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HYDRAULIC REPORT

OAK STREET STORM DRAIN

IN

SCOTTSDALE, ARIZONA

RECEIVED
AUG 2 1978
Engineering Division
City of Scottsdale

March, 1975

Registered Professional Engineer (Civil)
CERTIFICATE NO
5526
JOHN M.
HOOK
Date Signed 3/24/75
Arizona, U.S.A.

Prepared By

HOOK, ROCKWELL AND ASSOCIATES
3511 East Indian School Road
Phoenix, Arizona 85018

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Prepared By

HOOK, ROCKWELL AND ASSOCIATES
3511 East Indian School Road
Phoenix, Arizona 85018

HOOK, ROCKWELL
and Associates · Consulting Engineers, Inc.
3511 EAST INDIAN SCHOOL RD.
PHOENIX, ARIZONA 85018
TELEPHONE (602) 956-3200

March 21, 1975

City of Scottsdale, Arizona
Capital Improvements Engineering
3939 Civic Center Plaza
Scottsdale, Arizona 85251

Ref: Oak Street Storm Drain
Attention of: Mr. Jeff Kracht
Our Job No. #863

Dear Jeff:

Transmitted herewith is our report and recommendations concerning the planned Oak Street Storm Drain. Following your letter on this subject dated January 30, 1975, we have provided the results of our runoff study for the area bounded by Thomas Road, Palm Lane, Miller Road and the Arizona Cross Cut Canal.

Our major recommendation follows generally the original layout proposed by your department at the commencement of the study. You will find that we have broken the proposed storm drains into two design phases, the first being the Oak Street Main, to be built as soon as possible, and the second being the Scottsdale Road Lateral, to be built in conjunction with the planned improvement of Scottsdale Road from Palm Lane to Thomas Road.

Our cost estimates are based on the design for a 10-year storm. The Scottsdale Road phase is designed to maintain a two-lanes-dry condition during a 10-year storm.

We will be available for discussion on this report at your request. If you require additional information at this time, please call us.

Yours very truly,
HOOK, ROCKWELL & ASSOCIATES
Consulting Engineers, Inc.

John M. Hook

John M. Hook, P.E.
President

JMH:ph

TABLE OF CONTENTS

Title Sheet	Page	1
Letter of Transmittal	Page	2
Table of Contents	Page	3
Purpose and Scope	Page	4
Existing Drainage	Page	4
New Drains	Page	6
Preliminary Estimate of Construction Costs	Page	9
Plate: Theoretical Velocity (Curb-Full)	Page	10
Plate: Theoretical Velocity (0.2'- Over-Curb)	Page	11
Foldouts: Pipe Design Tabulation	Page	12
Surface Runoff Tabulation	Page	13
Runoff Areas	Page	14

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PURPOSE AND SCOPE

The purpose of this study was to determine a plan to drain storm runoff from the general area between Thomas Road and Oak Street, and the Arizona Cross Cut Canal and Miller Road. Outfall for the drain was to be the Indian Bend Wash area of El Dorado Park.

EXISTING DRAINAGE

Expected runoff was computed for the 2-, 5- and 10-year storms, using the Rational Method as presented in the Arizona Highway Department Hydrologic Manual "Hydrologic Designs for Highway Drainage in Arizona". Reference is made to the associated map entitled "Oak Street Storm Drain - Runoff Areas", and the tabulation sheet entitled "Oak Street Storm Drain - Surface Runoff Tabulation". Expected runoff was computed for expected conditions of development as determined from the zoning map prepared and maintained by the City of Scottsdale. Since the area does have some "non-contributing areas" (irrigated or bermed lawns, playgrounds etc.), the rights-of-way were separated from other properties even within small drainage areas. Separate times of concentration for lawns and local commercial areas (based on overland flow times), and for rights-of-way (based on curb and gutter velocities from Manning's equation, n = .015), were figured. Field surveys established a temporary bench circuit from which drainage area slopes, boundaries and diversions were determined.

