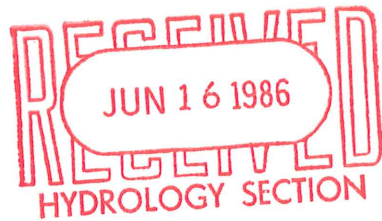


DRAINAGE REPORT
FOR
WASHINGTON BUSINESS PARK

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DRAINAGE REPORT
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DRAINAGE REPORT FOR WASHINGTON BUSINESS PARK

Introduction

At the request of Mr. Jim Folkman, Vice President of Jack Clifford & Company, Weiss-Hines Engineering, Inc., has prepared this drainage report to describe the treatment of storm waters generated within a 16-acre portion of Clifford Industrial Park, which is to be known as the Washington Business Park. The site will be developed into a group of office/warehouse units. The recommendations set forth in this report are in compliance with and an expansion of the Master Drainage Report for Clifford Industrial Park, prepared in August, 1982, by Bohannon-Huston, Inc., and approved by the City of Albuquerque.

Site Location

The site is located in the area, shown on the Vicinity Map on the Conceptual Drainage Plan (Plate 1). It is composed of Lots 55 through 62, and the southern portion of Tract B of the Clifford Industrial Park. It is bounded on the east by Washington Street, on the south by Washington Place, on the west by the City's sanitary landfill site, and on the north by the northern portion of Tract 'B', which extends to Alameda Boulevard.

Site Description

The site slopes uniformly at 2% from east to west. An earth diversion berm lies on the west property line. Adjacent to the east of this berm is a paved public drainage easement (Swale 'A'). Swale 'A' flows to the south, eventually emptying into AMAFCA's North Diversion Channel. A 200'-wide PNM easement overlaps this drainage easement along the west property line.

Proposed Development

The first phase of the development to be built on Lots 1-8 of the site will include 8 one-story frame and stucco, slab-on-grade office/warehouse buildings (typical size approximately 70x90 feet). At some future date, 16 similar office/warehouse buildings will be built on Tract B-3, and 3 larger warehouses (approximately 100x150 feet) will be built on Tract B-2. In addition, paved access drives and parking areas will be constructed, and necessary public utilities will be provided to the individual buildings.

Soils Report

The three types of soils found on the site are the Embudo gravelly fine sandy loams (EmB), the Embudo-Tijeras soil complex (EtC), and the Wink-Embudo soil complex (WeB). All three soil types are classified as Hydrologic Group "B".

A soils report, Geotechnical Engineering Evaluation, Project No. 3225J069, was prepared by Western Technologies Inc. in October, 1985. The report recommends positive drainage be provided throughout the site, and particularly in the vicinity of the buildings during and after construction. Site drainage plans are in accordance with the soils report recommendations.

Topographic Map

The topographic map used as a basis for the drainage and grading plans is the result of a field survey conducted by Clausen & Associates, Inc., in October, 1985. This map represents the site topography as it now exists.

EXISTING DRAINAGE CONDITIONS

The site presently drains to the west boundary as sheet flow where it is intercepted by Swale 'A'. Swale 'A', which is a paved drainage channel, drains to the south and west, eventually emptying into the AMAFCA North Diversion Channel.

The site is isolated from the effects of offsite runoff due to the following: Offsite runoff from the east is intercepted in Washington Street, which drains north to Alameda Boulevard, then west to the North Diversion Channel. The site is not affected by offsite flows from the west, due to an earth berm, or from the south, due to the Washington Place Street improvements. Offsite flows on the north parallel the flow patterns of the site and drain to the west into the drainage easement (Swale 'A').

DEVELOPED DRAINAGE CONDITIONS

The drainage plan is based on the Bohannon-Huston Master Plan developed for Clifford Industrial Park in 1982 and approved by the City of Albuquerque. Only on-site flows are being considered, because offsite flows do not reach the property.

Methods of Analysis

The peak flow rates were determined by application of the Modified Rational Method as outlined in the Development Process Manual (DPM).

Rainfall intensities were determined from Plates 22.2 D-1 and 22.2 D-2 of the DPM. The 100-year, 6-hour rainfall for the site is 2.2 inches.

