COMPREHENSIVE DRAINAGE STUDY

Rocky Hill, Connecticut

CE MAGUIRE, INC.
ARCHITECTS · ENGINEERS · PLANNERS

CABLE ADDRESS CEMI

CE MAGUIRE, INC.
ARCHITECTS · ENGINEERS · PLANNERS

31 CANAL STREET, PROVIDENCE, RHODE ISLAND 02903 401/272-6000
60 FIRST AVENUE, WALTHAM, MASSACHUSETTS 02154 617/890-0100
936 SILAS DEANE HIGHWAY, WETHERSFIELD, CONNECTICUT 06109 203/529-8674
7211 S.W. 62ND AVENUE, SOUTH MIAMI, FLORIDA 33143 305/661-5336
210 WEST STREET, KEENE, NEW HAMPSHIRE 03431 603/357-0111

PLEASE REPLY TO: One Court Street
New Britain, Connecticut 06051

August 11, 1975

Mr. Dana Whitman, Jr.
Town Manager
Town of Rocky Hill
699 Old Main Street
Rocky Hill, Connecticut 06067

Dear Mr. Whitman:

We are please to submit herewith our report for the Comprehensive Drainage Study of the Town of Rocky Hill, Connecticut. This report has been developed to furnish the Town with solutions to existing storm drainage problems, a comprehensive study of future drainage requirements to the year 2025, and the guidelines necessary for the Town to implement these improvements.

Authorization of the preparation of this report represented a significant step forward for the Town in addressing itself to Rocky Hill's storm drainage needs. We strongly urge that the Town Council adopt this report as the second step in your Storm Drainage Program.

Implementation, our ultimate objective, involves establishing a Capital Improvements Program (included herein) and requiring that all future storm drainage development be implemented using the recommended guidelines.

We feel that the findings and recommendations contained in this report will serve as a guide to the Town of Rocky Hill in solving the problems of flood control and storm drainage.

Very truly yours,

CE MAGUIRE, INC.

Russell D. Tong
Assistant Vice President

RDT:lem

COMPREHENSIVE DRAINAGE STUDY

ROCKY HILL, CONNECTICUT

PREPARED FOR

TOWN OF ROCKY HILL

ENGINEERING DEPARTMENT

ROCKY HILL, CONNECTICUT

CE MAGUIRE, INC.

ENGINEERS

AUGUST, 1975

ACKNOWLEDGEMENTS

Information and assistance were obtained from numerous individuals and agencies in connection with our investigation and studies for the preparation of this report. In particular, we would like to express our appreciation for the assistance and information provided by the Office of the Army Corps of Engineers at Waltham, Massachusetts; the Department of Transportation, Bureau of Highways, State of Connecticut; the Department of Agriculture Soil Conservation Service at Storrs, Connecticut; the U. S. G. S. in Hartford, Connecticut; and the State of Connecticut, Department of Environmental Protection.

Special acknowledgment is also made to the Town Manager, Mr. Dana T. Whitman, Jr., the Town Councilmen, Open Spaces and Conservation Commission and Mr. Manu Patel, Town Engineer (Ex-Officio).

TABLE OF CONTENTS

ITEM	PAGE
Letter of Transmittal	i
Acknowledgements	ii
Table of Contents	iii - iv
List of Figures	vi
List of Tables	vii
Appendices	viii
Glossary	ix - xi
SECTION A - INTRODUCTION	1
Statement of Problem	1
Purpose and Scope	2
Study Methods	2,3
SECTION B - SURVEY OF EXISTING TOWN CHARACTERISTICS	4
Drainage Basins and Drainage Pattern	4
Climatology	6
Temperature	6
Precipitation	7
Runoff	9
Water Table	9
Problem Drainage Areas	10
SECTION C - SURVEY AND ANALYSIS OF EXISTING FACILITIES AND PREVIOUS STUDIES	11
Previous Studies	11
Town Drainage System	11
Street Storm Drainage	11
Stream Drainage	12
Planning Requirements	13

TABLE OF CONTENTS

ITEM	PAGE
SECTION D - RECOMMENDED DESIGN CRITERIA AND GUIDELINES	14
Discharge	15
Runoff Coefficient	16
Rainfall Intensity	17
Catch Basins	18
Time of Concentration	18
Design Storm Frequencies	19
Coefficient of Friction	20
Pipe Cover	21
Pipe Bedding	22
Velocity of Flows	22
Size of Conduits	23
Closed Versus Open Drainage	23
Water Surface Elevations	24
Easements	24
Bends and Curves	25
Pipe Inverts	25
Manholes	26
Minimum Grades for Storm Sewers and Gutters	26
Types of Pipes	26
Erosion Protection	27
Flood Plains	29
Additional General Guidelines for Design of Municipal	31
Storm Drainage	31
Checking of Design Submittal	32
SECTION E - FLOOD CONTROL ON STREAMS - TRUNKS	35
Roadway Drainage Systems	36

TABLE OF CONTENTS

ITEM	PAGE
SECTION E - (CONTINUED)	
Terminology	37 - 38
Index Map For Drainage Basins	39
Index For Stream Analysis and Profiles	40 - 41
Stream Analysis and Profiles	42 - 124
Index Roadway Drainage Systems	125
Roadway Drainage Systems	126 - 138
SECTION F - FINDINGS AND RECOMMENDATIONS	139
Adequacy of Existing System	139 -140
Proposed New Drainage Systems	140 -142
Policies and Priorities	142 -144
Sources of Funds for Implementation	145
Inland Wetlands	146 -147
Flood Plains	148
Suggested Sequence of Operations	149 -151
SECTION G - A SUGGESTED ORDINANCE RELATING TO THE OBSTRUCTION OR POLLUTION OF RIVER, STREAM, BROOK, OR WATERCOURSE	152 -154
SECTION H - SUGGESTED CAPITAL IMPROVEMENT PROGRAM	
Cost Estimate Guidelines	155
Category I	156
Category II	157 - 159
Appendix A - Drainage Criteria	A-1 - A-28
Appendix B - List of References	B-1 - B- 2
Appendix C - 400 Scale Plan	

LIST OF FIGURES

FIGURE NO.		Page
1	Time of Concentration Chart (Seelye)	A-3
2	Intensity of Rainfall Graph	A-4
3	Rainfall Intensity Chart	A-5
4	Potter Izzard Graph	A-7
5	Flow Characteristic Curves for Gutters	A-12
6	Gutter Flow Analysis Form	A-13
7	Storm Sewer System Design Form	A-15
8	Hydraulic Capacity of Grate Inlet in Sump	A-19
9	Areas and Perimeters for Standard Connecticut Steel Frame and Grate	A-20
10	Riprap Channel or Ditch (Typical)	A-25
11	Design Chart for Riprap (Velocity vs. Slope)	A-26
12	Design Chart for Riprap (Discharge vs. Slope)	A-27
13	Filling of Flood Plain (Graphic Representation)	A-28

LIST OF TABLES

TABLE NO.	SUBJECT	PAGE
1	Monthly Temperatures	6
2	Monthly Precipitation	7
3	Monthly Snowfall	8
4	Runoff Coefficient "C"	16
5	Runoff Coefficient "C" For Zoning Districts	17
6	Design Storm Frequencies	19
7	Valves of Manning "n"	20
8	Minimum Width of Easements	25
9	Allowable Ditch Velocity	29
10	Stream Analysis - Dividend Brook	42
11	Stream Analysis - Auxiliary Cross Drains Dividend Brook Watershed	49,50,51
12	Stream Analysis - Hog Brook	54
13	Stream Analysis - Auxiliary Cross Drains in Hog Brook Watershed	59
14	Stream Analysis - Saw Mill Brook, East	61
15	Stream Analysis - Saw Mill Brook, West	66
16	Stream Analysis - Saw Mill Brook	70
17	Stream Analysis - Auxiliary Cross Drains in Saw Mill Brook, East Watershed	74,75
18	Stream Analysis - Auxiliary Cross Drains in Saw Mill Brook, West Watershed	77
19	Stream Analysis - Little Brook	79
20	Stream Analysis - Auxiliary Cross Drains in Little Brook Watershed	83
21	Stream Analysis - Valley Brook, East	86
22	Stream Analysis - Valley Brook, West	90
23	Stream Analysis - Valley Brook	94
24	Stream Analysis - Auxiliary Cross Drains Valley Brook, East	97
25	Stream Analysis - Auxiliary Cross Drains Valley Brook, West	99
26	Stream Analysis - Auxiliary Cross Drains in Valley Brook Watershed	101
27	Stream Analysis - Belden Brook	102
28	Stream Analysis - Auxiliary Cross Drains in Belden Brook Watershed	105
29	Stream Analysis - Tumble Brook	108
30	Stream Analysis - Auxiliary Cross Drains in Tumble Brook Watershed	112-113
31	Stream Analysis - Cold Spring Brook	117
32	Stream Analysis - Auxiliary Cross Drains in Cold Spring Brook Watershed	120
33	Stream Analysis - Auxiliary Cross Drains in Hang Dog Lane Brook and Westerly Terrace Brook Watersheds	121
34	Stream Analysis - Areas between Dividend Brook and Hog Brook	122

APPENDICES

APPENDIX NO.		PAGE
A	Rational Formula	A - 1
	Potter Izzard Formula	A - 6
	Selection of Pipe, Culvert and Channel Sizes	A - 8
	Gutter Flow Analysis	A - 9
	Storm Sewer System Design	A - 14
	Riprap	A - 21
B	List of References	B - 1
C	400 Scale Plans	

GLOSSARY

60": . . . . . Means one pipe of 60" diameter.

2 - 60": . . . . Means two pipes of 60" diameter each.

B = 12': . . . . Means the bottom width of the trapezoidal channel is 12'.

R.C.P. . . . . Reinforced concrete pipe

A.C.C.M.P. . . . Asphalt Coated Corrugated Metal Pipe

M.H. . . . . Manhole

C.B. . . . . Catch Basin

Sq.M . . . . . Square Miles

A. . . . . Area in Acres

"C". . . . . Runoff Coefficient

"I". . . . . Rainfall Intensity in inches/Hr.

Q . . . . . Discharge in cubic feet/second.

C.F.S. . . . . Cubic feet per second

"n". . . . . Coefficient of roughness in Manning's formula

"s". . . . . Slope of bottom of channel or pipe in feet/foot.

M.A.F. . . . . Mean Annual Flood having a frequency of 2.33 years.

M.D.C. . . . . Metropolitan District Commission

U.S.G.S. . . . . United States Geological Survey

Aquifer: Water-bearing stratum in soil.

Backwater Curve: The term applied to the longitudinal profile of the water surface in an open channel when flow is steady but non-uniform.

Catch Basin: A storm sewer structure to collect surface water.

Coefficient of Runoff "C": A factor in the Rational formula used to determine the runoff. It proportionally increases with increase in paved areas.

Design Discharge: The discharge that may be expected from the most severe combination of meteorologic and hydrologic conditions that can be considered reasonably characteristic of the geographical region involved.

Drainage Area : The area served by a drainage system receiving storm and surface water; or by a watercourse.

Encroachment Lines: These are the boundaries of areas adjacent to streams subject to flooding. Within these boundaries all development is restricted and regulated.

Erosion: Wearing away of the lands by running water and waves, abrasion and transportation.

Flood Plain: The lowland that borders a river, usually dry, but subject to flooding.

Floodway: A part of flood plain which, to facilitate the passage of flood water, is kept clear of encumbrances.

Free Board: It is the clearance between the design water level and bank level of a channel.

Laterals: Storm drains which receive storm water directly from streets, catch basins and surface flows, discharging to trunk drains.

Municipal or Street Storm Drainage: Drains storm water from the streets and roads through a network of laterals and trunks to their ultimate outfall in a natural stream. This is usually a closed conduit system.

Precipitation: All the water that falls as rain, snow, hail and sleet expressed as daily, monthly or annual inches of rainfall.

Recurrence Interval (Return Period): The average interval of time within which the given flood will be equalled or exceeded at least once.

Stream Storm Drainage: This involves drainage by natural streams, which usually traverse more than one municipality and includes flood protection works such as dams, dikes, embankments and deepening and realigning of open channels.

Section: Indicates the geometric configuration of the channel or drain and denotes the area of flow.

Storm Frequency: See Recurrence Interval.

Time of Concentration: The time required for water to flow from the farthest point on the watershed to the location of the drainage facility being designed.

Trunklines: Major arteries of storm drains collecting many lateral drains.

Water Table: The upper surface of zone of saturation. No water table exists where that surface is formed by an impermeable body.

SECTION A

INTRODUCTION

The Town of Rocky Hill is experiencing a continuous growth involving the development of large areas of land for residential, commercial and industrial use. This urban growth results in increased pavement area and changed topography which, in turn, greatly increase the problem of handling storm water runoff. Also, newly developed areas, if they encroach on flood plains, decrease the capacity of natural waterways. The result is flooding and damage during heavy rains.

It is essential that planning for future drainage be done now, based upon reliable projections of development and land use. If drainage facilities are planned for current needs only, they will assuredly be inadequate for future needs. Short-range planning also will result in excessive final costs because it will be necessary to later expand facilities to provide the required capacity.

This report furnishes a comprehensive study of future drainage needs in the Town of Rocky Hill based upon present zoning regulations and ultimate development of the Town according to those regulations.

STATEMENT OF PROBLEM

The Town of Rocky Hill has the following drainage problems:

1. To preserve the natural watercourses in the face of urbanization.

2. To expand the drainage system at the least expense and provide the greatest service.

3. To correct the deficiencies in the present storm drainage system.
4. To utilize flood plains for additional uses without causing flood obstruction.
5. To develop a master plan for a storm drainage system into which future developments will fit smoothly and economically.

PURPOSE AND SCOPE

The purpose of this report is twofold: (1) to provide general solutions to the problems stated above; (2) to furnish an effective framework for the implementation of anticipated problems. This report is comprehensive in scope, but does not deal with special local problems or provide detailed designs for any particular drainage line. Its contents, however, are based on a thorough, detailed study of all the relevant features and data pertaining to drainage problems in the Town of Rocky Hill.

STUDY METHODS

The contents of this report conform to Town, Regional, State and Federal regulations relating to storm drainage. Future planning and design shall conform to the design criteria developed under this report for the Town.

We have for the purposes of this study divided the storm drainage system in the Town of Rocky Hill into two types of drainage systems -- the Street Storm Drainage System and the Stream Drainage System. To provide for orderly urban growth, minimize costs to future generations and preclude loss of life and major property damage, the systems should be planned and designed separately.

Land use maps prepared by the Town have been used as the base for evaluation of anticipated future development. All drainage recommendations included in this report have provided for this future development.

Storm drainage data in previous reports prepared for the Town by Regional, State and Federal agencies and consultants were utilized in this study.

Where street storm drainage maps were not available, or were incomplete, information was obtained by field survey and used as the basis for the analysis of existing facilities.

Natural drainage ways are used for storm runoff wherever possible to eliminate the need of extensive piping and new channel construction.
For the purposes of this study we have based our analysis on the use of Reinforced Concrete Pipe and unpaved trapezoidal ditches and channels with grass and some weeds.

SECTION B

SURVEY OF EXISTING TOWN CHARACTERISTICS

DRAINAGE BASINS AND DRAINAGE PATTERN

The Town of Rocky Hill is located at the geographical center of the State of Connecticut. The Town is 13.6 square miles in area and measures approximately 4.4 miles east to west and approximately 3.1 miles north to south.

The Town is bounded on the west by the towns of Newington and Berlin; on the south by Cromwell; on the north by Wethersfield; and on the east by the Connecticut River and the Town of Glastonbury.

Rocky Hill is a suburban, agricultural, residential community. Generally the easterly half of the Town is the most developed area and the western portion is still largely agricultural. There is a 969-acre tract in the northeast corner known as the meadows which is part of the Connecticut River Flood Plain and is used mainly for expendable farm crops such as hay, etc. There are several commercial and large industrial zones scattered throughout the Town.

The entire watershed of the Town of Rocky Hill is located in the Connecticut lowland section of the New England Physiographic Province. The watershed is characterized by broad valleys and low hills and there are several small, permanent ponds. Elevations range from about 10 feet along the lower reaches of streams to about 250 feet on local hills. All of the area has been subject to glacial action.

The Town generally drains to the east from Interstate 91 to the Connecticut River and westerly from Interstate 91 to the Mattabasset River thence to the Connecticut River.

The Town of Rocky Hill is divided into the following principal brook watersheds having the noted lengths:

1. Dividend Brook (3.7± miles)
2. Hog Brook and its tributaries (2.3± miles)
3. Saw Mill Brook and its tributaries (4.0± miles)
4. Little Brook (1.7 ± miles)
5. Valley Brook and its tributaries (5.0± miles)
6. Belden Brook (0.7 ± miles)
7. Tumble Brook (1.8± miles)
8. Headwaters of Goff Brook* (0.8± miles)
9. Unnamed brooks (total 1.5± miles)

In general, drainage watershed boundaries seldom coincide with political boundaries and Rocky Hill is no exception. The natural watershed boundaries not only penetrate into neighboring communities but also extend into the adjacent Planning Region. It is therefore necessary to transcend the political boundaries of the Town for stream drainage planning. The seven major drainage basins in town have been subdivided into several smaller sub-basins. All are described and shown on enclosed plans.

* Note: The section of Goff Brook, located on the eastern boundary of the Town, is in the Connecticut River Flood plain and therefore will not be studied.

CLIMATOLOGY

An area's climate influences the nature and extent of storm drainage planning. The amount of precipitation, runoff and groundwater table are important factors which must be considered.

The climate of Rocky Hill is characterized by an even distribution of precipitation among the four seasons; wide daily and annual temperature ranges; notable climatic differences for the same season, or month, of different years; and considerable variety in the weather over short periods of time. Summers are generally warm to hot and winters are moderately cold. There are frequent, but usually short, periods of precipitation. In the late summer and autumn months, heavy rains pose a serious drainage problem in the area.

TEMPERATURE

The mean monthly temperatures over 60 years of record at the Bradley Field Weather Bureau Station are shown below. These are representative of temperatures experienced by the Town of Rocky Hill and, consequently, are valid for use in establishing design criteria for the Town.

MONTHLY TEMPERATURES (TABLE NO. 1)

Month	Mean	Month	Mean
January	27.5	July	73.0
February	27.8	August	70.6
March	37.0	September	63.6
April	47.9	October	53.4
May	58.9	November	42.1
June	67.7	December	30.5

ANNUAL MEAN - 50.0

PRECIPITATION

There is no rain or snowfall gauging station in Rocky Hill. The mean, maximum and minimum monthly precipitation for the past 60 years of record at Bradley Field is shown below. The average annual precipitation is approximately 43 inches as compared with 40 inches for the entire State of Connecticut and 30 inches for all of the United States.

MONTHLY PRECIPITATION (TABLE NO. 2)
(INCHES)

Month	Mean	Maximum	Minimum
January	3.61	7.7	0.91
February	3.21	5.72	1.54
March	3.69	9.21	0.29
April	3.68	7.66	0.65
May	3.43	7.04	0.73
June	3.46	8.08	0.66
July	3.67	11.24	0.54
August	3.98	21.87	0.93
September	3.52	14.59	0.20
October	3.03	11.61	0.18
November	3.71	7.36	0.87
December	3.55	6.88	0.78
ANNUAL	42.59	62.94	32.26

The table below shows the monthly average snowfall at Bradley Field for 60 years of record:

MONTHLY SNOWFALL (TABLE NO. 3)
(Depth in Inches)

Month	Snowfall	Month	Snowfall
November	1.9	February	12.1
December	8.1	March	7.5
January	10.9	April	1.5

Total Annual = 41.9

About 50 percent of the average annual precipitation in the Town enters the rivers as surface flow. The remainder is lost, principally by evaporation or underflow. Generally, the months of August, September and October have the highest maximum precipitation, whereas January and February have the lowest.

A recent very wet year was 1955. The runoff and high water levels experienced in that year are a good guide for designing major drainage structures. The rainfall for that year was 71.11 inches, approximately 12 inches of this falling within a 24-hour period.

Figure 2 gives the maximum rainfall for a selected duration of from five minutes to twenty-four hours with the expected return periods of from two years to one hundred years. This figure can be used for street drainage planning and design.

RUNOFF

The correct analysis of storm runoff is extremely important--that is, the determination of the peak rate of runoff, the volume, and the time distribution of flow. These factors provide the basis for all planning, design and construction of drainage facilities. To be in error here means that the works will be undersize or oversize--out of hydraulic balance. It must be kept in mind, however, that the result of runoff analysis is an approximation because too little is know about the factors influencing rainfall runoff. However, we do know that the primary factors are topography; available storage areas; soil type; size and slope of area; land use; and moisture conditions. All of these have an effect on the infiltration of rainfall into the ground. Because of several variables, known and unknown, involved in the computations of discharge, engineers have to either adopt actual observed discharges at gauging stations or resort to suitable empirical methods applicable to the area and project.

There are no stream gauging stations within the area studied. Hence, the empirical methods noted in this report are followed. These methods generally are approved by the regional and state agencies dealing with floods and drainage.

WATER TABLE

The water table is the surface of water under the ground, accommodating itself to the underlying geological and physical features. Groundwater moves very slowly; from inches per month to feet per day. Its general flow is in the direction of the slope of the water table which approximates that of the ground surface. For the most part, the surface of the water table

and the above-ground streams intersect at the shorelines of ponds; in fact, ponds may be considered outcrops of the water table.

The flow in the water table fluctuates, both locally and seasonally. Besides variations caused by the weather, groundwater flow is affected by the permeability of the water-bearing materials; the slope of the water table itself and of the ground surface; the type of vegetation; and the rate at which groundwater is being removed by pumping.

The replacement of all open channels by closed storm drains is not advisable in the Town of Rocky Hill because in that way we disturb the normal balance of water table level by eliminating the natural streams--the outlets for the water table--which would create drainage problems. For further discussion on this matter, reference may be made to the item "Closed versus Open Drainage" on Page 23 of this Report.

PROBLEM DRAINAGE AREAS

1. Southeast of Parsonage Street and Silas Deane Highway in the Valley Brook Drainage Area.
2. Northwest of Elm Street and Richard Street in the Valley Brook Drainage Area. Along West Valley Brook from Elm Street, Ridge Drive, Wright Road, Berkshire Road, Valley Brook Road, Textbook Avenue and Parsonage Street.
3. Northeast of West Street and Cromwell Avenue in the Saw Mill Brook Drainage Area.
4. East and west of New Road in the Saw Mill Brook Drainage Area.
5. Roadway Drainage Systems on State Highways and Town Roads.

Solutions to these problems have been formulated and can be found in SECTION - F, FINDINGS AND RECOMMENDATIONS of this Report.

SECTION C

SURVEY AND ANALYSIS OF EXISTING FACILITIES AND PREVIOUS STUDIES

The existing storm drainage and flood control facilities in the Town of Rocky Hill were scrutinized through exhaustive studies of various references, examination of previous studies, limited field surveys and interviews with persons who have had personal experience with storm water flow in the town. The following is a list of previous studies and a brief description of their scope.

Previous Studies

1. "Storm Drainage Guide for the Town of Rocky Hill, Connecticut", by W. G. Weaver & Associates, November 1967. This report included detailed recommendations concerning establishment of drainage criteria and factors for use by the Town in establishing a uniform basis for design of all future drains and systems. It also included a determination of the adequacy or inadequacy of certain existing drainage structures.

