Federal Emergency Management Agency
Region VI
Federal Regional Center
800 North Loop 288
Denton, TX 76201-3698

COPY

NTH

October 14, 1993

U.S. Army Corps of Engineers
Albuquerque District
District Engineer: CESWA-CO-R
P. O. Box 1580
Albuquerque, New Mexico 87103-1580

Dear Sirs:

Thank you for providing us with the opportunity to comment on the Public Notice, Permit Application No: NM-01-03358, dated September 28, 1993, regarding placing dredged and fill material as an aquatic park in Tingley Lake and wetland adjacent to the Rio Grande in Albuquerque, New Mexico.

We suggest, if you have not already done so, that you obtain comments and/or any necessary permits with regard to floodplain management from Mr. Gilbert Aldaz, City/County Administrator, 1 Civic Plaza NW, Albuquerque, New Mexico 87103 (505) 768-2650, who is the community's floodplain administrator.

Proper precautions must be taken with regard to development within a regulatory floodway. If this project should involve the floodway as delineated on the Flood Insurance Rate Map (FIRM), the project must comply with those provisions as outlined in Section 60.3(d) of the National Flood Insurance Program Regulations. No encroachments must occur within the designated floodway unless it is proven by an engineer's report that the water surface elevation has not been increased any within the designated floodway.

There is currently a Preliminary Flood Insurance Study dated September 30, 1993. The project area is located on Panel 333 of 835 and available for review in the City's Engineering office.

If we can be of further assistance, please feel free to contact this office by writing to the address above, or calling (817) 898-5136.

Sincerely,

Diane L. Calhoun

Diane L. Calhoun
Natural Hazards
Program Specialist

cc: Mr. Gilbert Aldaz

OCT 26

MASTER PLAN
The Albuquerque Biological Park

The Tingley Aquatic Park, Albuquerque Aquarium, & Rio Grande Botanic Garden

Element 6:

Public and Private Utilities

February 15, 1991

DRAFT

MASTER PLAN
The Albuquerque Biological Park

**The Tingley Aquatic Park,
Albuquerque Aquarium,
& Rio Grande Botanic Garden**

Element 6:

Public and Private Utilities

February 15, 1991

HEROLD GERBRANDT
NEW MEXICO
9641
REGISTERED PROFESSIONAL ENGINEER

DRAFT

Contents

wrong

Appendices

Exhibits

1.0 Mission and Goals

Public Utility Systems include City owned and operated systems which include
- *Water*
- *Sanitary Sewer*
- *Storm Drainage*

1.1 Public Utility Systems

Utility systems addressed in this section are for those systems owned and operated by the City of Albuquerque. They include water, sanitary sewer and storm drainage.

1.1.1 Mission

The purpose of the Public Utility Systems is to provide adequate and safe services for all functions of the Albuquerque Biological Park as cost efficiently as possible.

1.1.2 Goals

- **Water**
  - To provide safe and clean water supply as efficiently as possible for
    - facilities;
    - general landscape uses;
    - water for fire suppression and;
    - water features, lakes, and lagoons.

  - To conserve water. Emphasis must be placed on water conservation because the park facilities will be heavy water users, especially the Aquarium.

  - To separate system and well water. Both water from the City's system and well water will be used to meet project demands. Since City water is chlorinated, it is imperative to avoid contamination of City water with well water.

- **Sanitary Sewer System**
  - To provide services to all Park facilities.

  - To use the existing City sewer system whereever possible and mitigate any safety issues with other waste water.

  - To institute a Wetlands Treatment Demonstration Project. In keeping with the aquatic and botanic themes of the Park, a project goal is the installation of a wetlands demonstration project in the Botanic Garden or Aquatic Park area to treat a small portion of the sanitary sewage discharged from the facilities. This wetlands facility would be a showcase for the general public as well as for the technical community of Albuquerque, and should include a strong educational emphasis.

The Clean Water Act of 1977 (P.L. 95-217) favors innovative and alternative technologies, such as marsh/pond systems and aquaculture for treating wastewater. Such systems utilize the natural uptake of inorganic substances (nitrate, phosphate) and cations (sodium, potassium, calcium) into plant fibers to purify wastewater.

Storm drainage systems and facilities should be sensitively designed and provide adequate site drainage, maintain water quality and reduce run-off.

- **Storm Drainage**
  - To provide adequate drainage for the sites into acceptable drainage outfalls.
  - To design structures that are visible to the public in a manner that enhances the ambiance of the Park.
  - To provide a drainage system that will accommodate 100-year storm capacity run-off.
  - To maintain the water quality of the Aquatic Park fishing pond.
  - To control run-off from large impervious surfaces such as roofs, roads, and parking lots.

1.2 Private Utility Systems

Private Utility Systems provide services to all Park Facilities safely and efficiently and include:
- *Natural Gas*
- *Electricity*
- *Telephone*
- *Cable Television*

1.2.1 Mission

The mission for private utility systems for the Albuquerque Biological Park is to provide services to all Park facilities as safely and cost effectively as possible. Private utility systems include: natural gas, electricity, telephone, cable television, security and closed circuit television.

1.2.2 Goal

Private utilities will be designed by the service providers, however the goal of the infrastructure team is to provide guidance for design.

2.0 Inventory/ Analysis of Conditions

Major policies and plans which will impact infrastructure decisions include:
- *Albuquerque/Bernalillo County Comprehensive Plan*
- *Old Town Sector Development Plan*
- *City Edges Study*
- *Other Pertinent Policies and Regulations*

2.1 Planning Context and Policies

This section of the technical report discusses the major policies and plans which impact the utility elements of the Albuquerque Biological Park. Included in the analysis are the Albuquerque/Bernalillo County Comprehensive Plan, sector development plans which directly affect the plan area, plans which address the park periphery, and federal, state and local regulations.

2.1.1 Albuquerque/Bernalillo County Comprehensive Plan

The Albuquerque/Bernalillo Comprehensive Plan was created to be the primary planning document for the Albuquerque Metropolitan Area. In it are chapters on Planning Context, Land Use, Environmental Protection and Conservation, and Resource Management. Goals and Implementation Strategies are also presented. The proposed projects will be developed on land that is designated by the Comprehensive Plan as part of the Open Space Network. Below are brief synopses of important components of the Plan, pertinent to utility provision.

- **Utilities**

Utilities should be developed and managed in an efficient manner and must be consistent with land use goals and planning policies. Water quality, according to the Plan, must be dependable, and any contamination must be minimized. The Plan also states "Rank two facilities plans for water, sewer, transportation and drainage shall reflect the regional nature of these systems and the need for long range analysis". Capital spending for the City shall reflect land use goals.

- **Drainage**

The most salient point that the Plan references about the Biological Park drainage is that maximum absorption of rainfall shall be encouraged and wasteful use of water avoided. This especially applies to the City's protection of water rights and water conservation.

*The Botanic Garden Site is most impacted by **The Old Town Sector Development Plan.** However, most public facilities are in place with adequate service and supply.*

2.1.2 Old Town Sector Development Plan

The Old Town Sector Development Plan affects the neighborhood north of Central Avenue to Interstate 40, from the river on the west to Rio Grande Boulevard on the east. This plan has the most impact on the Botanic Garden site. The plan states that most public facilities are in place with a few deficiencies. Major recommendations of the plan that affect the area include:

- Installation of additional fire hydrants to bring the area up to code.
- Abondonment of certain ditches such as the Duranes Drain.
- Provision of safety upgrades to certain ditches, for example, to fence the Alameda drain.

*The **City Edges Study** advocates reducing complex drainage projects and encouraging a more natural approach to drainage and flood control.*

2.1.3 City Edges Study (1974)

There are minimal infrastructure improvement recommendations in this study. In general, the Plan states that the river should serve to a greater degree several purposes of society which include recreation, preservation of the natural environment, visual amenity and environmental education. It was recommended that heavily engineered drainage and flood control projects should be halted or reversed and a more natural approach be taken.

Other regulations that will impact design decisions are primarily local City and County codes, and also those that regulate environmental and safety (national) and those that govern water use and land subdivision (state).

2.1.4 Other Pertinent Policies and Applicable Regulations

There are a vast number of important regulations, ordinances, procedures, policies and plans which must be adhered to in the development of the Albuquerque Biological Park. These regulations are federal, state and local in origin. Other than those which regulate environmental and safety concerns on the national level and those that govern water use and land subdivision statewide, most of the regulations which affect this project are local, both City and County. In all cases, the development of this Park should follow all City standards, City specifications, the Development Process Manual, the Comprehensive Zoning Code and any other approved ordinances and policies.

2.2 Existing Conditions

The following section of the report identifies existing conditions and information discovered during site investigations. Maps were also prepared that provided topographic information and an inventory of conditions which allowed the consultants to study the area For more information regarding mapping, see Appendix 6, Section 2.

A site investigation identified the existing conditions of the following elements:

- *Geology*
- *Water Wells*
- *City Water Facilties*
- *Other Water Sources*
- *Ground Water*
- *Water Quality*
- *Sanitary Sewer*
- *Public Service*
- *Utility Systems*

2.2.1 Soil, Water Quality and Water Surface

Soil, water quality and water surface sampling and analysis were performed through the project site by Geo-Test, Inc. Their report and two addendum letters are included in Appendix 6, Section 5. The report and addendums provide information on groundwater conditions, seismicity, foundations, lateral load resistance, site grading, pavement design, excavations, lakes and water quality nutrients.

2.2.2 Water Wells

There are currently two existing water wells at Tingley Beach. There locations are shown on Exhibit 1B.

2.2.3 City Water Facilities

Existing water facilities are shown on Exhibits 1A and 1B. Water is currently available at the periphery of the Aquatic Park, Botanic Garden and Aquarium sites.

Both City water and well water are available for project uses.

- **Botanic Garden Site Service**
  A City of Albuquerque water line 10" in diameter extends from Central Avenue and Tingley Drive northward 1200' into the Botanic Garden, as shown on Exhibit 1A. From this point, a 6" line continues northward through the west side of the park, feeding fire hydrants and faucets. This 6" line completes a loop with the 6" PVC line traveling westward along Mountain Road.

- **Aquarium Site Service**
  A 12" water line in Central at the intersection of New York Avenue is available may be tapped to provide water for the Aquarium.

- **Aquatic Park Site Service**
  No City water lines feed the Aquatic Park area south of Central Avenue. The nearest possible connections are on

Central Avenue (6" DIP-Ductile Iron Pipe), Laguna Boulevard (6" PVC-Polyvynal Chloride) and on Alcalde Place (6" PVC). However, two 300-feet deep wells with 15 hp submersible pumps currently feed the ponds at Tingley Beach. Additionally, a water line of unknown diameter is located just west of the south-bound lanes of Tingley Drive and runs the length of the Tingley Beach. It is assumed that this line is connected to the two wells, however, the line is not connected to City water. The two existing wells provide approximately 1100 gallons per minute (gpm) using the 15 hp pumps.

The City lines and the wells (and future wells) are the most promising water sources for the project. In the remainder of this report, water supply will be identified as either "City water" or "well water" to distinguish the source.

Other potential water providers include the Riverside Drain and the Rio Grande that flank the Aquatic Park site. However, jurisdictional and water rights may preclude them as sources. Also, there is a wide variety of water source quality that must be taken into consideration.

2.2.4 Other Water Sources

Additionally, the Riverside Drain and the Rio Grande convey seasonal flows on each side of the future Aquatic Park. The Drain is under the jurisdiction of the Middle Rio Grande Conservancy District (MRGCD) and the Rio Grande waters are governed by the State Engineer's office. Both of these sources are normally lower in elevation than the Tingley Beach pond water surface elevation (approximately 4946.0') and could not be gravity fed into any Aquatic Park water facility with a water surface higher than an elevation of 4940.0 feet. Furthermore, jurisdictional and water rights conflicts with the Drain and the Rio Grande would most likely preclude these streams as available water sources for the Aquatic Park and Botanic Garden.

Well water is the preferred water source for the Aquarium and Aquatic Park fishing lake as well as for irrigation purposes. City water is the preferred for domestic use and for fire suppression.

2.2.5 Water Quality

Water quality is especially critical to the Aquarium and the Aquatic Park fishing lake where sensitive flora and fauna must be protected. Well water is the preferred supply source because City water is chlorinated and therefore inappropriate. De-chlorination would be costly and inefficient. ENARTEC Consulting Engineers, Inc, the consulting engineers for the Aquarium, have expressed preference for well water use rather than the City system water for most aquarium use. Additionally, all landscape irrigation should be well water. Only water for domestic needs and fire suppression will be provided by the City system, where the water chlorination and pressure are appropriate.

pressure are appropriate.

The report, *Natural Resources Overview for Tingley Aquatic Park*, by Bio/West, Inc., is considered the definitive statement on water quality for the Aquatic Park.

The groundwater level in the project area is relatively shallow and will influence the Aquatic Park and Botanic Garden design.

- **Groundwater Depth**
  The presence of shallow groundwater in the project area should not be ignored. This water level fluctuates throughout the year, mostly dependent on the flow in the Rio Grande, and is currently being monitored by GeoTest, Inc. Initial readings indicate groundwater from 5' to 10' below ground level. It is assumed that this groundwater interacts with the existing Tingley ponds, most likely being fed by (and to) the ponds through seepage.

  More detailed test data can be found in Appendix 6, Section 5.

2.2.6 City Sanitary Sewer Infrastructure

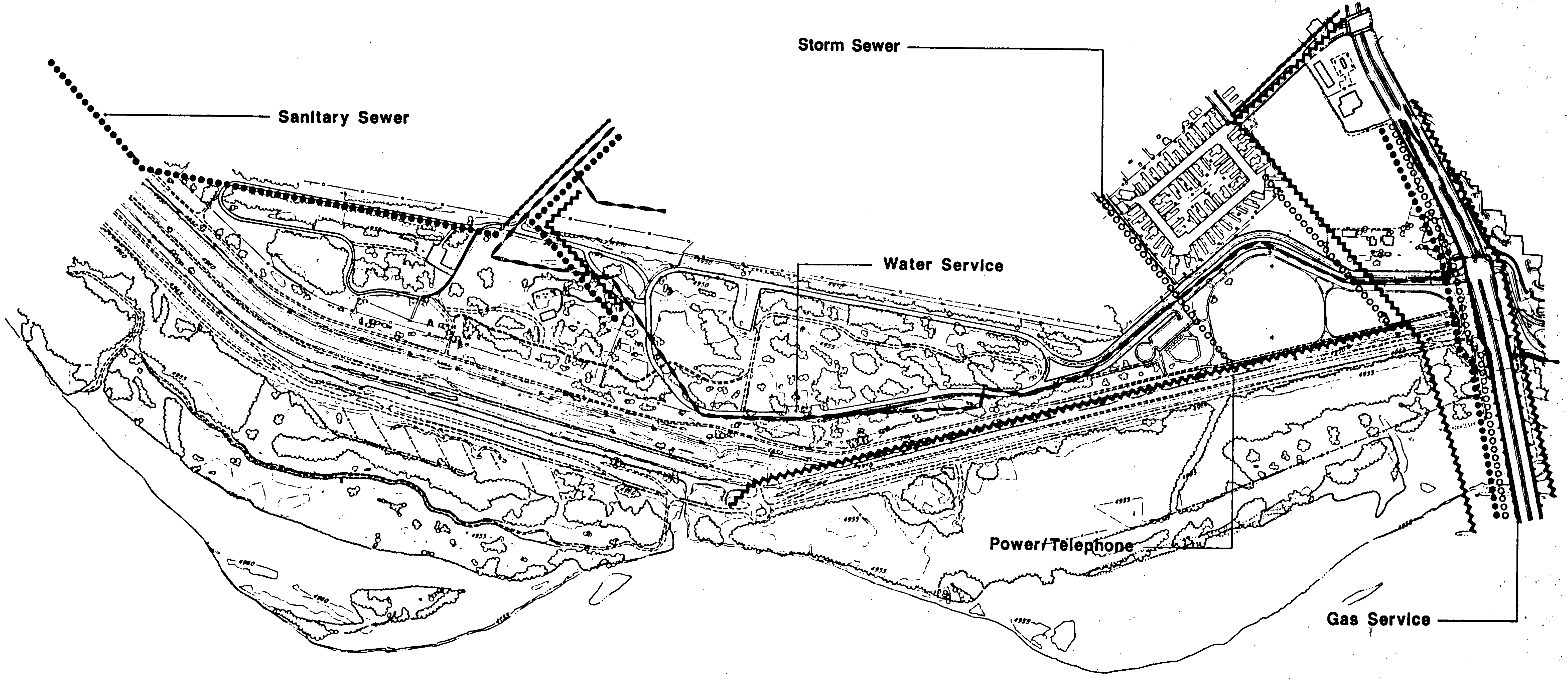
Existing City sanitary sewer infrastructure is minimal and difficult to access without modifications such as new lines and lift stations.

Existing sanitary sewer infrastructure in the vicinity of the Albuquerque Biological Park sites is minimal and difficult to access. Areas close to the river are naturally the lowest elevations and flattest areas in Albuquerque. In a predominantly gravity flow system such as Albuquerque's, this low and flat condition means that sanitary sewer lines are constructed at shallow depths and mild slopes. Often, the use of a sanitary sewer lift station is necessary to make the system functional. The existing sanitary sewer infrastructure around the project exhibits all of the above situations. Existing sanitary sewer infrastructure is identified on Exhibits 1A and 1B and is summarized below.

- **North of Central Avenue**

Existing sanitary sewer infrastructure is located at four points adjacent to the project area and they include:

- An eight-inch PVC line enters the site at the northernmost end of project area. Little is known about this line as it is not shown on City record maps. It appears to drain to the north. Approximately 1000' of this line is located within the project area.



