CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE

January 7, 1970

TO: W. T. Stevens, City Engineer

SUBJECT: Revised Drainage Report of a Tract of Land Situated in the Southwest Quarter of Section 8, Township 10N., Range 4E., N.M.P.M.

The drainage area involved in this revision was subjected to re-evaluation for the following reasons:

A. The parcel of land in the study is 80% residential with front and rear private , lawn areas and considerable land-scaping.

B. The lots are not radically sloped nor are the dwellings highly elevated above existing street elevations.

C. The conclusion drawn from the above would indicate that a runoff coefficient of .50* would be entirely realistic and consistent with good engineering practices.

The following computations and facts have been compiled to support any future proposals:

* The original report used .65

Design Criteria

Mannings Formula: $Q=A\frac{1.486}{n}(R\ 2/3)\ S\ 1/2)$

Rational Formula: Q=CiA

Storm Frequency: 100 yr.

Runoff Coefficient: .50

Tc-(Time of Concentration) (a) 30 Min.

i. - (Rainfall Intensity) (b) $i = \frac{163}{f+20} \cdot \cdot \frac{163}{30+20} = 3.26$ in./hr.

Q = CiA; Q = 212 (.50) (3.26) = 346 c.f.s. 363 cfs

In addition, a drainage study for the area near Conchas Park has shown that excess runoff from North of Candelaria Rd. during a peak storm, will overflow the curbing at Candelaria and Eubank Blvd. N.E., in the amount of approximately 148 cu. ft. per sec., due to lack of carrying capacity on Candelaria and on Eubank Blvd. This supplemental flow crosses a service station lot, a shopping center lot and then enters Lexington Ave. N.E. whence it moves Westerly and Southerly to combine with the runoff from the primary watershed area. The combined runoff which reaches the culvert at Menaul Blvd. and Phoenix Ave. is then

346 c.f.s. + 148 c.f.s. = 494 c.f.s.

The structural plate arch culvert at Menaul Blvd., N.E. and Phoenix Ave., N.E., when flowing full, will carry 649 c.f.s. which is greater than the contributory runoff.

$Q=A\frac{1.486}{n}(R\ 2/3)(S\ 1/2)$ ∴ $Q=28.274\frac{1.486}{.013}(1.310)(.1284)$

Q=543 c.f.s.

The culvert capacity of 543 c.f.s. as shown in the computations would require a 78" C.P.C. to carry the flow from the structural plate arch to the existing 60" C.P.C. at Wyoming Blvd., N.E. The 60" C.P.C. at Wyoming Blvd., N.E. will carry 360 c.f.s. leaving and excess of 494 c.f.s. - 360 c.f.s. or 134 c.f.s. to spill out of an overflow structure onto Wyoming Blvd.

It is therefore recommended that a 78" C.P.C., approximately 680' in length be installed to carry the flow from the structural plate arch at Menaul & Phoenix to the 60" C.P.C. at Wyoming Blvd. It is also recommended, when funds become available, that an interceptor trunk be extended to intercept a portion of the water in the vicinity of Moon & Menaul N.E., thereby eliminating the overflow structure in the future.

Respectfully Submitted:

Rick Elliott

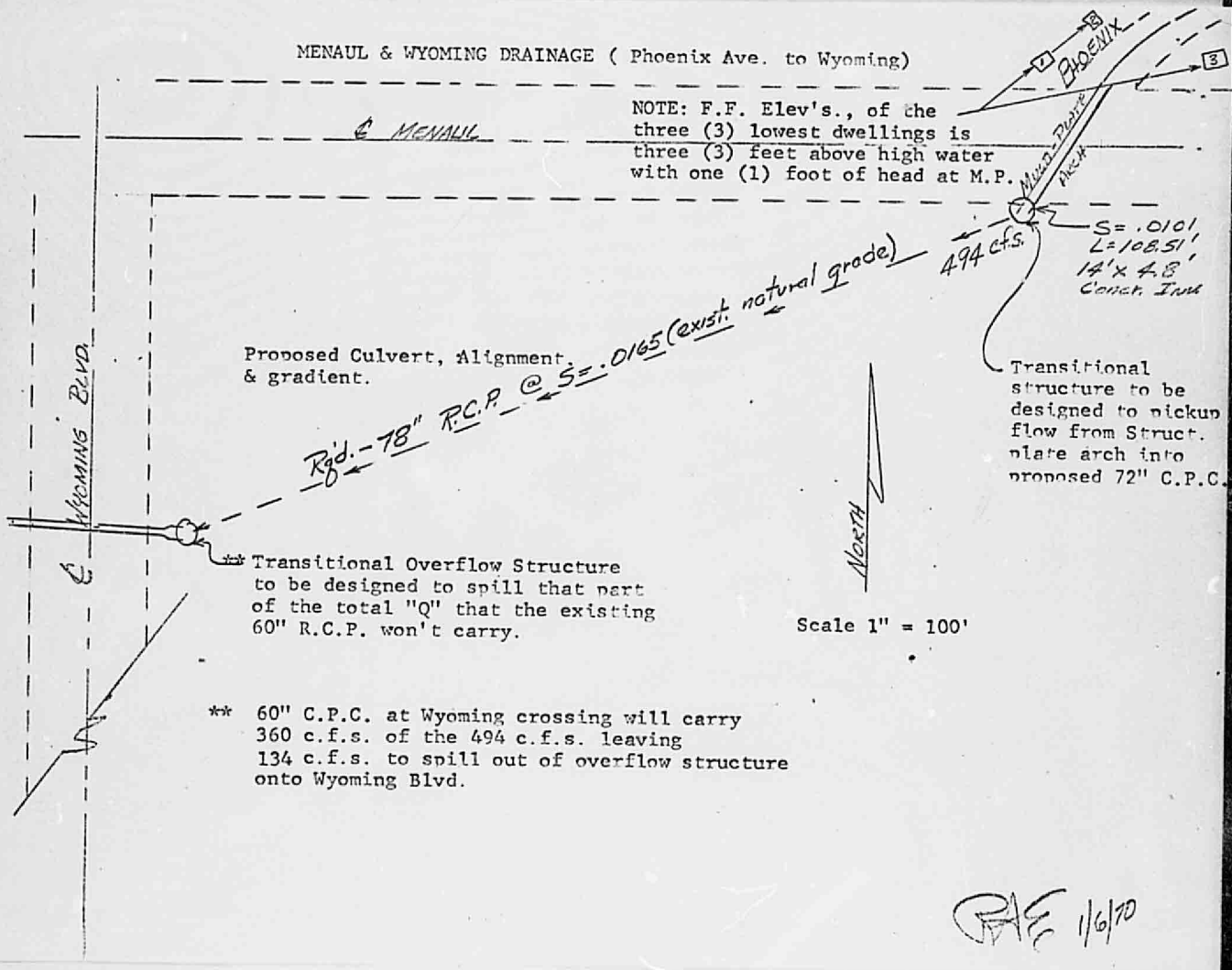
Rick Elliott, Design Engineer

Approved by:

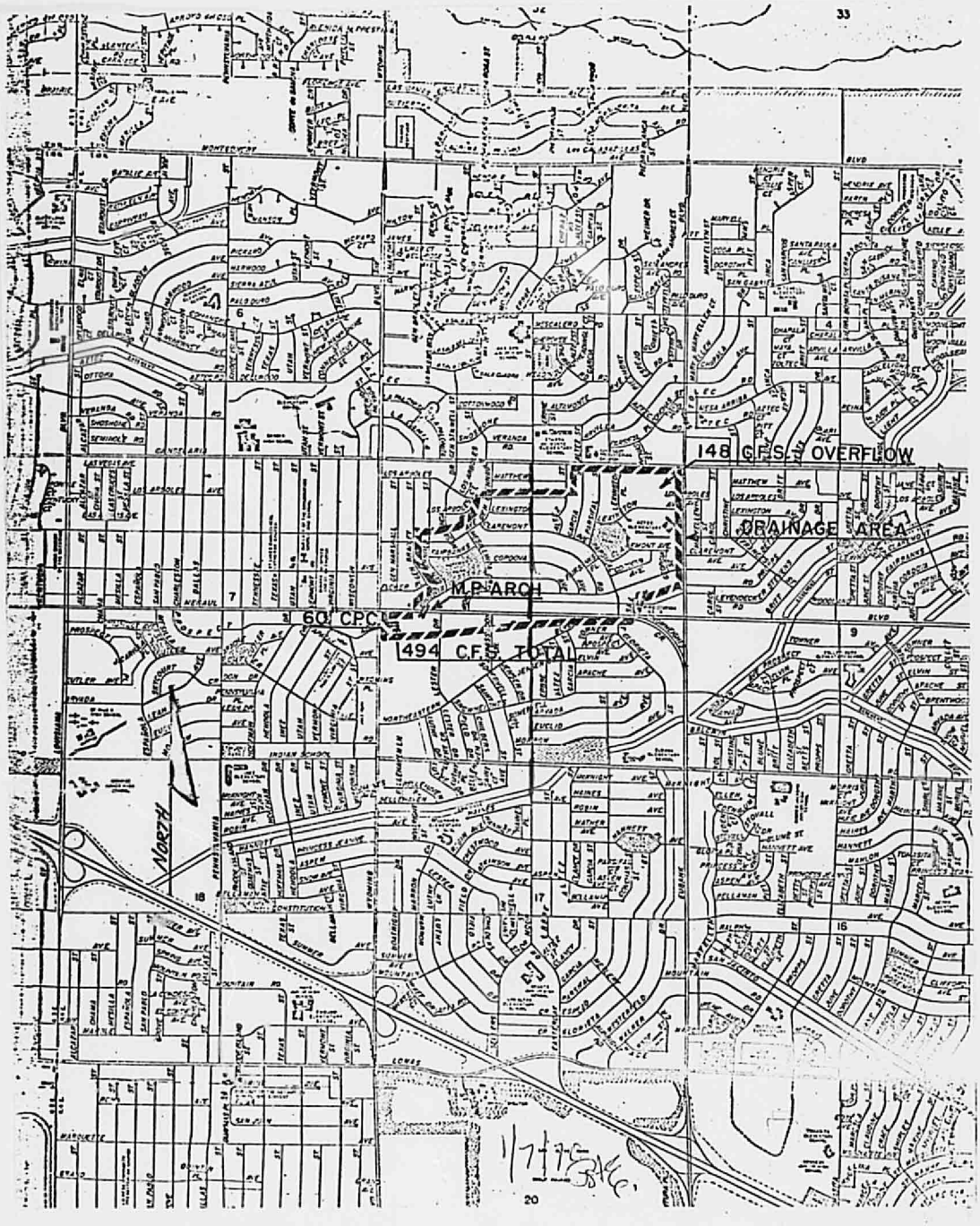
Frank J. Bailey

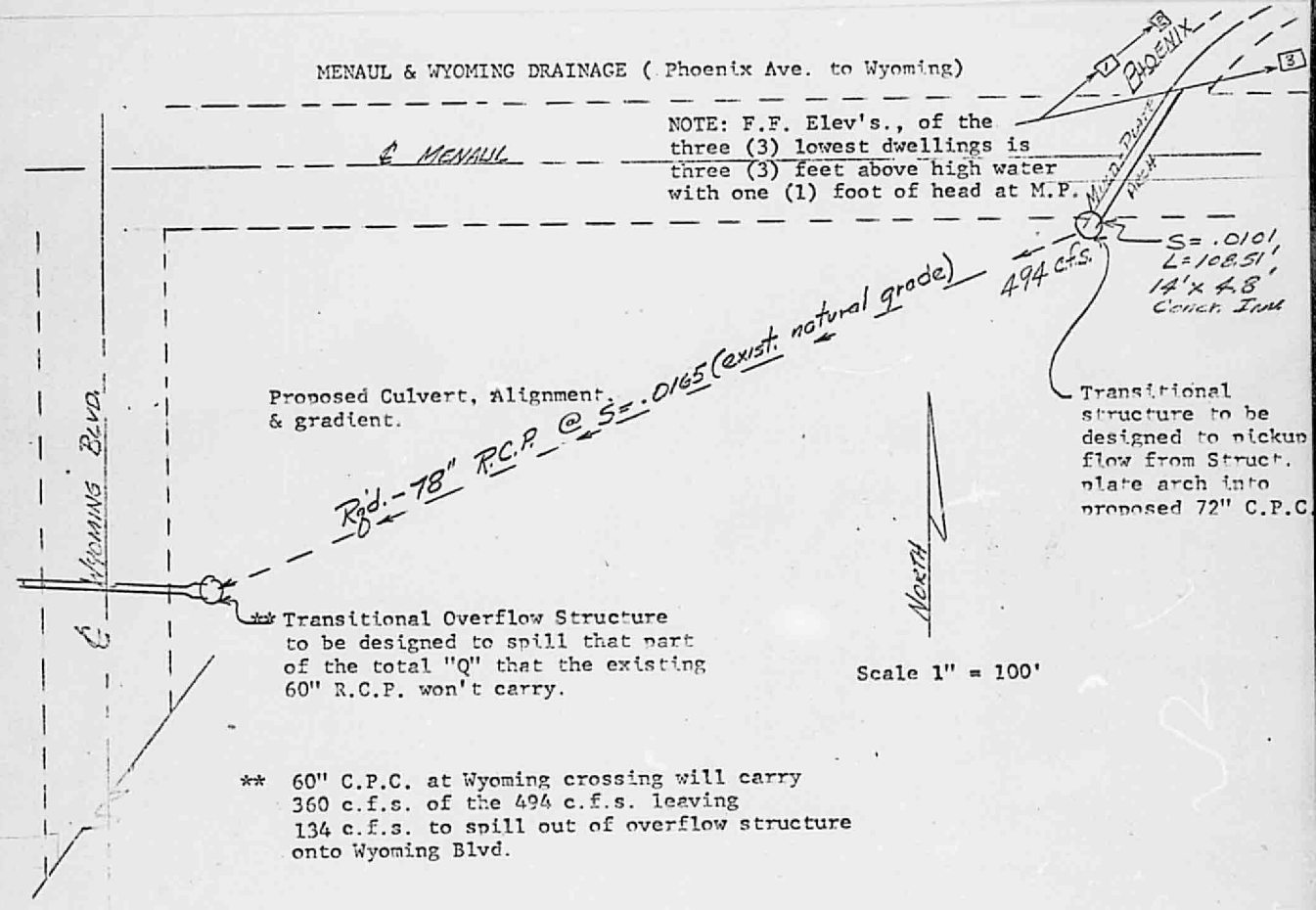
Frank J. Bailey, Assistant City Engineer