   The recommendations in this report need reviewing and updating to provide for the anticipated needs of the Town with total development in the light of the Zoning Map as of May, 1974.

2. "Study and Development Plan of Storm Water Drainage, 'Drum Hill' Sub-Drainage Basin for Town of Rocky Hill, Connecticut", by W. G. Weaver & Associates, July, 1968. This study covered detailed storm drainage design for the area of the Town known as "Drum Hill".

TOWN DRAINAGE SYSTEM

The existing town drainage system consists of open brooks and channels; some major storm drainage pipe systems; cross culverts under streets; street

drainage catch basins and pipes; and local drainage systems constructed by developers and turned over to the town for maintenance.

Open channels and ditches are the most common form of drainage in town. In many places, the system does not extend to regular streams, which would be its logical end. Many of the small, open, unnamed streams, themselves, meander and do not have well defined outlets. All these deficiencies need to be identified and corrected.

Street Storm Drainage

The existing roadway drainage system consists primarily of cross culverts which convey drainage from ditches and brooks under the roads, and isolated catch basin systems outletting through pipes into open channels.

Catch basins when provided are at the intersection of roads and at low points along the roadway. The roadways, in many cases, are below the elevation of the surrounding terrain which has often been raised around houses in order to provide effective runoff. Such runoff usually flows along the edge of the roadway to the catch basins and then is discharged into existing drainage ditches or streams. Existing street storm drainage is shown on the 200 scale topographic maps prepared in conjunction with this report. Reductions of these 200 scale maps are contained in this Report in Appendix C.

Stream Drainage

Although some studies have been carried out on major streams in Town, many small unnamed streams have not been analyzed. In many places, stream drainage systems are not capable of carrying off flood waters without overflowing and causing flooding.

PLANNING REQUIREMENTS

As a result of the studies of previous reports, the detailed analysis made for our preparation of this report, and in light of anticipated future drainage requirements, the following recommendations are made:

1. Establish standard design criteria to allow for future development requirements as well as conforming to Regional or State regulations.
2. Review all streams regarding their discharges, high flood levels and existing flood plains to establish guidelines for control of development.
3. Analyze the existing street storm drainage system to determine ways of correcting deficiencies for the present and future total development.
4. Establish guidelines so that major trunk lines will be capable of handling the future street draiange systems.
5. Prepare an overall master drainage plan as a guide for a future capital improvement program, both for short-range and long-range projects.

SECTION D

RECOMMENDED DESIGN CRITERIA AND GUIDELINES

The scope of this report does not include actual design and construction drawings for specific drainage problems. It is of the utmost importance to develop standard design criteria for the design and preparation of construction drawings before any substantial program for the solution of storm water problems can be undertaken. If this is not done, local practices, which may be inadequate or inconsistent in view of anticipated future developments and State or Regional regulations, would still prevail.

The recommended uniform design criteria and guidelines, if properly applied to future facilities, will result in a coordinated system of properly planned outfalls and local storm drains. These criteria and guidelines will also provide a common base for intermunicipal projects.

The procedures and practices followed by Federal, State and Regional agencies were considered in developing the criteria and guidelines. This is an important factor in expediting technical and financial assistance from State and/or Federal authorities for drainage projects initiated by the Town of Rocky Hill.

The design criteria represent current good engineering practice. They are not intended to be an iron-clad set of rules but are intended to establish guidelines, standards and methods for sound planning and design. They may be revised and updated as necessary to reflect advances in the field of urban drainage engineering, and urban water resources management.

The Comprehensive Drainage Plan developed in this Report will provide for the estimated total development of the Town based upon present zoning regulations.

DISCHARGE

The design discharge is the flow upon which the actual storm drainage system or flood control measures are based. It is dependent upon several factors: rainfall; runoff; anticipated land use; and storm-recurrence intervals. There is no single equation that can be applied to compute the discharge for all conditions and for every size drainage area. Moreover, the problem of forecasting future development in a specific section is more difficult than forecasting development for the entire Town. This factor of unreliability in the smaller drainage basins is important in forecasting design flows. We recommend that the following criteria be applied in determining the design discharge for all the basins in the Town of Rocky Hill.

THE DESIGN DISCHARGE SHOULD EQUAL FIVE TIMES THE MEAN ANNUAL FLOOD (M.A.F.) FOR ALL MAJOR STREAMS AND RIVER DISCHARGES.

To calculate the design discharge for drainage areas, use the following formulas:

a. The Rational Formula for areas up to 200-250 Acres.
b. The Potter Izzard Formula;
c. The New England Hill and Lowlands Area Method (NEHL);
d. "Estimating Peak Rates of Runoff from Small Watersheds" in portions of Connecticut and Massachusetts.

(Note: Items c and d are both published by the U.S.Bureau of Public Roads.)

Design discharge for storm drains in urban areas up to 200 Acres should be determined by utilizing the Rational Formula as detailed below:

$$Q = CIA$$

Q = Discharge in CFS

A = Area in acres - scaled from maps

I = Average railfall intensity in inches per hour

C = Coefficient of runoff

For the determination of "I", two additional factors, storm duration and storm frequency, must be determined. These parameters are shown in Section D of this Report.

RUNOFF COEFFICIENT "C" (TABLE NO. 4):

1.	Paved or otherwise impervious commercial or industrial areas	= 0.9
2.	Playgrounds, parks, farms, lawns, turf meadows, bare earth, unimproved open areas, cemeteries, railroad yards	= 0.3
3.	Cultivated fields, wooded or forested areas	= 0.2

4. Flood Plains = 0.2

5. Lawns in Residential or Public Places:

Flat 2% Slope or less	= 0.15
Average 2% to 7% slope	0.20
Steep 7% to 15% slope	0.30
15% to 25%	0.40
25% to 50%	0.50
50% and greater (2:1)	0.60

Values of "C" in Item 5 are for specific and detailed analysis

RUNOFF COEFFICIENT "C" FOR ZONING DISTRICTS (TABLE NO. 5):

Designation	Zoning Classification	Runoff Coefficient
R-40	Residence District	= 0.40
R-20	Residence District	= 0.45
RM	Residence District	= 0.50
RH	Residence District	= 0.60
T	Townhouse	= 0.50
NC	NeighborhoodCommercial District	= 0.60
C	Commercial District	= 0.60
HC	Heavy Commercial District	= 0.65
M	Manufacturing District	= 0.70
FP	Flood Plain District	= 0.20

INTENSITY OF RAINFALL "I":

Rainfall intensity - duration - frequency values for the Town of Rocky Hill are recommended as determined for the City of Hartford and vicinity (Figure 2). These values have been derived from Technical Paper No. 40, "Rainfall Frequency Atlas of United States". Rainfall intensities to be used in the Rational Formula should be for a specific frequency of storm and for duration equal to the time of concentration.

CATCH BASINS

Catch basins should be constructed at all low points and at all street intersections and are required at intermediate points along streets where the travel lane would be flooded or gutter capacity would be exceeded without them. It is recommended that Connecticut Department of Transportation Standards regarding type of catch basins be adhered to in the design of storm drainage systems. Required catch basin spacing shall be determined by analysis of gutter flows. Maximum spacing of catch basins shall be 300 feet.

TIME OF CONCENTRATION (DURATION TIME)

Time of concentration, or duration time, for use in the Rational Formula is composed of an overland flow-time plus a channel or pipe flow-time. Overland flow-time can be computed as described on Page A-3 of Appendix A and channel or pipe flow-time can be estimated with reasonable accuracy from the hydraulic characteristics of sewers. Normally, the average-full velocity of the conveyance for the existing or proposed hydraulic gradient is used. Channel or pipe flow-time is then determined as the flow-length divided by average velocity.

DESIGN STORM FREQUENCIES (TABLE NO. 6)

1.	Drainage Systems Along Roadways - Laterals and Trunks	
	a. Areas contributing to Town Roads	= 10 years
	- at sags in cut	= 25 years
	b. Areas contributing to State Highways	= 25 years
	- at sags in cut	= 50 years
2.	Channels, Ditches and Drainage Structures	
	a. No watercourse	= 25 years
	b. Watercourse	= 50 years
	c. Watercourse with discharges over 500 cfs 5 x M.A.F.	=100 years
	d. Drainage areas in excess of 1,000 Acres 5 x M.A.F.	=100 years
3.	Streams and Stream Crossing Structures	
	5 x M.A.F.	=100 years
4.	Encroachment Lines	
	5 x M.A.F.	=100 years
5.	Flood Plains	
	5 x M.A.F. or flood on record	=100 years

COEFFICIENT OF FRICTION "n"

The flow in conduits and channels is calculated by the Manning Formula:

$$Q = \frac{1.486}{n} \times A \times R^{2/3} \times S^{1/2}$$

Q = Flow in cfs

n = Coefficient of friction of pipe or channel

A = Area of Flow

R = Hydraulic Radius = $\frac{\text{Flow Area}}{\text{Wetted Perimeter}}$

S = Slope of Gradient

VALUES OF "n" (TABLE NO. 7)

PIPE	
Asbestos Cement	0.012
Bituminized Fiber	0.012
Cast Iron	0.013
Clay, vitrified	0.012 - 0.014
Concrete, portland cement	0.015
Corrugated metal 2 2/3 inch x 1/2 inch corrugations	
100 percent smooth asphalt lining	0.013
Paved invert	
50 percent of periphery paved	0.015
25 percent of periphery paved	0.019
Unpaved	
asphalt coated or non-coated	0.024
Corrugated Metal (6-inch x 2-inch corrugations field bolted)	0.030
Plastic	0.012
Steel Pipes	0.009 - 0.011

VALUES OF "n" (TABLE NO. 7)

OPEN CHANNELS

Paved	
Asphalt concrete, smooth texture	0.013
Asphalt concrete, rough texture	0.016
Concrete, portland cement	0.012 - 0.017
Riprap	0.034 - 0.041
Unpaved	
Fairly Uniform Section	
-No vegetation	0.022 - 0.025
-Grass, some weeds	0.025 - 0.030
-Dense weeds	0.030 - 0.035
Not Maintained	
-Dense weeds	0.080 - 0.120
-Clean bottom brush on banks	0.050 - 0.080
Natural Stream Channel	
Fairly uniform Section	
-Some grass and weeds	0.030 - 0.035
-Dense growth of weeds	0.035 - 0.050
-Weeds and heavy brush on banks	0.050 - 0.070

PIPE COVER

Normally, the minimum pipe cover for all storm drainage lines is set at 24" unless special pipe bedding and cover protection are provided. Special pipe bedding and cover protection are costly items and should be used only where absolutely required. For detailed procedures for the design of bedding and cover protection, the following items must be considered:

1. Determination of earth loads
2. Determination of live loads
3. Selection of bedding
4. Determination of load factor
5. Application of factor of safety
6. Selection of pipe strength

Reference should be made to a "Design Manual" as supplied by the manufacturer of the pipe used.

PIPE BEDDINGS

The State Highway Standards should be followed regarding pipe beddings and trench widths. For further details, reference should be made to a "Design Manual" for the type of pipe used.

VELOCITY OF FLOWS

It is common practice to design storm drains to be self-cleaning during moderate storms. The minimum slope should be that which will produce a cleaning velocity equal to or greater than three feet per second when the drain is flowing full.

The maximum desirable velocity of storm water flowing in closed drainage systems is ten feet per second. The maximum is set because of potential erosion of the pipe by sand and gritty material carried in the flow.

In open ditches and channels where silt, sand and gravel are being transported, the recommended allowable velocity may vary from two feet per second in channels of sandy loam to six feet per second for coarse gravel channels and higher for paved or rocklined channels.

SIZE OF CONDUITS

Circular conduits carrying flow from more than one catch basin should not be less than fifteen inches in diameter. This will provide space for silting of the invert during low flows. The conduits should be sloped so that the outfall is no lower than the backwater levels into which it flows.

CLOSED VERSUS OPEN DRAINAGE

Street storm drainage systems are normally of a closed conduit type. Large brooks, streams, or minor rivers may also flow in closed conduits in thickly populated areas in order to increase land utilization and to avoid the hazards of an open channel. Most often, however, large streams or small brooks, even those passing through developed areas, may be in open channels with delineated encroachment lines. Open channels are more desirable than closed conduits because storms of frequencies and intensities greater than that of the design storm would cause fewer problems. Further, open channels are more readily adaptable in low-lying and marshy areas where it is advantageous to lower the water table by constructing an open channel. They are also more beneficial from an environmental standpoint as they provide an open source of water for wildlife and vegetation for wildlife. The criteria

to use in deciding whether to use closed or open drainage is governed by benefits to be derived in the form of health, safety, decreased property damage, and environmental aspects, as compared with the cost of improvement.

Because maintenance of channels and pipes is absolutely essential for their efficient and optimum functioning, we recommend the provision of a regular maintenance appropriation. Furthermore, the public should be educated not to use storm drains for trash disposal, and regulations against dumping debris in storm drains should be enforced.

WATER SURFACE ELEVATIONS

The permitted water surface elevations in a stream must be determined from the elevation of its downstream outfall. Upstream elevations can be determined by backwater curve calculations for the design discharge to be carried by the use of known or predicted water-surface elevations at the downstream end of a stream. A minimum free-board of two feet should be provided above the selected water surface elevations. Bridge and major culvert sections and other obstructions should have a minimum clearance above the water surface of 2.0 feet. For lakes, ponds, reservoirs and bodies of water having large surface areas, a minimum free-board of 3.0 feet is desirable.

Channel improvement programs should start from their most downstream locations. Improvements made upstream before the downstream improvements can create flooding and great damage.

EASEMENTS

To provide working space for maintenance equipment within rights-of-way acquired for drainage installations, the following minimum widths shall apply:

MINIMUM WIDTH OF EASEMENTS (TABLE NO. 8)

Pipe Size	Minimum Width	Location of Centerline of Pipe Easement
Under 24"	20 feet	5' from edge of drainage easement
24" to 48"	25 feet	10' from edge of drainage easement
48" to 72"	30 feet	15' from edge of drainage easement

BENDS AND CURVES

Changes in direction of pipes are most commonly effected at manhole structures. This should be accomplished by proper location of the inlet and outlet openings and finishing of the invert in the structure to reflect the desired angular change of direction.

Where it is not feasible to restrict grade or alignment changes in pipes to manhole structures, other alternatives of providing bends and curves as detailed in the "Design Manual" as supplied by the manufacturer for the proposed type of pipe should be adopted.

PIPE INVERTS

When constructing an additional pipe of different diameter alongside an existing pipe, the slope of the new pipe should be kept the same as that of the existing with matching of crown elevations for both pipes the preferred method.

MANHOLES

Customarily, a manhole or a junction structure is provided at all changes in grade, pipe size, direction of flow, and quantity of flow. The maximum spacing of manholes shall be 350 feet.

Determination of head losses in manholes or junction structures is a tedious and time-consuming process. A suitable assumption of head losses is usually justified.

MINIMUM GRADES FOR STORM SEWERS AND GUTTERS

Uniform storm sewer slopes shall be maintained between manholes unless specifically approved otherwise. Minimum slopes shall be such as to give a velocity of 3.0 feet per second when flowing full. Normal grades will be governed by geometry, capacity and roughness of conduit.

TYPES OF PIPES

Pipes normally shall be reinforced concrete.

Corrugated metal pipe, arches, and pipe arches should be used when:

1. Available slope is over ten percent and loss of head through the pipe is not of critical significance; or,

2. Height of roadway or ground level from invert of pipe is limited (for arches only); or

3. Pipes are to be placed in areas where a possibility of settlement exists.

EROSION PROTECTION

Where there is sufficient allowable headwater depth, a choice of inlets may not be critical, but where headwater depth is limited, where erosion is a problem, or where sedimentation is likely, a special inlet may be required to obtain necessary discharges for the culvert. The following types of inlets and outlets are recommended for various locations and requirements:

1. Inlets and Outlets with Endwalls: Endwalls are recommended for a variety of reasons such as increasing the efficiency of the inlet, providing embankment stability, providing embankment protection against erosion, and ease of maintenance. Therefore, we recommend that endwalls be used on all pipe ends in the Town of Rocky Hill. Flared end sections may be substituted for endwalls where appropriate for the development of the area.

2. Endwalls with Wingwalls: In addition to the endwalls on all pipe ends, we recommend the use of wingwalls where the side slopes of the channel adjacent to the entrance are unstable and/or where the culvert is skewed to the normal channel flow. A short-channel apron should be provided at the toe of endwall if the approach velocity is likely to cause scour.

3. Endwalls: Among these are special end sections with the advantages of less maintenance around the pipe end, less damage due to maintenance work, an increase in embankment stability or a reduction in erosion at the outlet. These are recommended where maintenance equipment must be used near the pipe end or where, for aesthetic reasons, a projecting entrance is considered too unsightly.

4. Mitred Pipe Ends: The use of this type is recommended predominantly with corrugated metal pipes. It is not recommended in unpaved embankment slopes.

DITCHES AND CHANNELS

In ditches where flow velocities exceed the maximum allowable velocity for the soil, the original soil shall be protected with suitable lining. The maximum allowable velocities in ditches or channels for various types of lining are as follows:

ALLOWABLE DITCH VELOCITY (TABLE NO. 9)

Type of Lining	Allowable Velocity Ft./Sec.
Fine Sand	1.5
Silt and Loam	2.0
Firm Loam	2.5
Fine Gravel or Bunch Grasses	3.0
Stiff Clay	4.0
Coarse Gravel or Meadow Type Grass	5.0

Where erosion protection is required, the type used shall be determined in the drainage design.

FLOOD PLAINS

Within the context of this drainage study, the flood plain management regulations are for the purpose of:

1. Lessening the exposure of property and facilities to flood hazards

2. Improving the long-range land management and use of flood-prone areas.

3. Discouraging an unplanned and wasteful future development in such areas.

The following regulations shall serve as guidelines for all uses within flood plains:

a. The flood protection elevation (first floor or height) shall correspond to a point two feet above the elevation of flood profile, shown in this report for a design flood.

b. No structure (temporary or permanent) or fill or other flood plain use shall be permitted that affects the efficiency or capacity of the floodway. (Floodway is that portion of flood plains which carries a substantial volume of water.)

c. Within the flood plains, but outside floodways or encroachment lines, restricted uses shall be permitted.

d. Filling flood plains outside floodways may be permitted with appropriate hydraulic studies establishing not more than one foot rise in back water profiles as compared to existing conditions. Figure 13 gives a graphic presentation of this criteria.

ADDITIONAL GENERAL GUIDELINES FOR DESIGN OF MUNICIPAL STORM DRAINAGE

The following factors should also be considered in the design of a municipal storm drainage system:

1. The route which flood or runoff water will follow when there is a blockage in any existing drainage system or if that system should prove inadequate

2. The provision of traps, such as raised embankments for walk-ways on individual residential lots which would temporarily retain flood water.

3. The encouragement of the planned introduction of permanent retention areas in open places where permitted by the topography and climatology.

4. The planning of longer paths of storm water overland flow wherever possible to effect economies so that some lengths of drain may be eliminated.

5. The use of open joints in pipes, or perforated conduit, in specific areas of high water table.

6. The design of inlets of maximum capacity in accordance with available research findings to insure that the full capacities of existing urban conduits are utilized.

7. The consideration of costs, which are of particular significance in small communities and in areas of low population density and scattered development.

CHECKING OF DESIGN SUBMISSIONS

As an aid to the developer and design engineer as well as to those reviewing storm drainage plans, the following check lists are presented. These check lists should conform to the design criteria established for the Town.

The submittals should be in three main parts:

I. Basic Data

II. Layout Plans

III. Construction Plans and Cost Estimate

All the plans submitted in the above categories should have the following:

a. Title Block (lower right-hand corner perferred)

b. Scale and North Arrow

c. Date and Revisions, if any

d. Spaces for Approvals with Date Spaces.

e. Drawing Number

f. Professional Engineer's Seal

Check lists for the three main parts are as follows:

I. BASIC DATA

1. Map of total drainage basin (M.D.C. Map at 1"=200')
2. Map of the area to be storm sewered (1"=100') minimum.
3. Location and elevation of outfall points
4. Character of future development
5. Degree of imperviousness

6. Soil and Water Table Data

7. Method of Discharge Computations

8. Discharge Computations

9. Upstream Storage

II. LAYOUT PLANS

1. Scale (1"=100') Minimum

2. Contours (maximum 2.0 foot-interval)

3. Location and elevation of M.D.C. bench marks

4. Property lines

5. Boundary lines (counties, cities, sewer districts, drainage areas, etc.)

6. Subdivisions (name and location by section)

7. Streets with names, grades, widths and flow direction

8. Existing drainage structures and drainage ways including flow directions

9. Drainage basin and sub-basin boundaries

10. Easements required

11. Proposed curbs and gutters and gutter flow directions

12. Proposed inlet locations and inlet sizes

13. Proposed piping and open drainage ways

14. Existing drainage system

15. Existing and proposed utilities including removals and replacements of utilities

III. CONSTRUCTION PLANS AND COST ESTIMATE

1. Scale (1"=40' Horizontal)
(1"= 4.0' Vertical)

2. Property lines and ownership or subdivision information.

3. Street names and easements with width dimensions

4. Test-hole locations and boring logs

5. Existing utility lines (buried), location and depth of water, gas, telephone, storm drain, and sanitary sewers.

6. Ground surface, existing and proposed

7. Existing utility lines where crossed

8. Existing and proposed pipes with profile size, lengths, types, manholes, grade inlets and outlets, invert elevations and bedding details.

9. Open channels showing profile, grade cross section, lining details.

10. Special structures (manholes, culverts, endwalls, etc.)

SECTION E

FLOOD CONTROL ON STREAMS - TRUNKS

Stream storm drainage involves drainage by natural streams, which sometimes may traverse more than one municipality, and includes flood protection works such as dams and dikes. For economy and efficiency, such a system should be designed for a watershed basin, even though the natural boundaries of such a basin seldom coincide with the political boundaries of a town. The planning and implementation of stream control measures must, therefore, be based upon consideration of the entire stream length and watershed, rather than, merely, that portion of the stream that lies within one political boundary.

The basic methods used to provide control for stream storm drainage in the Town of Rocky Hill are:

1. Improving the channel by widening, deepening and realigning;
2. Maintaining the channel's capacity and capability of carrying off excess storm water rapidly by preventing the collection of debris;
3. Providing dikes or levees for protection against high flood stages; or flood control dams for the temporary storage of flood waters to reduce peak flows and flood stages; or
4. Piping a channel all along its length.

Any or all of these corrective steps should be adopted only after a detailed study of their hydraulic, environmental, and social impact has been made.

The analysis of present and proposed conditions of major streams follows. For each stream, this analysis includes design discharges, water surface levels, flood plain area, proposed channel, and proposed modification to structures where applicable. The data in existing reports which is still valid has been utilized.

Roadway drainage systems within the Town of Rocky Hill involve two types of roads: State Highways and Town Roads and Streets. Each of these road systems will be discussed separately within this section of the Report.

Based upon our analysis of the existing systems, many deficient areas have been noted. Corrective steps for these deficiencies have been noted.

Before any corrective action is taken, detailed studies and designs should be made considering hydraulic, environmental and social impacts.

EXPLANATION OF TERMINOLOGY USED ON PLANS FOR DEFINING STREAMS AND DRAINAGE AREAS

i.