Infrastructure Master Plan

Existing Infrastructure

Exhibit 1-A

●●●●●●●●●	Sanitary Sewer
ooooooooo	Storm Sewer
∿∿∿∿∿∿	Power/Telephone
----------	Gas Service
▬▬▬	Water Service

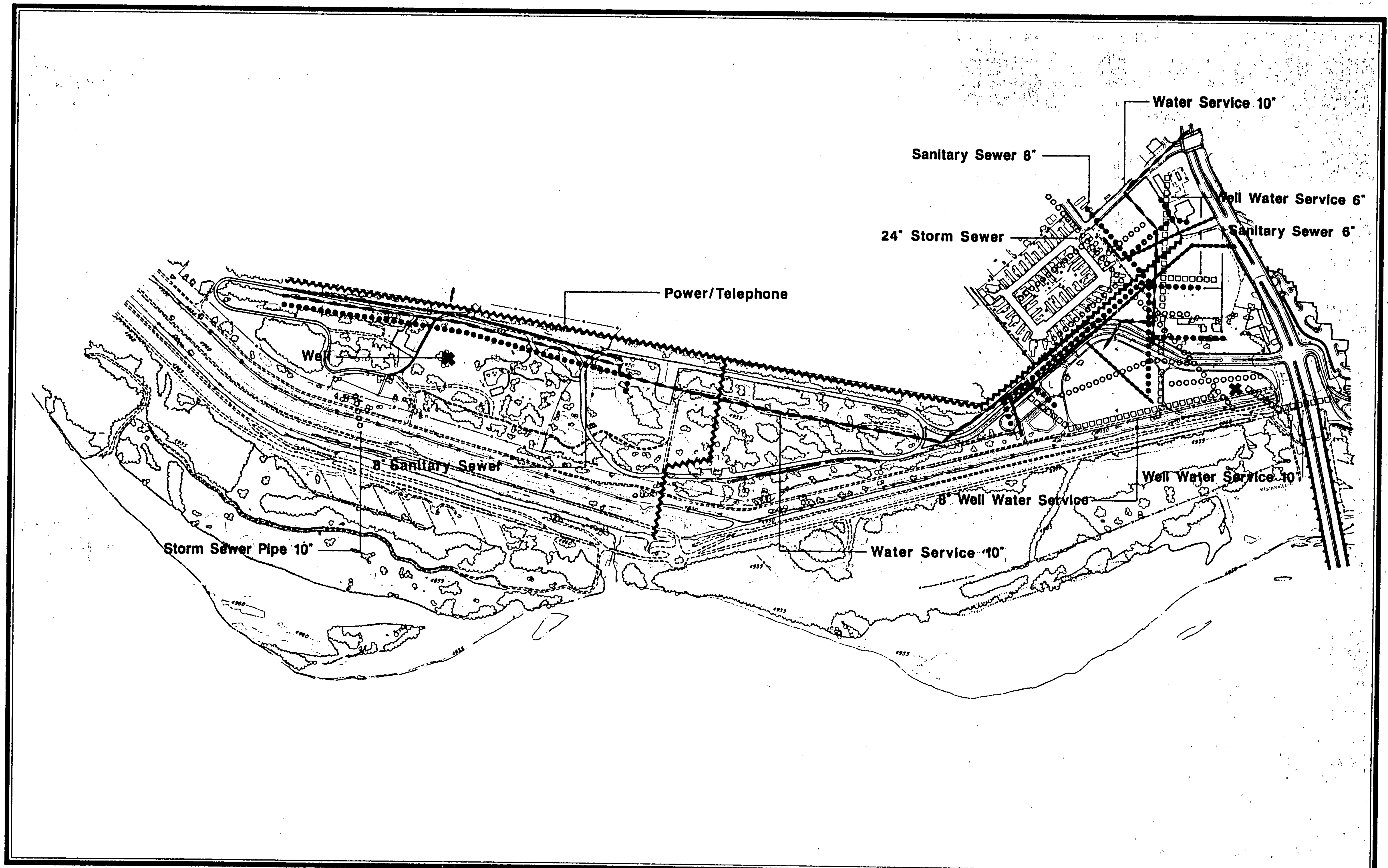
0 200 400 800

1" = 400' Scale in Feet

MASTER PLAN
The Albuquerque Biological Park

The Tingley Aquatic Park,
The Albuquerque Aquarium,
& Rio Grande Botanic Garden

BOHANNAN-HUSTON, INC.
BRW
Geo-Test, Inc.



Infrastructure Master Plan

Utilities

Exhibit 2-A

- Sanitary Sewer
- Storm Sewer
- Power/Telephone
- Gas Service
- Water Service
- Well
- Well Water Service

0 200 400 800

1" = 400'

Scale in Feet

MASTER PLAN
The Albuquerque Biological Park

The Tingley Aquatic Park,
The Albuquerque Aquarium,
& Rio Grande Botanic Garden

BOHANNAN-HUSTON, INC.
BRW
Geo-Test, Inc.

- An eight-inch vitrified clay pipe extends to the project area from Mountain Road. A 500' extension of this line extends into the site. This extension is not shown on City record maps and therefore may actually be a service line for existing facilities of San Gabriel Park.

- A lift station fed by a fifteen-inch line is operated by the City of Albuquerque and is located on New York Avenue, north of Central Avenue. This facility collects most of the sewage in the area and is the most accessible connection point, from a depth standpoint.

- A ten-inch concrete sanitary sewer line is located in the west bound lines of Central Avenue. This line is shallow and is located in a State Highway Department right-of-way that receives heavy use.

• **South of Central Avenue**

Existing sanitary sewer infrastructure is available at the locations described below:

- A twelve-inch concrete sanitary line is located in the east bound portion of the Central Avenue. This line is shallow and is located in a State Highway Department right-of-way that receives heavy use. An eight-inch extension from this line to the Beach Apartments is also located at this point.

- An eight-inch line exists at the Laguna Boulevard and Tingley Drive intersection. City record maps show that the line extends fully across the Albuquerque Riverside Drain so that a manhole is available within the project area. Mapping performed in conjunction with this master plan could not confirm this apparent extension.

- At the Alcalde Place intersection with Iron Avenue and Kit Carson Avenue, an eight-inch line is available. This line is located on the east side of the Riverside Drain.

A majority of the sewer system dates back to the 1950's and is made out of materials that exhibit long life and durability. However, existing concrete pipes are of questionable condition.

A. Sanitary Sewer System Age and Quality

All sanitary sewer lines and appurtenances within the vicinity have been in place for a long time. The bulk of the system is dated in the early 1950's. Pipe materials are primarily vitrified clay pipe which typically exhibits long life and durability. In areas where concrete pipe exists, these lines may be in various stages of deterioration.

B. Sanitary Sewer Line Pitch
Typical slopes range from 0.0025 to 0.0060 in the project vicinity. These slopes are far less than recommended engineering standards but are necessary in order to serve the low-lying, flat areas of Albuquerque.

There is sufficient existing sewer system capacity.

C. Sanitary Sewer System Capacity
At Bohannan-Huston, Inc.'s request, the City of Albuquerque's Industrial Waste Section monitored existing flows in two trunk lines, an 18" line in San Patricio Avenue (Manhole #244-K-13N) and a 60" trunk line in Stover Avenue (Manhole #572, K13-S). As stated in the City's report, "although the ultimate wastewater flows from the park are not yet known, the present peak flows in the 18-inch (56% of capaicty) and 60-inch (42% of capacity) interceptors appear to allow for substantial additional flow." A copy of the City's preliminary availability determination letter is included in Appendix 6, Section 6.

2.2.7 Existing Drainage Patterns/Storm Drainage
Very few drainage problems were encountered in the study area. The most serious deficiency exists in the Montoya Road storm sewer, which is under capacity. However, it should be noted that both the Botanic Garden and Aquatic Park areas currently utilize numerous depressions to store storm runoff. If these depressions are no longer available for storm water storage under future conditions, drainage would become much more problematic.

Limited drainage problems were discovered in the project area. However, both the Botanic Garden and the Aquatic Garden site currently use a number of on-site depressions to store storm run-off, which could be impacted by future development.

The Concepts/Recommendations Section will address future drainage patterns, illustrating creative drainage alternatives that can be used to enhance Park and Garden concepts rather than restrict them. Grading plans of the future Aquatic Park, Aquarium and Botanic Garden will be included in the design phase.

The existing conditions affecting the drainage within the study area were investigated in order to determine drainage patterns and problem areas. The Botanic Garden/Aquarium and Aquatic Park were analyzed separately, as the two areas are isolated from each other by Central Avenue. Methodology and detailed analysis is included in Appendix 6, Section 3.

2.2.8 Existing Private Utility Systems

Available Private Utilities include electrical, gas, telephone and cable television.

The following utility companies were contacted and interviewed and availability of service was investigated:

- Public Service Company of New Mexico (PNM) - Electrical Service
- Gas Company of New Mexico (Gas Company) - Gas Service
- US West Communications (US West) - Telephone Service
- Jones Intercable (Cable TV) - Cable Television Service

A. Utility Availability and Location

In general, the location of private utility infrastructure is around the perimeter of the Botanic Garden and Aquatic Park site, either underground or overhead.

The existing private utility system infrastructure in the vicinity of the Botanic Garden and Aquatic Park site appears to be adequate for the proposed uses. Existing underground and overhead facilities are favorably located about the perimeter of the site. These facilities are identified on Exhibit 1A and 1B.

Major facilities for private utilities are located along the Central Avenue Corridor.

Generally, major facilities are located along the Central Avenue corridor. South of Central Avenue, most utilities do not cross west of the Riverside Drain. When located outside the public right-of-way, the facilities may be located within utility easements and corridors.

- **Electrical Service**
  Major PNM facilities are located both north and south of Central Avenue. Overhead forty-six kilovolt three-phase transmission lines run along Central Avenue in an east-west direction. Other three-phase PNM lines are located at Mountain Road, Alcalde Place and Laguna Boulevard. Minor power lines, typically overhead lines, are scattered about the site, often serving the existing pump stations, lighting and wells located within site boundaries.

- **Gas Service**
  The Gas Company has a major 16" high pressure gas line under Central Avenue on the north side of the street. A 2" distribution line parallels the 16" line. Other smaller lines

are located under Mountain Road, New York Avenue, Alcalde Place and Laguna Boulevard.

- **Telephone Service**
  US West also has major facilities in the vicinity. The most significant is the major distribution line located on the north side of Central Avenue. Other available service lines are located at Mountain Road, New York Avenue, Laguna Blvd. and Alcalde Place.

- ***Cable Television Service***
  Jones Intercable has no significant facilities in this area. A minor service line is located within the Central Avenue right-of-way, primarily serving the Beach Apartments. This line may not have significant additional capacity.

2.2.9 Environmentally Impaired Properties

An Environmental Property Assessment was performed for:

- the Casa Grande Chevron Service Station and Convenience Store property located at 2501 Central Avenue, N.W. (aerial photos show that there has been a gas station at this location since at least the 1940s);
- the Casa Grande Restaurant, located at 2525 Central Ave., NW, Albuquerque; and
- the Old Town Learning and Child Care Center and Hair by Rosalie, located at 2713 Central Avenue, N.W.

The Environmental Assessment was performed by Bohannan-Huston, Inc., because the property was deemed important towards the workability of the area for the restaurant and concessions, north of Central Avenue. As part of property aquisition, especially because the site contains an existing service station, it was recommended that the City perform this assessment to help determine potential environmental problems. An on-site inspection has not been performed because authorization has not yet been approved. However, cursory observations (no environmental samples were obtained) of the sites on August 8th, 18th and 24th, 1990 indicate the following:

- The age and construction of site structures suggests that a very modest program of bulk sampling and analysis is needed to determine if asbestos-containing building materials were used in the office/convenience store building.

- Since no formal site inspection was approved, no samples for asbestos sampling could be obtained. This omission must be remedied to obtain the relief from liability offered under CERCLA by the Superfund Amendments and Reauthorization Act of 1986.
- Activities in the area revealed little to suggest contamination of the site by its surroundings.
- Casa Grande Chevron has three 19 year old underground storage tanks. The New Mexico Environmental Improvement Division are not aware of any problems with those tanks and Ever Ready Oil (owners) has indicated that the tanks are not leaking based on tests that have been performed in the Spring of 1990. Without a site inspection and lacking credible evidence to the contrary, one must conclude there is a high probability that the tanks have leaked based on their age and lack of corrosion protection, the corrosive soil in the area, and recent contractor experience at similar locations. Even if a formal site visit does not uncover evidence of leakage, sampling of the site's soil and ground water would still be needed to judge with reasonable confidence whether the site is contaminated from present or past underground storage tank leakage.

Before acquiring properties, sites should be inspected to comply with Environmental Protection Agency requirements and checked for petroleum and/or asbestos contamination.

- **Recommendation**

Before acquisition the site , at a minimum, should be formally inspected to complete minimum EPA requirements and appropriate sampling programs performed to check for the presence of petroleum and asbestos contamination.

2.2.10 Easements

Various easements cross the proposed project property. During the design phase, these easements must be acknowledged and contingencies determined where utility infrastructure conflicts with planned Park facilities. Several of the important easements are addressed below and can be found in the City of Albuquerque Zone Atlas:

Certain easements will require acknowledgement to reduce any possible conflicts with planning facilities.

- **Duranes Acequia Easement**

  This 30' wide easement carries return irrigation flow from the Duranes Acequia to the Riverside Drain. The waterway is an earthen ditch up to the edge of San Gabriel Park, where it goes into an underground CMP, crosses the park and drains into the Riverside Drain. The Duranes Acequia is currently in use, so vacation of the easement is not an option. However, MRGCD personnel said that the easement could be used for roadways, parking or any other non-structural use as long as the pipe can be accessed (dug up) if problems developed.

- **Power Lines/Drainage Easement**
  Substantial power lines cross the property. There is a 10' PNM easement, 5' of which is shared with a 20' wide drainage easement. PNM spokesmen say that the power lines can either be buried or relocated. New York Avenue is a possible relocation route. The lines primarily serve the sanitary sewer lift station on New York Avenue. The drainage easement carries the Montoya Road drainage through a buried 36" pipe to the Riverside Drain. The storm sewer can be utilized for project drainage, and its replacement or relocation is not suggested.

- **Power Lines through Casa Grande Site**
  Research identified a power line crossing the City-owne Casa Grande Motel site, which serves the privately owned Casa Grande Lounge/Restaurant and the adjacent filling station. No easement document has been discovered or shown on any plat, including the recent plat prepared for the City. This power line should be investigated by City Property Management to determine its status.

- **MRGCD Drainage Easement at New York and Central Avenues**
  This small easement carries the Alameda Drain, and its relocation is improbable. Its boundaries must be respected during planning of the Aquarium lagoon near this easement.

3.0 Utility Concepts and Recommendations

A Utilities Master Plan guides the design decisions necessary to adequately meet the requirements for The Albuquerque Biological Park.

Both City and well water sources should be used to meet project demands, however, special attention must be paid to separate and eliminate cross-contamination of these sources.

Some water can be collected at the downstream end, filtered (when necessary) and pumped back up stream for re-use.

3.1 Introduction

The Utility Master Plans presented in this section will recommend avenues to ensure adequate water, sanitary sewer and drainage facilities to support the fauna and flora of the Aquarium, the Botanic Garden and the Aquatic Park as well as accommodate the visiting public. The water master plan will be presented first followed by sanitary sewer and storm sewer.

3.2 Water Master Plan

No major obstacles are anticipated in providing adequate water for the Aquatic Park, the Aquarium and Botanic Garden. This report recommends the use of both City of Albuquerque water and well water for meeting demands. It is critical to keep these two waters separated to avoid cross-contamination, since the well water will not be treated. The approach taken in this plan is to isolate the two waters by providing only one cross connection between the two systems. A backflow preventor would be installed to keep well water from entering the City water system. In general, City water will be used for domestic purposes (restrooms, kitchens, drinking) and fire flow with well water supplying water features, aquaria and irrigation. Recommendations are based on demand analysis derived from a questionnaire distributed to the various project teams as well as usability factors of chlorinated City water and untreated well water. This analysis is discussed in Appendix 6, Section 4.

3.2.1 Recycling and On-site Treatment

Water flowing through streams and ponds will be collected at the downstream end of the project, filtered (when necessary) and pumped back to the upstream end. The Aquarium water will be treated by the Life Support System (LSS) to minimize discharge and maximize reuse. The estimated peak daily Aquarium wastewater discharge will be no more than 350 gpm, with negligible salt content and suspended solids concentration of approximately 2%.

3.2.2 System Recommendations

The following recommendations present an economical and sensible solution for project demands.

A. New Wells

To meet the well water demands, two additional wells must be drilled at Tingley Beach. Since the phasing of the Aquatic Park is in question, it is recommended that both new wells be drilled on City-owned land north of Central Avenue. The northern well (see Exhibit 2A) should have a capacity of approximately 1000 gpm, and the southern well a capacity nearer to 1500 gpm. Total well capacity for the Aquarium, Botanic Garden and Aquatic Park would be 3700 gpm, including the existing wells. Connection between all four wells (two existing and two new) is imperative, as this provides backup between the wells and allows down time at any single well for repair and maintenance.

It is recommended that two new wells be located on City-owned land, north of Central Avenue, to meet all anticipated requirements for Park projects. In addition, large storage tanks are not recommended because they may be obtrusive to the park atmosphere and are not required and

No large storage tanks are recommended for well water, as large emergency volumes are not required for fire fighting, and large storage tanks would be obtrusive and disruptive of the park atmosphere.