(a) Tc based on study by P.Z. Kirpich, Civil Engineering, Vol. 100 No. 6, June 1940, p. 362
(b) Sandia Conservancy Distr., 1954 Intensity Duration Curves


MENAUL & WYOMING DRAINAGE (Phoenix Ave. to Wyoming)
℄ MENAUL
NOTE: F.F. Elev's., of the three (3) lowest dwellings is three (3) feet above high water with one (1) foot of head at M.P.
PHOENIX
Menaul Phoenix Manh
S=.0101 L=108.51' 14'x4.8' Conch. Inv.
494 c.f.s.
Proposed Culvert, Alignment, & gradient.
Rqd.-78" R.C.P. @ S=.0165 (exist. natural grade)
Transitional structure to be designed to pickup flow from Struct. plate arch into proposed 72" C.P.C.
WYOMING BLVD.
℄
Transitional Overflow Structure to be designed to spill that part of the total "Q" that the existing 60" R.C.P. won't carry.
NORTH
Scale 1" = 100'
** 60" C.P.C. at Wyoming crossing will carry 360 c.f.s. of the 494 c.f.s. leaving 134 c.f.s. to spill out of overflow structure onto Wyoming Blvd.

RAE 1/6/70


148 C.F.S. OVERFLOW
DRAINAGE AREA
M.P. ARCH
60" CPC
494 C.F.S. TOTAL
NORTH



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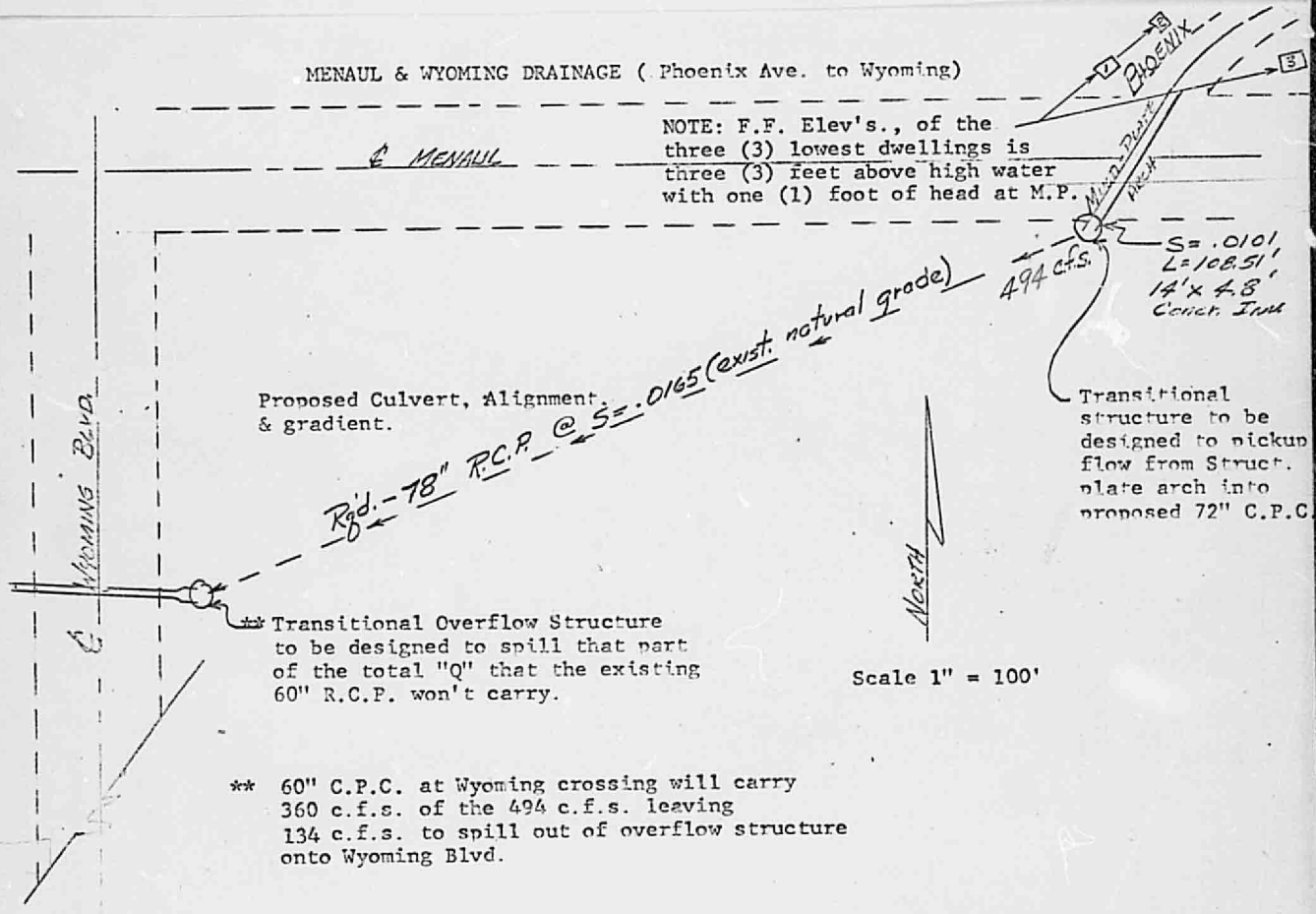
RAE 1/6/70

MENAUL & WYOMING DRAINAGE (Phoenix Ave. to Wyoming)