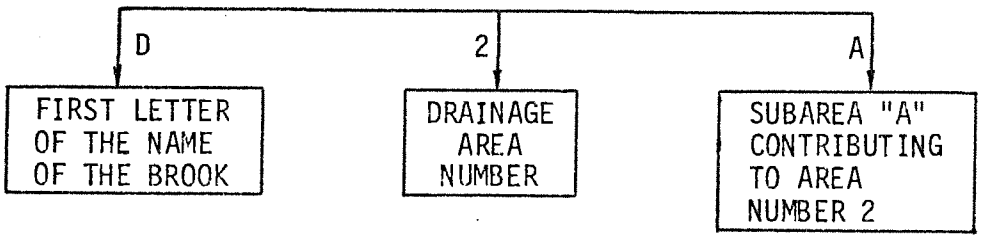
Letter	B	Refers to	Belden Brook
"	D	" "	Dividend Brook
"	H	" "	Hog Brook
"	SM	" "	Saw Mill Brook
"	SM(E)&SM(W)	" "	Saw Mill Brook East and West
"	L	" "	Little Brook
"	V	" "	Valley Brook
"	V(E)&V(W)	" "	Valley Brook East and West
"	T	" "	Tumble Brook
"	CS	" "	Cold Spring Brook
"	HD	" "	Hang Dog Lane Brook
"	WT	" "	Westerly Terrace Brook
"	BE	" "	Areas between Dividend and Hog Brooks

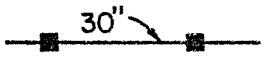
ii. D-3 refers to Drainage Area Number 3 in the Dividend Brook Watershed.

iii. D-2A refers to Drainage Sub-Area Number 2A in the Dividend Brook Watershed which ultimately contributes to Drainage Area Number 2 in the Dividend Brook Watershed.

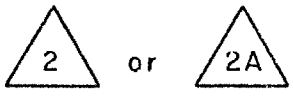
iv. DO-6 refers to the total Drainage Area Number 6 in the Dividend Brook Watershed. The letter "O" indicates that drainage area outside the Town of Rocky Hill is also contributing and is included.

EXAMPLE: D-2A





Proposed Drainage System



Number of Cross Drain and Location

EXPLANATION OF TERMINOLOGY USED IN THE FOLLOWING STREAM ANALYSIS TABLES

Indication in the columns:

Crossdrain No. & Location

Station

refers to the cross drain number and location as shown on the plans and profiles.

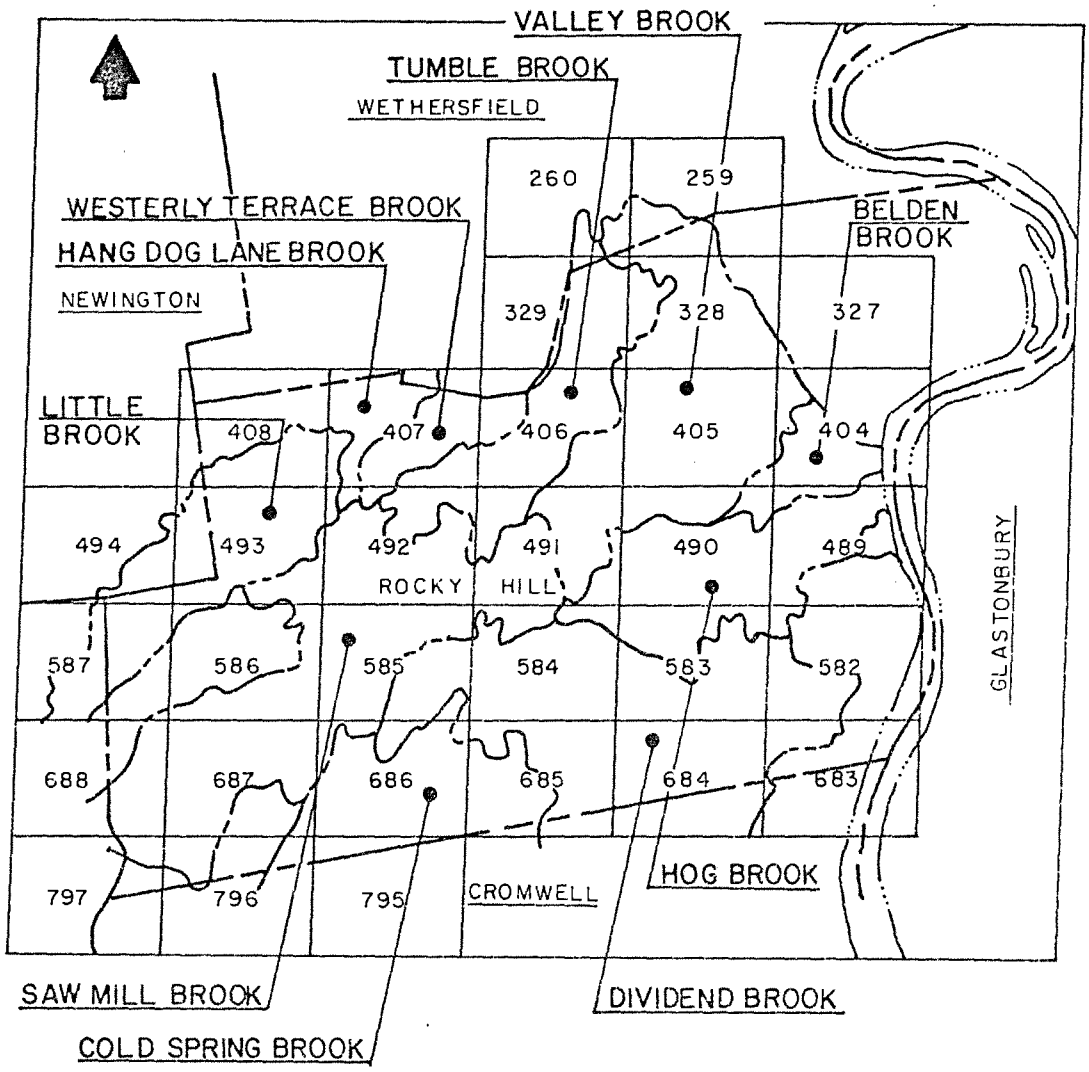
Indication in the Remark column:

Q = 150

means discharge (CFS) based on present development is 150 CFS.

High - Middle - Low

means degree of priority for replacement of existing structure. These priorities are based to accommodated present discharge and prevent property damages.


VALLEY BROOK
TUMBLE BROOK
WETHERSFIELD
WESTERLY TERRACE BROOK
HANG DOG LANE BROOK
NEWINGTON
BELDEN BROOK
LITTLE BROOK
260
259
329
328
327
408
407
406
405
404
494
493
492
491
490
489
ROCKY HILL
587
586
585
584
583
582
688
687
686
685
684
683
797
796
795
CROMWELL
HOG BROOK
GLASTONBURY
SAW MILL BROOK
COLD SPRING BROOK
DIVIDEND BROOK

INDEX PLAN

STREAM ANALYSIS AND PROFILES

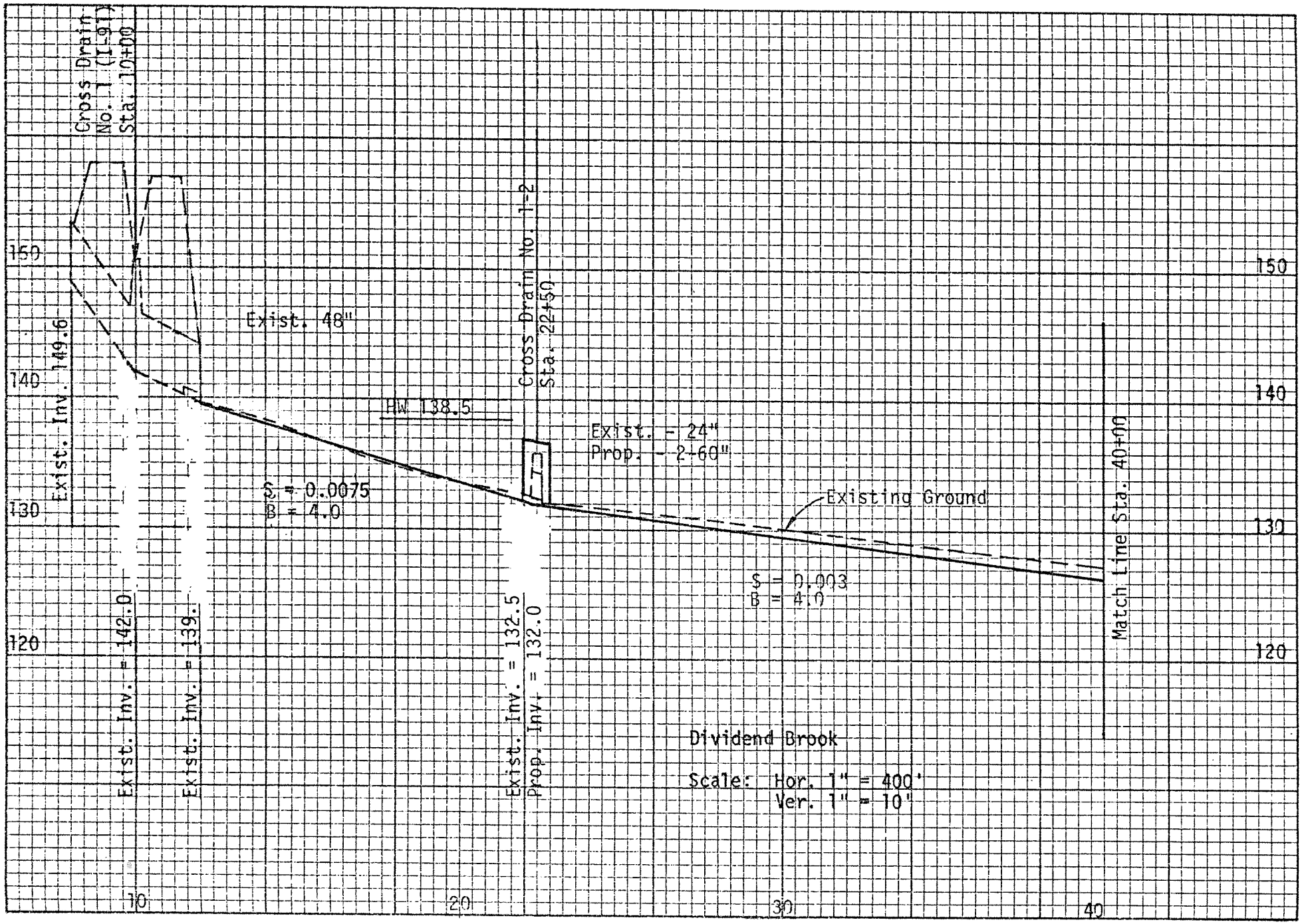
	Page No.
DIVIDEND BROOK	42
Profiles	43 - 48
Auxiliary Cross Drains	49 - 51
Profiles	52 - 53
HOG BROOK	54
Profiles	55 - 58
Auxiliary Cross Drains	59
Profiles	60
SAW MILL BROOK (EAST)	61
Profiles	62 - 65
SAW MILL BROOK (WEST)	66
Profiles	67 - 69
SAW MILL BROOK	70
Profiles	71 - 73
Auxiliary Cross Drains (East)	74 - 75
Profiles	76
Auxiliary Cross Drains (West)	77
Profiles	78
LITTLE BROOK	79
Profiles	80 - 82
Auxiliary Cross Drains	83
Profiles	84 - 85
VALLEY BROOK (EAST)	86
Profiles	87 - 89
VALLEY BROOK (WEST)	90
Profiles	91 - 93
VALLEY BROOK	94
Profiles	95 - 96
Auxiliary Cross Drains (East)	97
Profiles (East)	98
Auxiliary Cross Drains (West)	99
Profiles (West)	100
Auxiliary Cross Drains	101
BELDEN BROOK	102

	Page No.
Profiles	103 - 104
Auxiliary Cross Drains	105
Profiles	106 - 107
TUMBLE BROOK	108
Profiles	109 - 111
Auxiliary Cross Drains	112 - 113
Profiles	114 - 116
COLD SPRING BROOK	117
Profiles	118 - 119
Auxiliary Cross Drains	120
HANG DOG LANE BROOK AND WESTERLY TERRACE BROOK	121
UNNAMED BROOKS IN AREAS BETWEEN DIVIDEND AND HOG BROOK	122
Profiles	123 -124

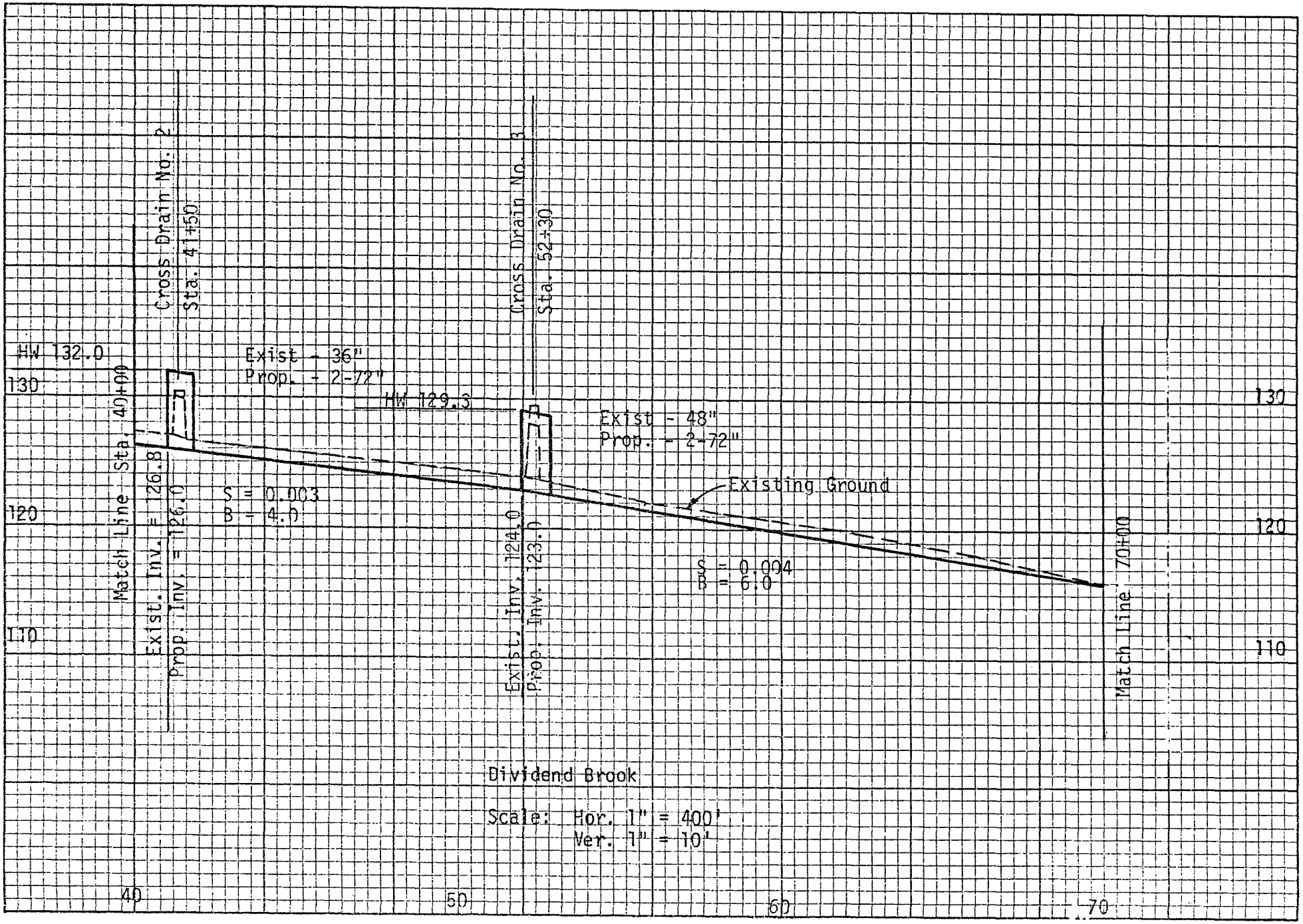
STREAM ANALYSIS - DIVIDEND BROOK (TABLE NO. 10)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL		REMARKS
							Bottom Width	Water Depth	
1				48"	149.6				
I-91	10+00	95	212	Same	Same	160.8	4.0'	3.4'	
				24"	132.5				Q = 153.6
1-2	22+50	192	390	2-60"	132.0	138.5	4.0'	4.8'	Low
				36"	126.8				Q = 204.0
2	41+50	326	440	2-72"	126.0	132.0	4.0'	5.0'	Low
				48"	124.0				
3	52+30	357	470	2-72"	123.0	129.3	6.0'	5.5'	Low
4				48"	114.0				
Brook St.	77+00	513	570	2-72"	113.0	120.4	8.0'	5.3'	High
				66"	103.0				
5	103+60	719	665	2-72"	102.0	110.4	10.0'	5.6'	Low
6				72"	100.5				
Main St.	114+00	1003	820	2-72"	98.5	108.7			Low
7				2-36"	23.0				
DAM	185+70	1568	1160						Exist. Dam
8				36" x 36" Box					Conn. River H.W. El. 16.0
Railroad	187+20	1568	1160	10'-0 x 10'-0 Box	12.0	23.0			Middle

K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



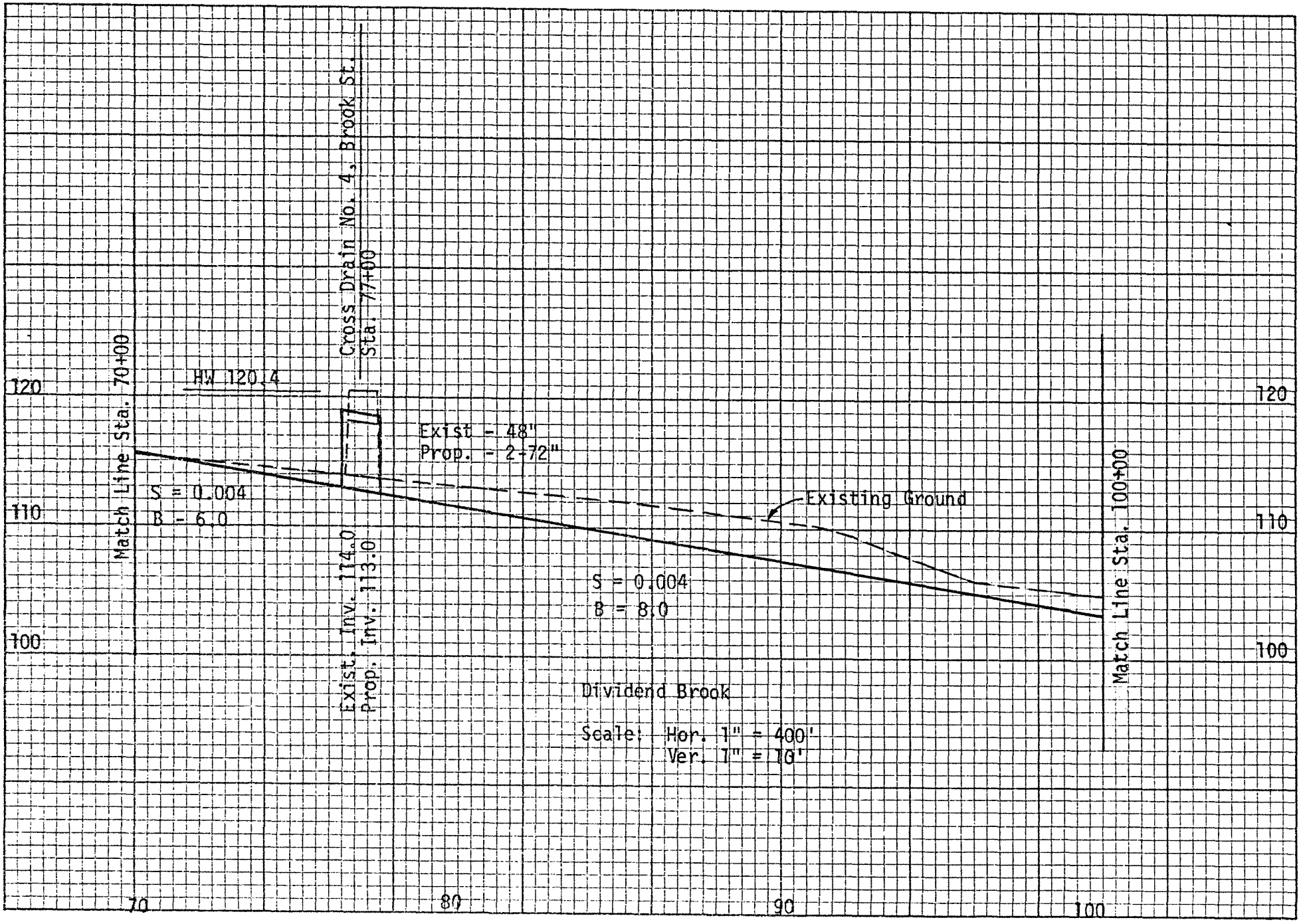
K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



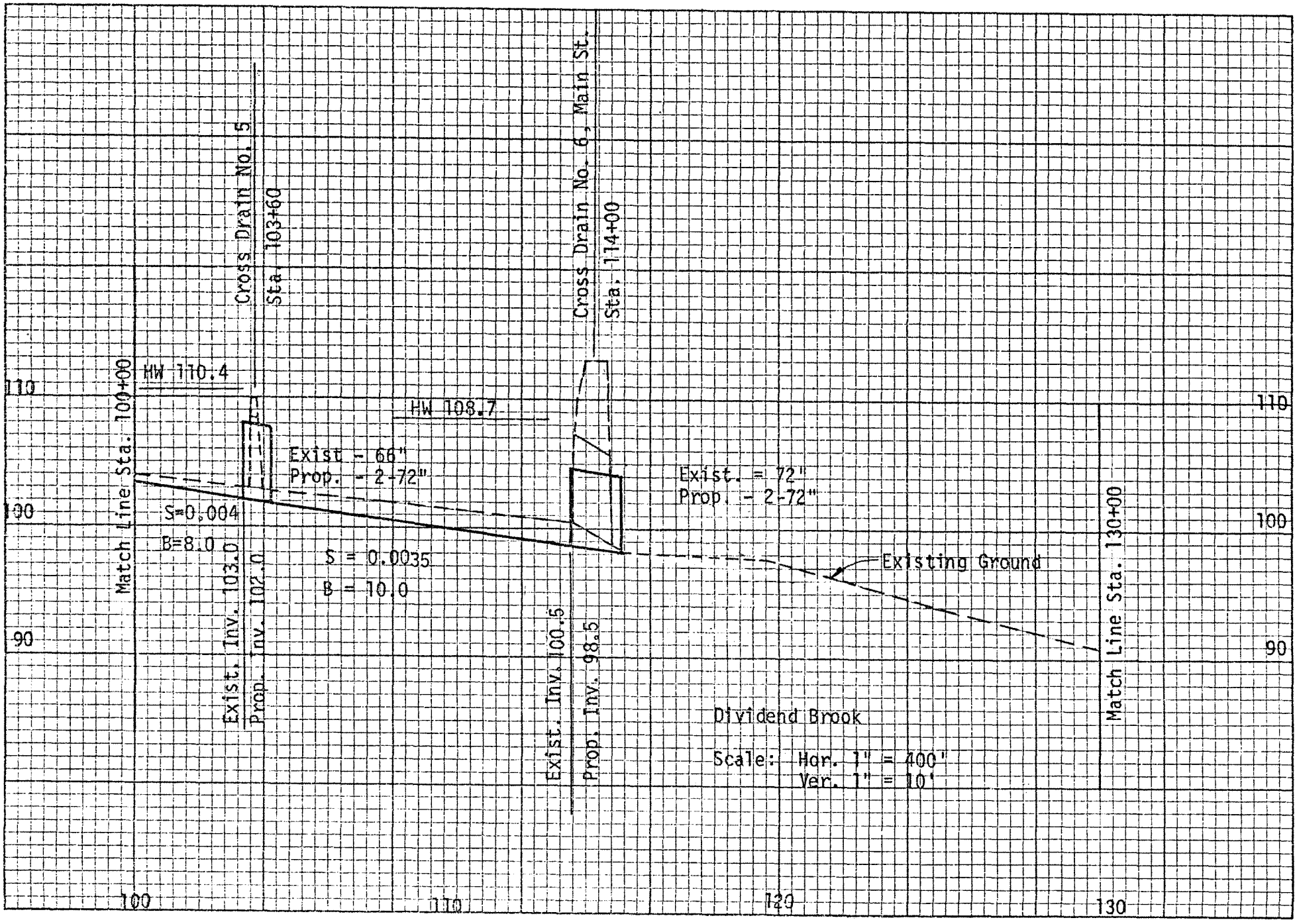
Dividend Brook

Scale: Hor. 1" = 400'
Ver. 1" = 10'