City Water rights expert Gary Davies' reports that the City has extra water available at a cost of approximately $40.00 per acre-foot for any new wells installed.

B. Water Lines

Exhibits 2A and 2B show the recommended water lines for the new facilities. A new 12" line should be installed in the Utility Corridor (Exhibit 2B) in the road traversing the Aquatic Park to carry City water. Connections to existing City lines will be on Central Avenue, Laguna Boulevard and Alcalde Place.

Well water for the Aquatic Park will be carried in a 10" line running north and south at the locations shown in Exhibit 2B. The existing 6" line should be removed and discarded. This new line will connect with the two existing wells. The alignment will be coordinated with Park features to minimize interference.

New water lines will be required to meet project demands at various points on and around the project area.

In the Botanic Garden, the existing 10" line will be used to

Infrastructure Master Plan

Existing Infrastructure

Exhibit 1-B

Sanitary Sewer

Storm Sewer

Power/Telephone

Gas Service

Water Service

1" = 400'

0 200 400 800

Scale In Feet

MASTER PLAN
The Albuquerque Biological Park

The Tingley Aquatic Park,
The Albuquerque Aquarium,
& Rio Grande Botanic Garden

BOHANNAN-HUSTON, INC.
BRW
Geo-Test, Inc.

Infrastructure Master Plan

Utilities

Exhibit 2-B

Sanitary Sewer

Storm Sewer

Power/Telephone

Gas Service

Water Service

Well

Well Water Service

1" = 400'

0 200 400 800

Scale In Feet

MASTER PLAN
The Albuquerque Biological Park

The Tingley Aquatic Park,
The Albuquerque Aquarium,
& Rio Grande Botanic Garden

BOHANNAN-HUSTON, INC.
BRW
Geo-Test, Inc.

carry City water from Central Avenue north to the point where it downsizes to 6 inches (see Exhibit 2A for existing utilities). At this junction, the 6" line will be disconnected and a new 10" line extended northward to the proposed maintenance building located north of Mountain Road. Tie-ins with City water will be located at Mountain Road and the existing 10" line north of Central.

The principal source of City water for the Aquarium will be from the intersection of Central and New York Avenues, where a 10" line will bring water from Central into the Aquarium area. This 10" line will continue westward from the Aquarium and tie into the existing line in Tingley Drive. An additional 10" spur off this line will loop through the Botanic Garden Visitor's Center, as shown on Exhibit 2A.

Well water for the Botanic Garden will utilize the existing 6" line running from Mountain Road south to the existing 10" line. At this junction, the 6" line will be disconnected from the existing 10" to isolate the two systems. Well water service in a new 8" line will extend southward under the Rio Grande Bridge and connect with the Aquatic Park well water line. The suggested location of the Botanic Garden wells is shown on Exhibit 2A.

Costs for the proposed water system are presented in the "Master Plan" section of this report.

3.2.3 Sanitary Sewer

The sanitary sewer system must meet the requirements of all proposed master plan elements.

The sanitary sewer system proposed for the Rio Grande Botanic Garden and the Aquatic Park should be planned to adequately serve the specific master plan elements. Proposed locations and alignments for the sanitary sewer system serving the above listed elements of the master plan are described in greater detail in the following service plan section as identified on Exhibits 2A and 2B. If the day use areas of the Aquatic Park are to be served by sanitary sewer, then minor additional extensions will be necessary.

A. Service Plan

- **Botanic Garden/Aquarium**
  The Botanic Garden should be served from two locations. The north portion of the site, including the greenhouses,

Sanitary Sewer service to the Botanic Garden and the Aquarium will be provided from two locations: one from the north and one from the south portion. Connections to the lines in Central Avenue are not recommended due to higher costs and disruptions.

maintenance facilities and should be served from the existing eight-inch sanitary sewer in Mountain Road. Gravity flow may be available to this area if minimum slopes are used in the service lines. An existing 8" line is already located in front of the greenhouse/maintenance complex. Little is known about the length and condition of this line. Due to these concerns, that portion of the existing line within the project boundaries will be removed or abandoned in place. New service to this area will then be made by line extensions to Mountain Road.

The south portion of the Botanic Garden, the Aquarium, restaurant and the entry complex, should be served from the existing fifteen-inch line in New York Avenue. Gravity service to this line is virtually assured due to the depth of the fifteen-inch line just upstream of the existing lift station.

Connections to the lines in Central Avenue are discouraged due to the probable disruption of traffic and higher connections costs.

An existing sewer line in Laguna Boulevard should provide service to the Aquatic Park.

- **Aquatic Park**
  The Aquatic Park, primarily the Nature and the Park Centers, should be served from the existing line in Laguna Boulevard. Additional field reconnaissance is needed to determine the final point of connection. This is necessary to determine if the existing eight inch line in Laguna Boulevard has been extended across the Riverside Drain, as shown on City maps. Gravity flow service to this line, especially if extended across the drain, should be available.

Permits may be required from the Middle Rio Grande Conservancy District for crossings of the existing irrigation and drain ditches.

B. System Design Considerations
Design and construction of the sanitary sewer infrastructure will be governed by the City of Albuquerque's Development Process Manual (DPM). Individual site lines and lines smaller than eight-inches in diameter will be designed in accordance with the Uniform Plumbing Code. Correspondence with the City of Albuquerque has indicated that the minimum slope criteria of the DPM may be reduced due to the project's

Sanitary Sewer infrastructure will be governed by the City of Albuquerque's Development Process Manual and the Uniform Plumbing Code.

topographical constraints. Typical line sizes in this project will be eight-inch diameter. The City has suggested that a slope of 0.004 may be permissible for the eight-inch size. A minimum eight-inch line size is recommended for lines serving more than a single user. An eight-inch line is considered to be an easily maintained line.

The Botanic Garden and the Aquatic Park generate small amounts of waste. The Aquarium will require extra measures in its sanitary sewer design.

- **Botanic Garden and Aquatic Park**
  Generally, an eight-inch diameter line size will be sufficient for the sanitary sewer infrastructure of this project. Many of the uses and elements of the Botanic Garden and Aquatic Park are light generators of liquid waste, and for these, an eight-inch minimum diameter line is suitable and adequate.

- **Aquarium**
  Extra care in design will be needed for the Aquarium's discharge to the sanitary sewer infrastructure. Line sizes up to ten inch diameter may be necessary to serve this facility.

The Life Support System will pre-treat Aquarium waste water.

C. Pre-Treatment

While most project facilities generating effluent will produce conventional sewage, the Aquarium may have high impact releases due to the high salt content of its wastewaters. The proposed Life Support System for the Aquarium will treat discharge water before release to the sanitary sewer system. These releases will have negligible salt content and a suspended solids concentration of approximately 2%. No further treatment is envisioned.

Grading and contouring of the Botanic Garden and Aquatic Park sites will eliminate the need for lift stations.

D. Lift Stations

Once discharge locations and elevations are finalized during design, assessment can be made about the viability of gravity flow discharge. These determinations will be made during the preparation of the construction documents for the individual project elements. For instance, final grading and contouring of the Botanic Garden and Aquatic Park will be done to eliminate the need for lift stations. The Aquatic Park area appears to be the most critical, in terms of available slope. Due to high initial installation and long-term maintenance costs, lift stations will be avoided by placing proposed improvements at finished elevations sufficiently high enough to be served by gravity sewer service.

E. Wetlands Treatment Demonstration Project
The Clean Water Act of 1977 (P.L. 95-217) favors innovative and alternative technologies, such as marsh/pond systems and aquaculture, for treating effluent and other wastewater. These systems use the natural uptake of inorganic substances (nitrate, phosphate) and cations (sodium, potassium, calcium) into plant fibers to purify wastewater.

In keeping with the Clean Water Act, a Wetlands Treatment Demonstration Project will be developed that will treat a small portion of the facility sanitary sewer discharge.

In keeping with the aquatic and botanic themes of the project, the installation of a wetlands demonstration project is proposed in the Botanic Garden area to treat a small portion of the sanitary sewage discharged from the facilities. This wetlands facility should be a showcase for the general public, as well as for the technical community of Albuquerque, and should include a strong educational emphasis.

When wetlands effectiveness declines during the colder months, a conventional discharge line to public sewer facilities should be available as an alternative for the wetlands discharge. Bar screens and other treatment space may be required upstream of the wetlands to pre-treat the flow.

Creative and imaginative drainage facilities can provide visual and educational opportunities as well as provide for functional requirements.

3.2.4 Drainage
Drainage systems are proposed to safely convey storm runoff to appropriate outfalls. Detailed analysis is discussed in the Appendix 6, Section 3. The Botanic Garden, Aquarium and Aquatic Park present the opportunity for creative and imaginative drainage facilities that can enhance the Albuquerque Biological Park visually and educationally, as well as functionally.

Proposed storm sewer systems can be modified depending upon final design decisions and discussion of options.

- **Proposed Systems**
  Exhibits 2A and 2B show the storm sewers proposed in this section for the project. While the Phase II parking lot sewers will be installed at a later date, the remainder of the facilities will be installed under Phase I. For the Aquatic Park, the two alternate outfalls, one to the boating pond and one to the Alcalde Pump Station, are shown. Final outfall determination will be made during the design phase, when pond water surface elevations are set, and the most prudent alternative can be identified.

  The Phase I and II parking lots to be used as detention?

facilities are designed for 3.5" and 7.5" water depth respectively for the 100-year storm. Each should be graded to allow positive surface drainage from their respective basins to enter the detention parking lot. Orifice plates should be installed in the parking lot outlet pipes to limit flow to 3 cfs from each lot. If free discharge is allowed in the future, the orifice plates can be removed.

All visible drainage facilities in this project should be designed and landscaped to enhance the visual quality of the Aquarium, Botanic Garden and Aquatic Park. Incorporation of rock masonry, curvilinear design and vegetation into traditional drainage elements is a start towards aesthetic design.

3.2.5 Private Utility Systems

A. Existing Conditions

Private utility systems have capacity to provide more than enough supply for Park components, with the exception for cable television service.

Major utility company facilities, such as power, telephone and gas, are located within and/or at the perimeter of the Botanic Garden and Aquatic Park sites. Individual discussions with utility company representatives indicate that these facilities should be more than adequate for the proposed loadings of this project. Obviously, minor on-site extensions will be necessary to extend service lines from these existing perimeter facilities to the individual users located within the park. Additionally, some of the existing lines currently situated within the project boundaries should be abandoned in place or removed and disposed of. Overhead power lines should be removed and their service lines buried underground and possibly relocated.

Other private utility system issues include:

- *Minor on-site extensions will be required.*
- *Some existing lines should be abandoned in place or removed.*
- *Any overhead power lines should be buried.*

Cable television service is an exception because the existing cable line in Central Avenue may not have sufficient signal left to serve the Botanic Garden. The resolution of this question will be based on the number of cable users proposed at the Park and the outcome of a thorough study by Jones Intercable. It is possible that an extension in Central Avenue will be necessary from larger cable facilities east of the site. Exhibits 2A and 2B identifies the probable line extensions required to serve the site. Line sizes are not given with this plan.

B. Recommendations for Provision

The following are various policies impacting utility distribution. These are not intended as a final or complete description of these polices. Many details, typically left to final design efforts, are still required to permit the utility companies to accurately apply their policies to this project.

Utility lines should be looped where economically feasible and logistically possible.

- **Utility Alignments**
  Generally, utility lines should be looped where possible. Additionally, the following suggestions are made for service:

  - *Botanic Garden greenhouses, maintenance facilities, hacienda*
    Dead end, unlooped gas and telephone service lines should be extended from Mountain Road. There is little justification for extending the gas line all the way to the other gas lines proposed for the Aquarium and Entry Complex area. Three-phase power should be looped between Mountain Road and Central Avenue. This line will then be available to serve the entire length of the Botanic Garden.

  - *Botanic Garden entry complex, Aquarium and support facilities*
    Gas, power and telephone service should all be looped between New York Avenue and Central Avenue, as feasible. Cable television should be extended to the entry complex area.

  - *Aquatic Park Centers and Well Systems*
    A dead end gas line should extend from existing lines in Laguna Boulevard. Power and telephone lines should be extended from Central Avenue. Power should be looped back to Central Avenue utilizing the same trench. The existing well and proposed new wells should be reconnected to this new line. Telephone will probably need to extend across Central Avenue via an overhead extension.

  - *Security and Closed Circuit Television*
    It is suggested that an empty conduit might be placed in the power line trenches in order to accommodate

these requirements for security and closed circuit television. More detailed analysis will be required dependent upon final design decisions.

Utility loadings will be contingent upon final design decisions.

- **Utility Loadings**
  At this preliminary design stage of development, exact utility loadings for the individual elements and users of the project can not be ascertained. Loadings were therefore estimated and discussed with the utility companies. The loadings that were used are available from Bohannan-Huston, Inc.

All new and existing utilities should be buried underground in plastic conduit. In addition, every opportunity should be made to provide for future utility expansion.

- **Underground Distribution**
  To preserve the natural and aesthetic character of the project, all new utilities should be buried underground or relocated to a less obtrusive area. Additionally, as stated above, all existing utilities that are currently of overhead construction should be removed and if their service is necessary, the lines buried.

  To provide ease of future upsizing and to avoid costly and unsightly trenching during repairs, utilities should be buried in plastic conduit. Gas, water, storm and sanitary sewer lines are the exception to this recommendation. These lines will be direct buried method conduit. The installation of conduit increases the initial cost of the infrastructure, however, long term flexibility and aesthetic considerations should be the priority. Additionally, the use of conduit, whether for current use or future use, should be liberally applied throughout the park, especially along streets and roadways. Appropriate placement of empty conduit under paving or other permanent structures could permit future expansion or repair of systems without damaging the existing infrastructure and leaving unsightly scars.

PNM's major 46 KV Transmission line should be buried. This will eliminate any aboveground power lines on the site in a cost-efficient manner.

- **Relocation or Burial of the 46 KV PNM Transmission**
  Although other lines within the project boundaries may require relocation or burial, PNM's major 46 KV transmission line on the north side of Central Avenue is the most problematic. This line runs through the most dense portion of the project, the entry complex of the Botanic Garden. PNM has indicated that the burial of

transmission lines, especially when suggested for an intermediate reach in an otherwise overhead system, is highly discouraged. However, given the nature of the project, PNM representatives will work with the project to bury the line, if that is desired.

A relocation alternative was discussed for the transmission line. The 46 KV line could be realigned to run within New York Avenue and Central Avenue rights-of-way via overhead lines. However, since this alternative uses overhead lines within the project vicinity, therefore, runnnig contrary to the prior stated policy of underground systems, it is not recommended.

It is also interesting to note that, although the linear foot cost is lower, the relocation alternative is a more expensive solution, due to its greater overall length.

Utilities should share common service trenches.

- **Trench Sharing**
  Where possible, utilities should share common trenches. This concept is shown on Exhibit 3. Generally, these trenches follow road alignments except where existing utility distribution made it impractical.

Utilities should follow underground utility corridors and be organized in a logical manner, both horizontally and vertically.

- **Utility Corridors**
  Where possible, utilities should follow underground utility corridors and be placed in a predetermined underground order, both horizontally and vertically. Exhibit 3 identifies a corridor arrangement.

Utility easements on site should be identified, and if possible, vacated and relocated.

- **Easements**
  Some utility easements are known to be located on the site. These easements should be identified and vacated where possible to prevent possible legal conflicts in the future. Vacation actions will require the preparation of a survey re-plat. New easements must be granted to the utility companies to cover proposed and existing facilities.

Utility Companies will need final project requirments for their design and constructions.

- **Design and Construction**
  Generally, facilities design and construction is performed by the utility companies. To perform these functions, they will require final project loadings and dimensions.

Exhibit 3
UTILITIES CORRIDOR

NOTE

PRIVATE UTILITY ALIGNMENTS AND DISTANCE FROM ROADWAY MAY VARY FROM THAT SHOWN ON THE ABOVE SECTION

3.2.6 Phasing

Economics, need and logistics will dictate phasing for the Albuquerque Biological Park.

Phasing for the Albuquerque Biological Park will be handled based on economics, need, and overall Park logistics.

A. Phase One

Phase I of development for Utilities will be fueled by the work that is planned for other Park elements. Phase I work will include storm drainage, water systems, sanitary sewer systems and private utility developmentnts.

Phase One developments include:

- *Storm Drainage*
- *Water System*
- *Sanitary Sewer*
- *Private Utility*
- *Transportation*

- **Storm Drainage**
  Phase I storm drainage elements include the majority of drainage facilities north of Central Avenue. The exceptions are the catch basins and connector pipes in the Phase II parking lot for the Aquarium and the planned storm sewers ~~is~~ located on property not yet acquired by the City. In future phases drainage is made up of the two exceptions north of Central (see above) and the entirety of the Aquatic Park south of Central. The roadway drainage in the Aquatic Park is the most expensive element of any phase, and is primarily responsible for the large future phases construction cost.

- **Water System**
  Water System phasing is divided by Central Avenue, with Phase I consisting of all water facilities north of Central (the Botanic Garden and the Aquarium) and future phases consisting of all work south of Central Avenue (the Aquatic Park). The bulk of the Phase I construction cost is the drilling of the two wells and their accompanying pumps and equipment. Place wells in phase II

- **Sanitary Sewer**
  Phasing of the sanitary sewer infrastructure will largely resemble that of the water system infrastructure. Phase 1 will primarily consist of improvements north of Central Avenue. Future phases of construction will include installation of sanitary sewer improvements south of Central Avenue.

- **Private Utility Development**
  Private utility infrastructure should also be phased in a manner similar to the water and sanitary sewer phasing

plans.