The map: "Runoff Areas" shows the breakdown of the area into smaller definable drainage areas, each having a numbered design point. As the study proceeds downstream, some design points are cumulative, encompassing several of the smaller areas. Such accumulations are noted in the de-

scriptions on the "Surface Runoff Tabulation".

By use of the Manning Equation with N = .015, and with the assumption of curb-full conditions, street capacities were determined for each typical street cross-section found in the area, and velocitites were plotted on the graph entitled "Theoretical Velocity" (Streets Curb-Full), page 10 of this report. Since most of the streets were found to be only barely capable of handling runoff from a 5-year storm, a field check was made to confirm that the areas of the rights-of-way sloped up and away from the curbs sufficiently to carry an increased depth of water. It was determined that lawn berms, house pads, etc., made channels centered on the rights-of-way which would carry an increased depth of water. In fact, a theoretical cross-section extending 0.2' to 0.3' directly above the paved streets was sufficient to carry 10-year storm runoff. Slope versus velocity for these cross-sections was plotted on the graph on page 11. Results of the street capacity study, for curb-full and the theoretical 0.2'-over-curb conditions are listed in the "Surface Runoff Tabulation".

NEW DRAINS

Initial ideas called for installation of a main in Oak Street from 71st Street to Miller Road, to run easterly into El Dorado Park, to an outfall in the area of the Indian Bend Wash. A short lateral was to run north in 71st Street to Vernon Avenue, the location of considerable ponding after rains. Another lateral was to run north in Scottsdale Road to the Virginia Avenue alignment, another ponding location. Subsequent study showed that the Scottsdale Road lateral must be extended further north, to maintain a two-lanes-dry condition for Scottsdale Road after improvement.

The final layout is shown on the "Runoff Areas" map. Reference is made to an associated tabulation sheet entitled "Pipe Design Tabulation". The preliminary design was made on the assumption of improvement of Scottsdale Road from Thomas Road to Palm Lane, as per paving plans designed by Hook, Rockwell and Zuendel, Engineers, in July, 1970, under City of Scottsdale number P-6827. It was assumed that Scottsdale Road would be maintained in a 2-lanes-dry condition for a 10-year storm. Manning's "n" for pipes and culverts was assumed to be .012.

This report assumes a two-phase construction program to provide drainage for the area. The first design phase will provide a main in Oak Street from 71st Street to Miller Road, and outfall line into El Dorado Park. The main will be designed to carry runoff from a 10-year storm. A lateral designed to carry a 10-year storm will extend north in 71st Street to the intersection at Vernon Avenue. The intersection at 71st Street and Vernon Avenue will be redesigned to try to trap and drain off to pipes the runoff from the west. In lieu of standard catch basins, slotted drains may be installed here and possibly for a short distance up Vernon Avenue, in new gutters, to more completely trap the water. The cost will be comparable to or less than that of less efficient curb inlet or grate - type catch basin.

At the intersection of Oak Street and Scottsdale Road, a stub should be installed to accept a future lateral designed to provide 10-year storm runoff drainage for Scottsdale Road between Thomas Road and Oak Street. A special structure will be required in this intersection to allow an existing 18" sewer to pass through the storm drain.

Cover and headroom become critical as the main runs east toward Miller Road. Elliptical pipe will be required from 74th Street to a point about 660 feet west of Miller Road, where cover will be decreased to about 2 feet under the finished grade. At this point, a single-barrel 8' x 4' box culvert will run east to Miller Road where it may form the finished grade of Miller Road.

Easterly from Miller Road, in El Dorado Park, three 48" pipes will run around the existing City Pool and through a planned flood control dike. The pipes will daylight into a new swale running easterly between the Pool and a Ball Field on the south. This swale will widen out gradually to match the existing lawn between the pool and the Indian Bend Wash Cahnnel. A grate-type catch basin will be designed at the mouth of the 48" pipes, to drain into a 12" diameter subsurface drain running to the Indian Bend Wash Channel, to handle nuisance water.

