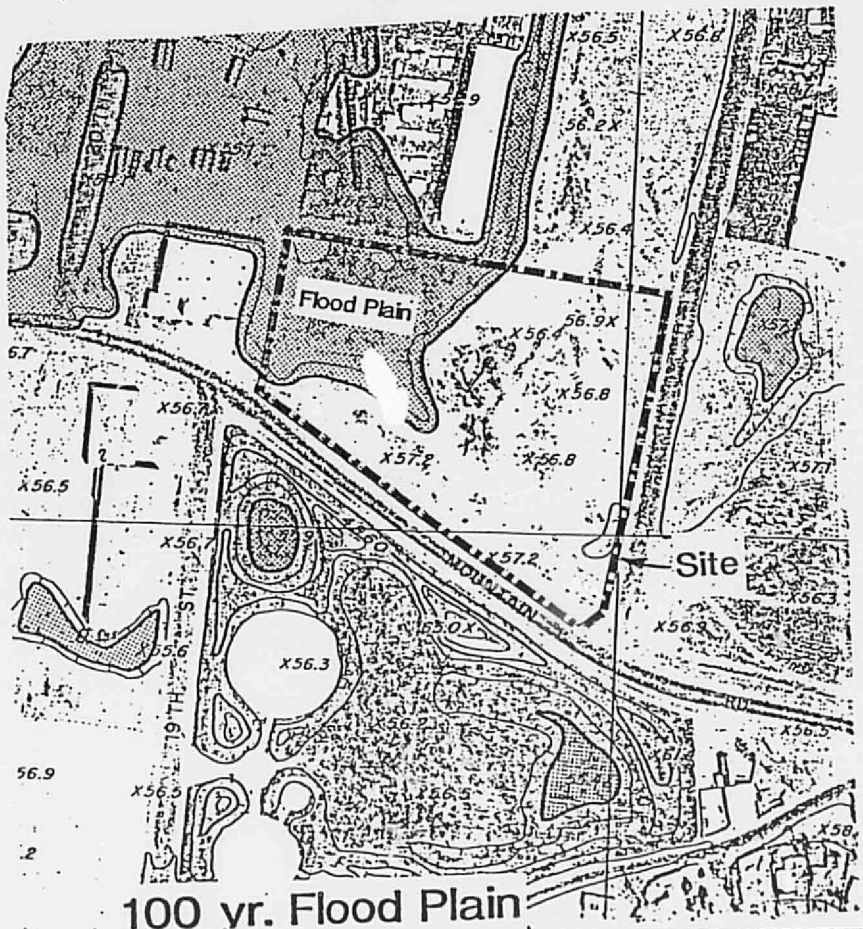
APPROVALS	NAME	DATE
A.C.E./DESIGN		10/16/81
INSPECTOR		11/11/81