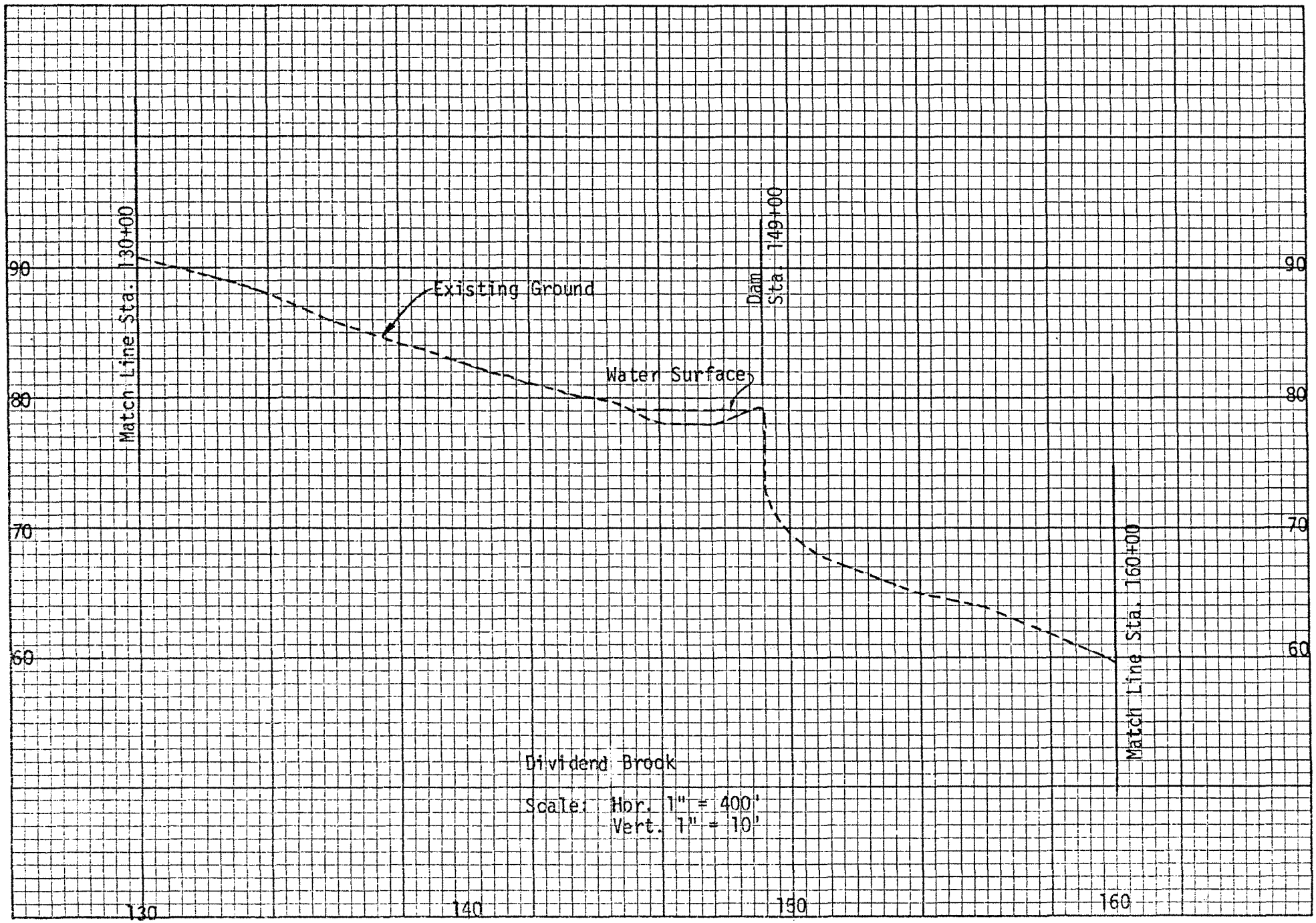
K+E 10 X 10 TO THE INCH 45 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



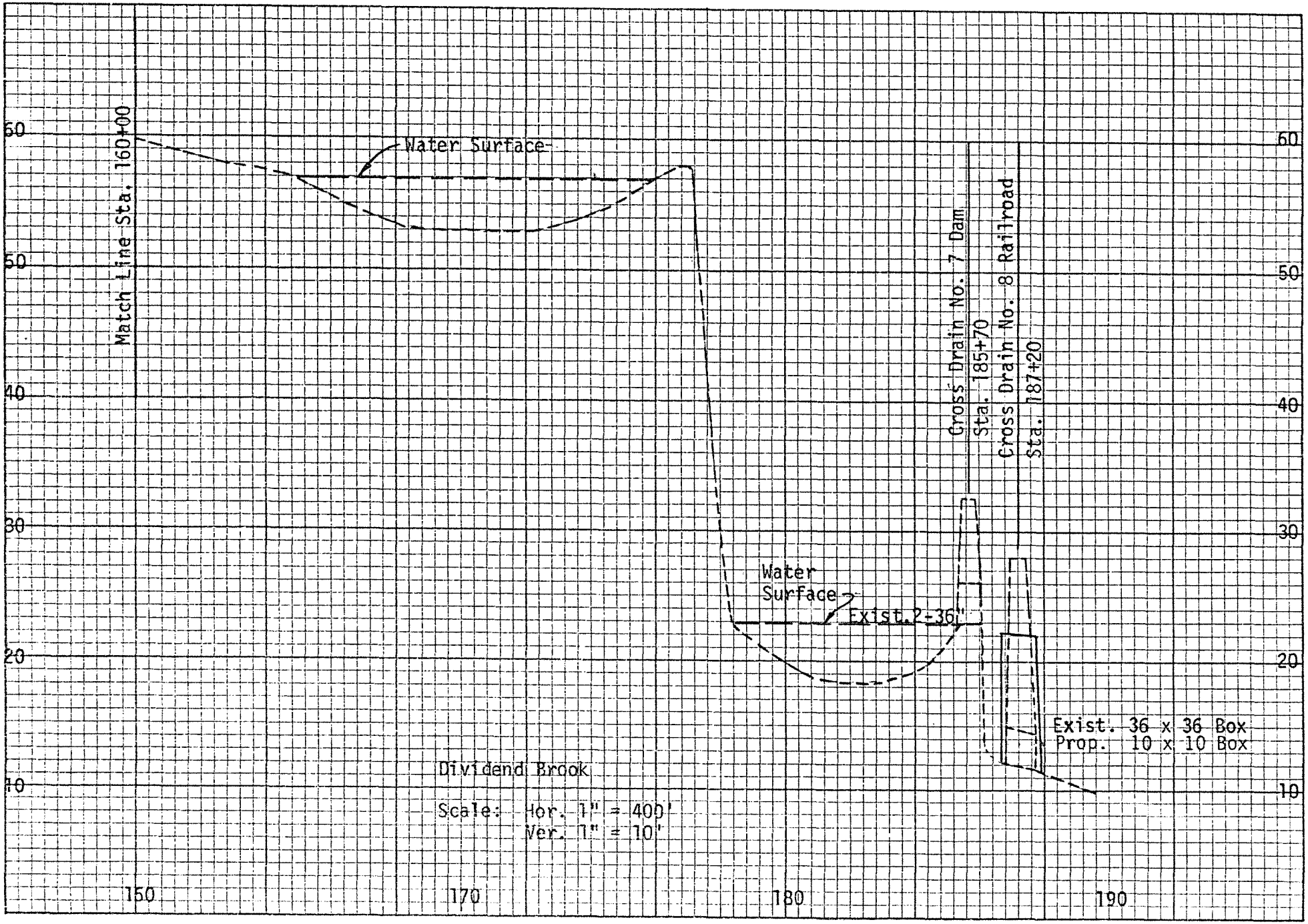
K&E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



KE 10 X 10 TO THE INCH 359 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



KEUFFEL & ESSER CO.
MADE IN U.S.A.



STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN DIVIDEND BROOK WATERSHED (TABLE NO. 11)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
1A Cromwell Ave	---	3.4	9.0	18" Same	160.50 Same	162.3			
1B Cold Spring Rd	---	8.3	22.5	24" Same	158.70 Same	161.7			
1C Cold Spring Rd	---	9.3	19.0	24" Same	173.4 Same	176.0			
1D Cold Spring Rd	---	33.9	72	15" & 42" Same	157.90 Same	163.0			
1E Cold Spring Rd	---	43.2	88	42" Same	156.9 Same	163.2			
1F Cromwell Rd.	---	62.4	146	42" 48"	154.10 154.10	162.9			Q = 72.0 Low
2A Country Dr.	---	19.4	46.5	12" 36"	182.0 182.0	185.9			Q = 12.2 Low
2B Country Dr.	---	6.7	22	None 24"	157.0	160.60			Q = 6.1 Low
2C Brook St.	---	13.2	42	None 36"	145.5	150.5			Q = 9.0 Low
2D Brook St.	---	30.2	84	12" 48"	138.6 136.0	140.8			Q = 20.0 High
7A Main Street	---	6.0	12	15" Same	143.7 Same	147.0			

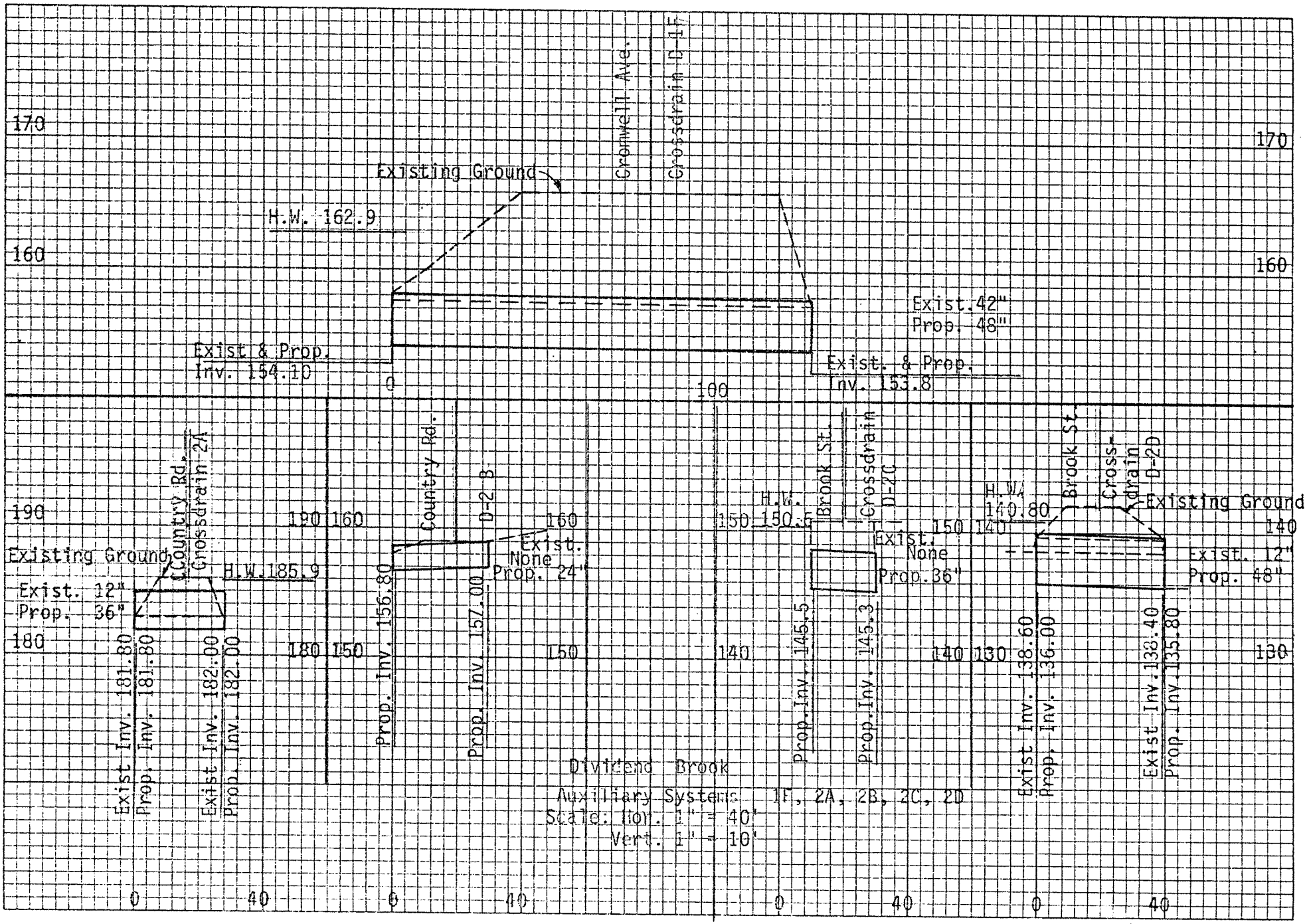
STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN DIVIDEND BROOK WATERSHED (TABLE NO. 11)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
7B Main St.	---	15.7	30	15" 24"	146.4 146.0	150.4			Q = 14.9 Low
7C Pleasant Valley Rd.	---	22.7	41	36" Same	85.4 Same	89.1			
7D Pleasant Valley Rd.	---	13.8	25	24" Same	82.0 Same	85.2			
7E Main St.	---	17.8	35	24" Same	155.5 Same	160.3			
7F Stones Throw Ct.	---	41.4	80	30" Same	111.0 Same	118.5			
7G Pleasant Valley Rd.	---	53.5	100	36" Same	82.5 Same	89.4			
7H Main Street	---	11.7	23	36" x 24" Same	169.0 Same	171.7			
7I School St. Outlet	---	47.3	85	42" Same	125.6 Same	130.7			
7J Walnut Rd.	---	10.9	20	18" Same	130.7 Same	135.5			
7K Pleasant Valley Rd.	---	88.5	168	None 54"	--- 60.0	67.0			Low

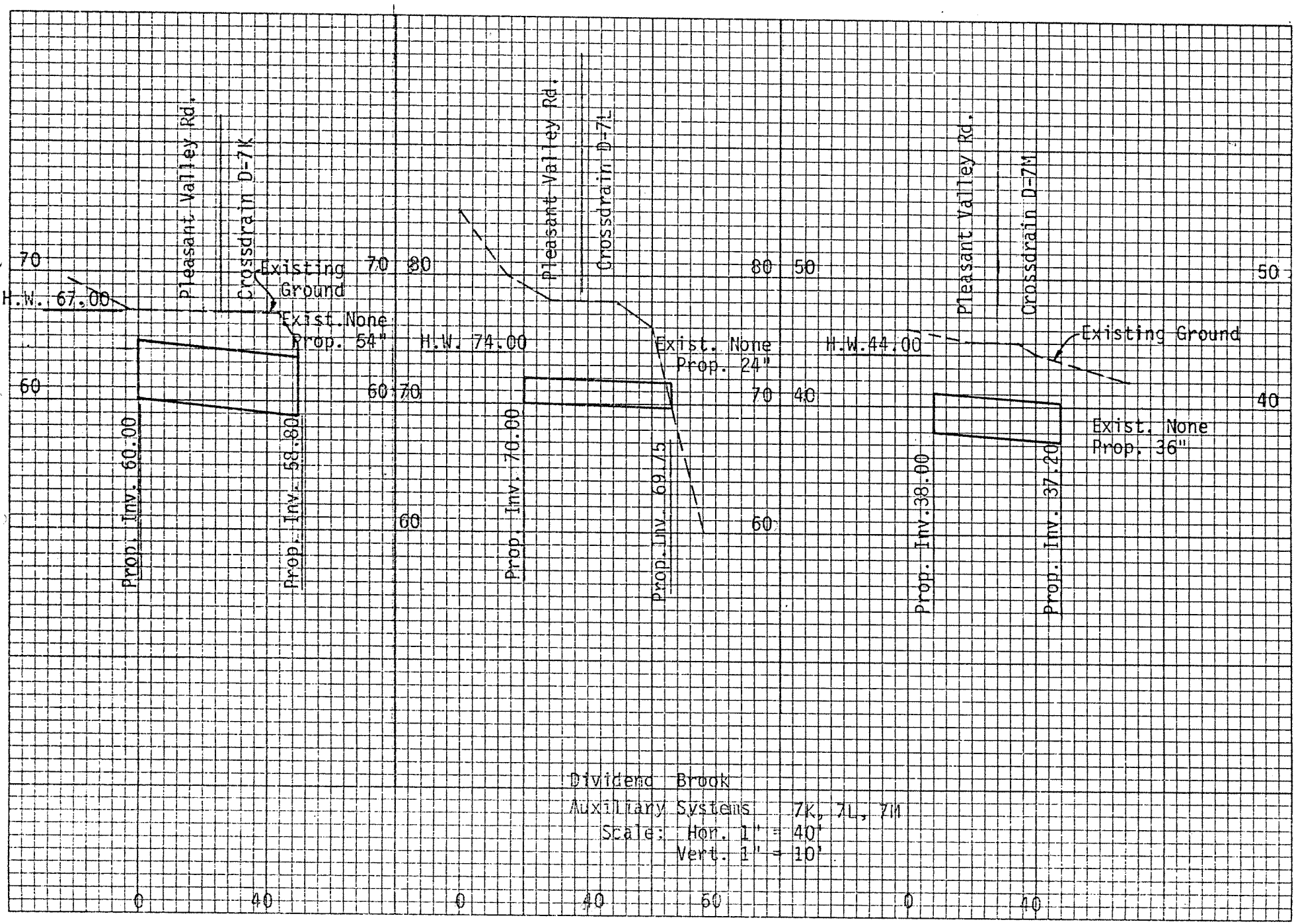
STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN DIVIDEND BROOK WATERSHED (TABLE NO. 11)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL		REMARKS
							Bottom Width	Water Depth	
7L Pleasant Valley Rd.		9.6	28.6	None 24"	--- 70.0	74.0			Low
7M Old Dividend Road		22.6	79	None 36"	--- 38.0	44.0			Low

KEUFFEL & ESSER CO. MADE IN U.S.A.



KEUFFEL & ESSER CO. MADE IN U.S.A.

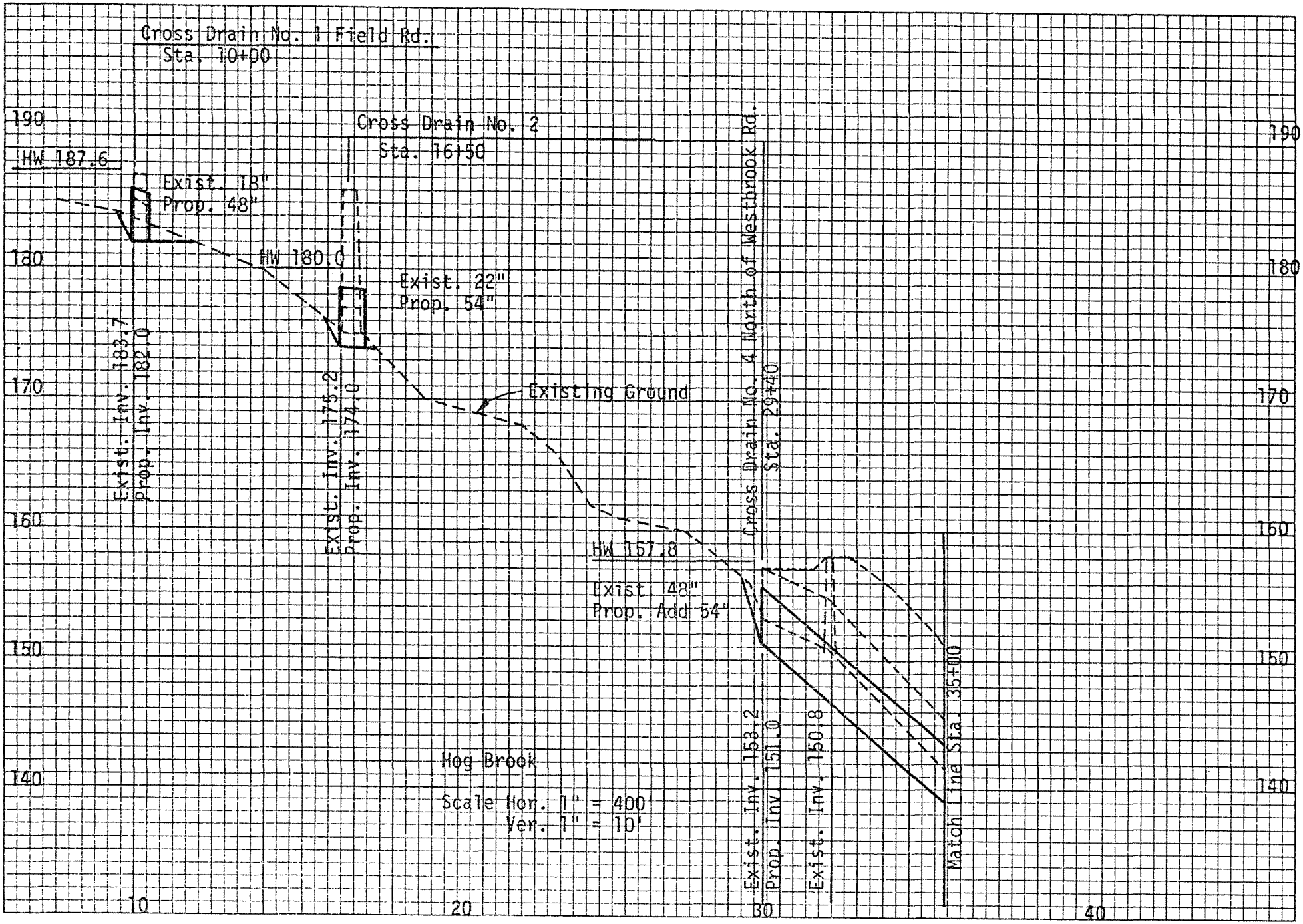


Dividend Brook
Auxiliary Systems 7K, 7L, 7M
Scale: Hor. 1" = 40'
Vert. 1" = 10'