- Note on Private Utility Costs: The private utilities costs are preliminary and conservative due to the large number of variables involved. All costs were discussed with the individual utility companies and are based on their own crews performing the work. Opportunities for cost reductions include presentation of detailed, final plans to the utility companies and use of competitive bid, commercial utility firms to perform the work.

B. Other Phases

In subsequent phases of Park development, improvements will take place to the New York Avenue/Central Avenue intersection, parking will be expanded around New York Avenue, and the Tingley Drive/Central Avenue intersection will be constructed with the northern part of Tingley Drive converted to a transit drop-off. All work on south Tingley Drive and Alcalde Place will take place in later phases.

MASTER PLAN
The Albuquerque Biological Park

The Tingley Aquatic Park, Albuquerque Aquarium, & Rio Grande Botanic Garden

Element 6:

Public and Private Utilities

Appendix

February 15, 1991

DRAFT

1. Bibliography

Boyd, Linda J., Editor, American Association of Zoological Parks and Aquariums, *Zoological Parks and Aquariums in the Americas, 1986-1987*, 1986.

Chambers and Campbell, Inc. for New Mexico State Park and Recreation Commission, Santa Fe, New Mexico, *Rio Grande Valley State Park: A Feasibility Study and Preliminary Plan for a Central New Mexico State Park Along the Rio Grande*, 1969.

City of Albuquerque/Bernalillo County Planning Department, *Albuquerque/Bernalillo County Comprehensive Plan*, Approved by the Albuquerque City Council and the Board of County Commissioners, August 1988.

City of Albuquerque/Bernalillo County Planning Department, *Old Town Sector Development Plan*, 1977.

City of Albuquerque, Drainage Design Criteria Committee, *Draft Revision of Section 22.2, Development Process Manual*, January, 1990.

City of Albuquerque, Municipal Development Department, *Development Process Manual*, March, 1982, periodically updated.

City of Albuquerque Municipal Development Department, *Huning Castle and Raynolds Addition: Neighborhood Sector Development Plan*, 1981.

City of Albuquerque, *North Barelas Sector Development Plan*, 1976.

City of Albuquerque, Parks and Recreation Department, Open Space Division, *Rio Grande Valley State Park Management Plan*, June 1987.

City of Albuquerque, Planning Department, *Center City Downtown Revitalization Strategy, Including a Sector Development Plan for the Downtown Urban Center*, Adopted by Albuquerque City Council, February 1989.

Gruen, Gruen, and Associates with assistance of New Mexico

Spectrum, *Market Potential and Recommended Development Strategies for Downtown Albuquerque,* 1984.

Middle Rio Grande Council of Governments of New Mexico, *2010 Socioeconomic Forecasts for State Planning and Development District 3 by Planning Analysis Subzones, TR-104,*1989.

Miller, J.F., R.H. Frederick and R.J. Tracey, *Precipitation-Frequency Atlas of the Western United States, Volume IV--New Mexico,* National Oceanic and Atmospheric Administration, 1973.

Olson, Jana and Hanson Hom for the East Bay Trails Council, A *Trail Manual for the East Bay Regional Park District,* 1976.

Regional Urban Design Assistance Team (R/UDAT),*Central Avenue Study, Albuquerque, New Mexico,* 1984.

Southwest Land Research, Inc., Hanamoto, Alley and Abey, Bohannan-Huston, Inc., and Manuel Molles, PHd., *Water-Based Recreation Study: A Planning and Feasibility Study of Water-Related Recreation along the Rio Grande,* 1985

Torr, Jerry, Architect and Planner, *Rio Grande Zoological Park Master Plan,* N.D.

2. Mapping

Mapping
A digital data base was produced by Bohannan-Huston, Inc. by use of an automated mapping system for the entire project area. The data was produced to be readable by AutoCADD software. In order to produce the base data we used information provided by the city, information collected by field survey, and data generated through aerial photogrammetry.

Mylar Base maps were prepared at 1 inch = 200 feet and 1 inch = 50 feet scales for the entire master plan area for design and planning purposes respectively. These maps provided topographic information and an inventory of conditions which allowed the consultants to study the area. Particular attention was paid to existing utilities, roadways, vegetation, trails and pathways.

Along with the Photogrammetric Mapping effort an extensive ground survey was preformed to gather data concerning sanitary sewer, storm sewer, water, gas, telephone, power and significant trees within the project area.

Further efforts were conducted identifying current property configurations based on city information systems. The information that was collected was then transferred to the computer data base for inclusion in the Master Plan and to be used as a planning tool. A plat was not prepared.

3. Drainage Analysis

Storm Drainage
This section describes the hydrology assumptions used to determine basin flowrates and runoff volumes, as well as summarizes the results of the hydrologic analysis.

- *Criteria*
  The City of Albuquerque standards for hydrologic analyses are presented in the Design Process Manual, Volume II Section 22.2. However, the City is currently rethinking its hydrologic approach, principally through a collaboration between the University of New Mexico Civil Engineering Department, AMAFCA and City of Albuquerque hydrology staff. While this new hydrology is being used for many drainage studies within the City area, consensus has not been reached, and the new hydrologic approach has not been approved by the City. (The latest Draft Revision is dated January, 1990.)

  For drainage areas of less than 320 acres, Section 22.2 suggests the Rational Formula (Q=CxIxA) for determining peak runoff. This widely used method produces a peak flowrate but no volume of runoff. As will be seen in the following sections, runoff volume is of great interest to the study area because of many local depressions serving to retain storm drainage.

- **Hydrologic Approach**
  Bohannan Huston, Inc. (BHI) in consultation with City hydrologists agreed to the following hydrologic approach:

  1. The Rational Formula would be used to determine peak discharges for the study area basins.

  2. The same basins would then be remodeled using the HYMO computer model as detailed in the Draft Revision of January, 1990, Section B.5. As long as the HYMO peak flowrates agreed reasonably well with those obtained using the Rational Formula, the HYMO discharges and volumes would be used for the analysis.

- **Hydrologic Parameters**

The following paragraphs describe the Rational and HYMO parameters used in the analysis.

- *Rainfall*

The 100-year rainfall amounts were taken from the 1973 NOAA Atlas 2, Volume IV. For a storm duration of 6 hours, the rainfall amount is 2.22 inches. The HYMO program also requires input of the 100-yr 1-hr rainfall, which NOAA shows to be as 1.9 inches. To determine the 10-yr 6-hr rainfall amounts, the 100-yr volume was multiplied by a factor of 0.657 for the Rational Method (DPM) and by a factor of 0.667 (January, 1990 Revision) for the HYMO model. The 10-yr 1- hour rainfall volume for HYMO was calculated as 1.27 inches based on the applicable formula from the January 1990 document. The rainfall depths used in this analysis are listed below:

Rainfall Depths in Inches

Recurrence Interval/Duration	Rational Formula	HYMO
100 yr/24 h	N/A	2.65
100 yr/6 hr	2.22	2.22
100 yr/1 hr	N/A	1.90
10 yr/6 hr	1.46	1.48
10 yr/1 hr	N/A	1.27

- *Time of Concentration (tc)*

This parameter identifies the time it takes for the runoff to reach an analysis point from the most hydraulically remote location in the basin. The minimum value used was 10 minutes.

- *Rational Method*

As average velocities were relatively small, the time of concentration was determined considering the hydraulic characteristics (slope, friction, and depth of flow) of the route over which runoff has to travel (street, bare ground, grass, etc.). Plates 22.2 B-1 and 22.2 B-2 (DPM) were used.

- *HYMO*

Times of concentration were calculated as the ratio between route length and water velocity. The velocity depends upon the slope of the reach and the conveyance condition (friction). The January 1990 document was used in determining the HYMO velocities and tc.

- *Time to Peak (tp)*

This value identifies the time to peak of the unit hydrograph of a specific basin. The time to peak input to the HYMO program was computed as being two-thirds of the time of concentration, but never less than 6.67 minutes.

- *Land Condition*

The condition of the land has a considerable effect on the runoff volumes as well as on the flowrates. For both the rational and the HYMO methods, the basins were subdivided into four basic land categories with different degrees of permeability: undeveloped (Treatment A); lawns and landscaping (Treatment B); unpaved parking, roads, and trails (Treatment C); and impervious areas, roofs, and streets (Treatment D). For the Rational method, a weighted runoff coefficient "c" was determined, based on the percentage of the whole basin area corresponding to each one of the land categories. Basin parameters for both the Rational and HYMO methods are presented in Exhibit A.1.

- *Approach*

The study area was divided into drainage basins, each with a separate outlet or ponding area. Offsite basins draining into the study area were also identified and analyzed. The basins are shown on Exhibits A.3.1 and A.3.2. For basins where the water ponds, flowrates and runoff volumes were calculated using the center of the ponds as analysis points. The Rational Formula was used to estimate the 10-year and 100-year flow rates. Basin parameters and resultant flow rates are presented on Exhibit A.1.

Having determined the Rational Formula flowrates, a computer model using HYMO was prepared to simulate runoff flow during a 100-year and a 10-year storm events. The flowrates obtained were compared to those estimated

BASIN	ANALYSIS POINT	AREA	Rational Formula (DPM)						DPM Revision, 1-1990							
			c	Lc	I10-Yr.	I100-Yr.	Q10-Yr.	Q100-Yr.	Treat.A	Treat.B	Treat.C	Treat.D	tc	tp	Q10 Yr.	Q100-Yr.
		(sq.mi.)		(min.)	(in/hr)	(in/hr)	(CFM)	(CFM)	(%)	(%)	(%)	(%)	(min.)	(hr.)	(CFM)	(CFM)
A1	AP1	0.0013	0.46	10.0	3.09	4.69	1.2	1.9	90	0	0	10	10.0	0.111	0.7	1.7
A2	AP2	0.0033	0.42	14.7	2.54	3.86	2.2	3.4	95	0	5	0	10.0	0.111	1.3	3.7
A3	AP3	0.001	0.46	10.0	3.09	4.69	0.9	1.3	90	0	0	10	10.0	0.111	0.6	1.3
A4	AP4	0.0025	0.45	10.0	3.09	4.69	2.2	3.4	89	0	4	7	10.0	0.111	1.3	3.1
A5	AP5	0.0027	0.47	10.0	3.09	4.69	2.5	3.8	87	0	4	9	10.0	0.111	1.5	3.5
A6	-	0.0077	0.47	10.0	3.09	4.69	7.2	10.9	55	25	5	15	11.0	0.123	5.3	11.2
A61	-	0.0286	0.60	52.0	1.33	2.02	14.6	22.2	40	15	5	40	44.0	0.500	13.3	2.8
A62	-	0.0102	0.58	43.1	1.47	2.23	5.6	8.5	45	15	5	35	31.0	0.350	5.5	9.7
A63	-	0.0007	0.95	10.0	3.09	4.69	1.3	2.0	0	0	0	100	10.0	0.111	1.5	2.2
-	AP6 (A6,A61, A62,A63)	-	-	-	-	-	-	-	-	-	-	-	-	-	16.6	30.0
A7	AP7	0.011	0.34	23.0	2.02	3.07	4.8	7.3	35	58	5	2	16.0	0.183	4.3	10.7
A8	AP8	0.0047	0.36	27.8	1.83	2.79	2.0	3.0	5	80	1	14	24.0	0.267	2.2	4.5
A9	AP9	0.0027	0.56	10.0	3.09	4.69	3.0	4.5	70	0	0	30	10.0	0.111	2.4	4.6
A10	AP10	0.0103	0.43	18.9	2.23	3.39	6.4	9.7	80	10	5	5	16.0	0.183	3.6	8.8
A11	AP11	0.0031	0.46	10.0	3.09	4.69	2.8	4.2	88	0	4	8	10.0	0.111	1.7	3.9
A12	AP12	0.0018	0.46	10.0	3.09	4.69	1.6	2.4	88	0	6	6	10.0	0.111	0.9	2.2
A13	AP13	0.0118	0.45	14.0	2.6	3.95	8.8	13.4	70	15	5	10	10.0	0.111	7.2	16.2
A14	AP14	0.0088	0.48	46.3	1.41	2.15	3.8	5.8	85	0	0	15	52.0	0.578	1.8	3.6
A15	AP15	0.0028	0.52	10.0	3.09	4.69	2.9	4.4	0	60	10	30	10.0	0.111	3.2	5.7
A16	AP16	0.0009	0.53	10.0	3.09	4.69	1.0	1.5	0	60	0	40	10.0	0.111	1.1	2.0
A17	AP17	0.0019	0.59	10.0	3.09	4.69	2.2	3.4	40	20	0	40	10.0	0.111	2.1	3.8
A18	-	0.0051	0.76	10.0	3.09	4.69	7.7	11.7	10	20	0	70	10.0	0.111	8.2	13.2
A19	AP19	0.0102	0.31	18.0	2.29	3.48	4.6	7.0	90	10	0	0	14.7	0.163	2.9	8.3
A20	A20	0.0657	0.28	46.0	1.42	2.15	16.7	25.3	50	50	0	0	37.3	0.414	9.6	26.8
A21	-	0.0698	0.67	25.3	1.92	2.92	57.4	87.4	20	30	0	50	26.5	0.294	53.6	91.6
A22	-	0.0103	0.48	42.0	1.48	2.26	4.7	7.1	85	0	0	15	39.9	0.444	2.5	5.2
-	AP18 (A18,A21, A22)	-	-	-	-	-	-	-	-	-	-	-	-	-	58.6	100.8
-	AP20, (A15,A16, A17,A20)	-	-	-	-	-	-	-	-	-	-	-	-	-	11.2	29.5
AA1	-	0.0439	0.68	10.0	3.09	4.69	59.0	89.6	50	0	0	50	10.0	0.111	53.7	92.0

Exhibit A.1
Aquatic Park - Basin Hydrology

by the Rational Formula. The corresponding values for the 100-year storm were similar, but those for the 10-year storm differed considerably. Therefore, only 100-year runoff volumes were analyzed. Exhibit A.1 shows the HYMO parameters used and the resultant flow rates for the 100-year event for all the basins.

Storage potential of the basins with ponds was determined using 1 foot contour mapping. The storage volume of the conservancy pond was calculated under the assumption of an initial water level at an elevation of 4946.0 ft.

- *Results*

Comparisons of the HYMO computer model with existing facility capacities showed several inadequacies in discharge and volume in the existing drainage structures for the 100-year storm. The following paragraphs assess the existing storm drain facilities.

- *Volume Assessment*

Most basins in the study area contain ponding areas within the basins or drain to ponding areas in other basins. Runoff volumes from these basins are compared with the volumes of the ponding areas in Exhibit A.2. Ponding areas in Basins A4, A6 and A8 were found to be under capacity for the 100-year runoff. Basin A4 will overflow into Basin 6, where a retention pond collects storm water from Basins A6, A61, A62 and A63 as well as the Basin A4 spillage. This retention pond, built under a City of Albuquerque project, was originally intended to have a 10" pipe outlet to the Riverside Drain, however, the outlet pipe was never installed, and the pond currently empties through evaporation and seepage. Overflow from this retention pond will spill into the Riverside Drain.

Basin A8 will spill westward into Basin 7, which does not have the capacity to handle the additional Basin 8 spillage. Basin 7 will, in turn, overflow into the Riverside Drain.

All other ponding areas have adequate volume to store the 100-year runoff from their respective basins. Note that the Aquatic Park area consists of a single basin which drains into the existing Conservancy Pond (Tingley Beach).

Analysis Point	100 year Runoff Volume (ac-ft)	Storage Volume (ac-ft)	
	Botanic Garden		
AP1	0.042	0.483	
AP2	0.084	0.339	
AP3	0.032	0.132	
AP4	0.076	0.045	Undercapacity
AP5	0.087	1.417	
AP6 , AP61, AP62, AP63	2.483	0.96	Undercapacity
AP7	0.345	0.395	
AP8	0.197	0.063	Undercapacity
AP9	0.128	0.743	
AP10	0.308	0.314	
AP11	0.097	0.651	
AP12	0.054	0.677	
AP13	0.402	0.43	
AP20, AP15, AP16, AP17	2.182	2.927	
	Aquatic Park		
AA1	2.756	55.52	

Exhibit A.2 100 Year Runoff Volume vs. Storage Volume
Botanic Garden and Aquatic Park

2.756 acre-feet of runoff will be generated in the basin during the 100-year storm, but the pond has a capacity of 55.52 ac-ft above the existing water surface.

- *Discharge Capacities*

Basins A17, A16 and A15 drain to drop inlets DI#1, DI#2 and DI#3 respectively as shown on Plate A (Section 7.6). The inlets drain into Basin A20 thru an 18" RCP pipe (P1 on same plate). The storage capacity of Basin A20 was found to be adequate for the 100-year storm event (see Exhibit A.2), however, it was observed that pipe P1 was heavily silted. It is recommended that this pipe be cleaned.

- **Aquatic Park Basin Hydrology Table**

Pipe P4 (see Exhibit A.3.1.), which drains an irrigation canal called the Duranes ditch into the Riverside Drain, was observed to be in very poor condition. It is recommended to replace this pipe to avoid overflow of the Duranes ditch which could increase the drainage requirements of the basin.

Analysis Point 18 corresponds to all the flows coming into a storm sewer system running through Montoya Road and finally draining into the Riverside Drain thru pipe P6. Both drop inlets #4 and #5 on Exhibit A.3.1 are part of this system. The most downstream pipe of this system is a 36" corrugated metal pipe with a slope of 0.00185. Assuming a Manning's coefficient "n" of 0.018, the maximum capacity of this pipe flowing full is 21 cfs. Exhibit A.1 shows that the flow rate going into this pipe (see AP18) is 101 cfs for the 100-year storm event. The Montoya storm sewer system will not, therefore, be able to drain the 100-year storm.