TITLE: Natural History Museum Private Drain Lines to Public Storm Sewer

PERMIT NO

MAP I-1

VICINITY MAP



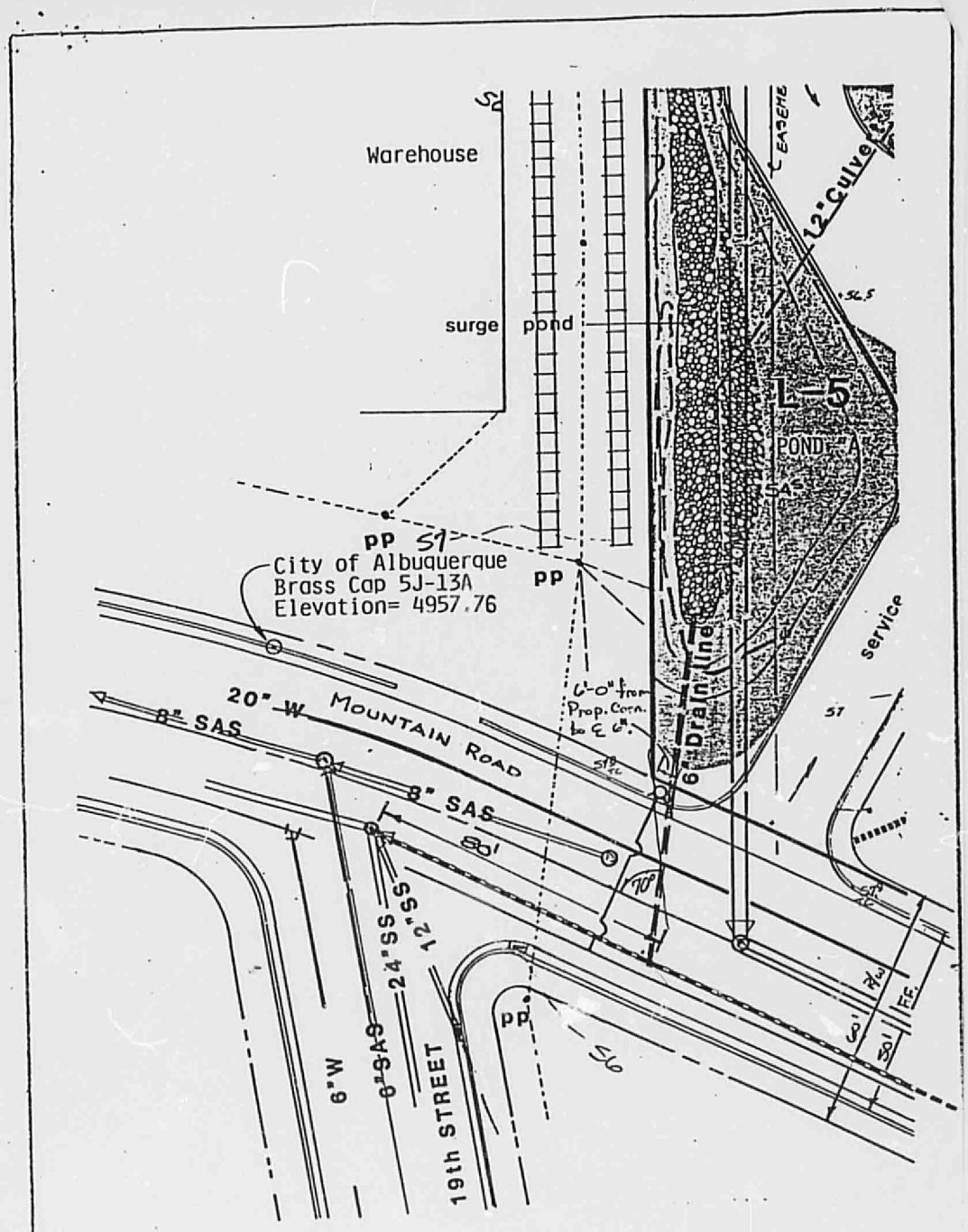
CITY OF ALBUQUERQUE

APPROVALS	ENGINEER	DATE
A.C.E./DESIGN		
INSPECTOR		7-11-93

TITLE: Natural History Museum
Special Order No. 19
2 of 5

PROJECT

MAP J-13



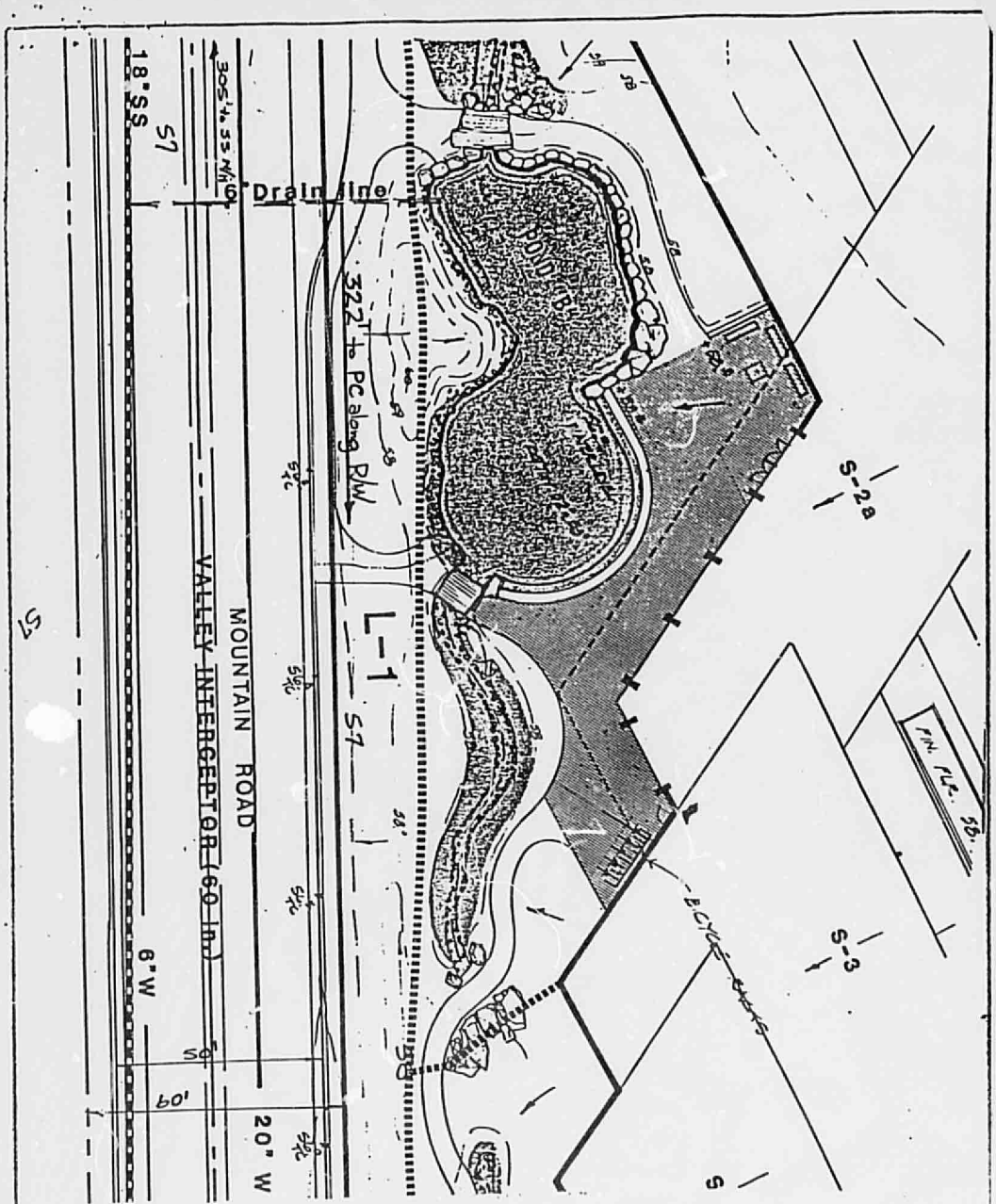
November, 1981

CITY OF ALBUQUERQUE

APPROVALS	ENGINEER	DATE
A.C.E./DESIGN		
INSPECTOR		7-1-83

TITLE: Natural History Museum
6" Outfall Drain from Pond "A"
to Storm Sewer in Mountain Rd.