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GAE 1/6/70

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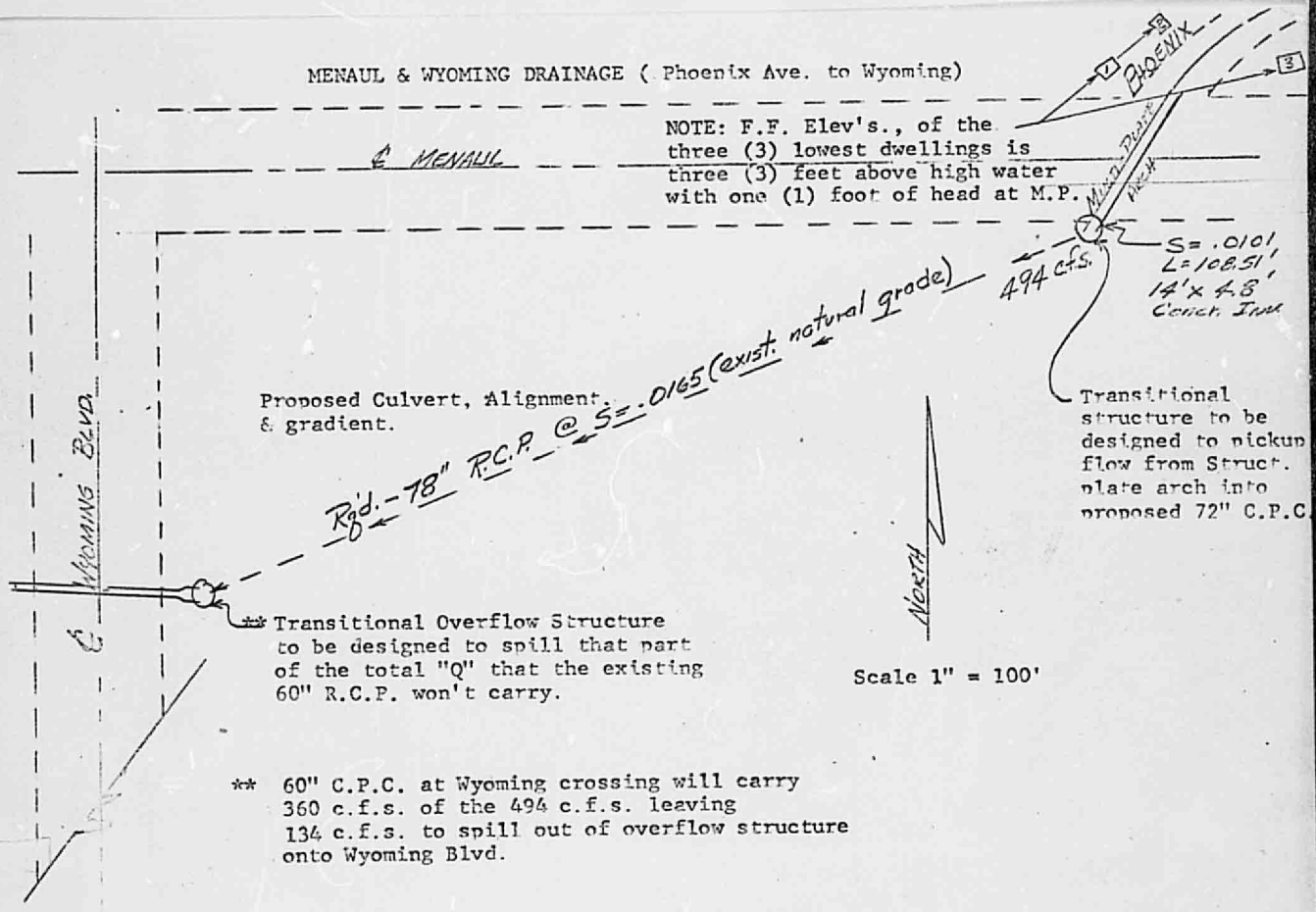