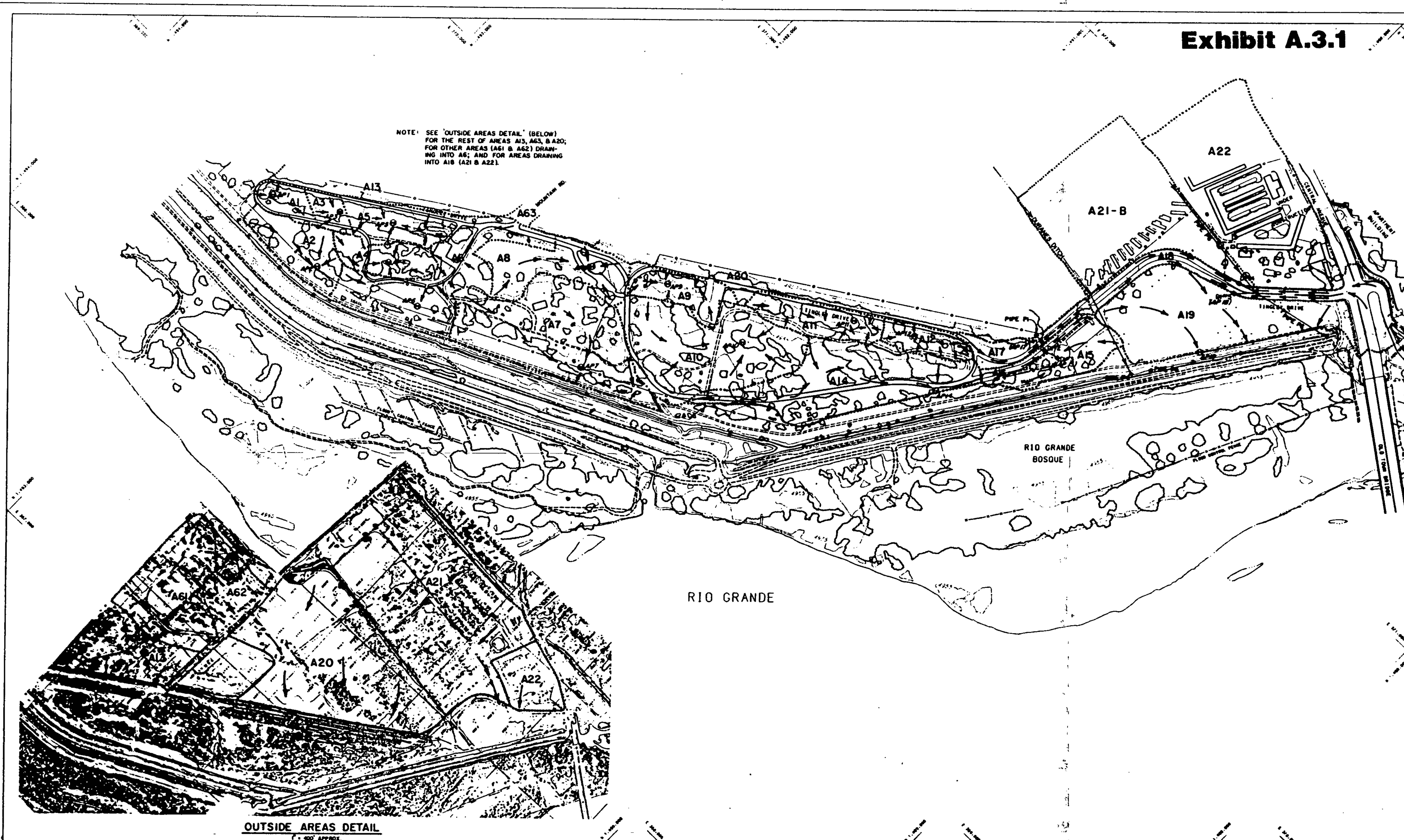
Tingley Beach Overflow Pipes. Several pipes serve as overflow for the Conservancy Pond (Tingley Beach). These pipes (P1, P2 and P3) are shown on Exhibit A.3.2. While the intended discharge of these conduits is not known, it was observed that the overflow pipe P2 is bent and would need to be straightened for proper functioning. It is also recommended to replace overflow pipe P3, due to its defective present condition.

THIS COMPUTER PLOTTED MAP WAS GENERATED FROM A DATA BASE PRIMARILY ESTABLISHED BY STEREO PHOTOGRAMMETRIC METHODS FROM VERTICAL AERIAL PHOTOGRAPHY EXPOSED DECEMBER 13, 1989, IN A ZEISS RMK A 15/23 CAMERA, SERIAL NO. 127792 CALIBRATED FOCAL LENGTH 153.506 MM. AND FROM DATA OBTAINED FROM FIELD SURVEYS.

WELL DEFINED FEATURES ON THIS MAP CAN REASONABLY BE EXPECTED TO BE PORTRAYED WITHIN 1.00 FT. OF THEIR TRUE X, Y COORDINATE POSITION. CONTOURS CAN REASONABLY BE EXPECTED TO BE WITHIN 0.40 FT. OF THEIR TRUE ELEVATION AND SPOT ELEVATIONS WITHIN 0.20 FT. OF THEIR TRUE ELEVATIONS UNLESS OBSCURED BY SHADOW OR VEGETATION. CONTOURS WERE CREATED USING DTM METHOD.

PREPARED BY BOHANNAN-HUSTON, INC. ALBUQUERQUE, NEW MEXICO

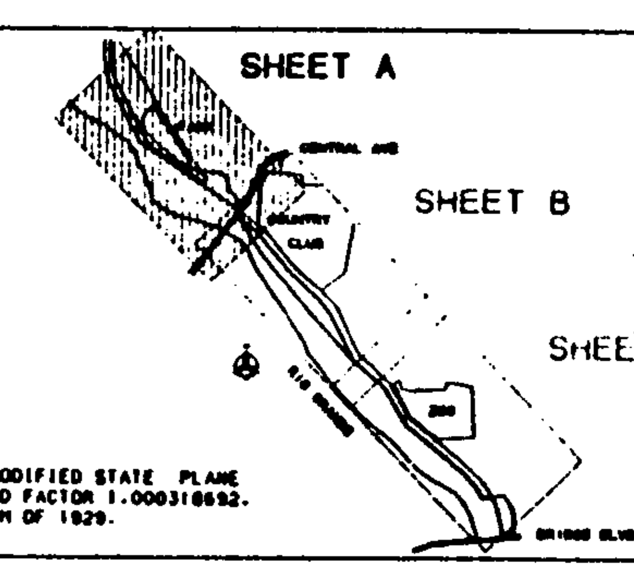
Exhibit A.3.1

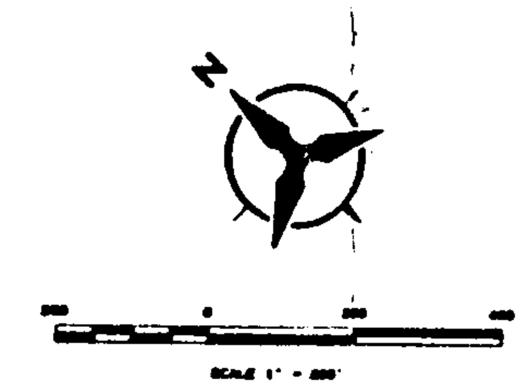


LEGEND

CONTOUR	TRAIL/PATH/WALKWAY - SURFACED
CONTOUR - DEPRESSION	BRIDGE
BUILDING - PERMANENT	BARBWIRE FENCE
BUILDING - TEMPORARY	CHAINLINK FENCE
CONCRETE SLAB/PAD	STREAM/DRAIN/ARROYO
UNGRADED ROAD	POND/LAKE
ROAD GRADED AND DRAINED	DITCH - UNLINED
ROAD/HIGHWAY, ASPHALT SURFACED	GENERAL DRAINAGE CONCRETE STRUCTURE
CURB	TREE/BUSH
BASIN BOUNDARY	DIRECTION OF FLOW
ANALYSIS POINT (AP 7)	DROP INLET/ ANALYSIS POINT (DI #2)

1000-FOOT GRID TICKS BASED ON A MODIFIED STATE PLANE COORDINATES SYSTEM. GRID TO GROUND FACTOR 1.000318692. ELEVATION BASED ON SEA LEVEL DATUM OF 1929.





CITY OF ALBUQUERQUE
PARKS & RECREATION
DESIGN & DEVELOPMENT

RIO GRANDE ZOO

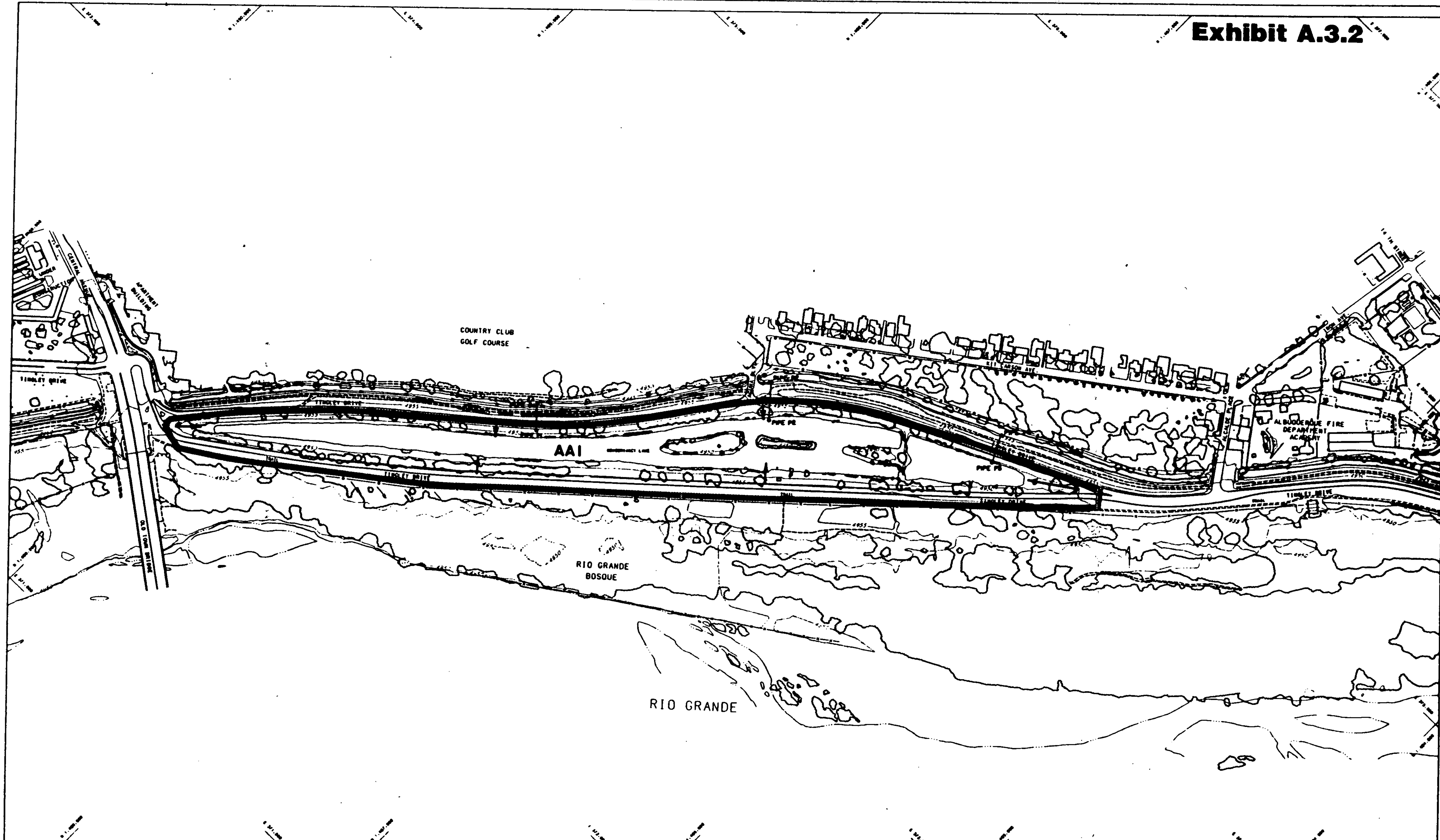
TITLE: TINGLEY AQUATIC PARK & RIO GRANDE BOTANICAL GARDENS

DRAINAGE STUDY
EXISTING CONDITIONS

DATE: FEBRUARY 1990

SHEET: A

Exhibit A.3.2

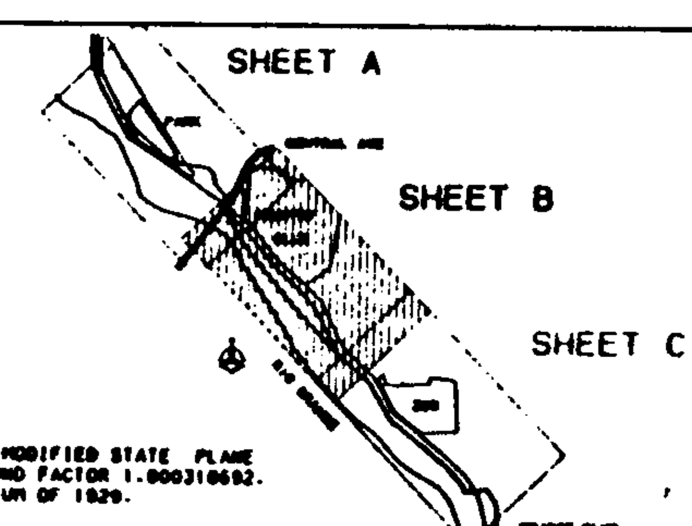


LEGEND

CONTOUR
CONTOUR - DEPRESSION
BUILDING - PERMANENT
BUILDING - TEMPORARY
CONCRETE SLAB/PAD
UNGRADED ROAD
ROAD GRADED AND DRAINED
ROAD/HIGHWAY, ASPHALT SURFACED
CURB

TRAIL/PATH/WALKWAY - SURFACED
BRIDGE
BARBWIRE FENCE
CHAINLINK FENCE
STREAM/DRAIN/ARROYO
POND/LAKE
DITCH - UNLINED
GENERAL DRAINAGE CONCRETE STRUCTURE
TREE/BUSH
BASIN BOUNDARY
DIRECTION OF FLOW

1000-FOOT GRID TICKS BASED ON A MODIFIED STATE PLANE COORDINATES SYSTEM. GRID TO GROUND FACTOR 1.000318692. ELEVATION BASED ON SEA LEVEL DATUM OF 1929.



PREPARED BY BOHANNAN-HUSTON, INC. ALBUQUERQUE, NEW MEXICO

CITY OF ALBUQUERQUE PARKS & RECREATION DESIGN & DEVELOPMENT	RIO GRANDE ZOO
TITLE: TINGLEY AQUATIC PARK & RIO GRANDE BOTANICAL GARDENS	
DRAINAGE STUDY EXISTING CONDITIONS	
DATE: FEBRUARY 1990	SHEET: 8

- **Drainage Analysis**
- **Future Land Use.**

Land use is one variable in the HYMO runoff model used to predict 100-year storm drainage flows. Land use is reflected by the treatment types (A, B, C and D) input into the computer model. Existing land use treatment types are shown in Exhibit A.1.

The final phase land uses of the project area are almost identical for much of the area, but drastically different where parking lots, roads and rooftop surfaces replace existing land cover with high rainfall infiltration. This is most prevalent in basin A22 and the west tip of basin A21 where the Aquarium and Botanic Garden Visitors' Center and accompanying roads and parking replace grassed areas in San Gabriel Park and fallow land of the old Casa Grande Hotel (now razed). Also, the proposed greenhouses and maintenance center of the Botanic Garden in Basins A1, A3 and A5 (see Exhibit A.3.1) will increase the runoff from those areas.

South of Central, the proposed land use changes impact storm runoff much less. Future uses include essentially the same amount of water surface as exists today and less paved roadway then is currently being used (two lanes instead of four). While a small amount of parking will be designed, use of permeable pavers is recommended for all Aquatic Park parking. These pavers will exhibit infiltration rates comparable to the packed earth currently used for parking along the entirety of the existing Tingley Beach.

Of greater concern in the Aquatic Park is the roadway drainage destination. Currently, roadway runoff is directed into the Tingley fishing pond via curb openings. In an effort to improve the water quality of the new fishing lake, this roadway drainage should be diverted elsewhere.

Exhibit A.4 presents the pre- and post-project land use treatment types for the HYMO runoff model. Only those basins with changes in pre-project to post-project land uses are listed:

Exhibit A.4

Basin	Treatment A	Treatment B	Treatment C	Treatment D
		(Pre- and Post-Project Percentages)		
A1	90/5	0/5	0/40	10/50
A3	90/5	0/5	0/40	10/50
A5	87/5	0/5	4/40	9/50
A22	0/0	0/15	85/0	15/85
A21B	0/0	15/10	15/0	70/90

All other basins are projected to have the same runoff characteristics post-project as existing.

These land use changes result in higher peak runoff and volumes from each of the five basins. A comparison is made below of the 100-year storm peak flows and volumes and the existing on-site natural storage available:

Exhibit 5.A

	Pre-Project		*Post-Project*		*Available*
	Runoff	*Volume*	*Runoff*	*Volume*	*Storage Volume*
Basin	*(cfs)*	*(ac-ft)*	*(cfs)*	*(ac-ft)*	*(ac-ft)*
A1	1.7	.042	3.1	.097	.482
A3	1.3	.032	2.4	.075	.132
A5	3.5	.087	6.5	.202	1.417
A22	5.2	.372	13.6	.962	None
A21B	27.4	.896	29.8	1.018	None

Thus, for basins A1, A3 and A5 adequate on-site storage is available even for post-project conditions if this natural storage is not diminished by project grading and facilities.