PROJECT | MAP J-13

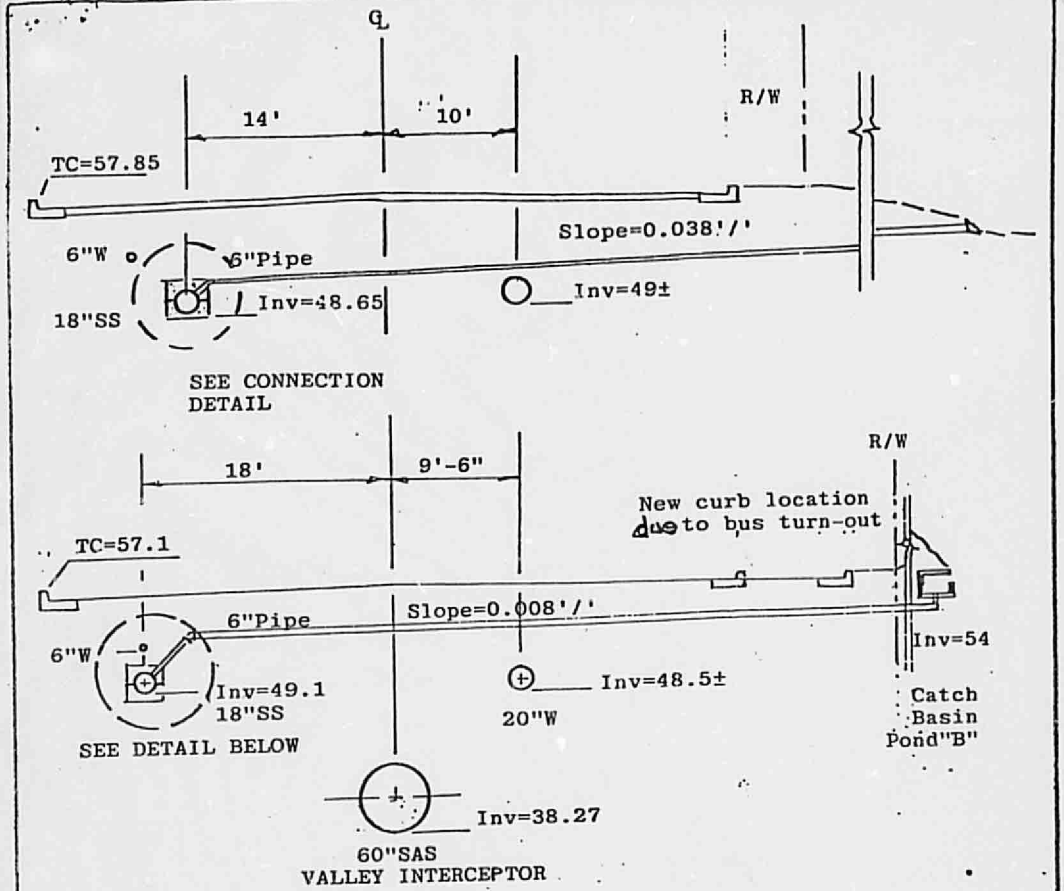


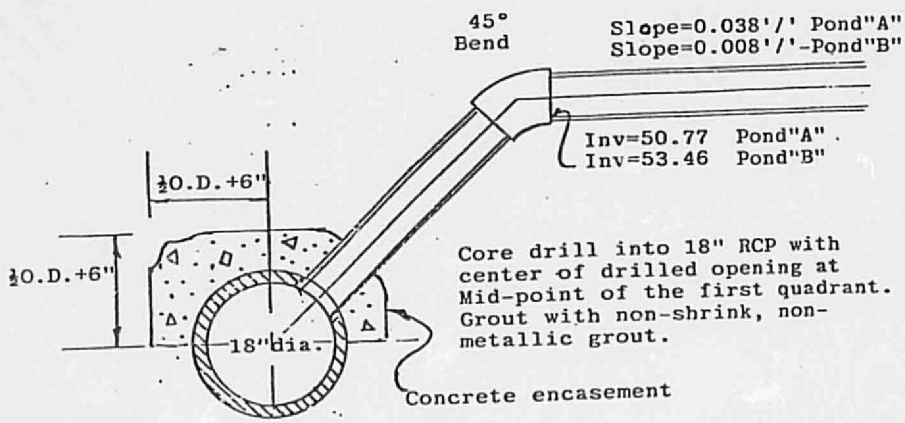
4 of 5
November; 1981

CITY OF ALBUQUERQUE

APPROVALS	ENGINEER	DATE	TITLE: Natural History Museum 6" Outfall Drain Line to Storm Sewer in Mountain Rd.
A.C.E./DESIGN	J Kelch	10 Nov 81	
INSPECTOR		7-11-83	PROJECT

MAP L-13





CONNECTION DETAIL

REVISED: 6-15-82

November, 1981

CITY OF ALBUQUERQUE

APPROVALS	ENGINEER	DATE	TITLE: Natural History Museum Connection Details
A.C.E./DESIGN	[signature]	15 Jun 82	5 of 5
INSPECTOR	[signature]	7-1-82	PROJECT MAP J-13

DRAINAGE STUDY

for the

NEW MEXICO

NATURAL HISTORY MUSEUM

Isaacson & Arfman, P.A.

Consulting Engineering Associates

• Albuquerque, New Mexico •

DRAINAGE STUDY

for the

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NATURAL HISTORY MUSEUM

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Consulting Engineering Associates
• Albuquerque, New Mexico •

DRAINAGE STUDY

FOR

NEW MEXICO NATURAL

HISTORY MUSEUM

Prepared by:

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2727 San Pedro Dr. N.E., Suite 114
Albuquerque, New Mexico 87110

SEPTEMBER 1981

INTRODUCTION

Our firm of Isaacson & Arfman, P.A. has been contracted by Mimbres & Associates of Santa Fe to assist them in the development of an acceptable drainage plan for the New Mexico Natural History Museum. This investigation and report shall be presented along the guidelines laid out in the "Hydrology Checklist and Procedures", August 1981.

Careful attention has been given to how the projected storm water runoff will act in conjunction with the overall site. Due to the site's valley characteristics, several pre-report meetings were held with the City Hydrologist's staff as well as with Jim Fink of Bohannan-Huston, Inc. These meetings resulted in the streamlining of the drainage report criteria and general clarification of intent on behalf of the city staff and consulting engineer.

SITE LOCATION & TOPOGRAPHY

The New Mexico Natural History Museum's site is located to the northeast of Albuquerque's Old Town area. More precisely,

VICINITY MAP

the site consists of 4.830 acres located on the northwest corner of Mountain Road and 18th St. (legal descirption found in the appendix). The site's terrain is characteristic of the area; that of very flat land with scattered debris and isolated trees. Other vegetation is sparce leaving a substantial portion of the site as exposed earth. This was due to emergency parking lot grading that was preformed by the City in order to accommodate an overflow crowd expected for the grand opening of the Museum of Albuquerque.

A soil investigation study was preformed by Sergent, Hauskins & Beckwith. The site drainage recommendations from their study can be found in the appendix of this report.

OFFSITE DRAINAGE

The New Mexico Natural History Museum site does not accept any definable flows by way of watercourses or sheetflow runoff from the surrounding properties. The existing site conditions are such that the northwest corner (approx. 1.3 acres) is covered by the flooding limits of the 100 year flood. The onsite volume of which is 14,[illegible] cu. ft. The flood volume is based on an average depth of 3 inches. The onsite generated volume, based on a "c" value of 0.35 and a total rainfall depth of 2.2" is 13,390 cu. ft. Since these are only close approximations, they shall be considered equal in volume for the drainage considerations of this study.

The offsite storm drainage systems have been investigated for the surrounding areas. The existing 18" storm sewer in Bellamah Ave. is overtaxed for improvement (No. 124-03) by the Albuquerque Drainage Masterplan. This plan recommends for the addition of 8 inlets in Bellamah Ave. and 20th St., and for the ungrading or paralleling of the storm sewer in Carson between Rio Grande Blvd. and the MRGCD drain.

At a professional consultation with Jim Fink of Bohannan-Huston, it was understood that the Carson improvements must proceed any new inlets, therefore the construction of such inlets would be premature since there is not sufficient downstream capacity.

To the south and west of the site, there exist a storm drain system independent of the previously mentioned system. There are 2 catch basins with accompanying 15" storm sewer located on the south end of 20th St. I Mountain Road, adjacent to the site, are 2 catch basins with their accompanying 18" line. These lines converge on 19th St. where they combine flows and are directed south. The portion of storm sewer in 20th St. is overtaxed at the present time, while the inlets and line in Mountain Road are capable of handling their required flows. This is an important fact and shall play a vital role in our drainage recommendations.

It should also be noted that this existing storm sewer becomes undersized as the system developes further to the south.

In summary, it is known that offsite drainage conditions are far from perfect, but until the system is expanded to alleviate the potential flooding problems, this site shall handle its own runoff and not accept any offiste storm waters.

ONSITE CHARACTERISTICS

The hydrological calculations in this section are based on the rational runoff method. Estimated were made in percents of area covered by each coverage type described in this section for each drainage sub-area. Volume calculations for the sizing individual ponds shall be based on the percentage of area to be ponded for each area. Determination of discharge rates are based on the one-year storm as designated by the City of Albuquerque's Hydrology Section.

The site for the New Mexico Natural History Museum does not have any definable drainage outfall. Therefore, only the undeveloped storm water volume needs to be considered under this study (see appendix for calculations). As stated earlier, this volume of 13,392 cu. ft. is approximately equal to that of the 100 year flood volume on the property. Site work must be preformed to insure that the remaining flood water remains off of the site (see recommendations).

Under developed conditions, this site must handle an increase of 19,132 cu. ft. This volume shall be handled by the use of four different methods.

1. A small landscaped area on the west side of the building will sheet flow onto 18th St. (Minor discharge).

2. A landscaped area at the corner of Mountain Rd. and 18th St. will accept storm water from the landscaped area only, into a retention pond.

3. A two-third majority of the roof along with the landscaped area [illegible]g Mountain Road shall enter into a permanent [illegible]d. The pond is allowed to surge to 2 feet a[illegible]e its natural water surface elevation while discharging at the Q_B rate.

4. The remaining roof area and all of the parking area is drained to the west and into a detention pond. This landscaped pond will not be designed to accept the entire 50 year volume. The parking

lot will accept the remaining surge volume. The pond (Pond "A") will be allowed to empty completely by means of a storm sewer hook-up that discharges at the Q_A rate.

The developed discharge totals do not exceed the required maximum Q_1 rate.