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GAE 1/6/70

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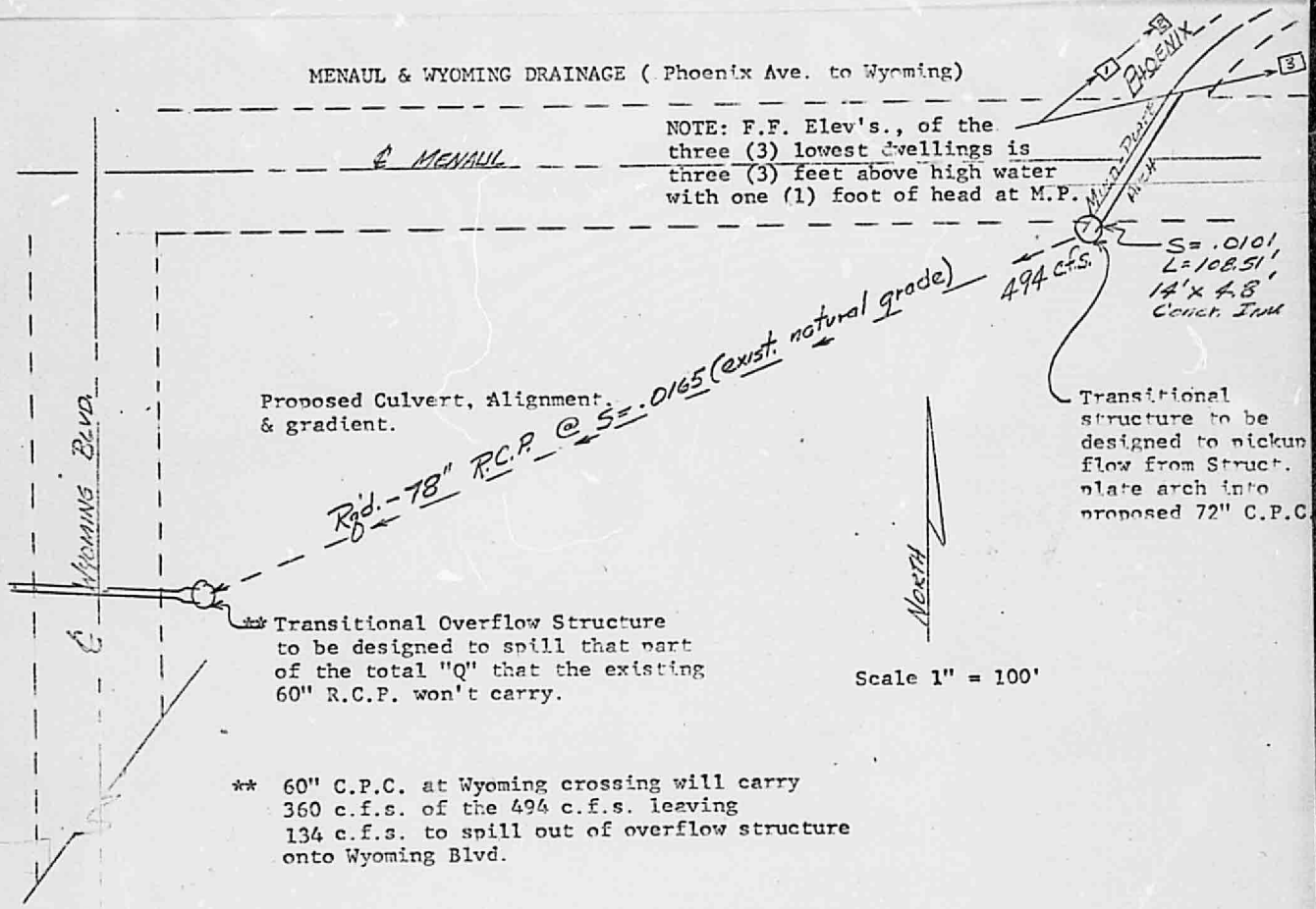
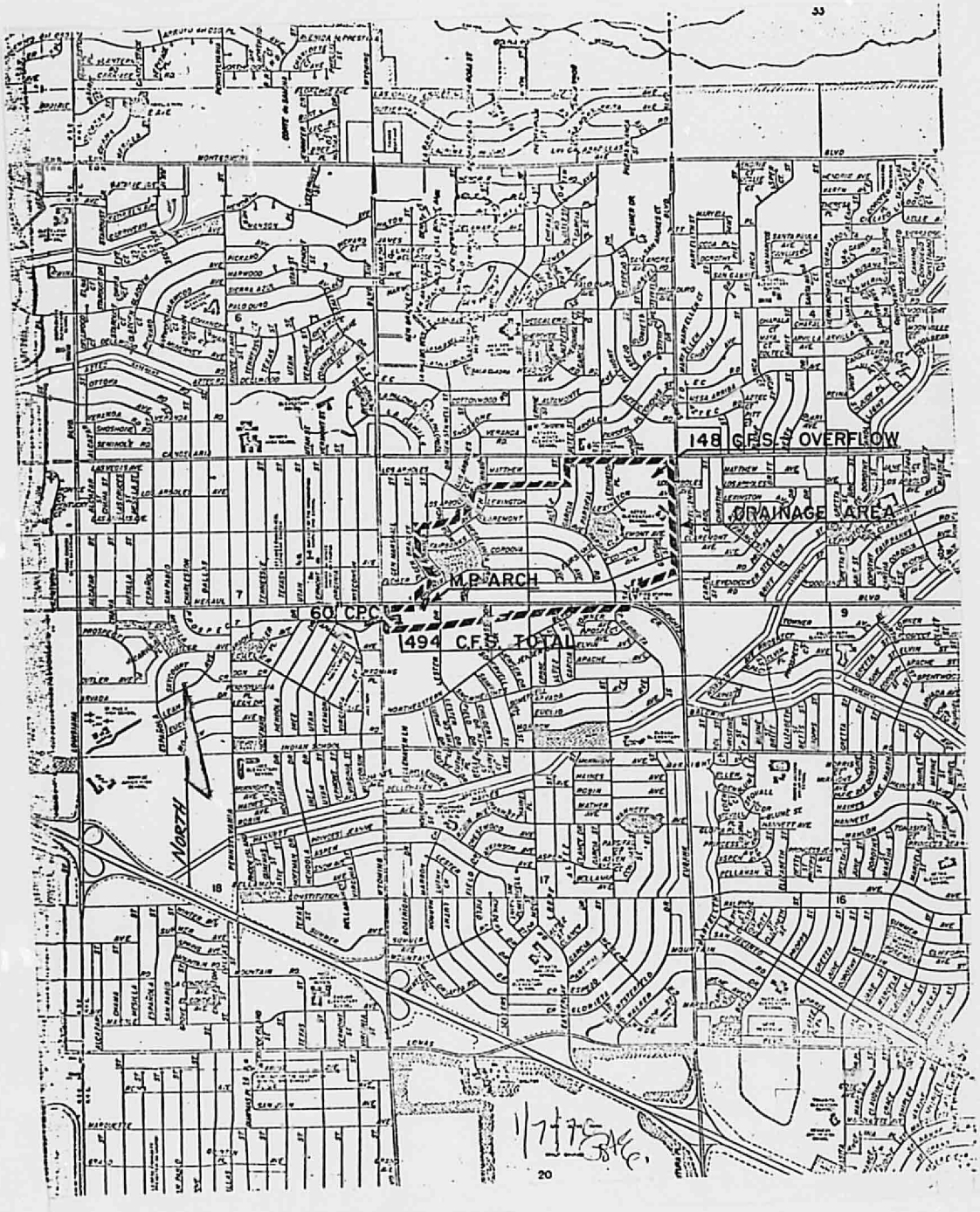
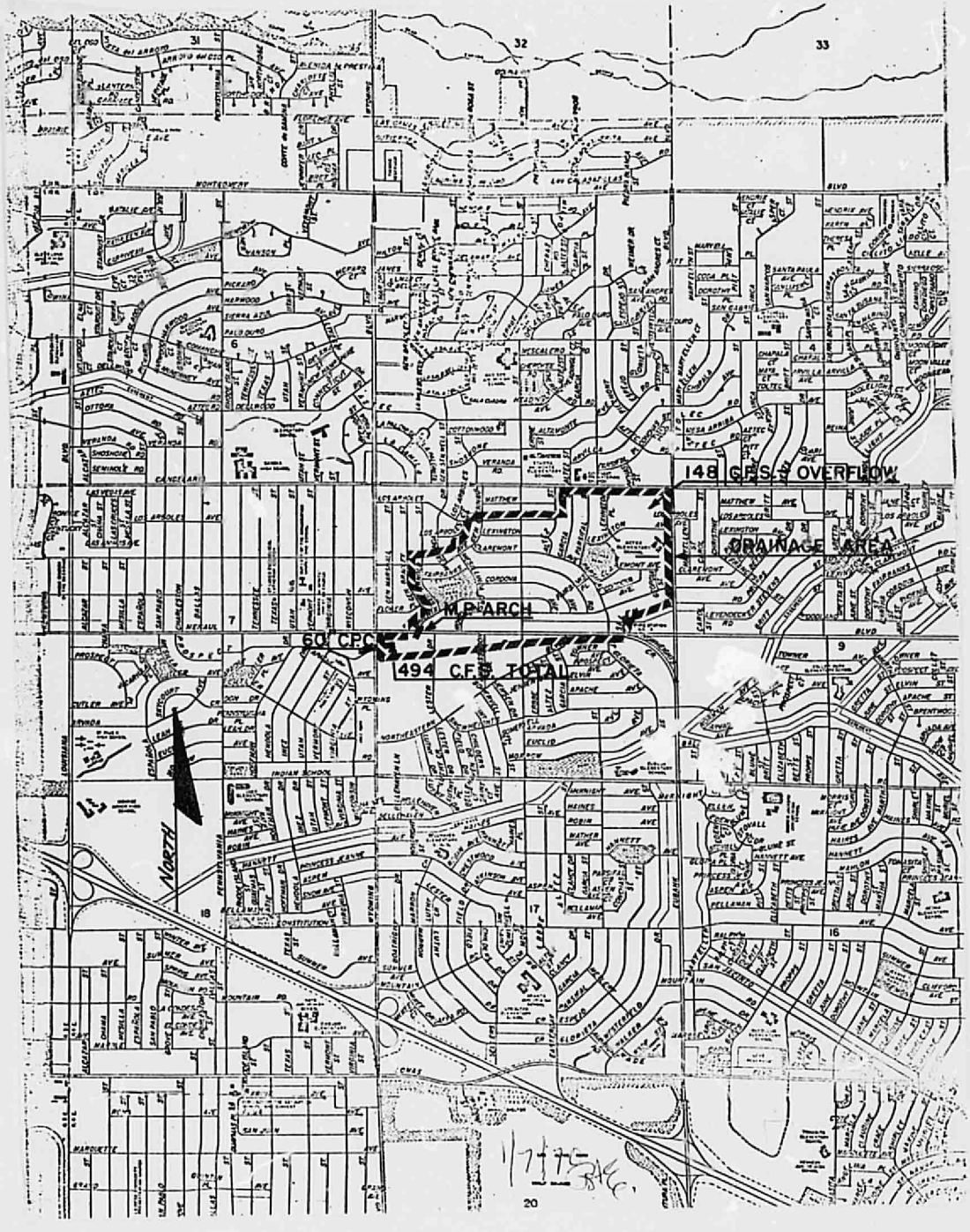