While basins A21B and A22 do not show a dramatic increase in flow rate from pre- to post-project conditions, the storm sewer draining these areas (Pipe P6) is under capacity for existing conditions, and cannot accept any additional flow.

- **Mitigation Approaches.**
The two drainage facilities running through the project area, the Rio Grande and the Riverside Drain, are problematic as discharge points of additional storm runoff. While discharge to the Rio Grande is allowable, storm water would have to be pumped up over the levee and into the riverbed. Pump stations for storm water are expensive because of the large flowrates involved and often require a storage reservoir because of the large volumes of water generated during a storm. While this is an option for the project area, it should be considered only as a last resort.

The Riverside Drain, which runs through both the Botanic Garden and Aquatic Park, is owned and operated by the Middle Rio Grande Conservancy District (MRGCD). Their current policy prohibits discharge of any additional flow to the drain above the existing conditions discharge.

Because of the restrictions connected with these two possible outlets, several drainage mitigation approaches are recommended for the study area:

- Continued use of natural swales to contain storm runoff in the Botanic Garden. These existing ponding areas can be incorporated into the Botanic Gardens design, and represent a natural approach to drainage, especially appropriate in the Ethnobotany, Cottonwood Gallery and Canoncito sections of the Garden.

- The existing water detention area near the northwest end of the Botanic Garden should be expanded slightly and the 10" outlet pipe to the Riverside Drain installed. This outlet is already approved by the MRGCD. The additional volume required is 1.7 acre-feet, the combined under capacity of Analysis Points 4, 6, 61, 62 and 8.

- Permeable pavers are recommended on an experimental basis for the Aquatic Park parking lots and the Botanic Garden overflow parking near Central and Tingley Drive. These pavers will increase infiltration and, in the Aquatic Park, produce less runoff than the packed earth currently used for parking. The main Phase I and Phase II parking lots located north of the Aquarium will be designed for conventional asphalt paving, as the permeable pavers are unproven in Albuquerque's harsh climate where freeze-thaw cycles could possibly break and up-heave the pavers.

Reference map showing phases

- The Phase I parking lot located in Basin A22 and the Phase II parking in Basin A21B will be designed as detention basins with discharge limited to 3 cfs each into Pipe P6. This will not only restrict basin outflow to existing conditions but actually reduce the discharge below existing conditions, partly alleviating the current under capacity of this system. The eventual solution to the Montoya Road storm sewer under capacity must involve either installation of a pumping station or increased discharge to the Riverside Drain. Suffice to say that the Aquarium and Botanic Garden drainage solution (parking lot detention) will decrease the Montoya Road system discharge by 26.6 cfs (5.2-3 + 27.4-3 = 26.6 cfs).

- The increased impermeability in Basin 19 due to the Botanic Garden Visitors' Center will not create a problem for Pipe P6 (the Montoya Road Storm Sewer), as the peak flows for this area will occur much sooner than the peak from Basins A21 and A22.

The Aquatic Park drainage has fewer drainage problems but fewer options as well. While all storm runoff from natural vegetated or dirt surfaces can collect in the water features (fishing pond, boating pond), the roadway drainage should not be allowed into the fishing pond, as the water quality of this ecologically sensitive water body would be compromised. Two alternative solutions for the road drainage are proposed:

- Direct the road drainage to the model boat pond, which will serve as a detention area for storm water. This pond can be drained slowly to its normal water level by the existing 10" pipe carrying overflow to the Riverside Drain.

- As an alternative, the roadway flow can be carried under the roadway south to the Kit Carson Drive storm sewer, which empties into the Alcalde Pump Station.

BOHANNAN - HUSTON INC.

DRAFT TECHNICAL REPORT
TINGLEY AQUATIC PARK AND RIO GRANDE BOTANIC GARDEN DRAINAGE STUDY

DRAFT

TECHNICAL REPORT

TINGLEY AQUATIC PARK AND RIO GRANDE BOTANIC GARDEN

DRAINAGE STUDY

MAY, 1990

PREPARED FOR:

CITY OF ALBUQUERQUE
P.O. BOX 1293
ALBUQUERQUE, NM 87103

PREPARED BY:

BOHANNAN-HUSTON INC.
COURTYARD I
7500 JEFFERSON ST., N.E.
ALBUQUERQUE, NM 87109

(505) 823-1000

JOB NO. 89247.13

TABLE OF CONTENTS

1.0 INTRODUCTION

Storm drainage systems, while vital to the health and safety of the general public, are usually preferred to be unseen, underground and out of mind. The Tingley Aquatic Park and Rio Grande Botanic Garden, however, present the opportunity for creative and imaginative drainage facilities that can enhance the Park and Garden visually and educationally as well as functionally.

This report addresses the existing drainage patterns in the project area and determines facilities with inadequate capacity or in need of maintenance. The subsequent report will address future drainage patterns, where creative drainage alternatives will be used to enhance Park and Garden concepts rather than restrict them. To date, grading plans and storm water storage facilities have not been identified for the future Aquatic Park and Botanic Garden.

The Hispanic Cultural Center (HCC) was originally conceived as part of the project, and utilities for the HCC were coordinated along with those of the Aquatic Park and Botanic Garden. However, the status of the HCC is now much more indefinite, and this cultural facility is not included in this master plan. It is assumed that utility hook-ups are available to the HCC in Central Avenue, much as the old Casa Grande Hotel was served. A detailed Infrastructure Feasibility Analysis for the HCC is available from Bohannan Huston, Inc (BHI).

2.0 EXISTING CONDITIONS HYDROLOGY

The existing conditions affecting the drainage of the study area were investigated in order to determine drainage patterns and problem areas. The Botanic Garden and Aquatic Park were analyzed separately, as the two areas are isolated from each other by Central Avenue.

This section describes the hydrology assumptions used to determine basin flow rates and runoff volumes, as well as summarizes the results of the hydrologic analysis.

2.1 Criteria. The City of Albuquerque standards for hydrologic analyses are presented in the Design Process Manual, Volume II Section 22.2. However, the City is currently rethinking its hydrologic approach, principally through a collaboration between the University of New Mexico Civil Engineering Department, AMAFCA and City of Albuquerque hydrology staff. While this new hydrology is being used for many drainage studies within the City area, consensus has not been reached, and the new hydrologic approach has not been approved by the City. (The latest Draft Revision is dated January, 1990.)

For drainage areas of less than 320 acres, Section 22.2 suggests the Rational Formula (Q=CxIxA) for determining peak runoff. This widely used method produces a peak flow rate but no volume of runoff. As will be seen in the following sections, runoff volume is of great interest to the study area because of many local depressions serving to retain storm drainage.

Bohannan Huston, Inc. (BHI) in consultation with City hydrologists agreed to the following hydrologic approach:

1. The Rational Formula would be used to determine peak discharges for the study area basins.

2. The same basins would then be remodeled using the HYMO computer model as detailed in the Draft Revision of January, 1990, Section B.5. As long as the HYMO peak flow rates agreed reasonably well with those obtained using the Rational Formula, the HYMO discharges and volumes would be used for the analysis.

2.2 Hydrologic Parameters. The following paragraphs describe the Rational and HYMO parameters used in the analysis.

2.2.1 Rainfall. The 100-year rainfall amounts were taken from the 1973 NOAA Atlas 2, Volume IV. For a storm duration of 6 hours, the rainfall amount is 2.22 inches. The HYMO program also requires input of the 100-yr 1-hr rainfall, which NOAA shows to be as 1.9 inches. To determine the 10-yr 6-hr rainfall amounts, the 100-yr volume was multiplied by a factor of 0.657 for the Rational Method (DPM) and by a factor of 0.667 (January, 1990 Revision) for the HYMO model. The 10-yr 1- hr rainfall volume for HYMO was calculated as 1.27 inches based on the applicable formula from the January 1990 document. The rainfall depths used in this analysis are listed in Table 1.

TABLE 1

Rainfall Depths in Inches

Recurrence Interval/Duration	Rational Formula	HYMO
100 yr/24 hr	N/A	2.65
100 yr/6 hr	2.22	2.22
100 yr/1 hr	N/A	1.90
10 yr/6 hr	1.46	1.48
10 yr/1 hr	N/A	1.27

2.2.2 Time of Concentration (tc). This parameter identifies the time it takes for the runoff to reach an analysis point from the most hydraulically remote location in the basin. The minimum value used was 10 minutes.

- Rational Method: As average velocities were relatively small, the time of concentration was determined considering the hydraulic characteristics (slope, friction, and depth of flow) of the route over which runoff has to travel (street, bare ground, grass, etc.). Plates 22.2 B-1 and 22.2 B-2 (DPM) were used.

- HYMO: Times of concentration were calculated as the ratio between route length and water velocity. The velocity depends upon the slope of the reach and the conveyance condition (friction). The January 1990 document was used in determining the HYMO velocities and tc.

2.2.3 Time to peak (tp). This value identifies the time to peak of the unit hydrograph of a specific basin. The time to peak input to the HYMO program was computed as being two-thirds of the time of concentration, but never less than 6.67 minutes.

2.2.4 Land Condition. The condition of the land has a considerable effect on the runoff volumes as well as on the flow rates. For both the rational and the HYMO methods, the basins were subdivided into four basic land categories with different degrees of permeability: undeveloped (Treatment A); lawns and landscaping (Treatment B); unpaved parking, roads, and trails (Treatment C); and impervious areas, roofs, and streets (Treatment D). For the Rational method, a weighted runoff coefficient "c" was determined, based on the percentage of the whole basin area corresponding to each one of the land categories. Basin parameters for both the Rational and HYMO methods are presented in Table 2.

2.3 Approach. The study area was divided into drainage basins, each with a separate outlet or ponding area. Offsite basins draining into the study area were also identified and analyzed. The basins are shown on Plate A. For basins where the water ponds,

TABLE 2
AQUATIC PARK
BASIN HYDROLOGY

BASIN	ANALYSIS POINT	AREA (sq.mi.)	Rational Formula (DPM) c	Lc (min.)	I10-Yr. (in/hr)	I100-Yr. (in/hr)	Q10-Yr. (CFM)	Q100-Yr. (CFM)	DPM Revision, 1-1990 Treat.A (%)	Treat.B (%)	Treat.C (%)	Treat.D (%)	tc (min.)	tp (hr.)	Q10 Yr. (CFM)	Q100-Yr. (CFM)
A1	AP1	0.0013	0.46	10.0	3.09	4.69	1.2	1.9	90	0	0	10	10.0	0.111	0.7	1.7
A2	AP2	0.0033	0.42	14.7	2.54	3.86	2.2	3.4	95	0	5	0	10.0	0.111	1.3	3.7
A3	AP3	0.001	0.46	10.0	3.09	4.69	0.9	1.3	90	0	0	10	10.0	0.111	0.6	1.3
A4	AP4	0.0025	0.45	10.0	3.09	4.69	2.2	3.4	89	0	4	7	10.0	0.111	1.3	3.1
A5	AP5	0.0027	0.47	10.0	3.09	4.69	2.5	3.8	87	0	4	9	10.0	0.111	1.5	3.5
A6	-	0.0077	0.47	10.0	3.09	4.69	7.2	10.9	55	25	5	15	11.0	0.123	5.3	11.2
A61	-	0.0286	0.60	52.0	1.33	2.02	14.6	22.2	40	15	5	40	44.0	0.500	13.3	2.8
A62	-	0.0102	0.58	43.1	1.47	2.23	5.6	8.5	45	15	5	35	31.0	0.350	5.5	9.7
A63	-	0.0007	0.95	10.0	3.09	4.69	1.3	2.0	0	0	0	100	10.0	0.111	1.5	2.2
-	AP6 (A6,A61, A62,A63)	-	-	-	-	-	-	-	-	-	-	-	-	-	16.6	30.0
A7	AP7	0.011	0.34	23.0	2.02	3.07	4.8	7.3	35	58	5	2	16.0	0.183	4.3	10.7
A8	AP8	0.0047	0.36	27.8	1.83	2.79	2.0	3.0	5	80	1	14	24.0	0.267	2.2	4.5
A9	AP9	0.0027	0.56	10.0	3.09	4.69	3.0	4.5	70	0	0	30	10.0	0.111	2.4	4.6
A10	AP10	0.0103	0.43	18.9	2.23	3.39	6.4	9.7	80	10	5	5	16.0	0.183	3.6	8.8
A11	AP11	0.0031	0.46	10.0	3.09	4.69	2.8	4.2	88	0	4	8	10.0	0.111	1.7	3.9
A12	AP12	0.0018	0.46	10.0	3.09	4.69	1.6	2.4	88	0	6	6	10.0	0.111	0.9	2.2
A13	AP13	0.0118	0.45	14.0	2.6	3.95	8.8	13.4	70	15	5	10	10.0	0.111	7.2	16.2
A14	AP14	0.0088	0.48	46.3	1.41	2.15	3.8	5.8	85	0	0	15	52.0	0.578	1.8	3.6
A15	AP15	0.0028	0.52	10.0	3.09	4.69	2.9	4.4	0	60	10	30	10.0	0.111	3.2	5.7
A16	AP16	0.0009	0.53	10.0	3.09	4.69	1.0	1.5	0	60	0	40	10.0	0.111	1.1	2.0
A17	AP17	0.0019	0.59	10.0	3.09	4.69	2.2	3.4	40	20	0	40	10.0	0.111	2.1	3.8
A18	-	0.0051	0.76	10.0	3.09	4.69	7.7	11.7	10	20	0	70	10.0	0.111	8.2	13.2
A19	AP19	0.0102	0.31	18.0	2.29	3.48	4.6	7.0	90	10	0	0	14.7	0.163	2.9	8.3
A20	A20	0.0657	0.28	46.0	1.42	2.15	16.7	25.3	50	50	0	0	37.3	0.414	9.6	26.8
A21	-	0.0698	0.67	25.3	1.92	2.92	57.4	87.4	20	30	0	50	26.5	0.294	53.6	91.6
A22	-	0.0103	0.48	42.0	1.48	2.26	4.7	7.1	85	0	0	15	39.9	0.444	2.5	5.2
-	AP18 (A18,A21, A22)	-	-	-	-	-	-	-	-	-	-	-	-	-	58.6	100.8
-	AP20, (A15,A16, A17,A20)	-	-	-	-	-	-	-	-	-	-	-	-	-	11.2	29.5
AA1	-	0.0439	0.68	10.0	3.09	4.69	59.0	89.6	50	0	0	50	10.0	0.111	53.7	92.0

flow rates and runoff volumes were calculated using the center of the ponds as analysis points. The Rational Formula was used to estimate the 10-year and 100-year flow rates. Basin parameters and resultant flow rates are presented on Table 2.

Having determined the Rational Formula flow rates, a computer model using HYMO was prepared to simulate runoff flow during a 100-year and a 10-year storm events. The flow rates obtained were compared to those estimated by the Rational Formula. The corresponding values for the 100-year storm were similar, but those for the 10-year storm differed considerably. Therefore, only 100-year runoff volumes were analyzed. Table 2 shows the HYMO parameters used and the resultant flow rates for the 100-year event for all the basins.

Storage potential of the basins with pond was determined using 1 foot contour mapping. The storage volume of the conservancy pond was calculated under the assumption of an initial water level at an elevation of 4946.0 ft.

2.4 Results. Comparisons of the HYMO computer model with existing facility capacities showed several inadequacies in discharge and volume in the existing drainage structures for the 100-year storm. The following paragraphs assess the existing storm drain facilities.

2.4.1 Volume Assessment. Most basins in the study area contain ponding areas within the basins or drain to ponding areas in other basins. Runoff volumes from these basins are compared with the volumes of the ponding areas in Table 3. Ponding areas in Basins A4, A6 and A8 were found to be under capacity for the 100-year runoff. Basin A4 will overflow into Basin 6, where a retention pond collects storm water from Basins A6, A61, A62 and A63 as well as the Basin A4 spillage. This retention pond, built under a City of Albuquerque project, was originally intended to have a 10" pipe

TABLE 3

100-YR RUNOFF VOLUME VS. STORAGE VOLUME
BOTANIC GARDEN AND AQUATIC PARK

ANALYSIS POINTS	100-YEAR RUNOFF VOLUME (ac-ft)	STORAGE VOLUME (ac-ft)	
	BOTANIC GARDEN		
AP1	0.042	0.483	
AP2	0.084	0.339	
AP3	0.032	0.132	
AP4	0.076	0.045	UNDERCAPACITY
AP5	0.087	1.417	
AP6, AP61, AP62, AP63	2.483	0.960	UNDERCAPACITY
AP7	0.345	0.395	
AP8	0.197	0.063	UNDERCAPACITY
AP9	0.128	0.743	
AP10	0.308	0.314	
AP11	0.097	0.651	
AP12	0.054	0.677	
AP13	0.402	0.430	
AP20, AP15, AP16, AP17	2.182	2.927	
	AQUATIC PARK		
AA1	2.756	55.520	

outlet to the Riverside Drain, however, the outlet pipe was never installed, and the pond currently empties through evaporation and seepage. Overflow from this retention pond will spill into the Riverside Drain.

Basin A8 will spill westward into Basin 7, which does not have the capacity to handle the additional Basin 8 spillage. Basin 7 will, in turn, overflow into the Riverside Drain.