RECOMMENDATIONS

The following recommendations are based on our drainage investigation and the information gathered from various pre-design meetings. The valley area criteria was adhered when deriving the following:

1. The site drainage improvements not address itself to any offsite facility upgrading (i.e. storm drains in Bellamah and Carson).

2. A perimeter cut-off wall be constructed where necessary on the north and west boundaries to prohibit offsite storm water volumes from entering onto the site.

3. The landscaped area on the east side of the museum and a narrow strip along Mountain Road shall have its storm waters sheet flow offsite. The developed flow from these areas (0.34 ac.) is 0.74 cfs.

4. The building shall have a finish floor elevation of 4958.7 feet.

5. The building be designed utilizing an interior roof drain network. The north portion of the roof, designated as N-1 & N-2, shall discharge its storm waters to the north and/or west. The flow shall then enter directly into or be directed toward the west detention pond (Pond "A").

6. The remaining roof area shall discharge directly into the permanent exhibit pond (Pond "B") via the interior roof drains (See roof drainage patterns in appendix).

7. Pond "A", shall pond the storm waters generated from the 100 year design storm. The increase is required since the site conditions prohibit the utilization of an emergency spillway onto Mountain Road. Therefor, this detention pond/area shall hold 18,430 cu. ft. (ponding area includes a portion of the parking surface as shown on the exhibit). Waters shall be detained on the parking lot for 138 minutes based on 8880 cu.ft. discharging at a rate of 480 gpm. Pond "A" shall be allowed to discharge

480 gpm via a 6" diameter pipe that connects to the storm sewer in Mountain Road. A direct tap without any additional structure is recommended. The line shall be laid at a slope of 3.8% and have a intake invert of 54.0. Release time is 4.79 hours.

8. Pond "B"- Shall pond the storm water generated from a 50 year design storm and provide an emergency spillway to allow for the release of any additional flows. This pond shall have a permanent pond elevation of 56 and a surge elevation of 58.0. This equates to a detention volume of 8,143 cu. ft. This volume is allowed to discharge into the storm sewer in Mountain Road at a rate of 230 gpm. A 6" diameter pipe at 0.8% will satisfy the discharge rate. The invert of the drain pipe shall be set at 4956.0. Release time is 4.33 hours.

9. Pond "C", shall accept storm waters only from the landscaped area which surrounds it. Pond volume (100 yr.) = 512 cu. ft.

10. Storm waters falling in the parking lot area(s) and from the roof section designated by N-2, shall be directed toward the center swale. Curb cuts shall allow the flows to enter onto the swale. The east end of the swale is designed as an open channel. Flows then enter into a 12" culvert at the parking lot's mid-access lane. After 30', the culvert becomes perforated and buried in the rock landscaping. Flows shall also enter into the collection system from the parking lot surface by curb cuts.

    It should be noted that the 12" perferated pipe can not accept all the storm waters generated by a large storm. But, this is satisfactory since the pond would be full and this area of the parking lot is designated as the ponding surge area. As the pond receeds, this area shall discharge its volume to the west detention pond via a 12" culvert.

APPENDIX

PONDING VOLUMES & DISCHARGE CALCULATIONS

Pond "A", located in the west landscaped area. This pond accepts storm water from the roof areas designated as N-1 and N-2, from landscaped areas L-5 and L-6 and from the parking area P-1.

Area Designation	Area (Sq. ft.)	C-Value	Fraction
N-1	12,486	0.95	0.09
N-2	4,810	0.95	0.04
L-5	10,368	0.49	0.04
L-6	2,255	0.35	0.01
P-1	97,564	0.80	0.61
			0.79

Volume (V):

V = C·D·A for 50 yr. storm, D = 0.158'

= (0.79) (0.158) (127,483)

= 15,912 cu. ft.

V(100 yr. storm)

V = (0.79) (D.183) (127,483)

= 18,430 cu. ft.

The 100 yr. volume shall be used since site conditions prohibit an overflow spillway. Pond capacity is computed from the area covered by one-foot contours.

POND CAPACITY - POND "A"

CONTOUR	AREA (SQ. FT.)	VOLUME
54.5	2525	
		2137
55	6021	
		7413 = 9550 cu. ft.
56	8802	

The permanent pond has a volume potential of 9550 cu. ft. The 56 contour is the elevation of the entrance.

The remaining 8880 cu. ft. shall be above the ponds entrance elevation and shall surge out into the parking surface. The ultimate water surface of the pond shall be 56.3 The remaining 8880 cu. ft. of storm waters are contained within the parking and pond areas as follows:

340 cu. ft. - loading dock area
4000 cu. ft. - west end of parking lot center swale
4500 cu. ft. - west pond/parking area
8840 cu. ft.

Pond "B", this is a permanent pond located between the building and Mountain Rd. It will probably maintain a depth of 2-3 ft. It shall have a non-surged pond surface area of 3678 sq. ft. It must accept storm waters from area designated by: S-1, S-2a, S-2b, S-3, S-4 and L-2.

Area Designation	Area (Sq. ft.)	C-Value	Fraction
S-1	7,872	0.95	0.126
S-2	20,294	0.95	0.324
S-3	7,716	0.95	0.123
S-4	5,734	0.95	0.091
L-2	17,955	0.61	0.184
	59,571		0.848 Use 0.85

Volume (V):

V = C·D·A for 50 yrs. storm, D = 0.158'
= (0.85) (0.158) (59,571)
= 8000 cu. ft.

This volume of storm water is directed to the pond by means of interior roof drains for the building and by overland sheet flow from the surrounding landscaped area.

The pond's surge capacity is derived from the following table.

POND "B" - STORM WATER SURGE CAPACITY

CONTOUR	SURFACE ELEV.		VOLUME PER 1-FT. CONTOUR
56	3686	-	3903
57	4120	-	4240
58	4360		8,143 cu. ft.

An overflow spillway is provided such that excess water are discharged onto Mountain Road. The elevation of this spillway shall be set at an elevation of 4958.

Pond "B" emergency spillway must be designed to handle the difference in the flows from the 50 yr. and the 100 yr. storms. Compute the volume of storm water generated by the 100 yr. storm.

$V = (0.85)\ (0.183)\ (59{,}571)$
$= 9{,}266$ cu. ft.

Based on a surface elevation of 4360 @ contour 4958, the difference in volume (9,266 - 8,000) = 1,266 cu. ft. would rise to an elevation of:

$(1{,}266 \div 4{,}360) = 0.29 + 58 = 58.29$
58.3 - Use

The overflow spillway for Pond "B" shall allow 1,266 cu. ft. of storm water to discharge toward Mountain Rd. over a landscaped area. The length of travel between the pond's edge and the curb is approximately 25 feet. The spillway shall be rock lined with a broad weir opening of 20'. The weir shall be incorporated into the pond and area landscaping.

Provide a storm water discharge system that allows detained volume to exit the site at a combined 'Q' rate:

Flows leave the site at four locations.

1. Pond "A" - discharge drain
2. Pond "B" - discharge drain
3. Landscaped Area L-1 - overland flow
4. Landscaped Area L-4 - overland flow

The combined rate shall not exceed the overall Q_1 rate for the site in its undeveloped condition.

$Q = C\ I\ A$
$= (0.30)\ (1.62)\ (4.80)$
$= (2.33)$ cfs.