** 60" C.P.C. at Wyoming crossing will carry 360 c.f.s. of the 494 c.f.s. leaving 134 c.f.s. to spill out of overflow structure onto Wyoming Blvd.

RAE 1/6/10


148 C.F.S. OVERFLOW
DRAINAGE AREA
M.P. ARCH
60" CPC
494 C.F.S. TOTAL
NORTH


148 CFS & OVERFLOW
DRAINAGE AREA
M.P. ARCH
60" CPC
494 CFS TOTAL
NORTH
1/7/75 BAE

Phone 242-1526 Phone 24

Wm. W. Ellison & Associates Architects
1617 University Blvd., N. E.
Albuquerque, New Mexico 87106

DATE October 30, 1969

TO: Mr. Frank Bailey
Engineering Office
City of Albuquerque

SUBJECT: Foodway No. 7
Transmittal No.
Gentlemen:

Enclosed are 1 copies/sets of Mr. George Paul

_____ Color (Chart (s))
_____ Brochures
_____ Letter (s)
_____ Literature
_____ Other
_____ Plans and Specifications
_____ Samples
_____ Schedules, Catalogs
_____ Shop Drawings

COVERING: Drainage Report

_____ APPROVED

_____ APPROVED AS NOTED
Resubmission (is) (is not) Requi

_____ DISAPPROVED

REMARKS:

Very truly yours,

Wm. W. Ellison and Associates A

By: Layer Bynum

DRAINAGE REPORT
CONCERNING A TRACT OF LAND
SITUATE IN THE SOUTHWEST QUARTER OF
SECTION 8, TOWNSHIP 10 N., RANGE 4 E., N.M.P.M.
for:

WILLIAM W. ELLISON & ASSOCIATES

ARCHITECTS

Prepared By: George E. Paul

N.M.P.E. & L.S. #2544

DRAINAGE REPORT

INTRODUCTION:

The parcel of land involved in this study is almost wholly surrounded by development of both commercial and residential nature. Although the main drainage area or watershed for this location is relatively small (less than one-half square mile in area), the high density of fully-developed land with buildings, paved streets and some paved parking areas creates a situation in which storm runoff concentrates quite rapidly at the outlet of that drainage area. Said "outlet" is also the inlet for all runoff reaching the study, or "Project" area and consists of multiplate arch culvert (one) having a 15'-3" span by 6'-0" rise, with a concrete floor. The Project Area has an earth channel which traverses the entire width of the property from Northeast to Southwest, carrying that flow which enters the area from the above-noted multiplate arch culvert. This channel is a natural water-course; has no maintenance and does not occupy any dedicated public easement. On the Wyoming Blvd. side of the property, a 60" concrete pipe culvert installed by the New Mexico State Highway Dept. about 1952, serves as an outlet for the Project Area. This pipe is too small to carry all flow which reaches it and hence overflows onto Wyoming Boulevard during periods of heavy runoff. (This condition was verified in 1961 and in 1963, during the storms of August 11 and August 10, respectively, for those years.) As long as any open channel persists through the Project Area, the flow in such channel will be throttled by the 60" diameter pipe at Wyoming Blvd., and flooding will occur at the lower, or West side of this property.

Drainage from remote areas East of Eubank Blvd. reaches the North boundary of the Project, but is contained within the curb lines of Menaul Blvd., which has sufficient carrying-capacity to contain those flows, without subjecting the Project to any danger of overflow from the street. All land of any consequence lying due East of the Project, drains to Lester Dr., a North-South street slightly East of the Project. Lester Dr. intercepts all flow from the East and diverts it North to Menaul Blvd. and South to Northeastern Blvd., in each case carrying the runoff well away from the area with which this report is concerned.

DRAINAGE REPORT, Cont'd.

CRITERIA USED:

Manning's Formula ($Q = a \cdot \frac{1.486}{n} \cdot R^{2/3} \cdot S^{\frac{1}{2}}$) for open-channel flow.

National Formula ($Q = A \cdot c \cdot i$) for runoff from watershed area.

SEELYE DESIGN (Engineering Data book) for Nomographs and Charts used in conjunction with runoff calculations made by "Rational" Formula.

ARMCO HANDBOOK (Data book for corrugated pipe sections) for area and flow computations regarding multiplate arch culvert on Menaul Blvd.

Storm Frequency ..... 100 Years

Runoff/Total Rainfall Ratio 0.65

Storm Intensity..... Sandia Conservancy Dist.-1954 Intens.-Duration Curves, Albuquerque Area.

The multiplate arch culvert at Menaul Blvd. has a cross-section area of 68.5 sq. ft., a roughness coefficient of 0.026 and is laid on a grade of 1.00%. It is capable of carrying up to 635 cu. ft./sec. of runoff, when flowing full; about 652 cfs when flowing under a 1-ft. head (Water surface 1 ft. above top of pipe). The curb-line on Menaul Blvd. is only 1 ft. above top of pipe, as presently constructed. Forthcoming data will show, however, that anticipated runoff from the watershed which is tributary to this Project, will be slightly less than the full capacity of the multiplate arch culvert.