During final design, consideration will be given to alternates for the box culvert (multiple elliptical pipes, poured half-section pipe on flat base, etc.) Alternate designs may be given for bidding, with the low bid being the basis for final design acceptance.

A future design phase will provide drainage for Scottsdale Road from Thomas Road to Oak Street. The lateral in Scottsdale Road will extend north to Windsor Avenue, with catch basins at the end and a short lateral into Windsor to drain the shopping center located at the southeast corner

corner of Thomas Road and Scottsdale Road. This report recommends a future change of drainage, to drain the northeast end of this center into Thomas Road, rather than south into the residential area. A future lateral should be planned to extend east into Wilshire Avenue to catch surface runoff from the planned commercial areas on the east side of Scottsdale Road.

PRELIMINARY ESTIMATE OF CONSTRUCTION COST

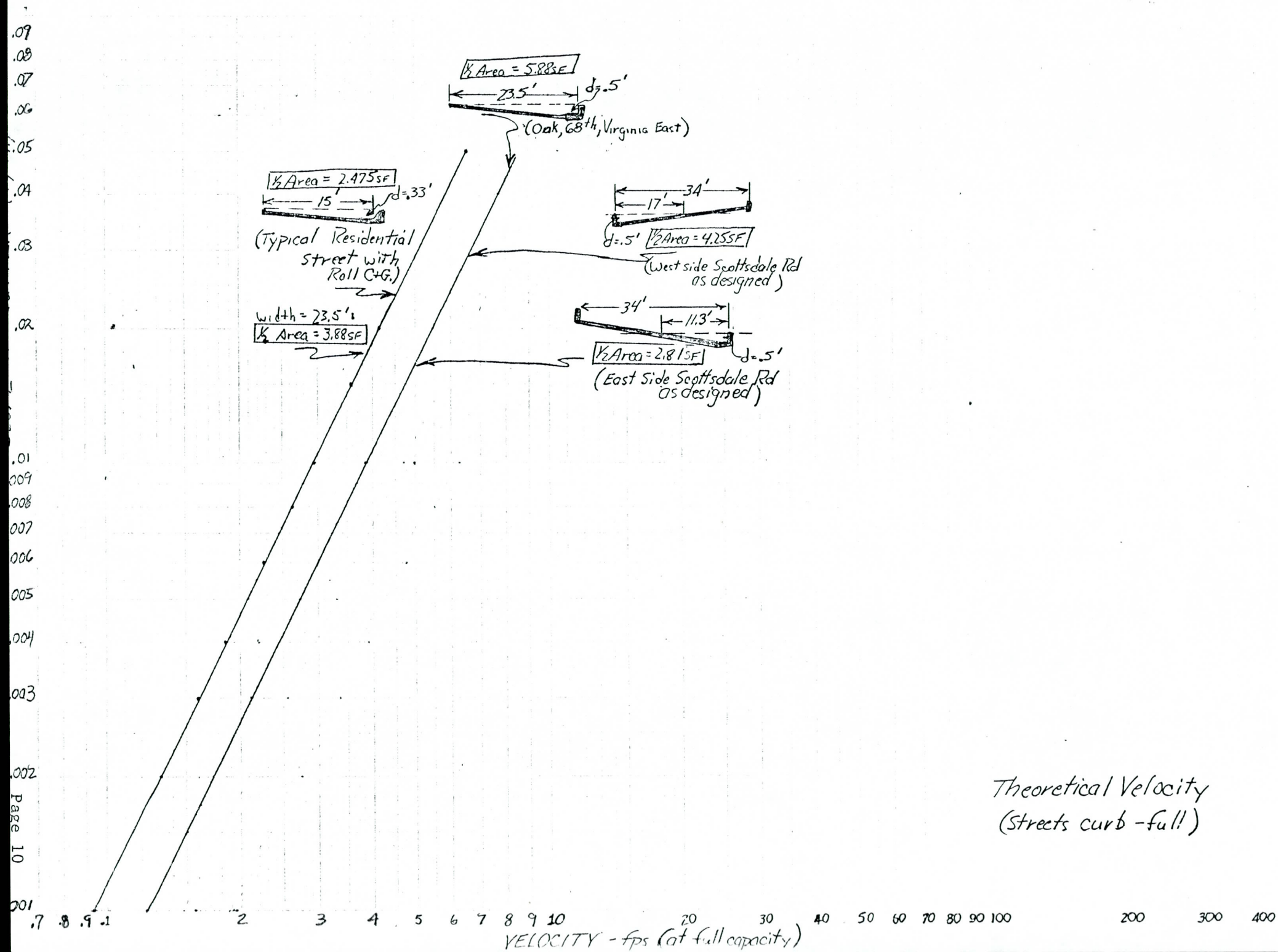
The following tabulation lists the major items of construction, and the estimated costs for the items, including repaving and appurtenances. The estimate does not include purchase of rights-of-way, engineering or inspection. Catch basins may in some places be replaced by slotted drains, at comparable cost. The estimate is based on current market conditions, as given by estimators in the construction industry.