The rate of discharge from the landscaped areas next to the street is:

$Q = (0.40)\ (5.40)\ (0.34)$
$= 0.74$ cfs

Therefore, the ponds can release at the combined rate of:

$2.33 - 0.74 = 1.59$ cfs
$= 713$ gpm.

$Qa + Qb = 1.59$ cfs

Since the volume of Pond "A" is more than twice that of Pond "B", let the ratio of 2:1 be the design factor for the discharge rates of Qa-vs-Qb.

Therefore,

$0.67\ Qa = 0.33\ Qb = 1$
$Qa = (0.67)\ (713) = 478$ gpm
$Qb = (0.33)\ (713) = 235$ gpm.

A 6" diameter pipe shall be utilized for the pond's drain.

Pond "A": 6" @ 3.8% = 480 gpm
Pond "B": 6" @ 0.8% = 230 gpm

(Based on Mannings Formula with "n" value of 0.013).

Discharge Time:

Pond "A" shall release it's volumes at 480 gpm.

Discharge time is found by:

$$\frac{V \text{ cu. ft.} \times \frac{\text{gal}}{\text{cu. ft.}}}{Q \frac{\text{gal}}{\text{min.}}} = \frac{18{,}430 \times 748}{480}$$

$$= 287 \text{ min.} = 4.79 \text{ hrs.}$$

Pond "B";

$$\frac{8000 \times 7.48}{230} = 260 = 4.33 \text{ hrs.}$$

Both have discharge time of less than 24 hrs., thereby making them acceptable.

Pond "C" is a retention pond that accepts storm waters from the landscaped area (L-3) which surrounds it. It accepts no flows from the roof of the building. There shall be no emergency spillway, therefore design for 100 yr. storm.

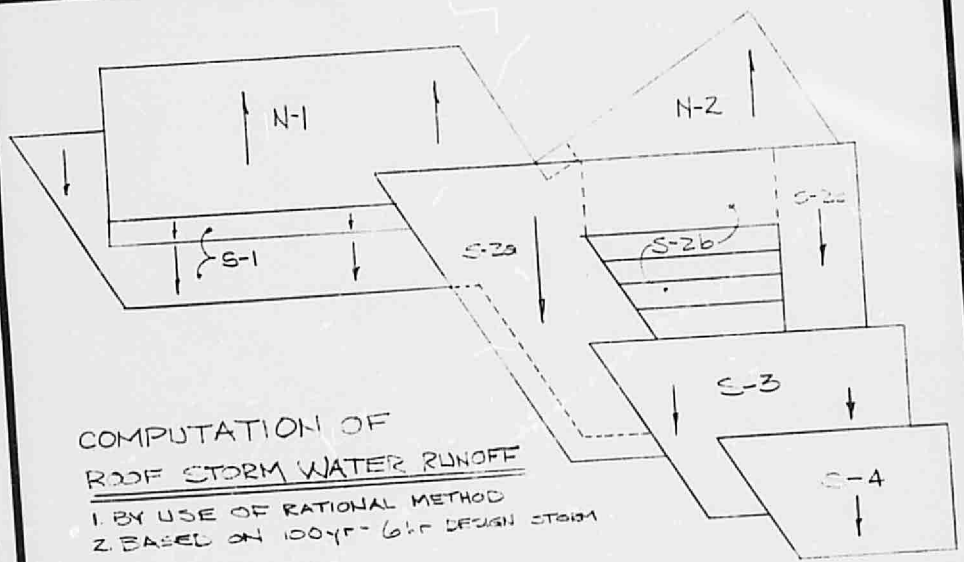
Area (L-3) = 6507

"C" = 0.43

Volume (V) = (0.43) (0.183) (6507)

= 512 cu. ft.

The gravel or river rock area is 837 sq. ft. The depth of pond for the 100 yr. frequency storm is approximately 0.6 feet.



COMPUTATION OF

ROOF STORM WATER RUNOFF

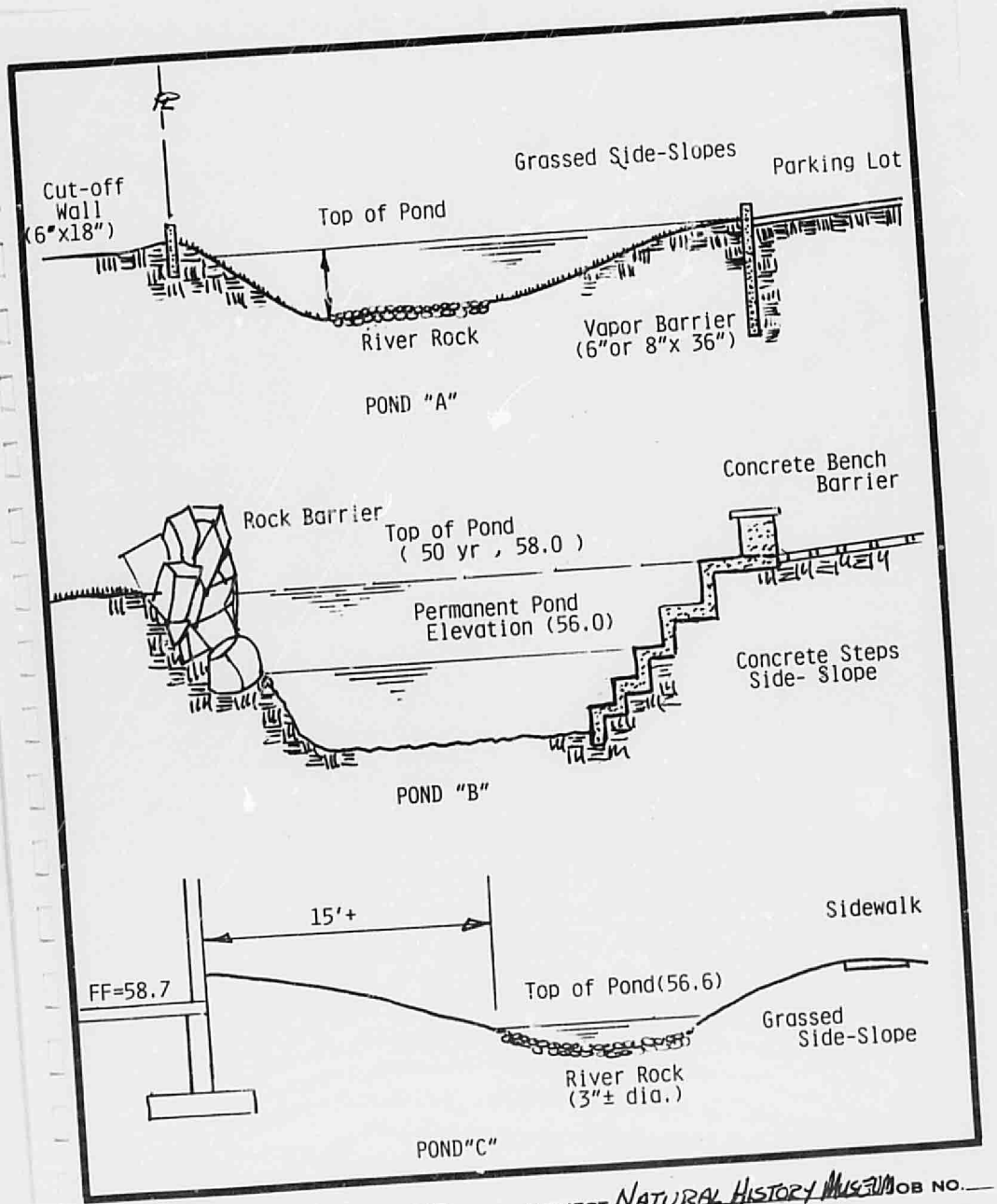
1. BY USE OF RATIONAL METHOD
2. BASED ON 100yr - 6hr DESIGN STORM