Drainage Area (A) ..... 212 Acres

Runoff Coefficient (c) 0.65

Rainfall Intensity (i) ..... 3.45 In./Hr. (Based on a Concentration Time or "Duration" of 27.0 min.

Then, $Q = Aci = 212 \cdot 0.65 \cdot 3.45 =$ 475.4 cu.ft./sec. (runoff from the immediate watershed.

In addition, a drainage study for the area near Conchas Park has shown that excess runoff from North of Candelaria Rd. during a peak storm, will overflow the curbing at Candelaria and Eubank Blvd., N.E., in the amount of approximately 148 cu. ft. per sec., due to lack of carrying capacity on Candelaria and on

Rubank Blvd. This supplemental flow crosses a service station lot, a shopping center lot and then enters Lexington Ave., N.E. whence it moves Westerly and Southerly to combine with the run-off from the primary watershed area. The combined runoff which reaches the culvert at Menaul Blvd. and Phoenix Ave. is then 475.4 + 148 or approximately 623 cu. ft./sec. as predicted for a 100-year frequency storm. This quantity of water would require an 84" diameter pipe, on a grade of 1.5%, in order to be contained in a closed conduit without back-up of flow. On the other hand, extending the existing 60" pipe at Wyoming Blvd. across the width of the project as a storm sewer, would only afford a water-carrying capacity of approximately 360 cfs, thus creating an overflow condition at the upstream multiplate arch culvert at Menaul Blvd. Such overflow would escape onto Menaul Blvd. before damaging any houses on Phoenix Ave. North of the culvert. The water would, however, reach well up into the residential lots, themselves.

A graded earth channel could be considered, having a section such as that suggested in the detail on Plate 3. Location of the channel, to be economically feasible, would be along the North property line on Menaul Blvd., then Southerly and Westerly, beginning at a point about 1/0 feet East of Wyoming Blvd. as shown on Plate 2. Channel, as shown, has 6' bottom; 1.5 : 1 side-slopes and is 6' deep from floor to top of berm, or ground level.

Using the Manning Formula, $Q = a \cdot \frac{1.486}{n} \cdot R^{2/3} \cdot S^{\frac{1}{2}}$, it can be shown that such design can carry a depth of 4 feet of water (or 2 feet of "freeboard" to top of channel) as follows:

Where,

n = 0.020 for smooth earth channel
a = 12 • 4 = 48 sq. ft.
R = area/wetted perimeter = 48/20.6 = 2.33
S = 0.015 (1.5% grade)

$$Q = 48 \cdot \frac{1.486}{0.020} \cdot 2.33^{2/3} \cdot 0.015^{\frac{1}{2}} = \underline{767.6} \text{ cu.ft./sec.}$$

Since 767.6 cfs greatly exceeds the maximum anticipated flow of 623.4 cfs, the channel design is adequate and will have enough "freeboard", or clearance from high water to top of channel, to take care of surges (Hydraulic Jump) caused by sharp bends in the channel. Of course, with the open channel, there would be an overflow at Wyoming Blvd. in any case, because the 60" pipe culvert beneath that street (to which the channel outlet would be connected) lacks the necessary flow-carrying capacity.

DRAINAGE REPORT, Cont'd.

CONCLUSIONS AND RECOMMENDATIONS:

The relatively high quantity of runoff draining to the area, coupled with the "throttling" effect of the undersized culvert (60" Reinf. Conc. Pipe) installed at Wyoming Blvd. during construction of that street by the State a number of years ago, has caused this parcel of land under study, to be a real "problem" area. Future plans by the City to extend a storm sewer system on Menaul Blvd. would help to alleviate the problem, as would extension of a closed conduit system through the Project area. Any such extension would require dedication of a public easement through the development area in order to be constructed from public funds. An easement would also have to be given by the property owners East of this project, in order to connect to the culvert at Menaul Blvd. In addition, since such plan would cause water to back up on the North side of Menaul, it would require the City Engineer's approval in any event, even though the high water would not reach the building line of any residences in that sector.

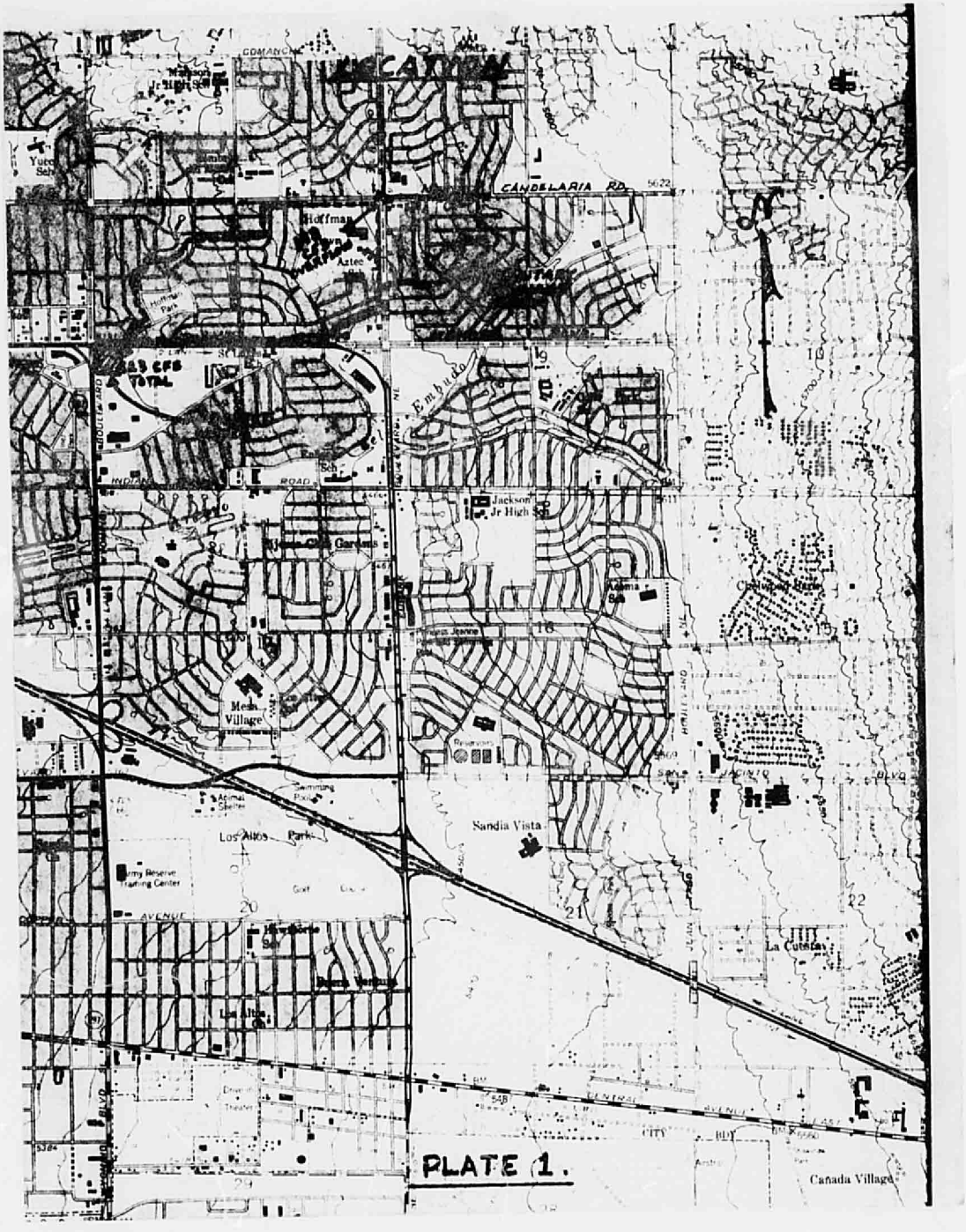
The alternate plan of an open channel (lined or unlined) can provide flow-carrying capacity, but would also require an easement of sorts from the abutting property owner in order to tie back into the existing natural channel. Furthermore, such channel would need to have clear-span crossings (one or more) for access to the project area on the Menaul Blvd. side; each crossing costing an estimated $11,000 or more. The channel would have some maintenance needs, also, as it would tend to collect trash and weeds.