Runoff coefficients were obtained by combining the pervious percentages of different land uses to arrive at a composite "C" factor. *what % impervious*

Flow depths and velocities were computed using Manning's equation for open channel flow.

*Master Plan uses 72%
impervious*

On-Site Runoff

The hydrologic data for the developed basins, calculated by using the Rational Method, is summarized in Table 1. Hydrographs were prepared using the SCS "convex" routing method to establish peak flows at four Analysis Points (Figures 1 & 2). Plate 1 (Conceptual Drainage Plan) shows flow routes and data for the first phase of development.

Basin 'A' - The runoff from Basin 'A' will travel west as sheet flow to a 1' high earth berm located near the Tract B-3 west line. This berm will direct flows to Analysis Point 1. From Analysis Point 1, the flows travel west across a paved access drive to Analysis Point 2, then through the remainder of the site as described below. The peak flow discharging from Basin 'A' is 12 cfs.

Basin 'B' - The runoff from Basin 'B' flows across paved access drives and parking areas in a north-and westerly pattern until it reaches the NW corner of Lot 1 (Analysis Point 2). It then combines with discharge from Basin 'A' and travels west in a proposed paved drainage swale to Analysis Point 3 (the head of Swale 'A'). Basin 'B' discharges a peak flow of ~~11~~ cfs. *14 cfs SC 6/16/86*

Basin 'C' - The runoff from Basin 'C' travels as sheet flow to the paved west drainage swale on Tract B-3 (Swale 'A'). This flow combines with runoffs from Basins 'A', 'B', and 'D'. This discharge passes through Analysis Point 4 and eventually empties into the North Diversion Channel. Basin 'C' contributes a peak flow of 8 cfs.

Basin 'D' - The runoff from Basin 'D' travels as sheet flow to the existing west drainage swale and then south to the site's SW corner (Analysis Point 3). The paved drainage swale (Swale 'A') will extend to this point to pick up these flows. Basin 'D' contributes a peak flow of 22 cfs.

Analysis Point 1 - Runoff from Basin 'A' discharges at AP-1. The hydrograph (Figure 1) indicates a maximum flow rate of 12 cfs. The flows passing through AP-1 travel west to AP-2.

Analysis Point 2 - Runoff from Basins 'A' and 'B' combine at AP-2. The combined hydrographs at AP-2 (Figure 1) indicate a peak discharge rate of ~~23~~ cfs. These flows continue west to AP-3. *26 SC 6/16/86*

Analysis Point 3 - The combined runoff from Basins 'A', 'B', and 'D' discharge through AP-3 at a maximum rate of ~~43~~ cfs (see Figure 1). These flows then travel south to AP-4. *46 SC 6/16/86*

Analysis Point 4 - Discharges from Basins 'A', 'B', and 'D' (AP-3) combine with those in Basin 'C' and are routed in Swale 'A' southerly to AP-4. These flows discharge at a peak rate of ~~39~~ cfs (see Figure 2). From AP-4, flows discharge into the North Diversion Channel. *40 SC 6/16/86*

CONCLUSIONS

Based on the recommendations set forth in this report, the developed site will safely handle all on-site runoff generated during a 100-year storm and discharge these flows to the North Diversion Channel at an uncontrolled rate. Off-site flows do not affect the developed site. Thus, site development will comply with current AMAFCA and City of Albuquerque requirements.

Table 1. Washington Business Park Drainage Data

Basin	Area (Ac)	H (Ft)	L (Ft)	Slope (Ft/Ft)	V (Ft/Sec)	Tc (min)	I ₁₀₀ (In.)	Q ₁₀₀ (cfs)
Total Undeveloped	33.08	22	2300	0.0096	1.9	20	3.27	36.8
=====								
Developed A (Tract B-3)	7.50	14	1075	0.013	1.8	10	4.65	11.9
B (Lots 1-8)	3.51	6	775	0.008	1.3	10	4.65	11.4 14.4
C (Tract B-2)	4.92	8	800	0.010	1.3	10	4.65	7.8
D (Tract B-1)	17.16	22	1600	0.014	1.8	15	3.78	22.1