ROOF SUB-AREA DESIGNATION	AREA (ft^2)	AREA (ac.)	"C"	I	Q (cfs)	Q (gpm)	D (ft.)	VOLUME (cu. ft.)
N-1	12,436	0.2856	0.95	5.4	1.47	660	0.183	2,171
N-2	4,810	0.1104	0.95	5.4	0.564	254	0.183	836
S-1	7,872	0.1807	0.95	5.4	0.927	416	0.183	1,367
S-2a	9,412	0.2161	0.95	5.4	1.108	497	0.183	1,636
S-2b	6,343	0.1457	0.95	5.4	0.747	335	0.183	1,104
S-2c	4,000	0.0918	0.95	5.4	0.471	211	0.183	695
S-3	7,716	0.1771	0.95	5.4	0.908	408	0.183	1,341
S-4	5,734	0.1316	0.95	5.4	0.675	303	0.183	997

Isaacson & Arfman, P.A.
Consulting Engineering Associates

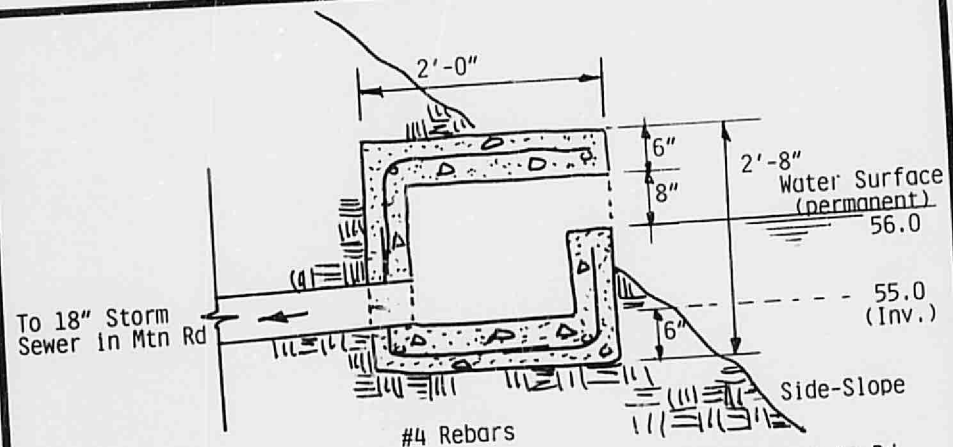
SUBJECT N.M. Nat'l. History Museum JOB NO.

BY EGK DATE 2-5 SHEET NO. OF

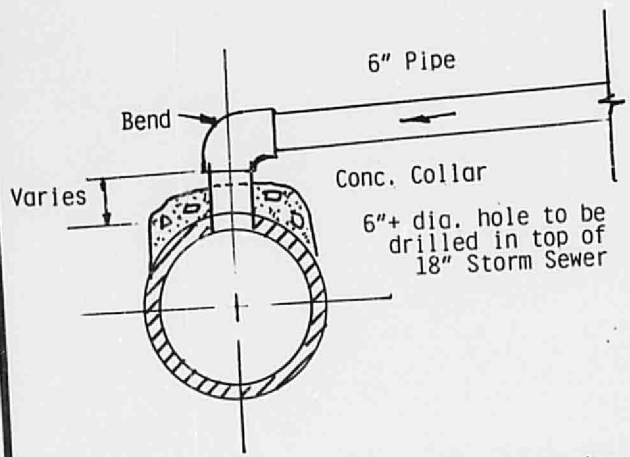


Isaacson & Arfman, P.A.
Consulting Engineering Associates

SUBJECT NATURAL HISTORY MUSEUM JOB NO.
BY F&A DATE 9-81 SHEET NO. OF



Entrance structure from Pond "B" to Storm Sewer in Mountain Rd.
Exact location to be determined at time of final lanlscaped plans.



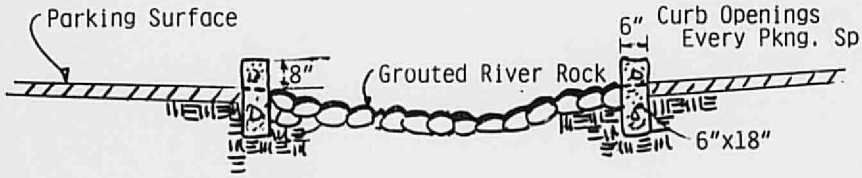
From Pond

SLPOES
Pond"A" - 3.8%
Pond"B" - 0.8%

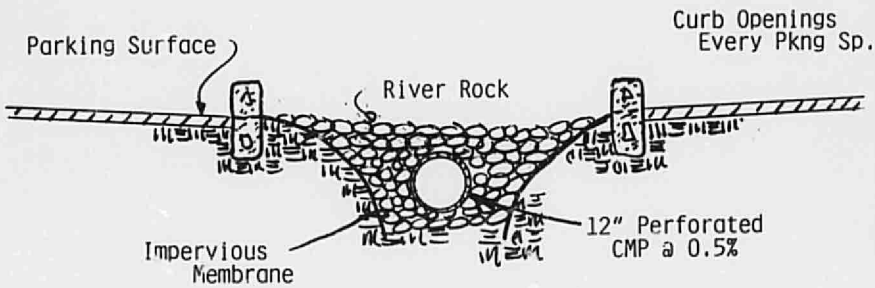
Pond's drain connection to 18" Storm Sewer
Typical for both connection from Pond"A"&"B"