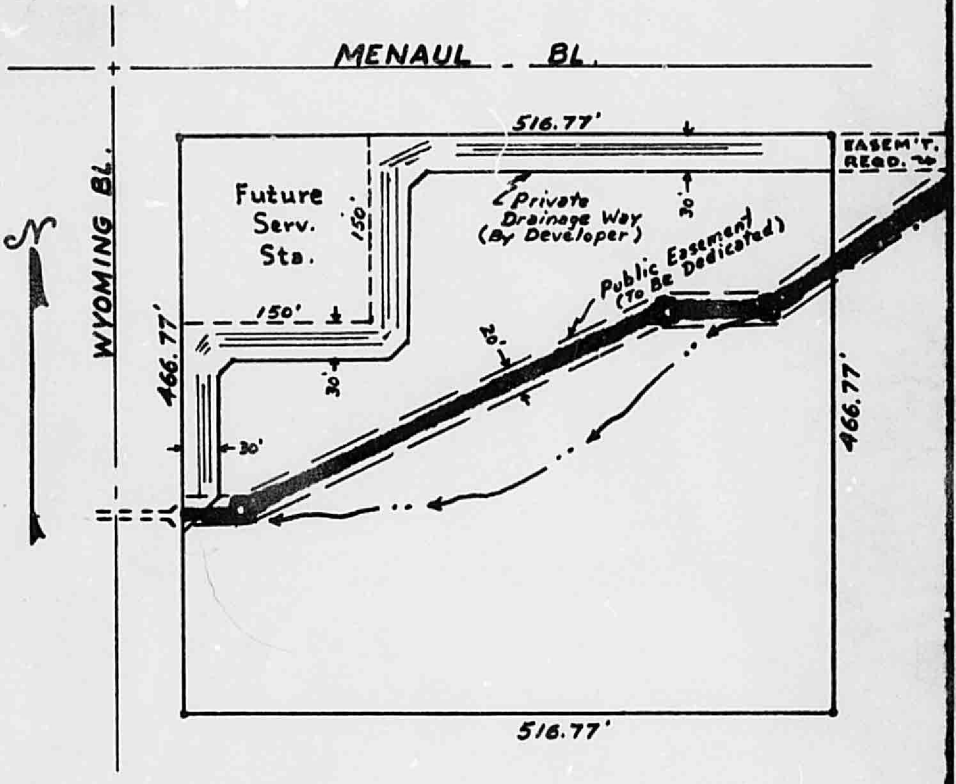
I would, therefore, recommend that the City be approached with the idea of constructing a closed-conduit system through the project area, along with any other storm drainage relief lines on Menaul Blvd. which might aid in relieving the excess flow, above the 60" pipe capacity. This would be the cleanest and most effective treatment of water in the project, itself. However, should such proposal not be acceptable, an earth channel could be constructed along the alignment shown, and protected on the outside, or "scour" side of each bend, by a 12" thick blanket of wire-enclosed dump rock or "Rip-rap"; the same material to be used also at the entry to the 60" culvert at Wyoming Blvd. A concrete-lined channel is a third and possibly least desirable solution for, while its appearance would be a bit more attractive, and its maintenance a bit less costly, the first cost of construction would be excessive for so small an area.

Respectfully Submitted,

George E. Paul

George E. Paul, N.M.P.E.
& L.S. # 2544


CANDELARIA RD.
Hoffman
Aztec
Jackson Jr High
Mesa Village
Los Altos Park
Sandia Vista
Army Reserve Training Center
La Cuesta
Canada Village
PLATE 1.



LEGEND:

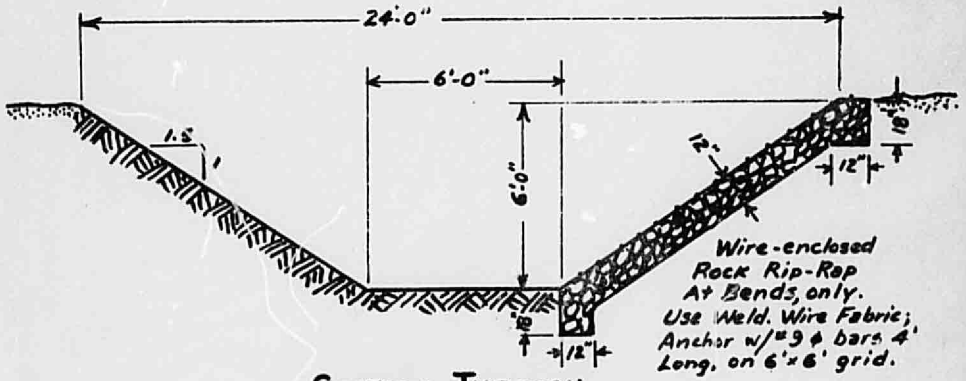
— Proposed Closed Conduit Drain

— Alternate Earth or Concrete Channel

— Existing Natural Water Course

PLATE 2.

DRAIN. CHANNEL DETAIL



SECTION THROUGH
DRAINAGE CHANNEL
(TYPICAL)

Scale: 1" = 4'-0"

PLATE 3.