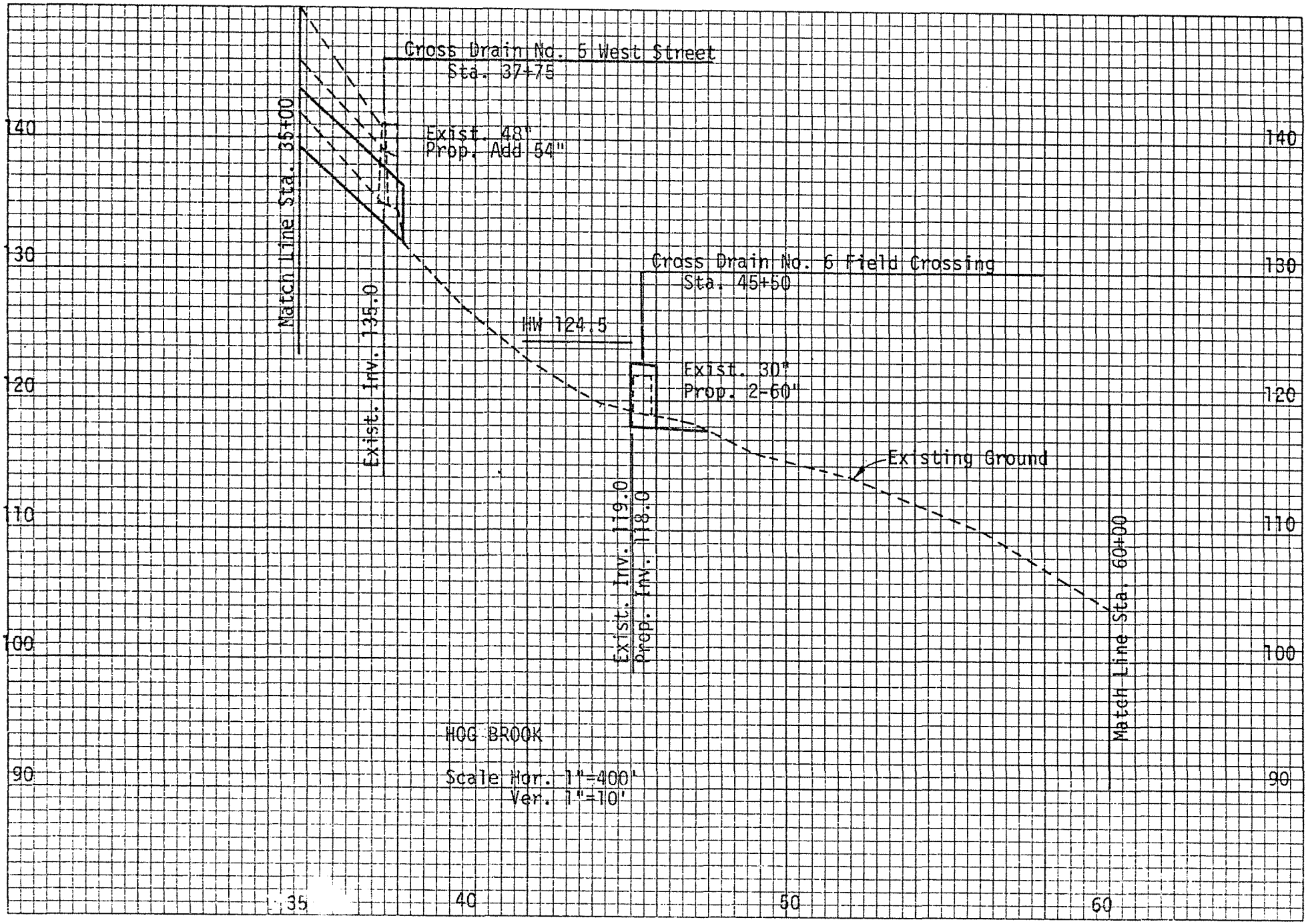
STREAM ANALYSIS - "OG BROOK (TABLE NO. 12)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
1 Field Road	10+00	70	125	18" 48"	183.7 182.0	187.6	---	---	Q = 57.5 Low
2	16+50	82	138	22" 54"	175.2 174.0	180.0	---	---	Q = 72 Low
3	---	---	---	30" Same	157.1 Same	---	---	---	
4 No. of Westbrook Rd.	29+40	189	300	48" Add 54"	153.2 151.0	157.8	---	---	Q = 171.0 Low
5 West Street	37+75	206	316	48" Add 54"	135.0 N/A	N/A	---	---	Q = 180.0 Middle
6 Field Crossing	45+50	275	386	30" 2-60"	119.0 118.0	124.5	---	---	Middle
7 Eastview Ter.	64+75	369	450	11' x 10' Culvert Same	95.6 Same	100.5	---	---	
8 Main Street	70+30	388	460	13' x 5' Arch Culvert Same	80.7 Same	87.7	---	---	
9 Dividend Road	87+00	497	560	8' x 12' Culvert Same	52.9 Same	61.8	---	---	
10 Field Road	102+50	553	610	96" ACCMP Same	27.7 Same	37.8			
11 R.R. Tracks	110+60	574	630	2- 2-6' x 3' Culverts Same	11.7 Same	24.0	---	---	

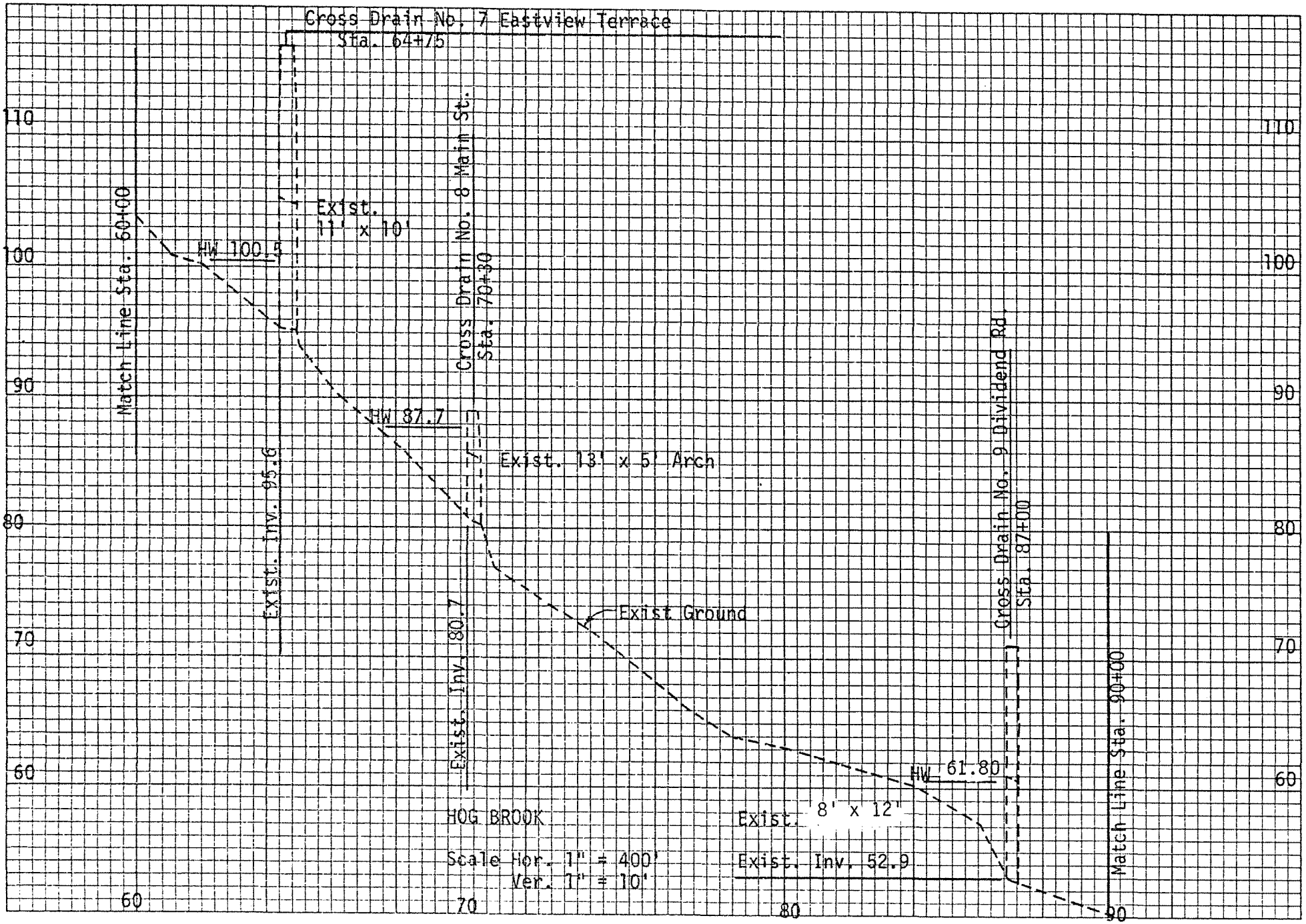
KEUFFEL & ESSER CO. MADE IN U.S.A.

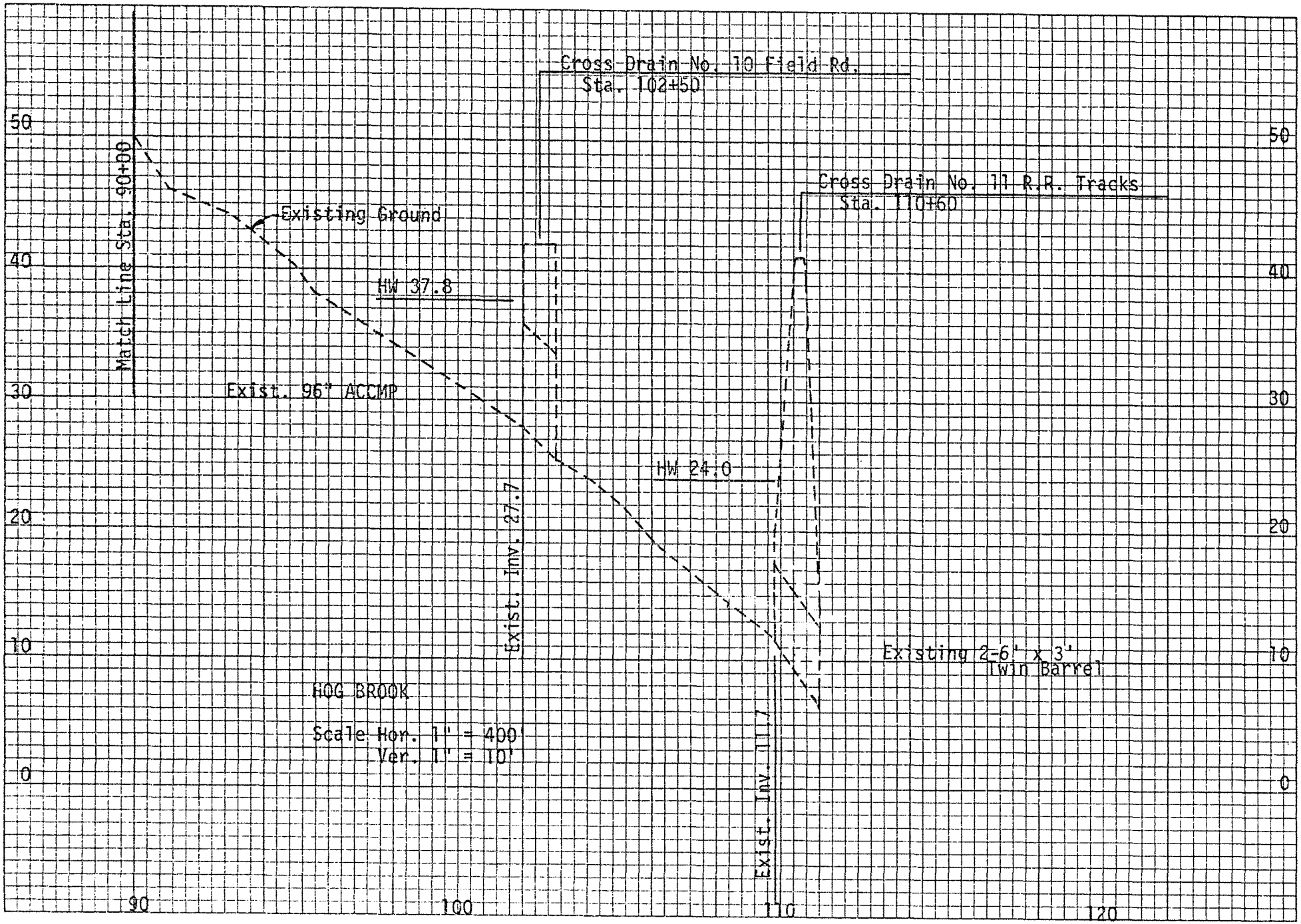


KE 10 TO INCH 0 INCH
KEUFFEL & ESSER CO. MADE IN U.S.A.



K+E 10 X 10 TO THE INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

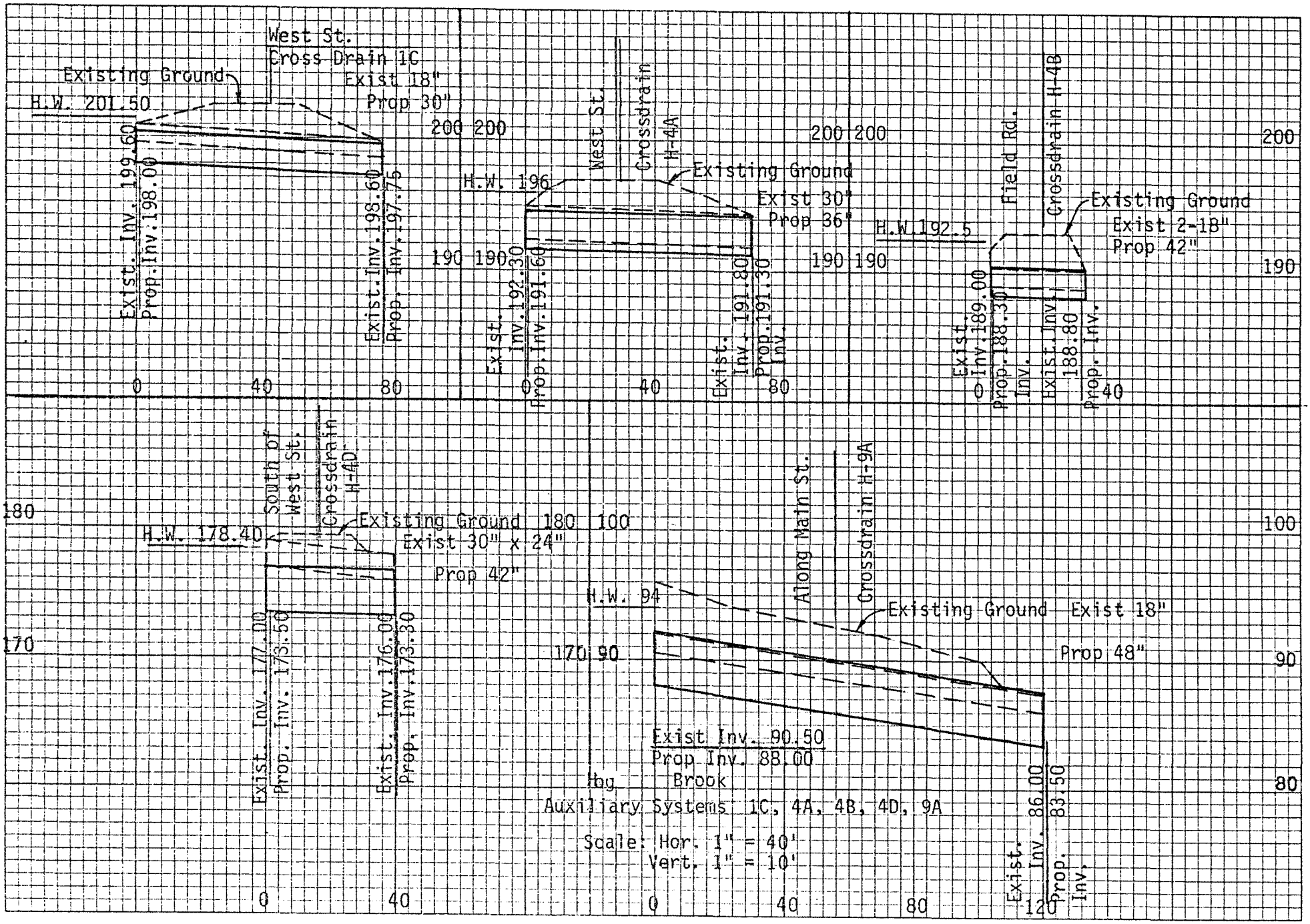



Cross Drain No. 10 Field Rd.
Sta. 102+50
Cross Drain No. 11 R.R. Tracks
Sta. 110+60
Match Line Sta. 90+00
Existing Ground
HW 37.8
Exist. 96" ACCMP
HW 24.0
Exist. Inv. 27.7
Exist. Inv. 11.7
Existing 2-6' x 3'
Twin Barrel
HOG BROOK
Scale Hor. 1" = 400
Ver. 1" = 10'
50
40
30
20
10
0
90
100
110
120

STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN HOG BROOK WATERSHED (TABLE NO. 13)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
1A West Street	---	7	20	18" Same	209.1 Same	213.0	---	---	
1B West Street	---	3	7	18" Same	202.1 Same	203.8	---	---	
1C West Street	---	16	38	18" 30"	199.6 198.0	201.5	---	---	Q = 21.2 High
4A West Street	---	33	54	30" 36"	192.3 191.6	196.0	---	---	Q = 36.4 Very Low
4B Field Road	---	39	71	2-18" 1-42"	189.0 188.3	192.5	---	---	Q = 44.0 Low
4C West Street	---	4	8	18" Same	182.0 Same	184.0	---	---	
4D So. of West St.	---	49	84	30" x 24" 42"	177.0 173.5	178.4	---	---	Q = 54.0 Middle
4E Westbrook Rd.	---	14	27	24" Same	158.5 Same	161.7	---	---	
6A West Street	---	16	40	18" & 30" Same	141.8 Same	144.6	---	---	
9A Main St.	---	69	128	18" 48"	95.5 88.0	94.0			Q = 98.0 High

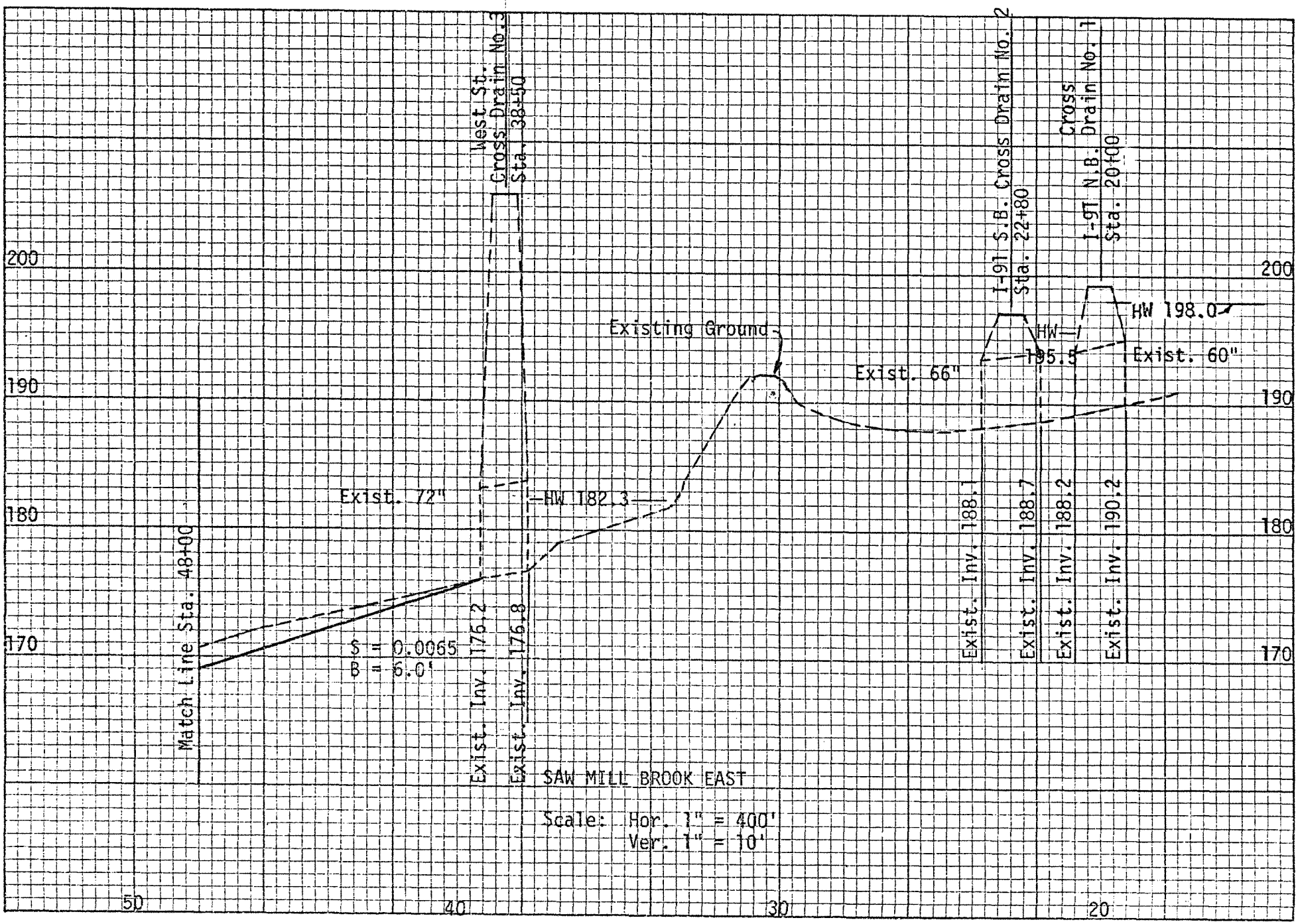
10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



STREAM ANALYSIS - SAW MILL BROOK - EAST (TABLE NO. 14)