Isaacson & Arfman, P.A.
Consulting Engineering Associates

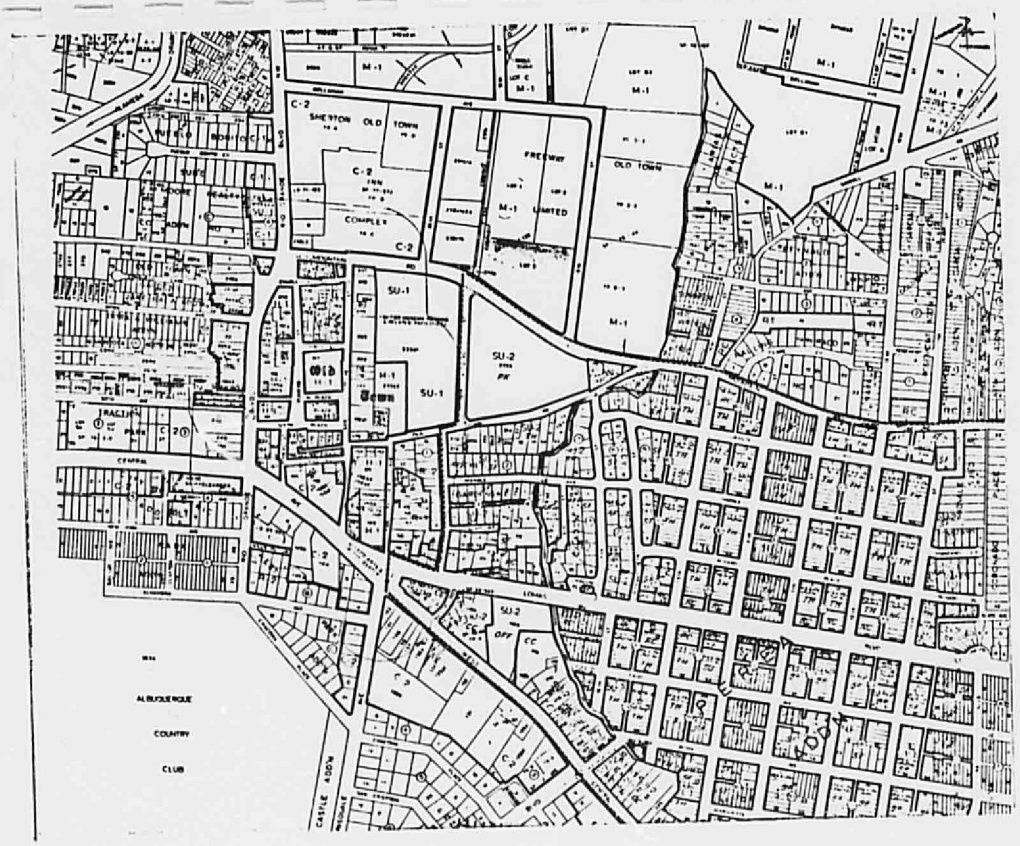
SUBJECT NAT'L. HISTORY MUSEUM JOB NO.
BY FCA DATE 9-81 SHEET NO. OF



Parking Lot Drainage Swale located in the center (east half) of the parking area.



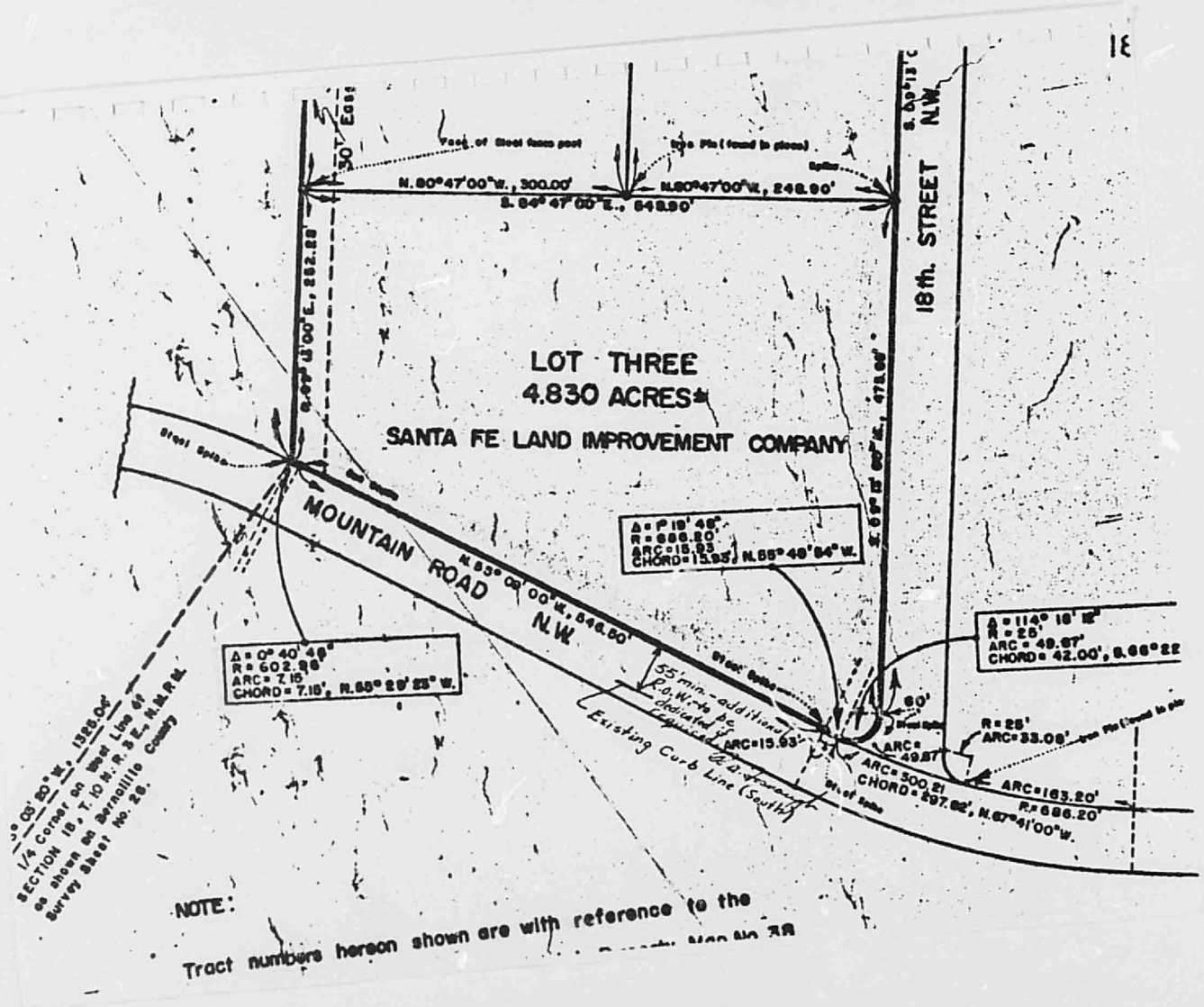
Parking Lot Drainage Swale with 12" Perforated CMP. The first 30', starting at the east end, is solid wall.