All other ponding areas have adequate volume to store the 100-year runoff from their respective basins. Note that the Aquatic Park area consists of a single basin which drains into the existing Conservancy Pond (Tingley Beach). 2.756 acre-feet of runoff will be generated in the basin during the 100-year storm, but the pond has a capacity of 55.52 ac-ft above the existing water surface.

2.4.2 Discharge Capacities. Basins A17, A16 and A15 drain to drop inlets DI#1, DI#2 and DI#3 respectively as shown on Plate A. The inlets drain into Basin A20 thru an 18" RCP pipe (P1 on same plate). The storage capacity of Basin A20 was found to be adequate for the 100-year storm event (see Table 3), however, it was observed that pipe P1 was heavily silted. It is recommended that this pipe be cleaned.

Pipe P4 (see Plate A), which drains an irrigation ditch called the Duranes ditch into the Riverside Drain, was observed to be in very poor condition. It is recommended to replace this pipe to avoid overflow of the Duranes ditch which could increase the drainage requirements of the zone.

Analysis Point 18 corresponds to all the flows coming into a storm sewer system running through Montoya Road and finally draining into the Riverside Drain thru pipe P6. Both drop inlets 3 and 4 (D.I. #4 and D.I. #5 on Plate A) are part of this system. The most downstream pipe of this system is a 36" corrugated metal pipe with a slope of 0.00185. Assuming a Manning's coefficient "n" of 0.018, the maximum capacity of this pipe flowing full is 21 cfs. Table 2 shows that the flow rate going into this pipe (see AP18) is 101 cfs for the 100-year storm event. The Montoya storm sewer system will not, therefore, be able to drain the 100-year storm.

2.4.3 Tingley Beach Overflow Pipes. Several overflow pipes serve as overflow for the Conservancy Pond. These pipes (P1, P2 and P3) are shown on Plate B. While the intended discharge of these conduits is not known, it was observed that the overflow pipe P2 is bent and would need to be straightened for proper functioning. It is also recommended to replace overflow pipe P3 due to its defective present condition.

2.5 Summary of Existing Conditions. Very few drainage problems were encountered in the study area under existing conditions. The most serious deficiency is the under capacity of the Montoya Road storm sewer described in Section 2.4.2. However, it should be noted that both the Botanic Garden and Aquatic Park areas currently utilize numerous depressions to store storm runoff. If these depressions are no longer available for storm water storage under future conditions, drainage would become much more problematic.

3.0 FUTURE DRAINAGE FACILITIES

Storm runoff in the future condition will follow the existing flow pattern. Runoff which currently flows to a storm drain will continue to do so and runoff which flows to depressed basins with no outlet will flow to retention ponds. In considering the use of retention ponds for this project the effect on downstream land was appraised. The land downstream of the Biological Park is the Rio Grande, thus the use of retention ponds, with the consequence of their failure being negligible, is an acceptable alternative. Conceptual grading plans for the Aquarium and Botanic Garden north of Central and the Aquatic Park south of Central are included with this report.

3.1 Aquarium and Botanic Gardens. North of Central the 36" storm drain line that parallels Central will drain the Aquarium area and the parking lots adjacent to it. To reduce the impact of the increased flow rate from the parking lots they will act as detention ponding areas and limit the flow to the pipe to 3 cfs.

Existing runoff is contained in numerous depressions (ponding areas) in the Botanic Garden area. For the Botanic Garden, a future alternative for drainage storage is to design a retention pond/marshland that not only tolerates but requires occasional inundation for ecological stability. This marshland could accept storm water runoff during the rainy season and receive supplementary irrigation as needed between storms.

3.2 Aquatic Park. South of Central, the proposed land use changes impact storm runoff much less. Future uses include essentially the same amount of water surface as exists today and equivalent pavement area. All runoff from the Aquatic Park will be collected in either the ponds (model boating or fishing) or depressed areas with no outlets. Of greater concern for the ponds is the quality of water being directed to them. Planting strips that naturally filter pollutants from the runoff are planned to be strategically placed to intercept runoff before it reaches the ponds.

4.0 CONCLUSION

Few problems were found for the existing condition of storm water drainage. Close coordination and imaginative planning have been used by the project teams to adequately address the future drainage patterns. Drainage solutions will be utilized that parallel and supplement the goals and themes of the Park and Garden including maximum utilization of water conservation principles.

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

May 19, 1993

Dan Grochowski, P.E.
Bohannan-Huston, Inc.
7500 Jefferson Street, NE
Albuquerque, New Mexico 87109

RE: CONCEPTUAL GRADING & DRAINAGE PLAN FOR ALBUQUERQUE BIOLOGICAL PARK RECEIVED MAY 6, 1993 FOR SITE DEVELOPMENT PLAN APPROVAL (J-12/D4)

Dear Mr. Grochowski:

Based on the information included in the submittal referenced above, City Hydrology REJECTS this project for Site Development Plan.

The following comments must be addressed before this project will be approved:

1. Plan must be stamped & dated. Add Vicinity Map. Zone Atlas Map J-12 indicates that part of the park west of the Duranes ditch is in the county. Will it need to be annexed? Will there be a plat for the Aquarium & Botanical Garden?

2. Drainage plan only indicates what the existing basins are. What are the proposed basin boundaries? Who owns Basin 20. Does the City have a right to drain Basins 15-17 to it? Label Riverside Drain. Which basins are restricted to 3 cfs discharge to the Montoya storm drain.

3. Grading Plan does not include the northwest end of the Botanical Garden nor the Aquatic Park. Add Legend to plan. Existing Contours are not visible on the copy submitted. Indicate Montoya storm drain and the proposed alignment for the Duranes ditch. Indicate finished floor elevations for all structures. In general, the plan is so cluttered with landscaping and parking information that it is difficult to understand the grading information.

4. Label retention ponds. Retention ponds must be designed for 100 year 10 day storm. It would be more beneficial if ponding could be done on landscaping areas instead of on paved parking lots.

If you have any questions about this project, you may contact me at 768-2727.

Sincerely

John P. Curtin

John P. Curtin, P.E.
PWD/Hydrology

xc: Fred Aguirre

WPHYD+2584;jpc

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Albuquerque Biological Park ZONE ATLAS/DRNG. FILE # J-12/D14 ~~K-12~~

DRB #: ______ EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: ______

CITY ADDRESS: Central Ave. & Tingley Dr.

ENGINEERING FIRM: BOHANNAN HUSTON, INC. CONTACT: Dan Grochowski

ADDRESS: 7500 JEFFERSON NE, ALB. NM 87109 PHONE: 823-1000

OWNER: City of Albuquerque CONTACT: Pat Westbrook

ADDRESS: P.O. Box 1293 PHONE: 857-8648

ARCHITECT: Van H. Gilbert Architect CONTACT: Jim Graf

ADDRESS: 319 Central NW Suite 201 PHONE: 247-9955

SURVEYOR: Bohannan-Huston Inc. CONTACT: Silas Sanzo

ADDRESS: 7500 Jefferson NE PHONE: 823-1000

CONTRACTOR: ______ CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

- ___ DRAINAGE REPORT
- ___ DRAINAGE PLAN
- X CONCEPTUAL GRADING & DRAINAGE PLAN
- ___ GRADING PLAN
- ___ EROSION CONTROL PLAN
- ___ ENGINEER'S CERTIFICATION
- ___ OTHER

PRE-DESIGN MEETING:

- ___ YES
- X NO
- ___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SKETCH PLAT APPROVAL
- ___ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D. APPROVAL
- X S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
- ___ SECTOR PLAN APPROVAL
- ___ FINAL PLAT APPROVAL
- ___ FOUNDATION PERMIT APPROVAL
- ___ BUILDING PERMIT APPROVAL
- ___ CERTIFICATE OF OCCUPANCY APPROVAL
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ S.A.D. DRAINAGE REPORT
- ___ DRAINAGE REQUIREMENTS
- ___ OTHER ______ (SPECIFY)

RECEIVED
MAY - 6 1993
HYDROLOGY DIVISION

DATE SUBMITTED: 5/6/93

BY: Bohannan-Huston, Inc.; Dan Grochowski

2584

ENGINEERS ARCHITECTS PHOTOGRAMMETRISTS SURVEYORS

BOHANNAN-HUSTON INC.

COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

May 6, 1993

Mr. John Curtin, P.E.
City of Albuquerque
Public Works Department
P.O. Box 1293
Albuquerque, NM 87109

Re: Albuquerque Biological Park

Dear John:

Attached please find one (1) copy of the conceptual report and drainage plan for the Albuquerque Biological Park.

I have expanded on the future conditions portion of the report, as we discussed by phone, to receive conceptual approval for the EPC submittal. Instead of just replacing the affected pages, I have taken the liberty of reprinting the whole report to correct several typographical errors in other portions of the report. The conceptual grading plans submitted with the EPC package are included for your information. I have also attached the original submittal that you marked up for your reference.

Please feel free to call with any questions.

Sincerely,

Daniel J. Grochowski

Daniel J. Grochowski, P.E.& P.S.
Project Manager

DJG/rkl
Attachment

RECEIVED
MAY - 6 1993
HYDROLOGY DIVISION

BOHANNAN-HUSTON INC.

COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

MEMORANDUM

TO: BILLY GOOLSBY, DRC CHAIRMAN
WALT NICKERSON, PUBLIC WORKS DEPARTMENT
ED ADAMS, TRANSPORTATION DEVELOPMENT
JOHN CURTIN, HYDROLOGY
JOE LUEHRING, CITY UTILITY COORDINATOR
VAN GILBERT, VAN H. GILBERT ARCHITECT
PAT WESTBROOK, PARKS
RUSSELL B. GIVLER, CHIEF CONSTRUCTION ENGINEER
ED JEUNG, CIP
JIM GRAF, VAN H. GILBERT ARCHITECT
DAN GROCHOWSKI, BOHANNAN-HUSTON INC.

FROM: MICHIAL M. EMERY, P.E., BOHANNAN-HUSTON INC. MME

RE: TINGLEY AQUATIC PARK & BOTANIC GARDENS - PROJECT NO. 4379.90
RESPONSE TO COMMENTS REFLECTING THE DESIGN REVIEW COMMITTEE MEETING ON MARCH 2, 1993

DATE: MARCH 26, 1993

We would like to clarify comment numbers 3, 4, and 6 given at the DRB meeting on March 2, 1993. It is our recollection that the comments need to be corrected in the following fashion:

Comment #3 - The comment reads "that the Traffic Impact Study (TIS) would need to be updated before Transportation Development can give any definitive comments." Our recollection is that the Traffic Study that was done would be submitted for their review and comments to see if it is adequate as presently written. There is presently no project funding for redoing the study.

Comment #4 - States that "an updated drainage report needs to be submitted to Hydrology." Our recollection indicates that the present drainage report would be submitted to Hydrology for their review and comment to see if it is adequate for the purpose of a conceptual drainage plan.

Comment #6 - This comment, as written, refers to "septic system." I think "septic system" needs to be changed to "sewage collection system."

We will proceed in accordance with the corrected comments. Studies have been submitted and we await comments.

MME/dlhs
Enclosure

Job Nos. 91302.20 & 91308.20

RECEIVED
APR - 1 1993
HYDROLOGY DIVISION

I:\MICHIAL\GOOLSBY.MEM-3/30/93

RECEIVED BHI MAR 18 1993

File 91302.02

→ MME

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

DESIGN REVIEW COMMITTEE MEETING 03-02-93 1:30 P.M.

PROJECT: Tingley Aquatic Park & Botanic Gardens Project No. 4379.90

CONSULTANT: Bohannan-Huston, Inc.

PRESENT: BG Billy Goolsby, DRC Chairman
Ed Adams, Transportation Development
John Curtin, Hydrology
Dan Grochowski, Bohannan-Huston, Inc.
Michial M. Emery, Bohannan-Huston, Inc.
Joe Luehring, City Utility Coordinator
Pat Westbrook, Parks
Ed Jeung, CIP
Jim Graf, Van H. Gilbert Architect
Russell B. Givler, Chief Construction Engineer

COMMENTS:

1. Pat Westbrook gave a presentation of the project to the Committee members.

2. Dan Grochowski, Bohannan-Huston, said that the parking to the south west of the main building would be temporary and would not be paved. Ed Adams, Transportation Development said that this lot should be done with millings instead of just gravel.

3. Ed Adams said that the Traffic Impact Study (TIS) would need to be updated before Transportation Development can give any definitive comments on the project.

4. John Curtin stated that, similarly, an updated drainage report needs to be submitted to Hydrology.

5. Joe Luehring, provided verbal and written comments.

6. Stuart Reeder provided verbal comments. One suggestion was that the ~~septic~~ Sewage system be a pressure system (grinder pump) to replace the 8" gravity system.

7. Russell B. Givler, suggested that more thought be given to the "Triangular Plumbing" room for the salt-water aquarium system. He also, suggested that since this will be constructed in phases that the future phases be minimal visual and sound operation for the phased construction.

8. The DRC Chairman's only comments at this time is that the infrastructure design be on standard DPM construction plan sheets.

The Consultant will prepare these designs and submit to the Master Scheduler for distribution and scheduling of a preliminary review session.

BG:vgl(WP+125478)

BOHANNAN-HUSTON INC.

Courtyard I 7500 Jefferson Street, N.E. Albuquerque, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

Transmittal

To: Hydrology
City of Albuquerque
3rd Floor - West End
Old City Hall

☐ Parcel post ☑ Messenger
☐ First Class ☐ UPS
☐ Express Mail ☐ Air Freight
☐ Bus ☐ ____

Attention: John Curtain

Date: 3/23/93 Our job number: 91302.20

Your job number:

Job: Biological Park

We are enclosing:		For:
1	Drainage Study	Your Information
1	Various Correspondence	

Comments: John, This information/data was prepared during the Master Plan phase of the Biological Park project. Also, I have spoken with Fred Aguirre about this project and he is familiar with the proposed concept.

RECEIVED
MAR 2 3 1993

By: Don Gooloomaks thank you

Rec'd by: Dolores Lopez Date: 3/23/93

☐ Please Return Signed Yellow Copy

4/92

ALBUQUERQUE NEW MEXICO 1706

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

April 11, 1991

Butch Gerbrandt, P.E.
Bohannan-Huston, Inc.
7500 Jefferson Street, NE
Albuquerque, New Mexico 87109

RE: MASTER PLAN DRAINAGE REPORT FOR ALBUQUERQUE BIOLOGICAL PARK RECEIVED MARCH 27, 1991 FOR CONCEPTUAL APPROVAL (J-12/D4)

Dear Mr. Gerbrandt:

The information provided on the referenced submittal is insufficient in order to make a decision on your proposed drainage concept. The reason being is no topography or proposed grading was submitted. Please Check the requirements in the DPM for Conceptual Approval.

However, we will add the following criteria which should be considered on your future submittal:

1. All ponds should be drained within 24 hours. If a pond takes longer than 6 hours to drain, then design for a 24 hour storm.

2. Existing downstream capacity should be addressed and how your development will impact the limited capacity.

3. We strongly recommend that parking lots should not be used as ponding areas, since it could deteriorate your pavement over time.

4. If you are going to consider infiltration as a way of discharging a pond which accepts runoff from impervious areas, then you may need to analyze how the infiltration will be impacted over time with silty fines and other contaminants.

5. It appears some coordination will be needed with MRGCD, since we may be impacting their system.

If you should have any questions, please do not hesitate to call me at 768-2650.

Cordially,

Gilbert Aldaz

Gilbert Aldaz, P.E. & P.S.
Civil Engineer/Hydrology

xc: Fred Aguirre, City Hydrologist
wp+2584

PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

BOHANNAN-HUSTON INC.
COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

March 22, 1991

Mr. Fred Aguirre
City Hydrologist
Hydrology Department
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

Re: Request for Conceptual Approval of the Drainage Plan for the Albuquerque Biological Park

Dear Fred:

I am enclosing the Public and Private Utilities portion of the Albuquerque Biological Park Master Plan for your review and conceptual approval. The entire Master Plan was submitted to the City Public Works for review during the week of February 18th, however, on your request, I am resubmitting only the portions pertaining to utilities and drainage. Since the format of the Master Plan intermingles all of the utilities including the drainage, I am sending you the entire Element 6: Public and Private Utilities, and will present an outline below of the pertinent drainage sections.

- The enclosed document is divided into two parts--(1) the Master Plan Element 6: Public and Private Utilities and (2) the Element 6 Appendix, also entitled Public and Private Utilities.

- The Existing Conditions drainage assessment is initially referred to in the Master Plan, Section 2.2.7, pages 11 and 12, but is presented in detail in the Appendix, Section 3, pages 4-10.

- The Future Conditions are presented in Section 3 of the Appendix on pages 11 and 12.

- Master Planning alternatives are presented in the Appendix in Section 3, pages 13 and 14. Recommendations are then made in the Master Plan portion, Section 3.2.4, pages 23 and 24.

- Phasing for storm drainage is described in the Master Plan Section 3.2.6, page 30.

I realize that the structure of the Master Plan is not ideal when looking specifically for drainage issues, and I hope that this abbreviated document and the outline above will be a help in your review. Please call me with any questions or comments about the report.