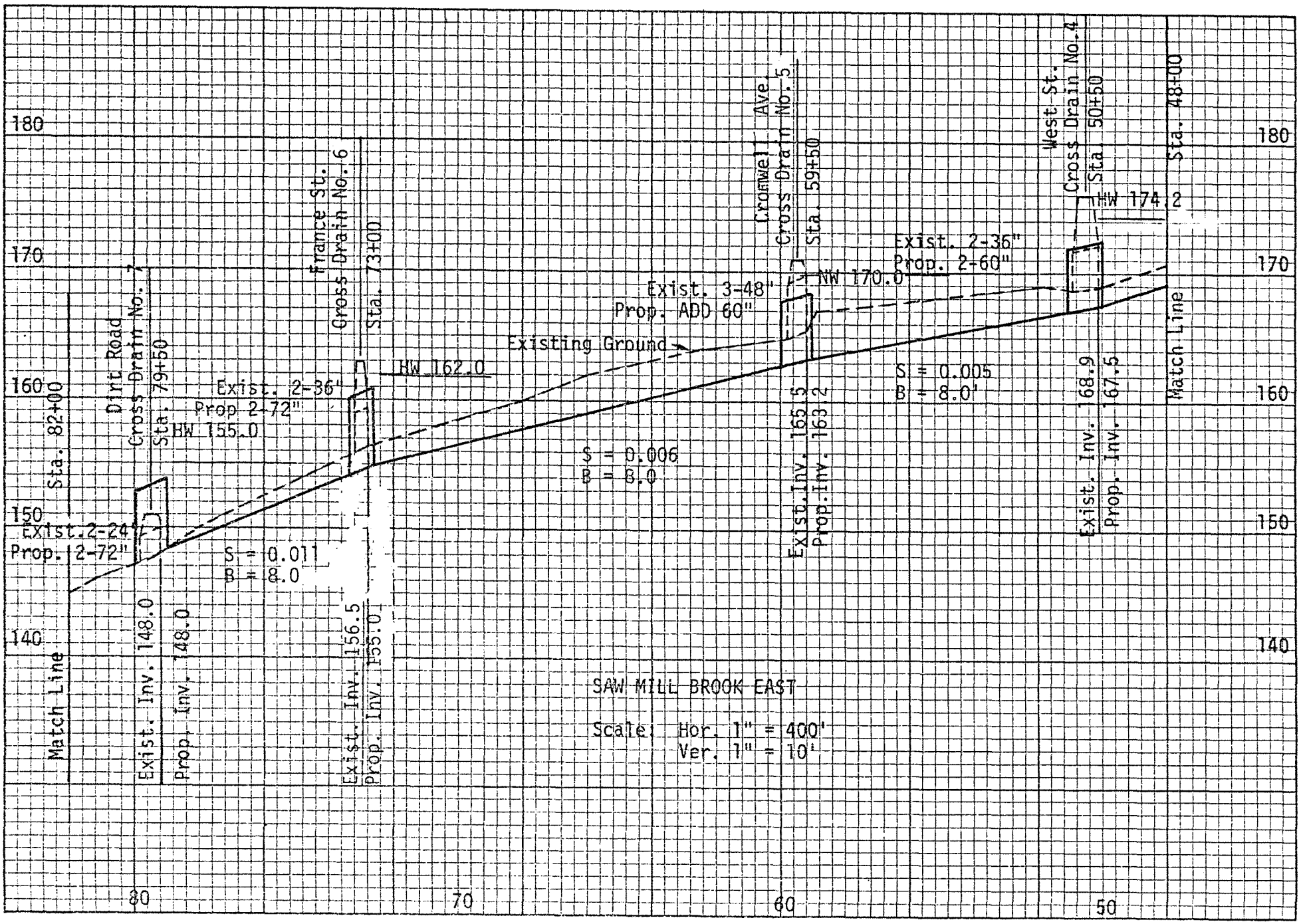
CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
1 I-91 (NB)	20+00	75	185	60" SAME	190.2 SAME	198.0			
2 I-91 (SB)	22+80	81	197	66" SAME	188.7 SAME	195.5			
3 West St.	38+50	117	260	72" SAME	176.8 SAME	182.3			
4 West St.	50+50	200	382	2-36" 2-60"	168.9 167.5	174.2	6.0'	4.0'	Q = 180.0 Low
5 Cromwell Ave.	59+50	359	470	3-48" Add 60"	165.5 163.2	170.0	8.0'	4.2'	Low
6 France St.	73+00	385	500	2-36" 2-72"	156.5 155.0	162.0	8.0'	4.3'	Middle
7 Dirt Rd.	79+50	403	520	2-24" 2-72"	148.0 148.0	155.0	8.0'	3.8'	Low
8 Dirt Rd.	87+00	447	570	24" 2-72"	138.2 138.0	145.0			Low
9 France St.	107+50	725	745	72" 2-72"	118.1 112.0	122.0			Low
10 oint of Confluence	131+00	1172	1120	---	---	---			

10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

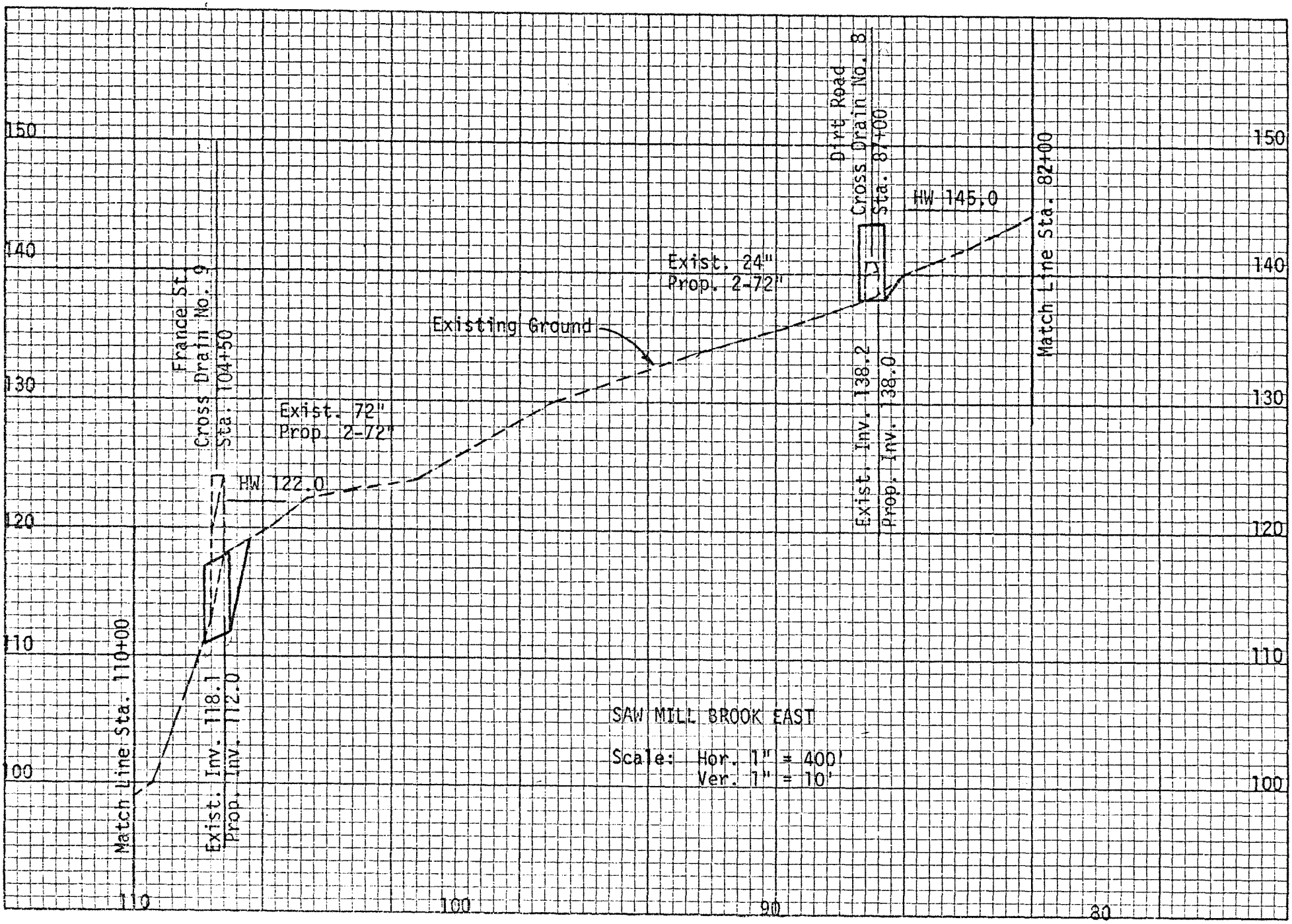


62.

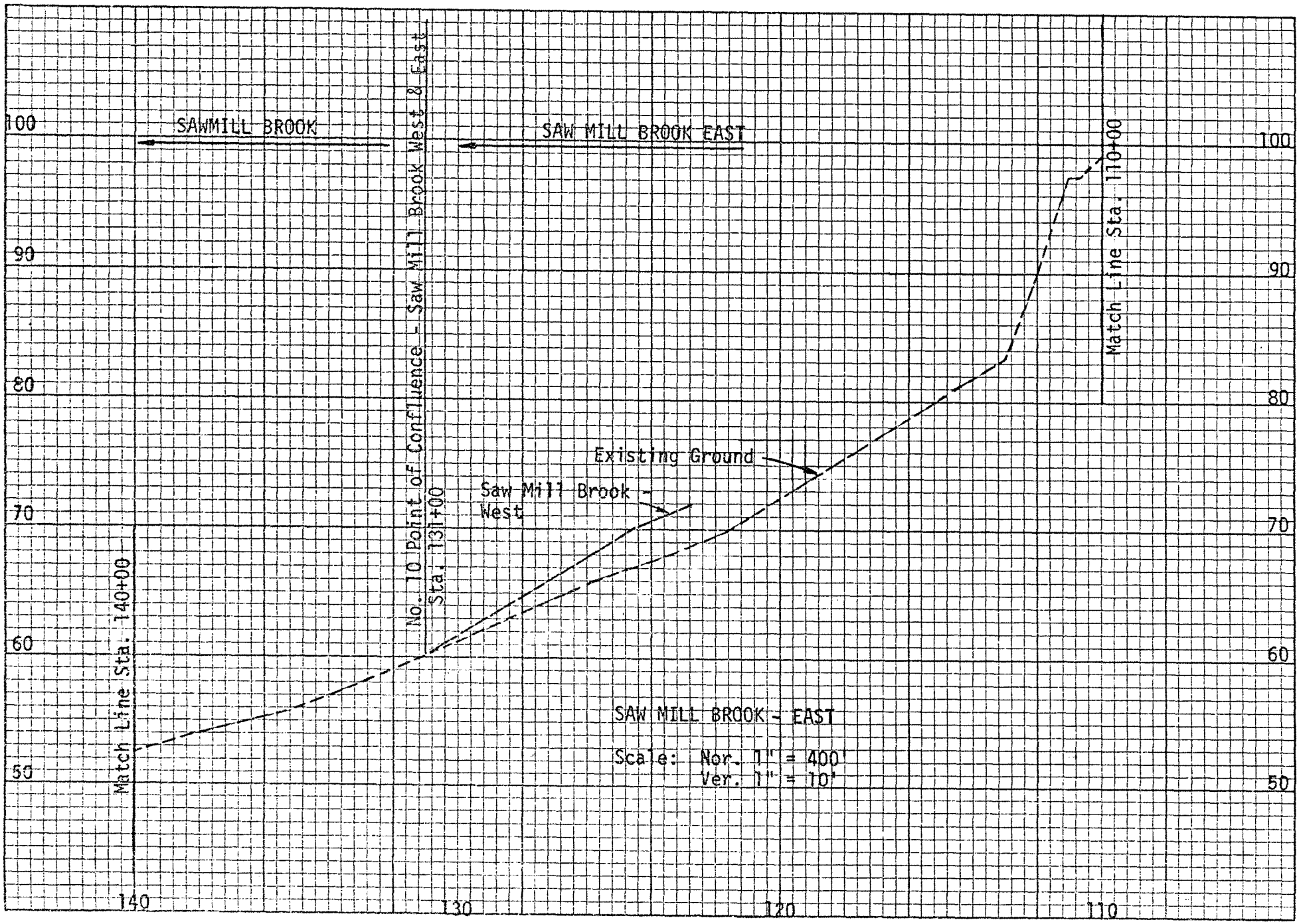
K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



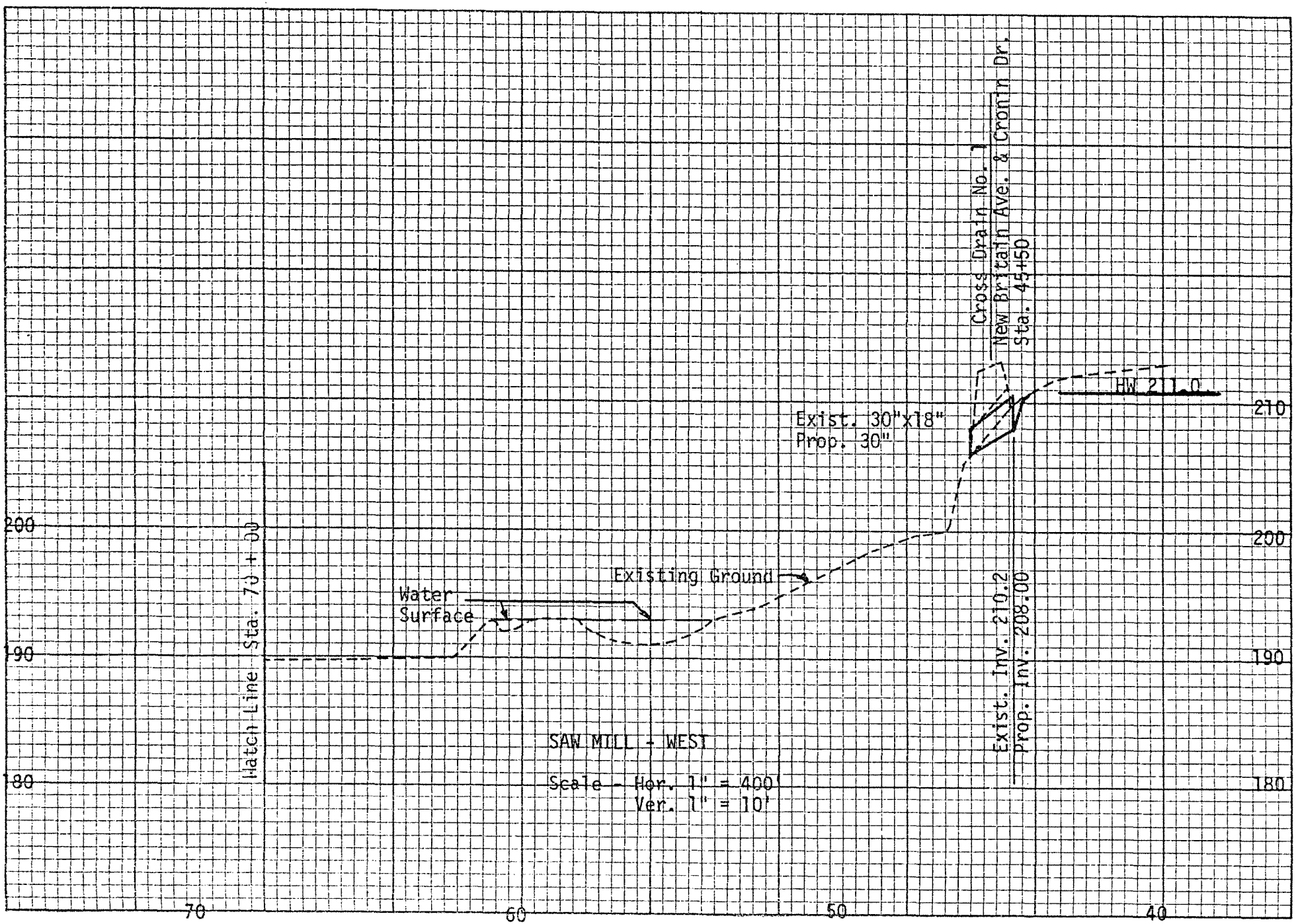
K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



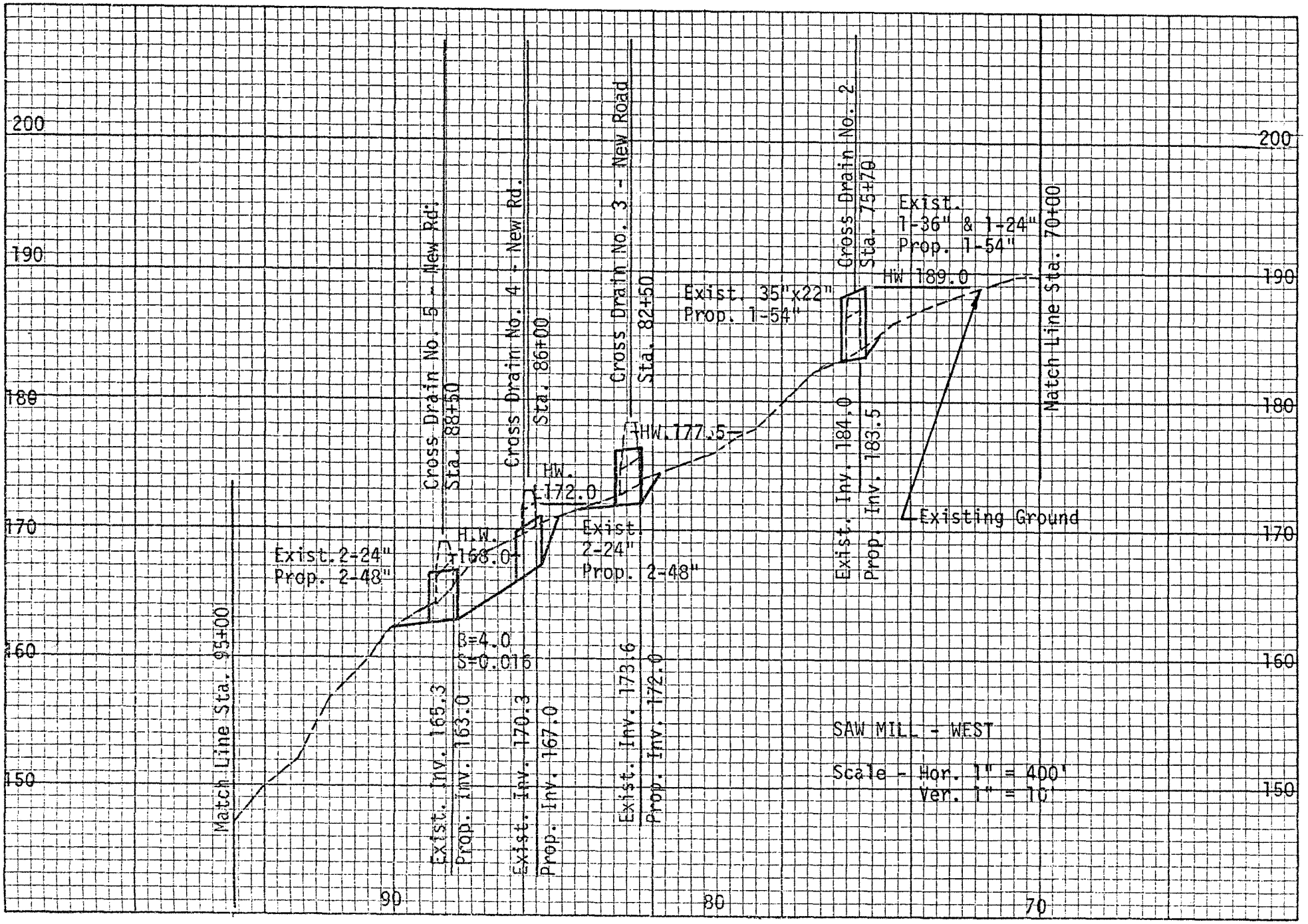
STREAM ANALYSIS - SAW MILL BROOK - WEST (TABLE NO. 15)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL		REMARKS
							Bottom Width	Water Depth	
1 New Britain Av.	45+50	15	30	30" x 18" 30"	210.2 208.0	211.0			Q = 19.2 High
2 Field Road	75+50	80	141	36" & 24" 54"	184.0 183.5	189.0			Q = 81.0 Low
3 New Road	82+50	88	146	35" x 22" 54"	173.6 172.0	177.50			Q = 90.0 Low
4 New Road	85+50	158	214	2 - 24" 2 - 48"	170.30 167.0	172.0	4.0	3.0	Q = 120.0 Low
5 New Road	88+50	165	222	2 - 24" 2 - 48"	165.3 163.0	168.0			Q = 125.0 Low
6 Ten Rod Hwy.	108+60	278	342	1 - 48" Add 60"	110.0 108.0	115.0			Middle
Point of Confluence	131+00	1172	1120	---	---	---			

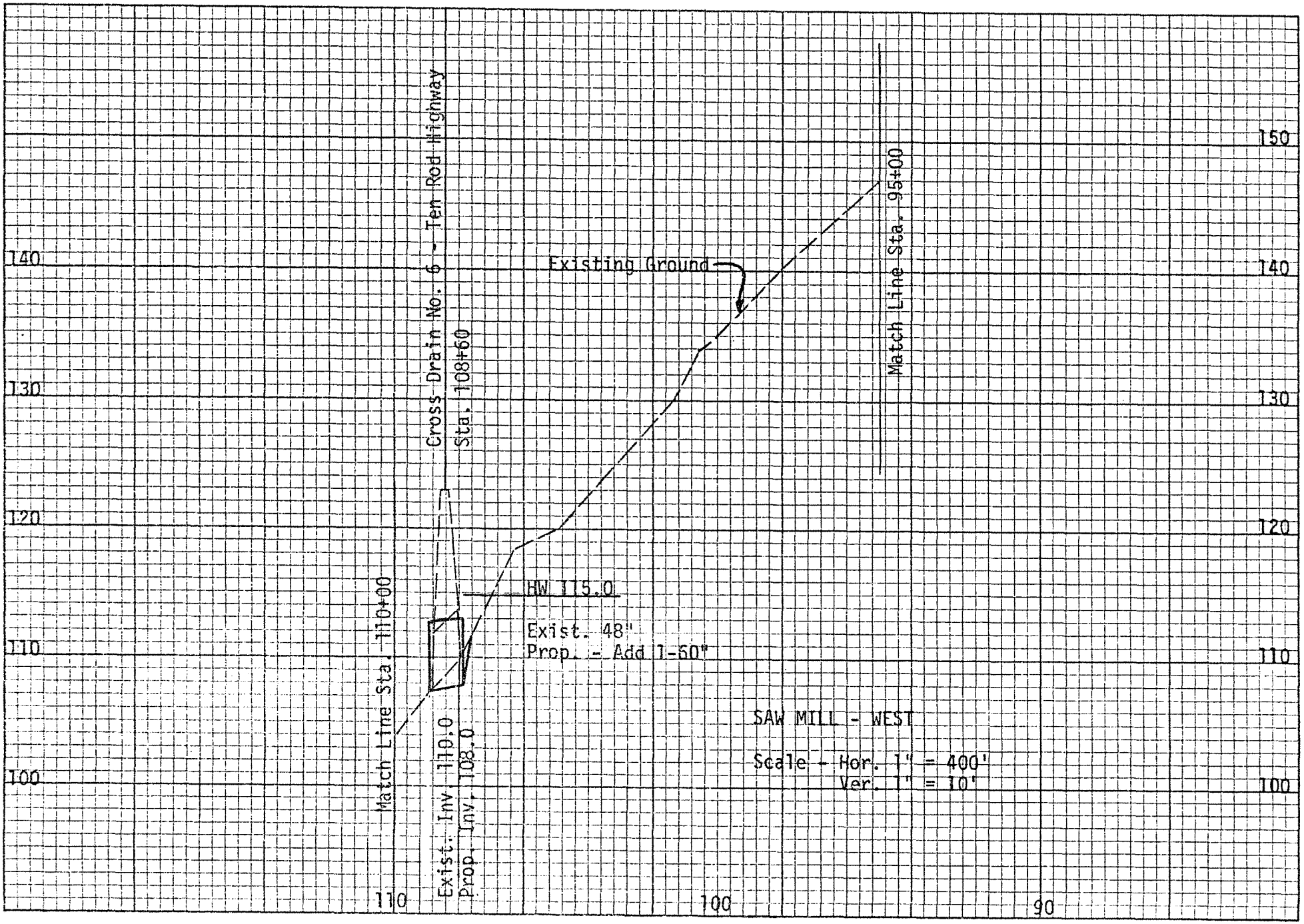
K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