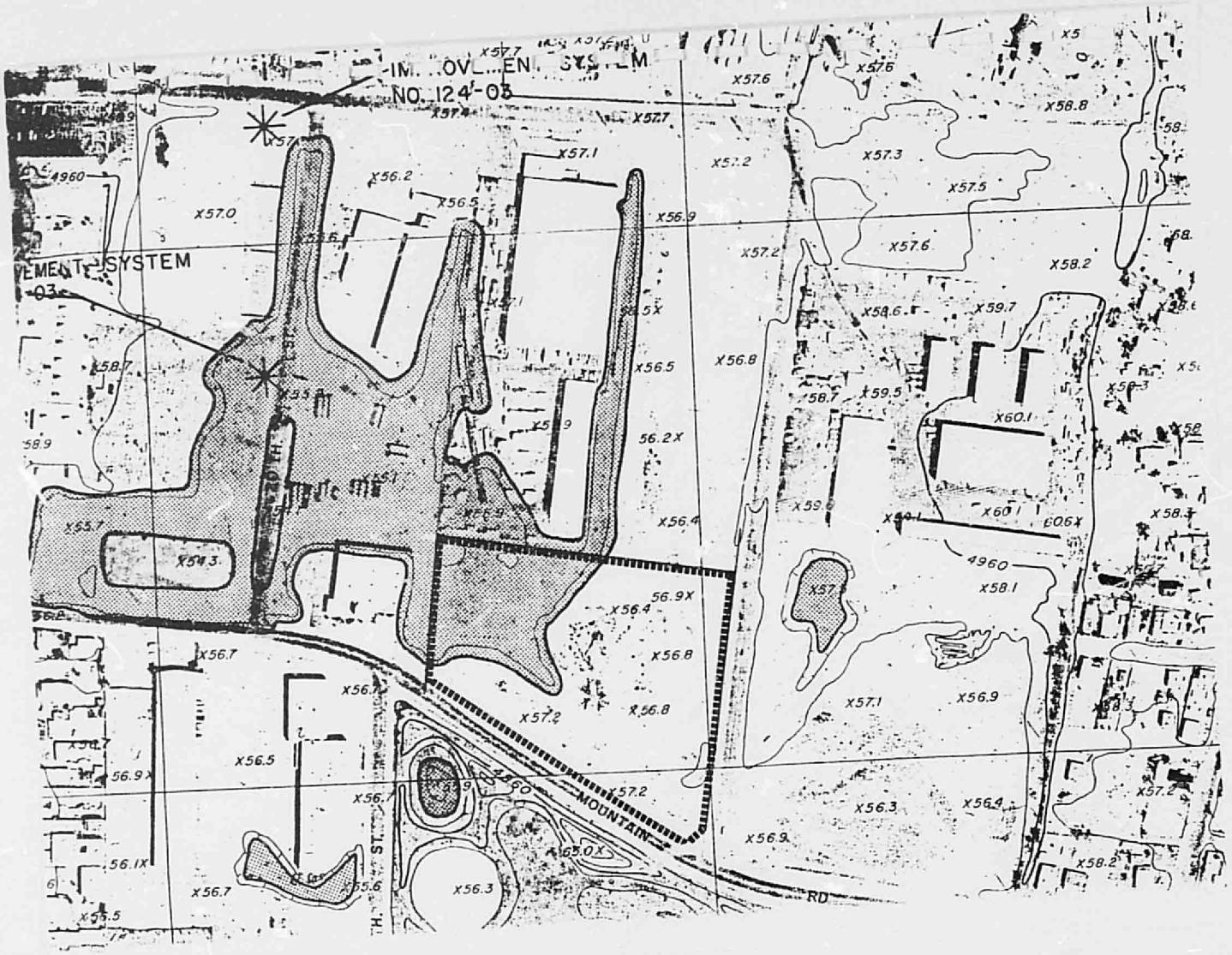


J-13-Z

PROPOSED NATURAL HISTORY MUSEUM SITE

Scale: 1"=750'±


LOT THREE
4.830 ACRES±
SANTA FE LAND IMPROVEMENT COMPANY
MOUNTAIN ROAD N.W.
18th. STREET N.W.
N. 80°47'00"W., 300.00'
N.80°47'00"W., 248.90'
S. 84° 47' 00" E., 848.90'
30' East
Steel Spike
Existing Curb Line (South)
55 min. additional R.O.W. to be dedicated if required
Δ = 0° 40' 48"
R = 602.96'
ARC = 7.15'
CHORD = 7.15', N. 85° 29' 23" W.
Δ = 1° 19' 48"
R = 686.20'
ARC = 15.93'
CHORD = 15.93', N. 85° 49' 54" W.
ARC = 15.93'
Δ = 114° 19' 12"
R = 25'
ARC = 49.87'
CHORD = 42.00', S. 66° 22
R = 25'
ARC = 33.08'
ARC = 49.87'
ARC = 300.21'
CHORD = 297.92', N. 67° 41' 00" W.
ARC = 163.20'
R = 686.20'
60'
1/4 Corner on West Line of SECTION 18, T. 10 N., R. 3 E., N.M.P.M. as shown on Bernalillo County Survey Sheet No. 28.
NOTE:
Tract numbers hereon shown are with reference to the


NO. 124-03
4960
MOUNTAIN
RD

The upper 18 inches of basement wall backfill should consist of relatively impermeable soils. These soils should have at least 30 percent passing the no. 200 mesh sieve and have a plasticity index of between 5 and 15. This treatment will help minimize infiltration of water into the basement backfill and the build-up of lateral earth pressures greater than those recommended for design.

5.7 Site Drainage & Moisture Protection

Positive surface drainage should be provided during construction and maintained thereafter. Where possible, concrete slabs or asphaltic pavement should immediately adjoin the structure. Where they do not adjoin the structure, the ground surface should be sloped at a 2 percent grade, or steeper, for at least 20.0 feet away from the building perimeter with positive drainage being provided from that point onward.

Roof runoff should be conveyed away from the building by nonerosive devices at the ground surface. In no case should long-term ponding of water be allowed in the vicinity of the structure or exterior slabs. The possibility of moisture infiltration beneath the structure, in the event of plumbing leaks, should be considered in the design and inspection of underground water and sewer conduits. In addition, water tight boxes should be used for landscaped areas immediately adjacent to the structure. These boxes should have provisions for drainage for excess irrigation waters.

C-537

(4)

CONTROL STATION DATA

City of Albuquerque, New Mexico
Municipal Development
Engineering Division

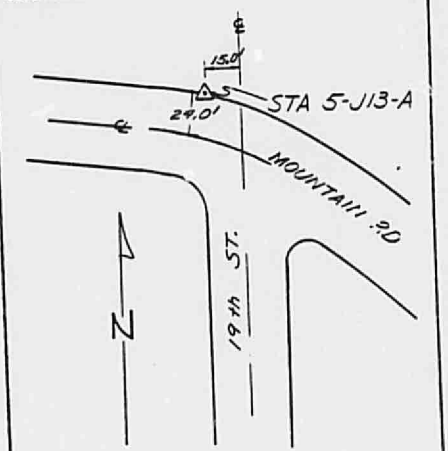
Name of Station 5-J13A State N.M. Co. Bernalillo
Establishing Agency ACS Year 1978 Chief of Party S. Trujillo
Section 18 Township 10N Range 3E Map No. J13

Description:
The station is located 1.2 miles northwest of downtown Albuquerque at the intersection of Mountain Rd. N.W. and 19th St. N.W.

To reach the station from the interchange at I-40 and Rio Grande Blvd. N.W., go south on Rio Grande 0.4 miles to Mountain Rd. Turn left, go east on Mourtain 0.2 miles to 19th St. and the station on the left.

The station mark is a standard ACS brass tablet, stamped "5-J13-A", set flush with curb.

Location Sketch:



HORIZONTAL DATA

FIELD METHOD ☒ Traverse ☐ Triangulation ☐ Trilateration

GEOGRAPHIC POSITION (NAD 1927) 2nd -order

Latitude 35° 05' 53.60253 Longitude 106° 39' 59.74642

PLANE COORDINATES Projection T.M. State N.M. Zone Central

X 375387.46 Y 1491255.48 Ground-to-Grid Factor 0.9996807

ELEVATION DATA

SPIRIT LEVEL ELEVATION (SLD 1929) Feet 4957.76 Meters 1511.126 3rd Order

TRIGONOMETRIC ELEVATION Feet _____ Meters _____

AZIMUTH DATA

θ (or △α) Angle -0° 14' 22"

Station	Grid Azimuth	Geodetic Azimuth	DISTANCE Feet	DISTANCE Meters
8-J13A	303 36 04		779.75	237.667
7-J13A	98 53 05		985.37	300.34