FIRST DESIGN PHASE (Oak Street Main, for 10-year storm)

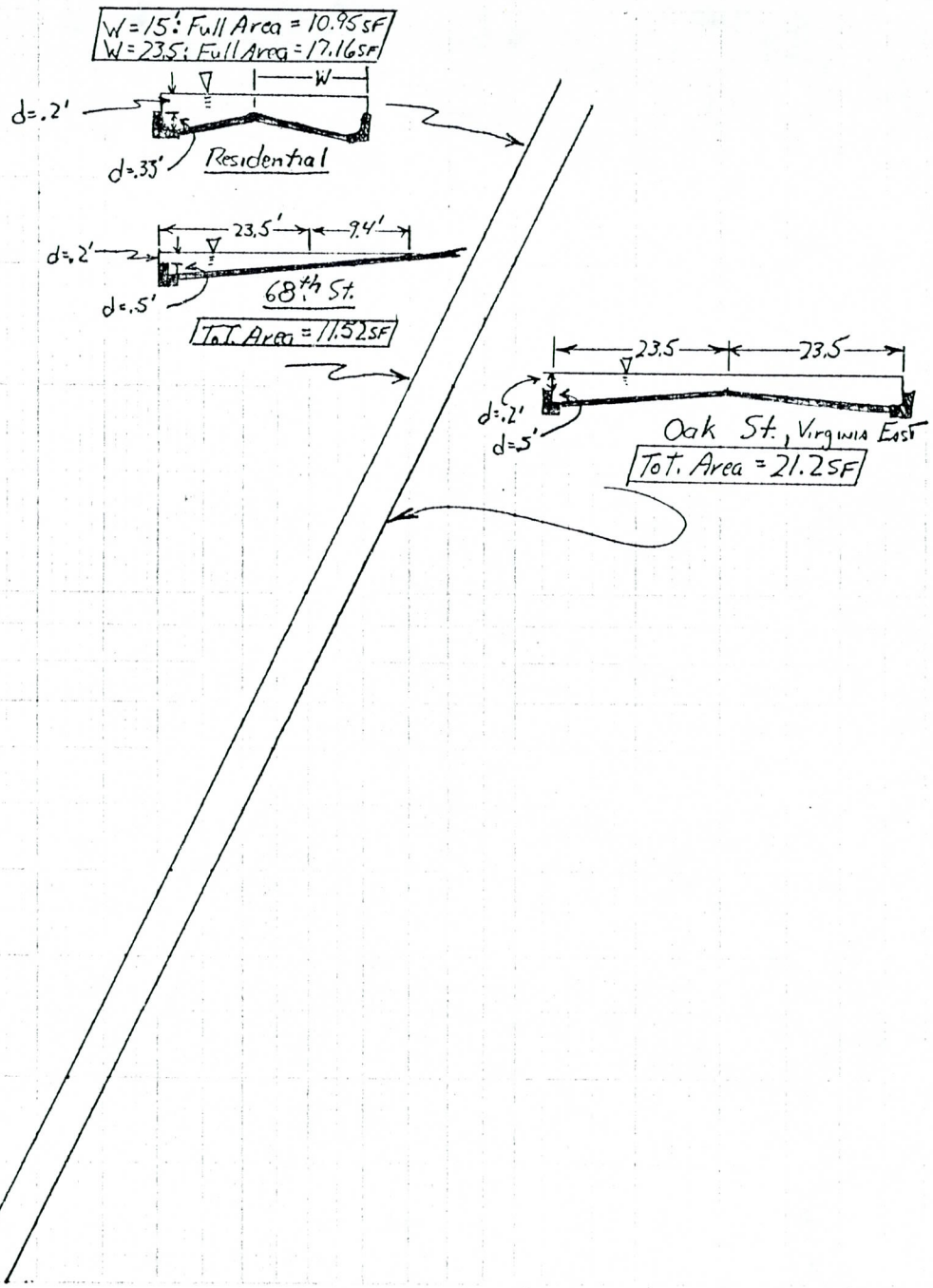
Item No.	Quantities	Description	Unit Price	Total
1.	500 L.F.	12" C.P.	$ 7.50	$ 3,750.00
2.	300 L.F.	39" R.C.P.	27.50	8,250.00
3.	1,545 L.F.	48" R.C.P.	42.50	65,662.00
4.	1,325 L.F.	60" R.C.P.	55.00	72,875.00
5.	680 L.F.	66" Ellip. R.C.P.	70.00	47,600.00
6.	550 L.F.	8' x 4' Single-Barrel Box Culvert	175.00	96,250.00
7.	6 Each	Manholes	1,600.00	9,600.00
8.	12 Each	Catch Basins	1,750.00	21,000.00
9.	3,000 S.Y.	Pavement Replacement	10.00	30,000.00
		Estimated Total Construction Cost:		$ 354,987.00