Cordially,

Butch Gerbrandt

Butch Gerbrandt, P.E.
Project Manager

Enclosure

cc: Kapil Goyal
Pat Westbrook
Ray Darnell

BG/al

Job No. 8924713

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Albuquerque Biological Park ZONE ATLAS/DRNG. FILE #: J-12 & K-12

DRB #: 9 - EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: ______

CITY ADDRESS: Central & Rio Grande

ENGINEERING FIRM:	Bohannan Huston	CONTACT:	Butch Gerbrandt
ADDRESS:	Courtyard I 7500 Jefferson NE	PHONE:	823-1000
OWNER:	City of Albuq, Parks & Rec.	CONTACT:	Pat Westbrook / Ray Darnell
ADDRESS:		PHONE:	857-8640 / 843-7413
ARCHITECT:	N/A	CONTACT:	
ADDRESS:		PHONE:	
SURVEYOR:	N/A	CONTACT:	
ADDRESS:		PHONE:	
CONTRACTOR:	N/A	CONTACT:	
ADDRESS:		PHONE:	

TYPE OF SUBMITTAL:

- ____ DRAINAGE REPORT
- ____ DRAINAGE PLAN
- ____ CONCEPTUAL GRADING & DRAINAGE PLAN
- ____ GRADING PLAN
- ____ EROSION CONTROL PLAN
- ____ ENGINEER'S CERTIFICATION
- X OTHER Master Plan Drainage Report

PRE-DESIGN MEETING:

- ____ YES
- ____ NO
- ____ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ____ SKETCH PLAT APPROVAL
- ____ PRELIMINARY PLAT APPROVAL
- ____ S. DEV. PLAN FOR SUB'D. APPROVAL
- ____ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
- ____ SECTOR PLAN APPROVAL
- ____ FINAL PLAT APPROVAL
- ____ FOUNDATION PERMIT APPROVAL
- ____ BUILDING PERMIT APPROVAL
- ____ CERTIFICATE OF OCCUPANCY APPROVAL
- ____ GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ S.A.D. DRAINAGE REPORT
- ____ DRAINAGE REQUIREMENTS
- X OTHER Conceptual Approval (SPECIFY)

RECEIVED MAR 27 1991 HYDROLOGY DIVISION

DATE SUBMITTED: 3-22-91

BY: Butch Gerbrandt, BHI

BOHANNAN-HUSTON INC.
Courtyard I 7500 Jefferson Street, N.E. Albuquerque, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

RECEIVED
MAR 27 1991
HYDROLOGY DIVISION

Transmittal

To: City of Albuquerque
Hydrology Dept.
3rd Floor

- ☐ Parcel post
- ☒ Messenger
- ☐ First Class
- ☐ UPS
- ☐ Express Mail
- ☐ Air Freight
- ☐ Bus
- ☐ ______

Attention: Fred Aguirre

Date: 3/27/91

Our job number: 89247.13

Your job number:

Job: Albuquerque Biological Park

We are enclosing:		For:
1	Private/utilites Report	your use
1	Ltr-Request for Conceptual Approval	

Comments: Engineers Stamp has been added!

By: [signature] thank you

Rec'd by: Joann Candelaria Date: 3-27-91

☐ Please Return Signed Yellow Copy

9/88

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

CITY OF ALBUQUERQUE PUBLIC WORKS DEPT.

INTER-OFFICE CORRESPONDENCE March 6, 1991 ENGINEERING GROUP

TO: Patricia Westbrook, Superintendent, Design and Development, Parks and Recreation Department

FROM: Kapil K. Goyal, Hydrology Planning Manager, Hydrology Division - PWD Kapil Kumar Goyal.

SUBJECT: THE ALBUQUERQUE BIOLOGICAL PARK MASTER PLAN (DRAFT) DATED FEBRUARY 15, 1991 (REFERENCE: MY LETTER DATED FEBRUARY 18, 1991 TO YOU) 3-6-91

Fred Aguirre, Hydrology Development Section Manager; Butch Gerbrandt, Project Manager, Bohannan - Huston Consulting Engineers and I met on March 6, 1991 to discuss the drainage issues associated with this project. Fred Aguirre wishes to obtain a copy of the conceptual plan.

Butch will submit the conceptual drainage plan in a separate submittal (expected to be extracted out of reports dated 2-15-91) to Kapil Goyal for Fred Aguirre's review. The submittal will include hydrologic and hydraulic information as well. DONE

Oil traps should be considered for installation in the parking lots for compliance with the NPDES regulations.

If there are any questions, please call me at 768-3645.

cc: Dan Hogan, Hydrology Division Manger - PWD
Fred Aguirre, Hydrology Planning Section Manager - PWD
Butch Gerbrandt, Bohannan - Huston, Inc.

KKG:jc
WP+2515

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1580
ALBUQUERQUE, NEW MEXICO 87103-1580
FAX (505) 766-2770

REPLY TO
ATTENTION OF:

February 25, 1991

Construction-Operations Division
Regulatory Branch

Ms. Pat Westbrook
City of Albuquerque
Parks and Recreation Department
P.O. Box 1293
Albuquerque, New Mexico 87103-1293

Dear Ms. Westbrook:

Reference is made to your memorandum dated January 23, 1991, regarding your proposed Botanic Garden, Aquatic Park, and Aquarium in and near Tingley Beach and an adjacent wetland in Albuquerque, Bernalillo County, New Mexico.

We have reviewed the draft Master Plan enclosed with your memorandum. The Master Plan adequately addresses Department of the Army permit requirements.

During processing of a Section 404 permit for work in wetlands and waters of the U.S., a Section 404(b)(1) guidelines review will be performed. This analysis includes evaluation of alternatives to the discharge of dredged and fill material into waters of the U.S. and consideration of all mitigation measures taken to reduce these discharges. There are three categories of mitigation measures: avoidance of discharges, minimization of fills, and compensation for waters lost due to unavoidable discharges.

You may wish to include in the Master Plan your consideration of alternative sites and why they were rejected, as well as your proposed mitigation. Or, you may provide this information to us during permit processing.

The project does not appear to impact or compromise any existing Corps of Engineers' flood control projects, studies, or interests. The project will not impact the Rio Grande floodplain.

If you have any questions regarding this review, please feel free to write or call Ms. Jean Manger at (505) 766-2776, or Mr. Mark Andrews at 766-1239.

Sincerely,

Robert E. Meehan

Robert E. Meehan, P.E.
Chief, Construction-Operations
Division

Jimmy / Butch
Review & Comment
Then meeting with City.

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

CITY OF ALBUQUERQUE PUBLIC WORKS DEPT. PW

INTER-OFFICE CORRESPONDENCE February 18, 1991

ENGINEERING GROUP

TO: Pat Westbrook, Superintendent, Design & Development, Parks and Recreation Department

FROM: Kapil K. Goyal, Hydrology Planning Section Manager, Hydrology Division, PWD Kapil Kumar Goyal. 2-18-91

SUBJECT: THE ALBUQUERQUE BIOLOGICAL PARK MASTER PLAN (DRAFT) DATED FEBRUARY 15, 1991

The following comments are offered for your consideration:

1. Element 1, P 46: Is it prudent to state that "MRGCD is reluctant to accept storm water into their drainage ditches"? To provide a solution around such a phenomena may jeopardize many other valley drainage projects which rely on the Alameda and Riverside drains. I recommend that such citations about MRGCD should be deleted from the report.

2. Element 6, Ex 2A: Storm sewer pipe should be minimum 24".

3. Element 6, Ex 2B: The sizes and locations of the proposed storm sewer and the alternative storm sewer discharge are unknown. Is the storm sewer represented by small circles the existing Riverside Drain or a proposed facility? Please label the Alameda and Riverside drains.

4. Elmnt 6, P 23, 24: Where are Phase I and Phase II defined? They should be referenced here. Where is the detention parking lot at? Where does the 3 cfs outflow restriction come from?

5. General: The consulting engineers should hold a meeting with Fred Aguirre, Hydrology Development Section Manager and me. The consultant should explain to both of us the hydrologic and hydraulic analysis. I expect the consultant to be fully responsible for the accuracy of the calculations and the methodology. The Hydrology Division review will remain incomplete until such meeting is held and additional comments provided.

   Has the possibility of discharging the storm water runoff directly to the river been analyzed?

   What is the status of the approvals required from the MRGCD Board for successful completion of the drainage facilities?

General (cont.): During November 1990, the Federal storm water discharge regulations were enacted into law. By contacting EPA-Dallas, you should establish if the Rio Grande Botanic Garden, Tingley Aquatic Park and the Aquarium will be required to comply with the new EPA regulations and if an individual storm water discharge permit is required. In this regard, Brent Larson or Tom Gardner of the EPA-Dallas may be contacted at (214) 655-7175. The EPA's written response should be included in the drainage report.

Pat, thank you for the opportunity given to me for reviewing the master plan report. If there are any questions, please call me at 768-3645.

cc: Dan Hogan, Hydrology Division Manager
Fabrizio Bertoletti, Special Projects Manager, Mayor's Office
Ray Darnell, Assistant Director, Zoo
Larry Blair, Executive Engineer, AMAFCA
Fred Aguirre, Hydrology Development Section Manager, PWD
Mike Emery, President, Bohannan-Huston Inc.
Butch Gerbrandt, Bohannan-Huston Inc.
George Radnovich, Bohannan-Huston Inc.

RECEIVED BHI MAR 02 1990

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

February 28, 1990

Butch Gerbrandt
Bohannan-Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

RE: TINGLEY AQUATIC PARK AND RIO GRANDE BOTANICAL GARDEN (YOUR LETTER DATED FEBRUARY 28, 1990)

Dear Mr. Gerbrandt:

I reviewed your letter and concur that the City staff agreed to the methodology described in your letter.

Please note that whatever hydrology is used for the referenced project; the outflow to the Riverside Drain or the Alameda Drain will depend on the outcome of the Alameda/Riverside Drains Engineering Analysis which is expected to be completed by June 1990 by Leedshill-Herkenhoff, Inc. If it becomes apparent that a storm run-off detention facility is needed in your project, you should finalize its size in concert with Leedshill Herkenhoff's project.

A copy of the draft report prepared by Leedshill Herkenhoff, Inc. is provided to you. Please return it as soon as you finish using it.

Sincerely,

Kapil Kumar Goyal

Kapil K. Goyal
Planning Section Manager

cc: Deborah Dixon, Leedshill-Herkenhoff, Inc.
Fabrizio Bertoletti, Special Project Coordinator

KKG:jc
WP+1678

ENGINEERS ARCHITECTS PHOTOGRAMMETRISTS

BOHANNAN-HUSTON INC.

COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

February 28, 1990

Mr. Kapil Goyal
Hydrology Division, Public Works
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

Re: Hydrology for the Infrastructure Master Plan, Tingley Aquatic Park and Rio Grande Botanical Garden

Dear Kapil:

In a February 20, 1990 meeting, we discussed hydrology for the Aquatic Park/Botanical Garden project. The following comments reflect the issues involved and our discussions.

The City of Albuquerque standards for hydrologic analyses are presented in the Design Process Manual, Volume II Section 22.2. However, the City is currently rethinking its hydrologic approach, principally through a collaboration between the University of New Mexico Civil Engineering Department, AMAFCA and City of Albuquerque hydrology staff. While this new hydrology is being used for many drainage studies within the City area, consensus has not been reached, and the new hydrologic approach has not been approved by the City. (The latest Draft Revision is dated January, 1990).

For drainage areas of less than 320 acres, Section 22.2 suggests the Rational Formula (Q=CxIxA) for determining peak runoff. This widely used method produces a peak flowrate but no volume of runoff. Runoff volume is of great interest to the study area because of many local depressions serving to retain storm drainage.

Bohannan-Huston, Inc. (BHI) in consultation with City hydrologists agreed to the following hydrologic approach:

1. The Rational Formula as presented in the existing DPM Section 22.2 will be used to determine peak discharges for the study area basins.

2. The same basins would then be remodeled using the HYMO computer model as detailed in the Draft Revision of January, 1990, Section B.5. As long as the HYMO peak flowrates agree closely with those obtained using the Rational Formula, the HYMO discharges and volumes can be used for the analysis.

PRINCIPALS
LARRY W. HUSTON
MICHIAL M. EMERY, P.E.
BRIAN G. BURNETT, P.E.

Accordingly, we are proceeding with the drainage analysis using the above two statements as guidelines. Please let me know as soon as possible if I have misrepresented our discussions.

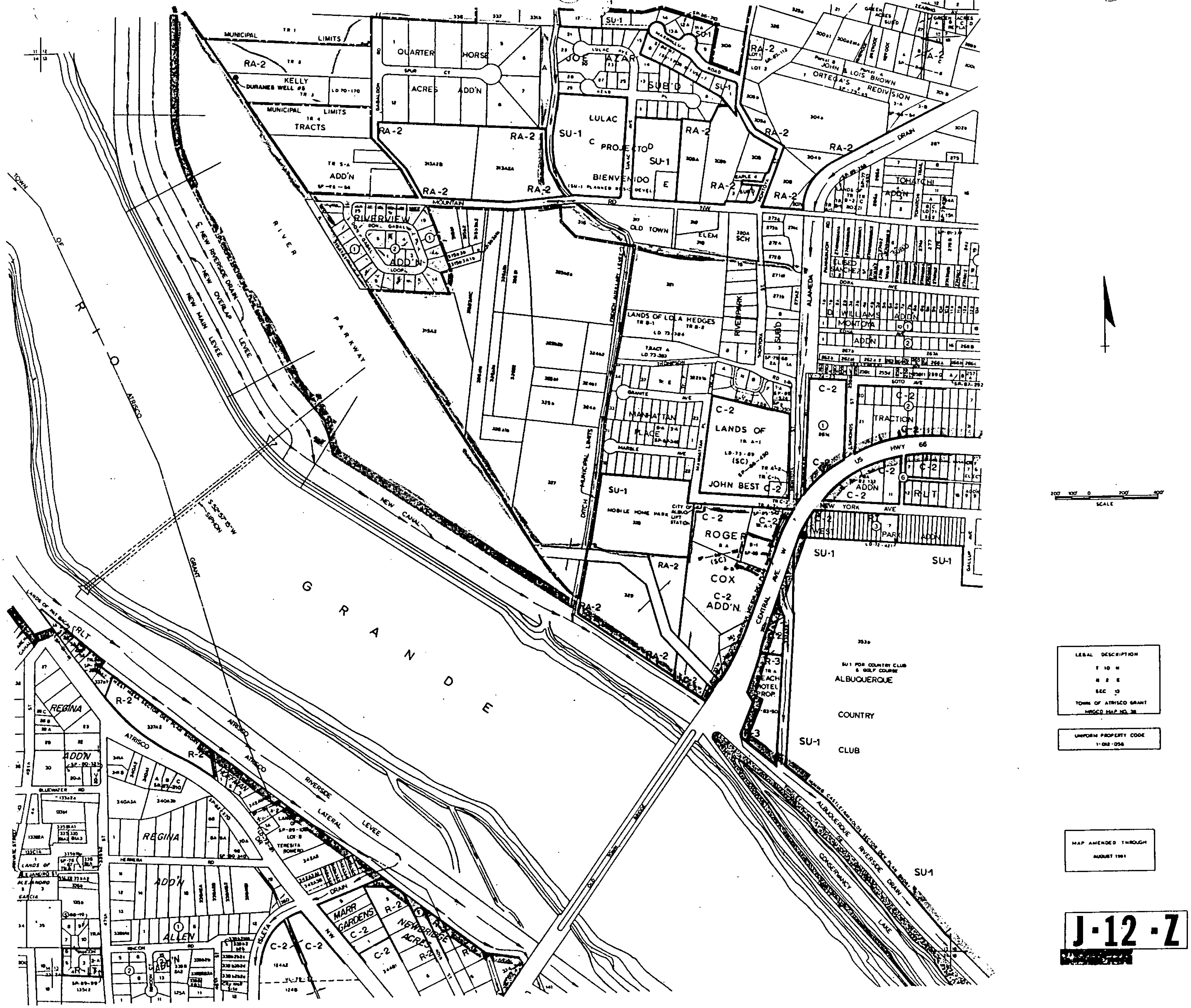
Cordially,

Butch Gerbrandt

Butch Gerbrandt, P.E.
Project Manager

cc: Mr. Fabritzio Bertoletti
Ms. Pat Westbrook
Mr. Dale Sokkary
Mr. George Radnovich

BG/br
Job No. 89247.13


J-12-Z
MAP AMENDED THROUGH AUGUST 1981
LEGAL DESCRIPTION
T 10 N
R 2 E
SEC 13
TOWN OF ATRISCO GRANT
MRGCD MAP NO. 38
UNIFORM PROPERTY CODE
1-012-056
SCALE
RIO GRANDE
RIVER PARKWAY
NEW CANAL
NEW RIVERSIDE DRAIN
NEW OVERLAP LEVEE
NEW MAIN LEVEE
TOWN OF ATRISCO GRANT
ALBUQUERQUE COUNTRY CLUB
SU-1 FOR COUNTRY CLUB & GOLF COURSE
CENTRAL AVE
US HWY 66
ALAMEDA
MOUNTAIN RD NW
QUARTER HORSE ACRES ADD'N
KELLY
DURANES WELL #5
MUNICIPAL LIMITS
TRACTS
RIVERVIEW ADD'N
LULAC PROJECTO BIENVENIDO
JOE AZAR SUB'D
ORTEGA'S REDIVISION
JOHN & LOIS BROWN
TOHATCHI ADD'N
OLD TOWN
ELEM SCH
LANDS OF LOLA HEDGES
RIVERPARK
MANHATTAN PLACE
LANDS OF JOHN BEST
TRACTION
MOBILE HOME PARK
ROGER COX ADD'N
BEACH MOTEL PROP.
NEW YORK AVE
WEST PARK ADD'N
REGINA ADD'N
ALLEN ADD'N
MARR GARDENS
NEWBRIDGE ACRES
RIVERSIDE LATERAL LEVEE
ALBUQUERQUE RIVERSIDE DRAIN
CONSERVANCY LAKE
ISLETA
SIPHON
RA-2
SU-1
C-2
R-2
R-3