1/4.4
SC 6/1/98

COMBINED HYDROGRAPHS

BASINS A, B, & D AT
AP-3

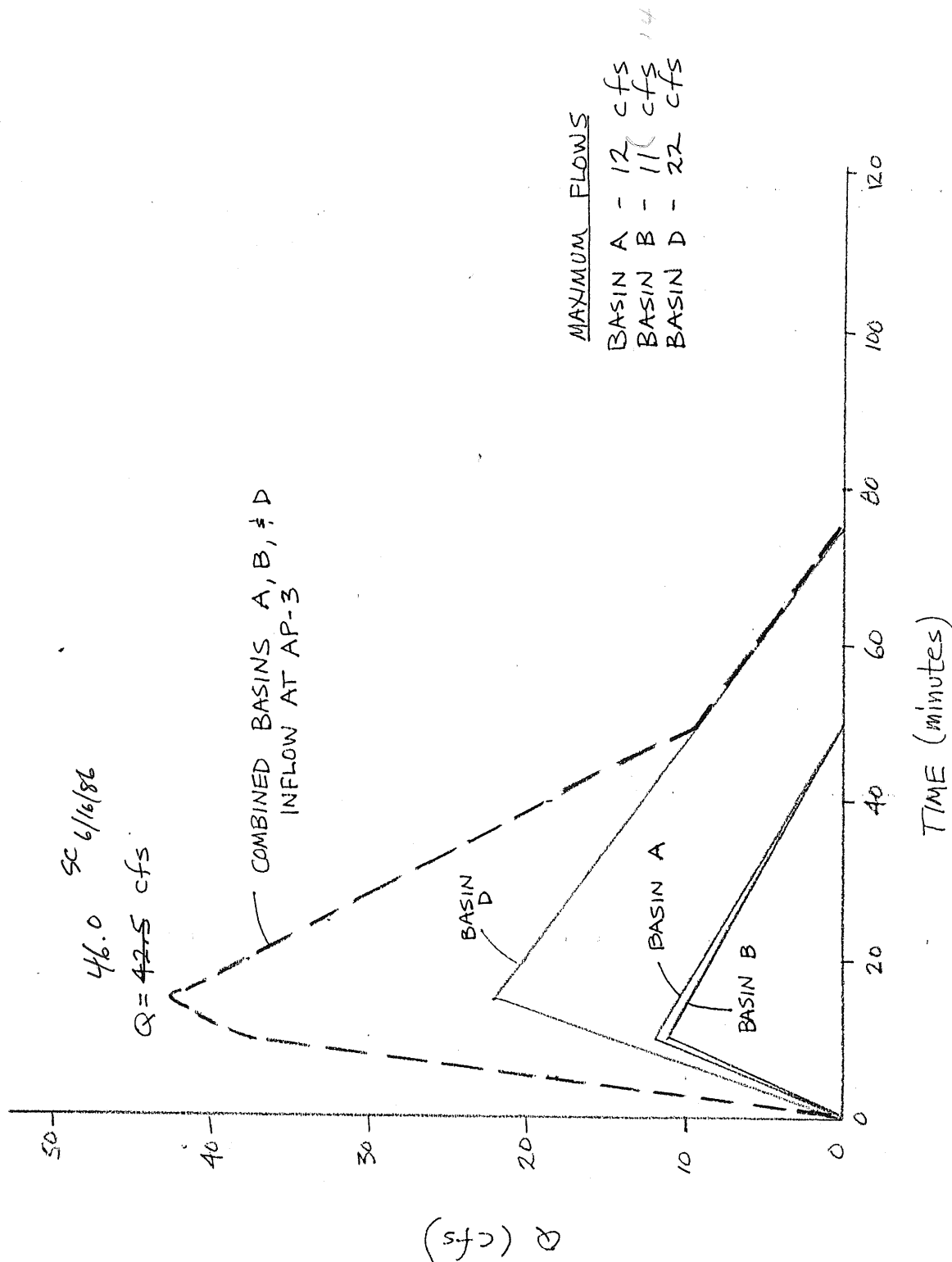


FIGURE 1

COMBINED HYDROGRAPHS

BASINS A, B, C, & D AT
AP-4