SECOND DESIGN PHASE (Scottsdale Road Lateral, for 10-year storm)

1.	640 L.F.	27" R.C.P.	$ 15.75	$ 10,080.00
2.	1,100 L.F.	42" R.C.P.	37.50	41,250.00
3.	230 L.F.	48" R.C.P.	42.50	9,775.00
4.	6 Each	Manholes	1,600.00	9,600.00
5.	12 Each	Catch Basins	1,750.00	21,000.00
6.	PAVEMENT REPLACEMENT (None, if done with paving).			
		Estimated Total Construction Cost:		$ 91,705.00

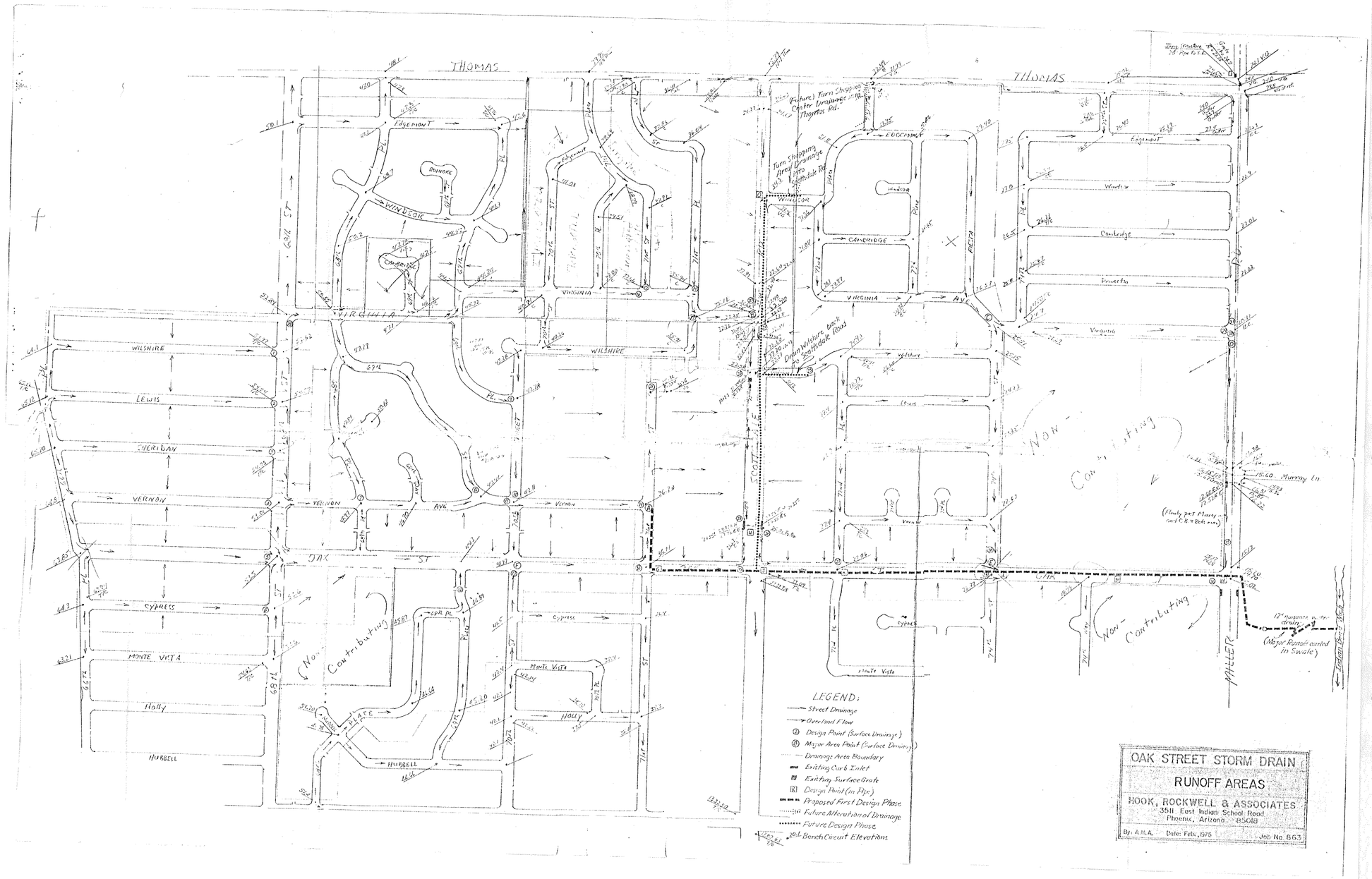


Theoretical Velocity
(Streets curb-full)



Theoretical Velocity
(Streets full plus 0.2')

Velocity for (running 0.2' Above Top of Curb)


THOMAS
THOMAS
EDGEMONT
WINDSOR
CAMBRIDGE
VIRGINIA
WILSHIRE
LEWIS
SHERIDAN
VERNON
OAK ST
CYPRESS
MONTE VISTA
HOLLY
HUBBELL
PLACE
SCOTT AVE
MILLER
Non-Contributing
Non-Contributing
Non-Contributing
Murray Ln.
(Major Runoff carried in Swale)
LEGEND:
Street Drainage
Overland Flow
Design Point (Surface Drainage)
Major Area Point (Surface Drainage)
Drainage Area Boundary
Existing Curb Inlet
Existing Surface Grate
Design Point (in Pipe)
Proposed First Design Phase
Future Alteration of Drainage
Future Design Phase
Bench Circuit Elevations
OAK STREET STORM DRAIN
RUNOFF AREAS
HOOK, ROCKWELL & ASSOCIATES
3511 East Indian School Road
Phoenix, Arizona 85018
By: A.M.A.
Date: Feb., 1975
Job No. 863