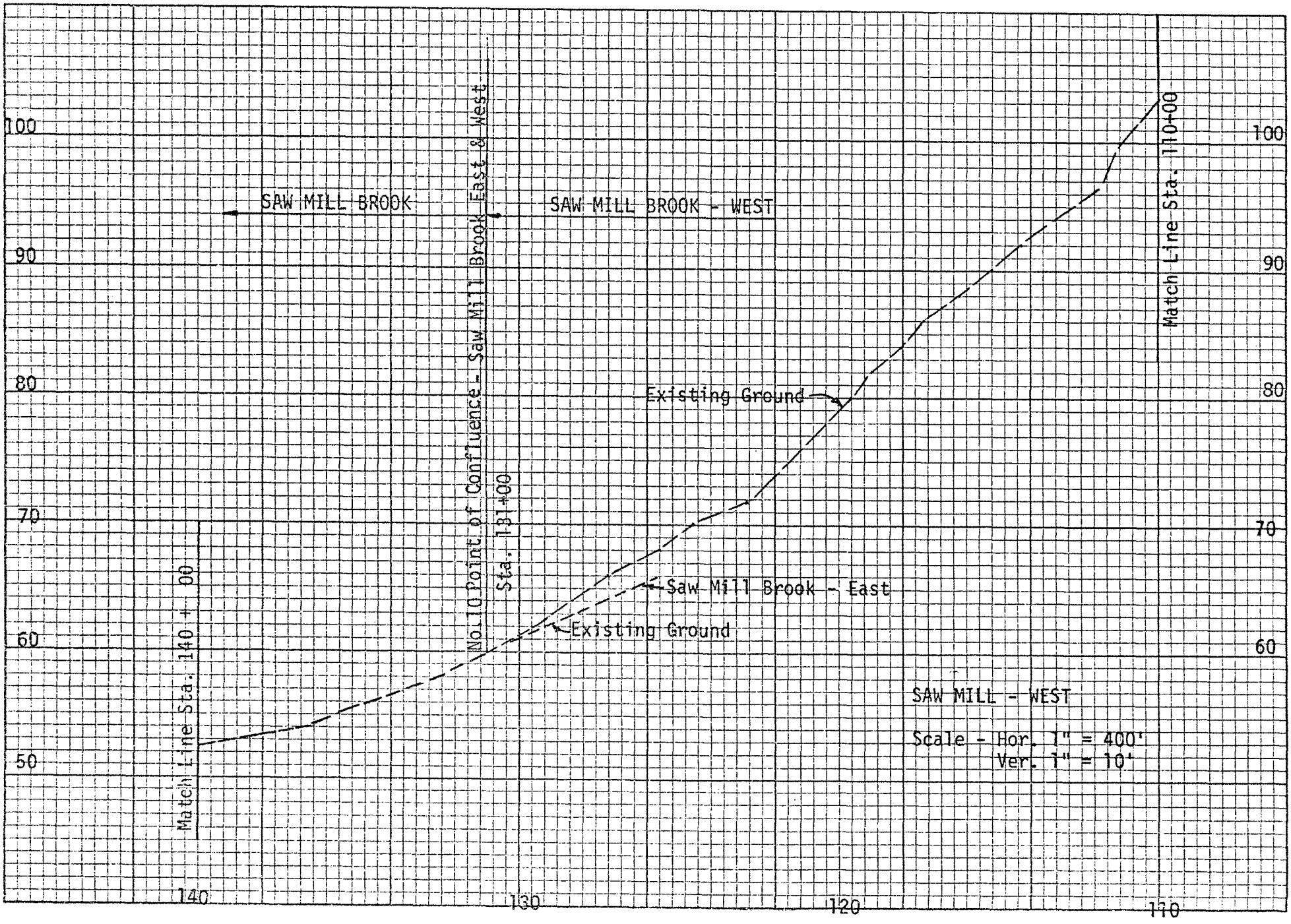
K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



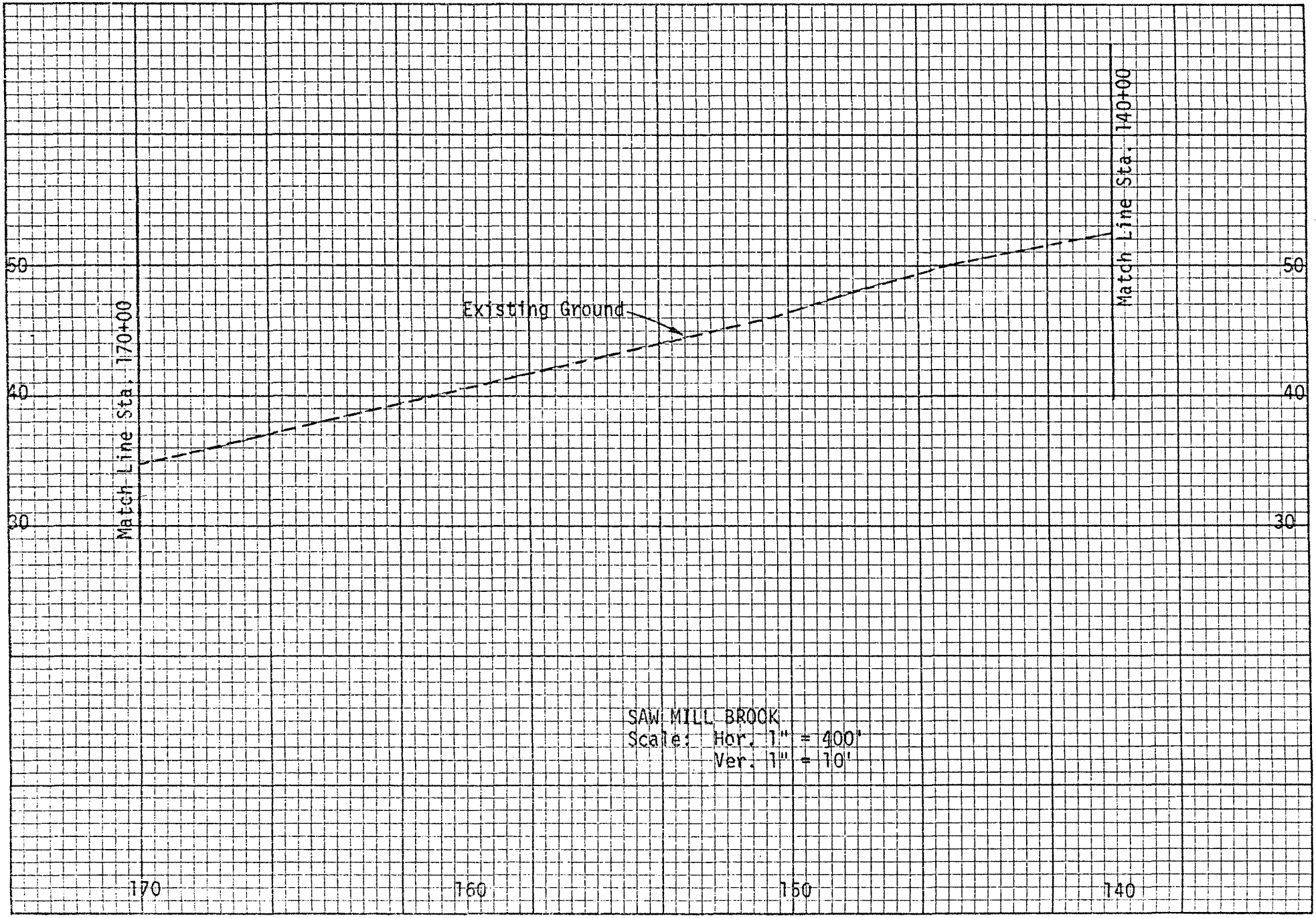
STREAM ANALYSIS - SAW MILL BROOK (TABLE NO. 16)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL		REMARKS
							Bottom Width	Water Depth	
10 int of Confluence	131+00	1172	1120						
11 France St.	181+00	1411	1290	2-30 & 1-36" 14' x 10' Box	30.8 30.4	40.4			Low
12	184+50	1534	1355	40" 14' x 10' Box	29.2 28.5	38.5			Low
13	189+50	1545	1360	2-36" 14' x 10' Box	26.5 26.5	36.5			Low

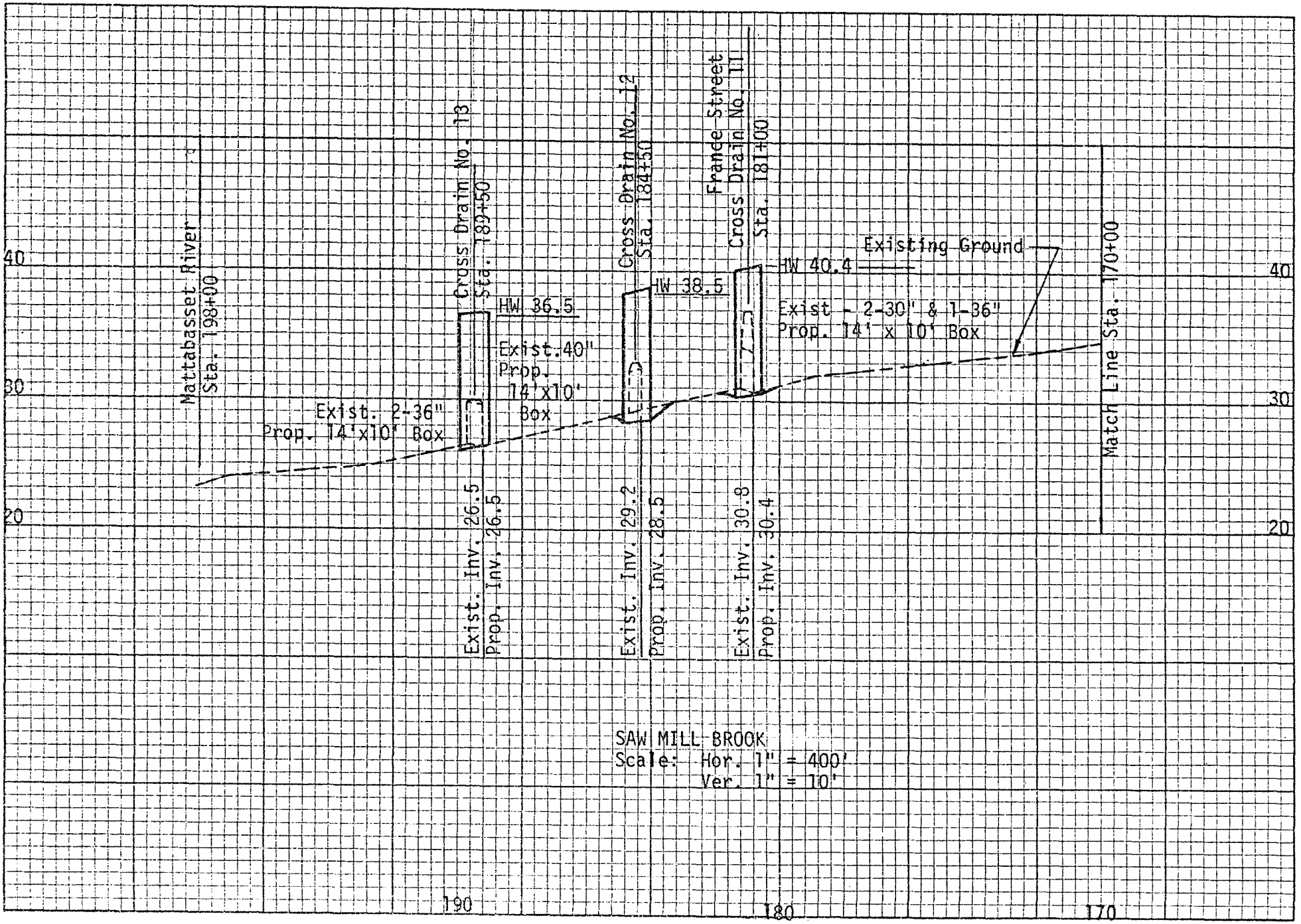
K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



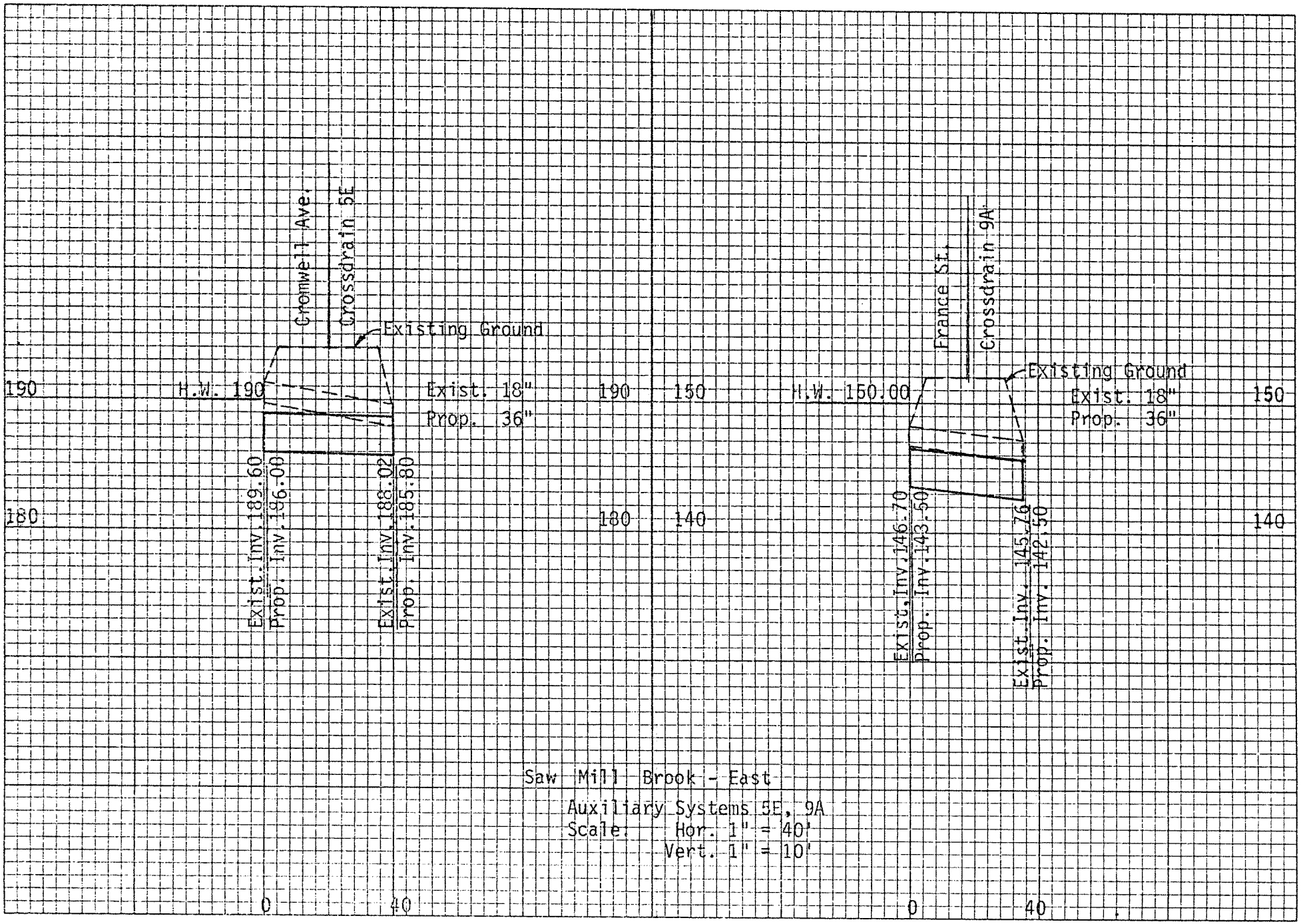
STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN SAW MILL BROOK - EAST WATERSHED (TABLE NO. 17)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
4A West Street	---	30.0	77	30" Same	186.6 Same	193.0			
4B I-91	---	44.3	115	36" Same	179.9 Same	188.0			
4C I-91	---	55.3	134	60" Same	178.50 Same	183.5			
4D Cromwell Ave.	---	10.6	34	24" Same	170.1 Same	174.5			
5A Elm St.	---	13.5	36	15" 30"	184.6 183.0	186.2			Q = 12.8 Middle
5B Elm & Cromwell	---	11.4	37	24" Same	188.7 Same	192.9			
5C Cromwell Ave.	---	10.6	30	18" 24"	196.8 195.0	199.0			Q = 11.8 Low
5D Cromwell Ave.	---	8.0	25	18" 24"	198.5 197.0	200.0			Q = 11.5 Low
5E Cromwell Ave.	---	20.5	50	18" 36"	189.6 186.0	190.0			Q = 25.6 High
5F Cromwell Ave.	---	2.0	6	18" Same	186.7 Same	188.2			
9A France St.	---	56.3	77	18" 36"	146.7 143.50	150.0			Q = 50.2 Middle
5G Cromwell Ave.	---	4.8	14	18" Same	170.9 Same	173.5			

STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN SAW MILL BROOK - EAST WATERSHED (TABLE NO. 17)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL		REMARKS
							Bottom Width	Water Depth	
10A France St.	---	14.5	35	18" 24"	149.7 146.0	150.5			Q = 18.3 Middle
10B France St.	---	8.0	21	18" 24"	179.6 178.0	180.6			Q = 10.8 Low

KEUFFEL & ESSER CO. MADE IN U.S.A.



Saw Mill Brook - East

Auxiliary Systems 5E, 9A

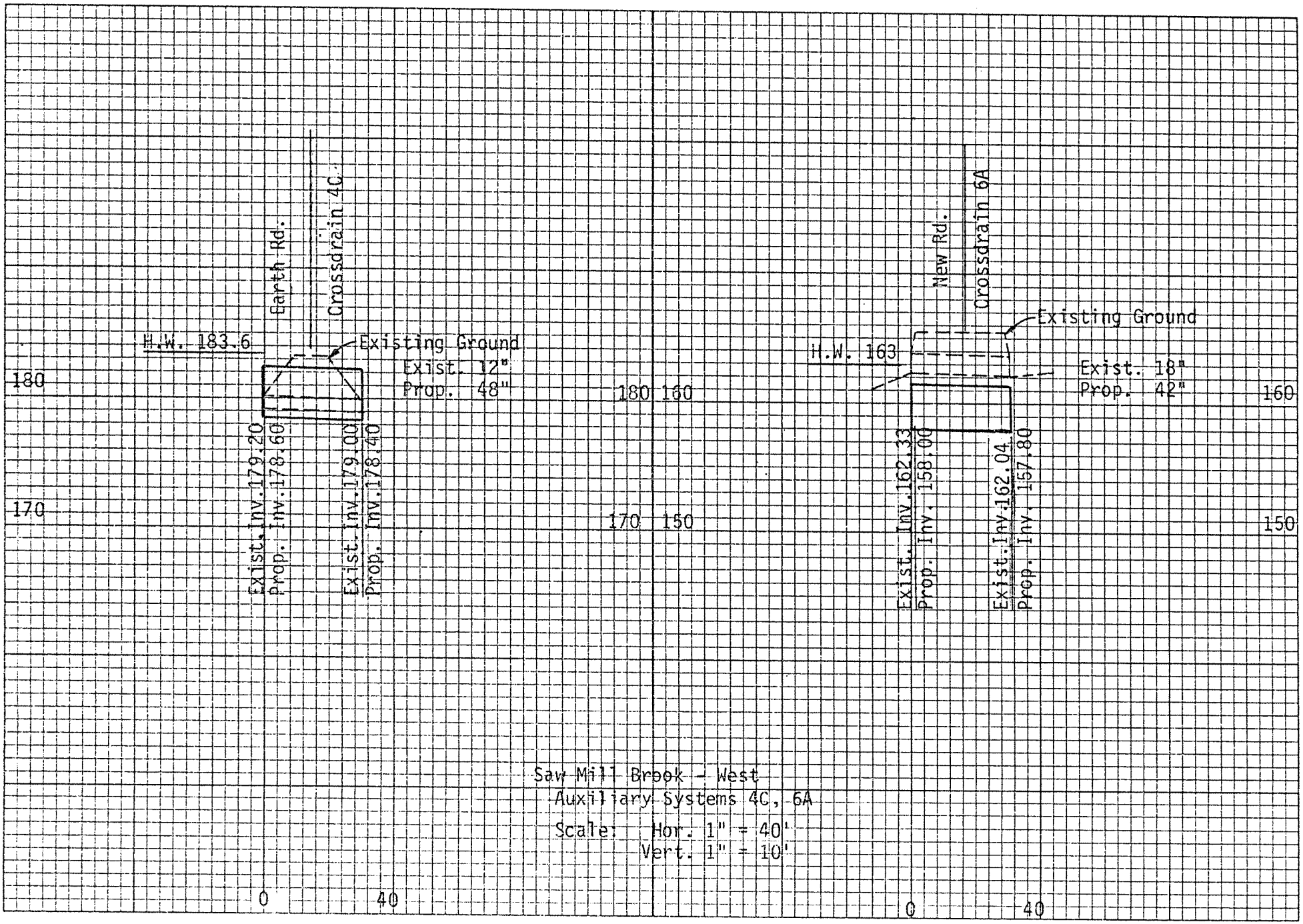
Scale: Hor. 1" = 40'

Vert. 1" = 10'

STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN SAW MILL BROOK - WEST WATERSHED (TABLE NO. 18)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
2A New Britain Ave.	---	10.4	24	18" 24"	211.7 210.50	213.5			Q = 18.1 High
4A Trinity Ridge Av.	---	14.6	28	30" x 18" Same	208.0 Same.	210.5			
4B New Britain Av.	---	16.8	31	18" 24"	204.3 201.50	205.5			Q = 24.0 Low
4C Field Road	---	58.2	87	12" 48"	179.2 178.6	183.6			Q = 55.0 Low
6A New Road	---	64.8	88	18" 42"	162.3 158.0	163.0			Q = 65.0 Middle

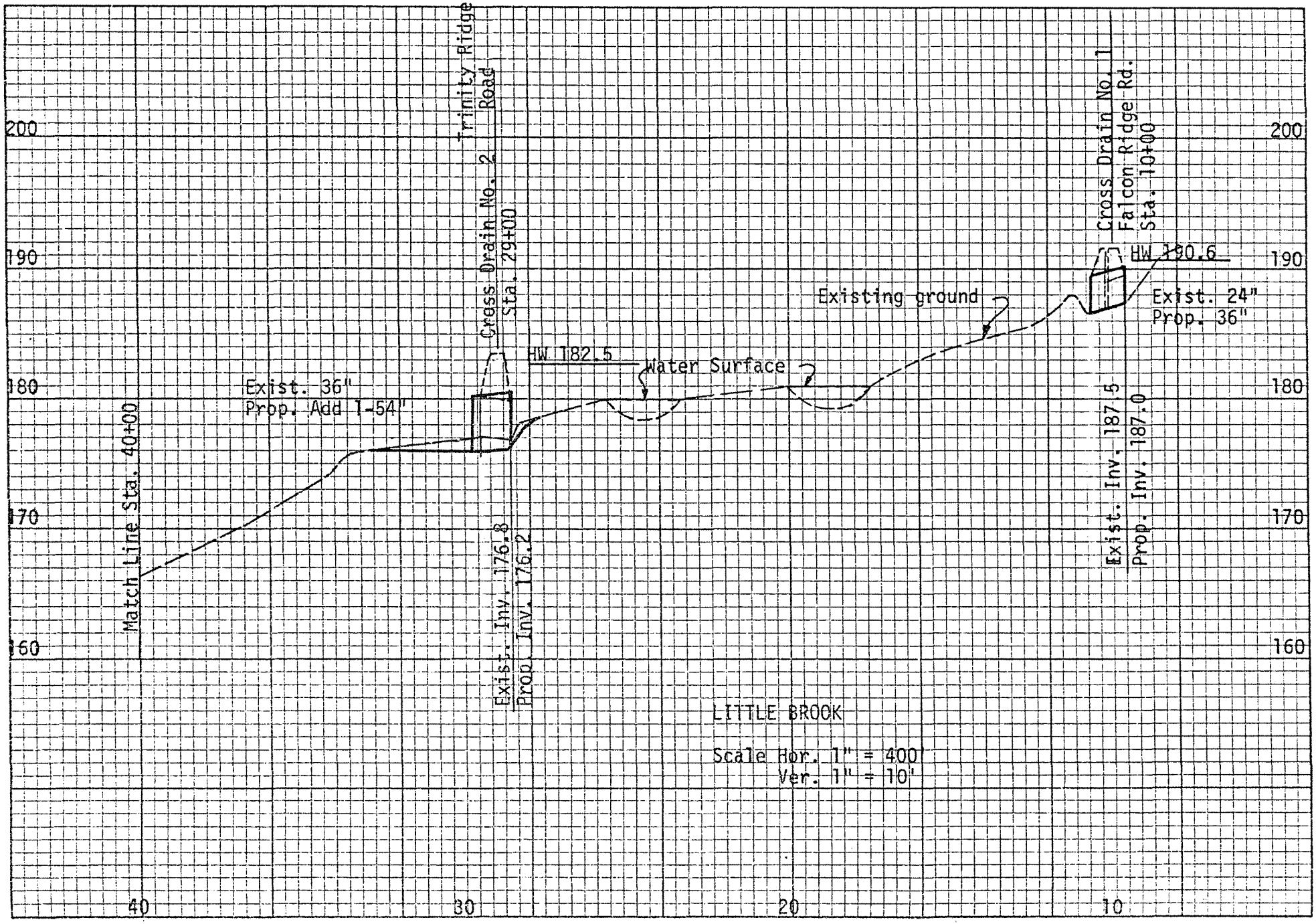
KEUFFEL & ESSER CO. MADE IN U.S.A.