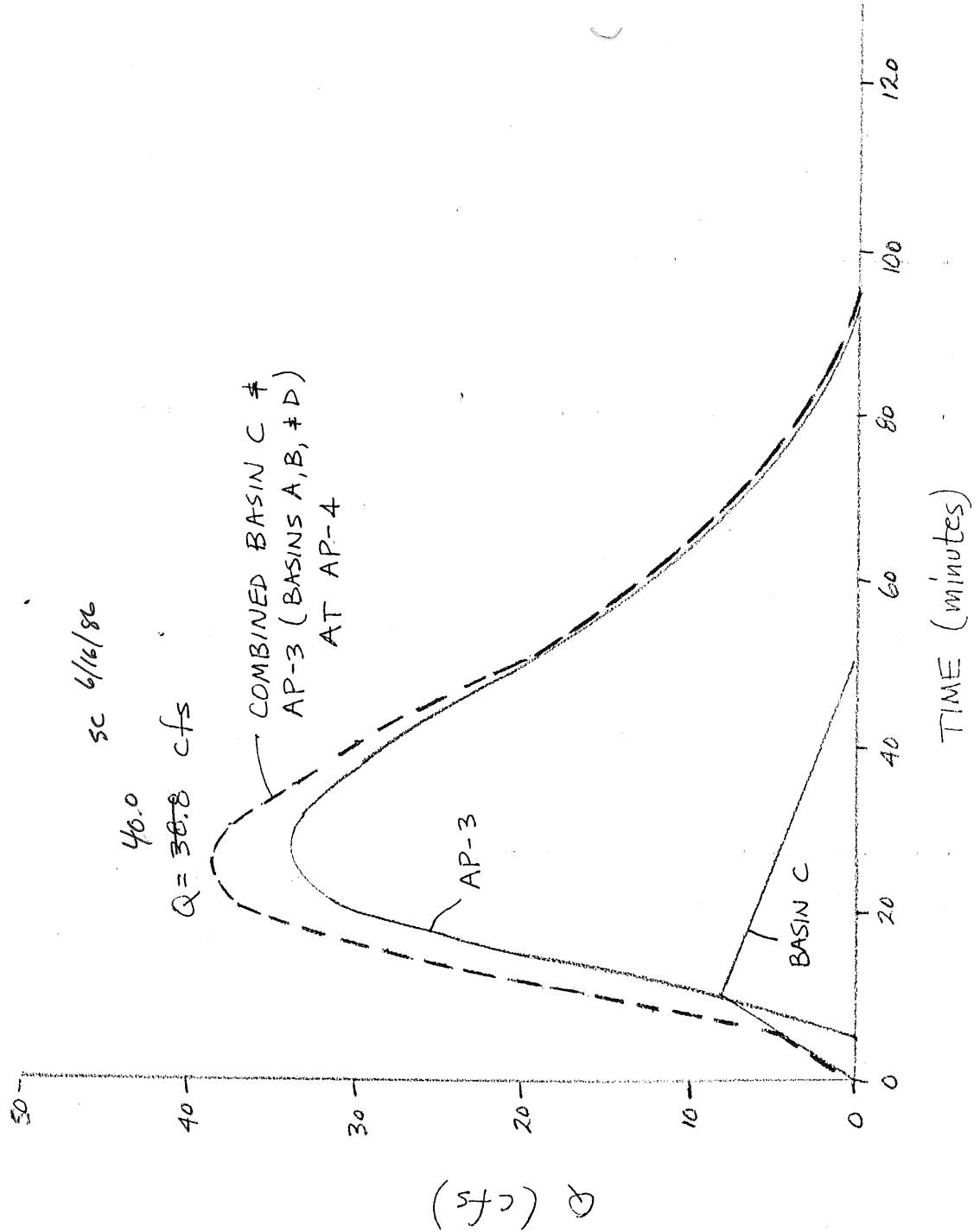
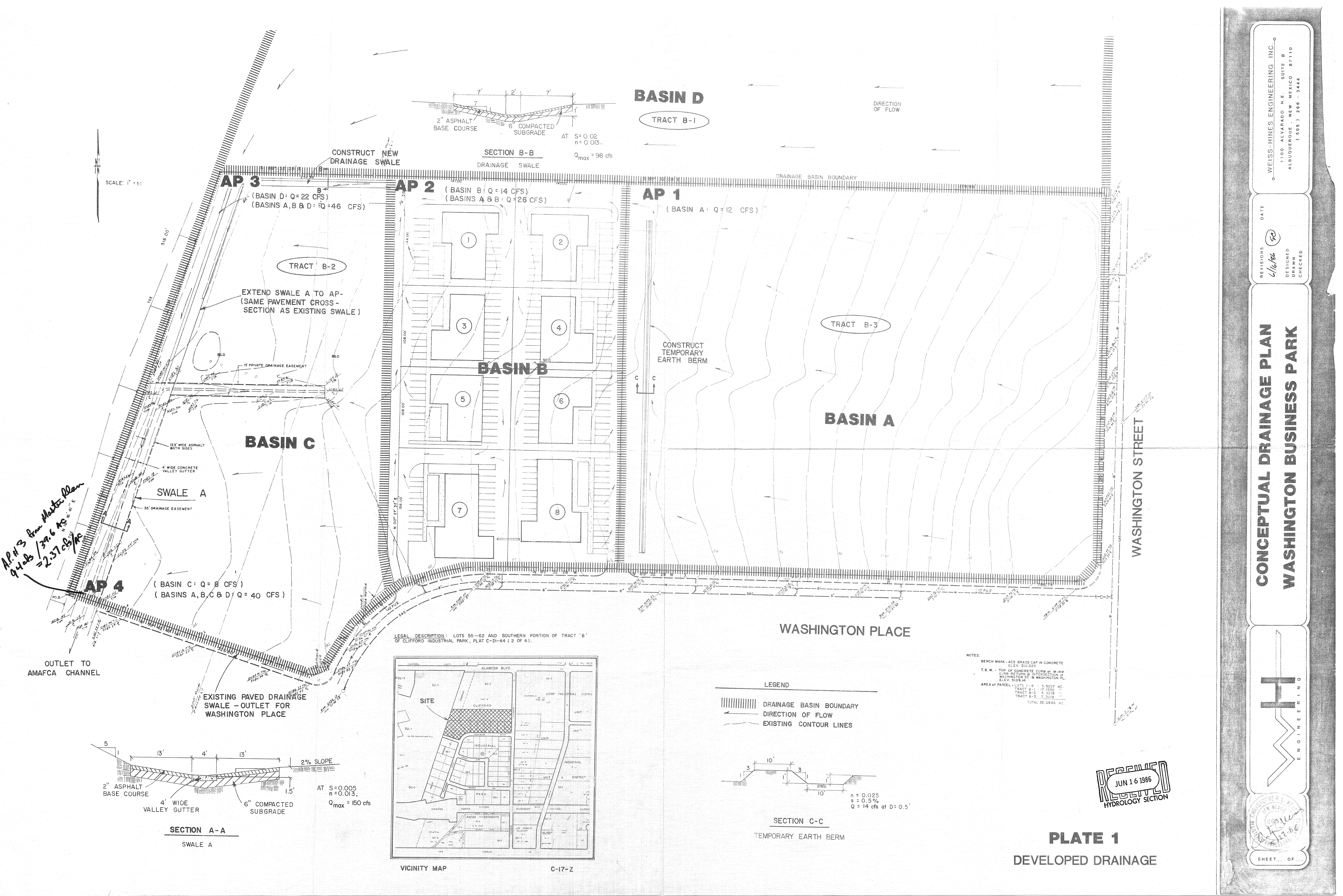


FIGURE 2



WEISS-HINES ENGINEERING INC.
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DATE
11/16/86

DESIGNED
CRAVE

CHECKED

CONCEPTUAL DRAINAGE PLAN
WASHINGTON BUSINESS PARK

ENGINEERING

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JUN 16 1986
HYDROLOGY SECTION

SHEET OF