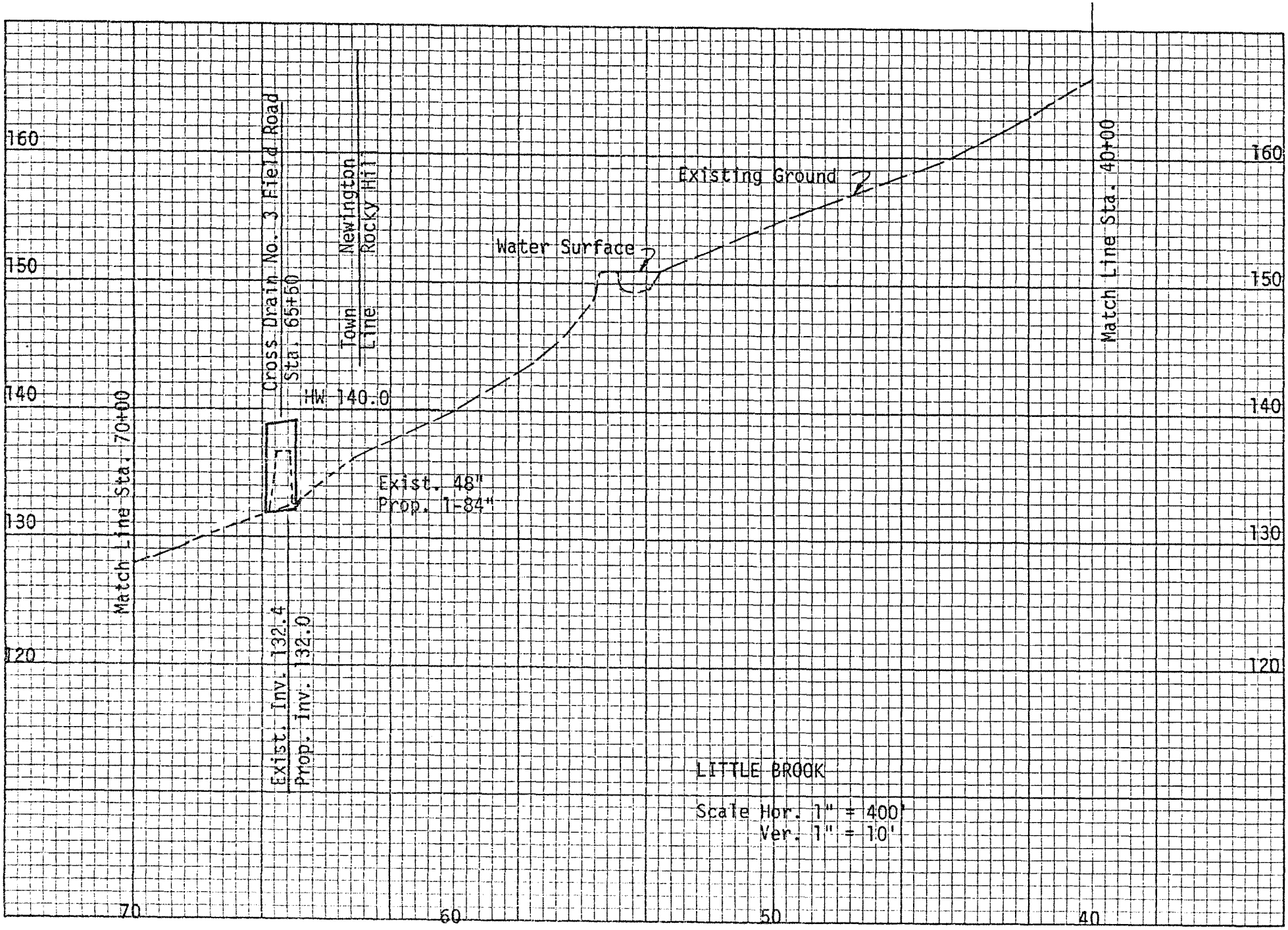
STREAM ANALYSIS - LITTLE BROOK (TABLE NO. 19)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS	
1 Falcon Ridge Rd.	10+00	24	50	24" 36"	187.5 187.0	190.6	---	---	Q = 41.2 Middle	Shown as existing But proposed
2 Trinity Ridge Rd.	29+00	121	224	36" Add 54"	176.8 176.2	182.5	---	---	Q = 12.7 Middle	
3 Field Road	65+50	418	480	48" 84"	132.4 132.0	140.0	---	---	Low	
4 Beach Road	83+00	518	600	2-36" 2-72"	102.7 99.3	107.1	---	---	Middle	
5 Cobey Road	101+30	638	690	108" x 78" Add 72"	74.1 73.0	81.6	---	---	Low	

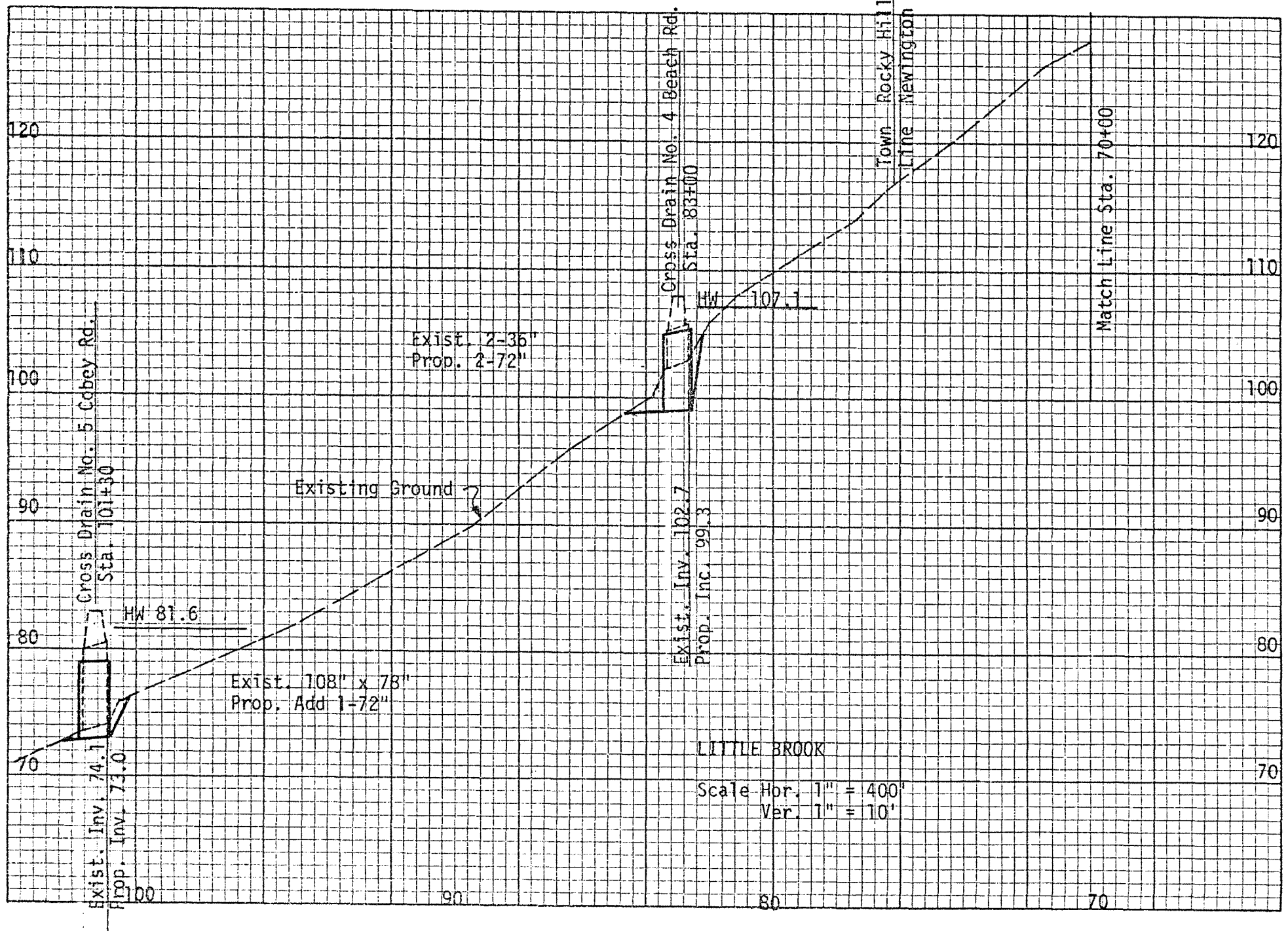
10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



K&E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



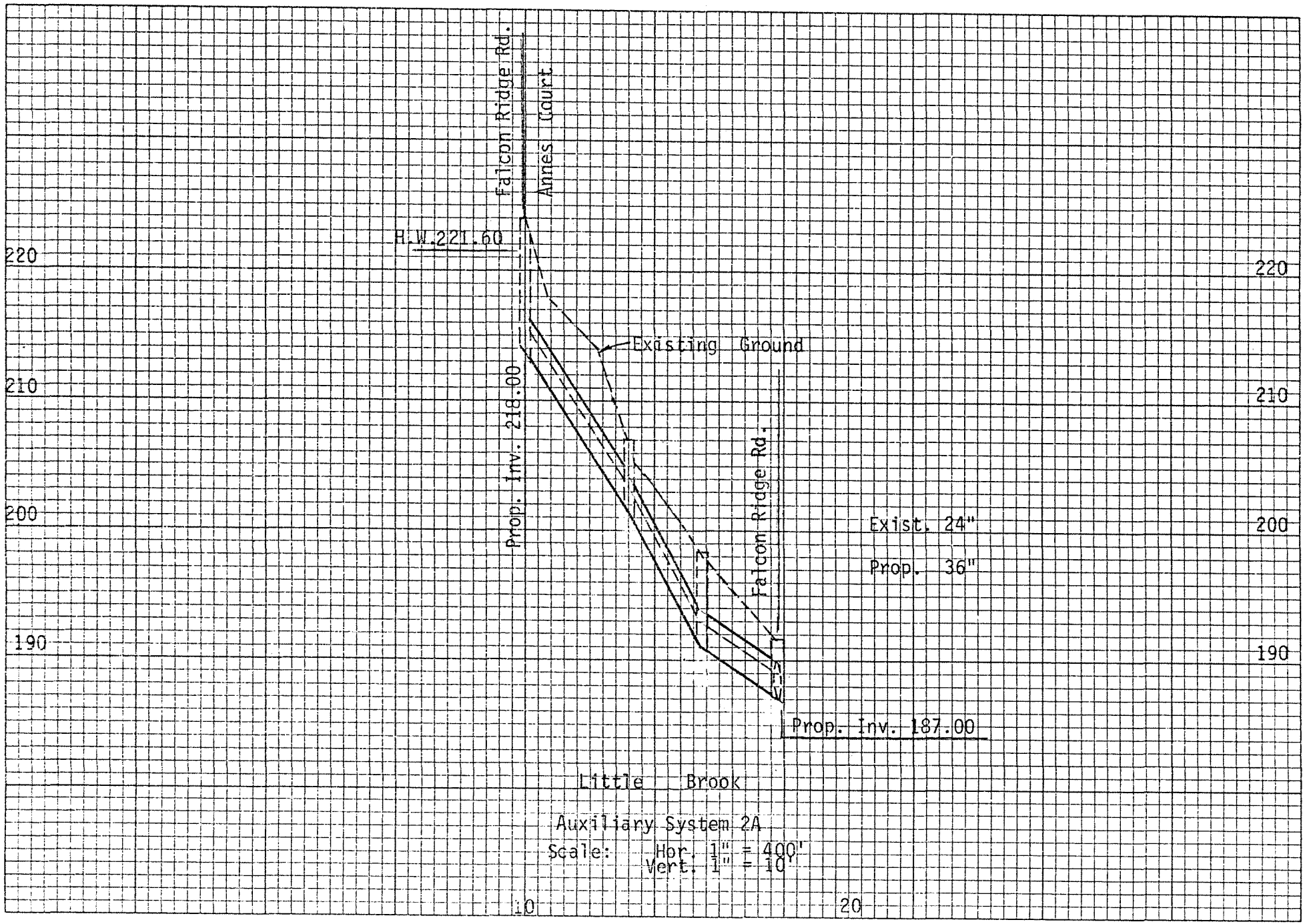
K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



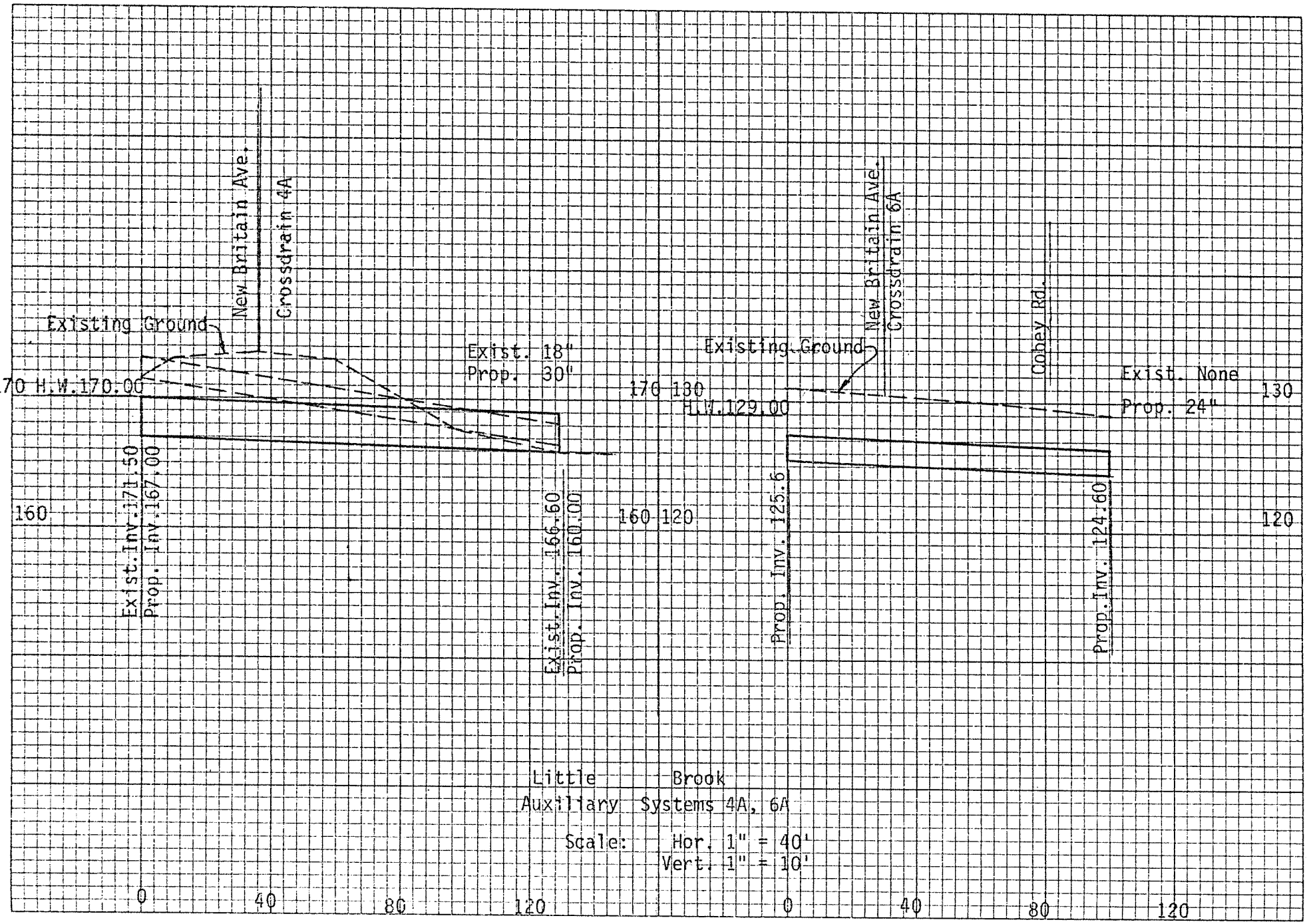
STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN LITTLE BROOK WATERSHED (TABLE NO. 20)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
2A alcon Ridge Rd.	---	23	48	24" 36"	218.0 218.0	221.6	---	---	Q = 48 Shown as existing Middle But proposed
4A ew Britain Ave.	---	21	32	18" 30"	167.0 167.0	170.0	---	---	Q = 24.5 High
6A ew Britain	---	13	18	None 24"	125.6	129.0			Q = 12.0 Low
6B ethersfield Rd		9	14	24" Same	101.0 101.0	103.0			

KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0703



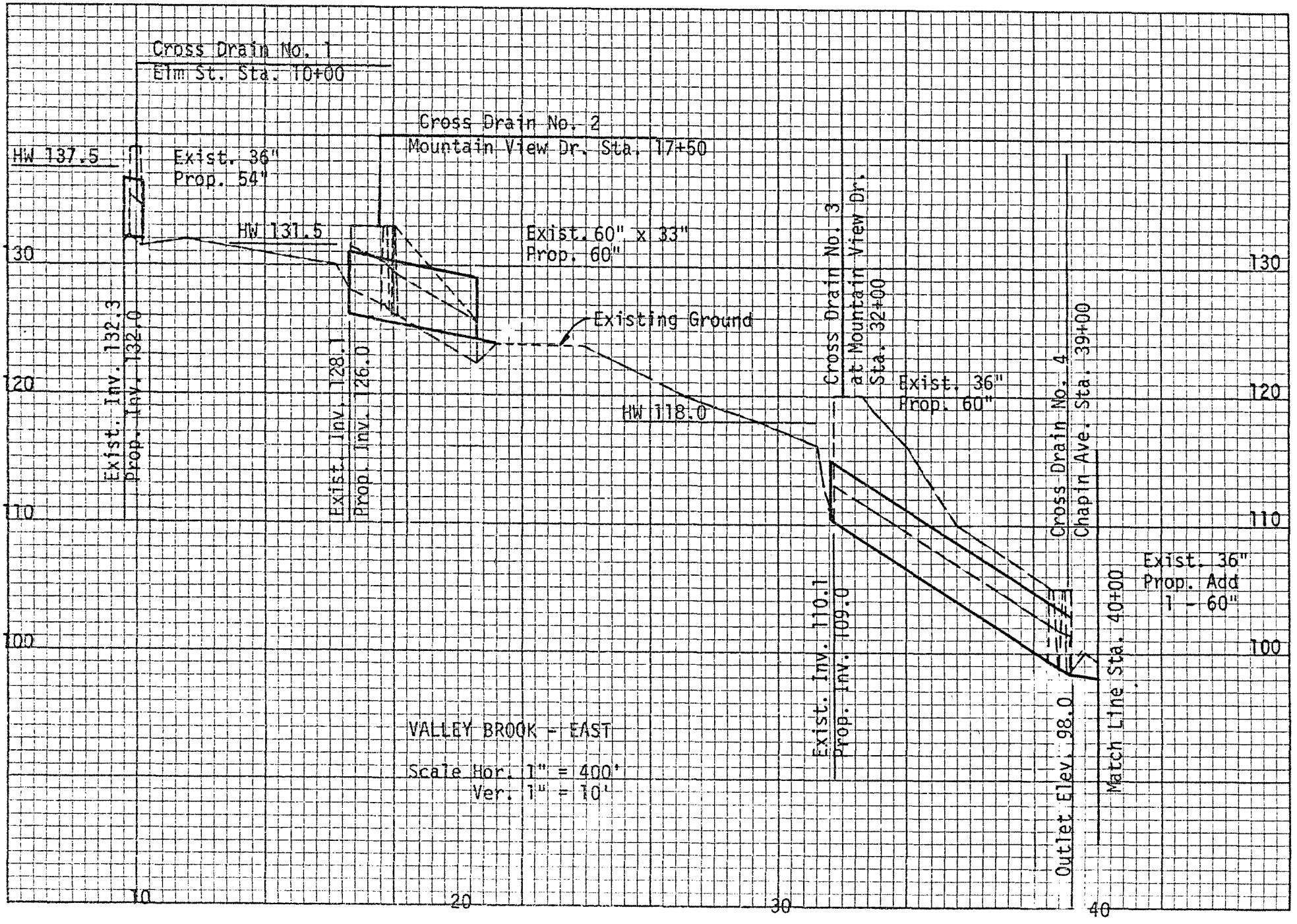
K+E 10 TO THE INCH 10 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



STREAM ANALYSIS - VALLEY BROOK - EAST (TABLE NO. 21)

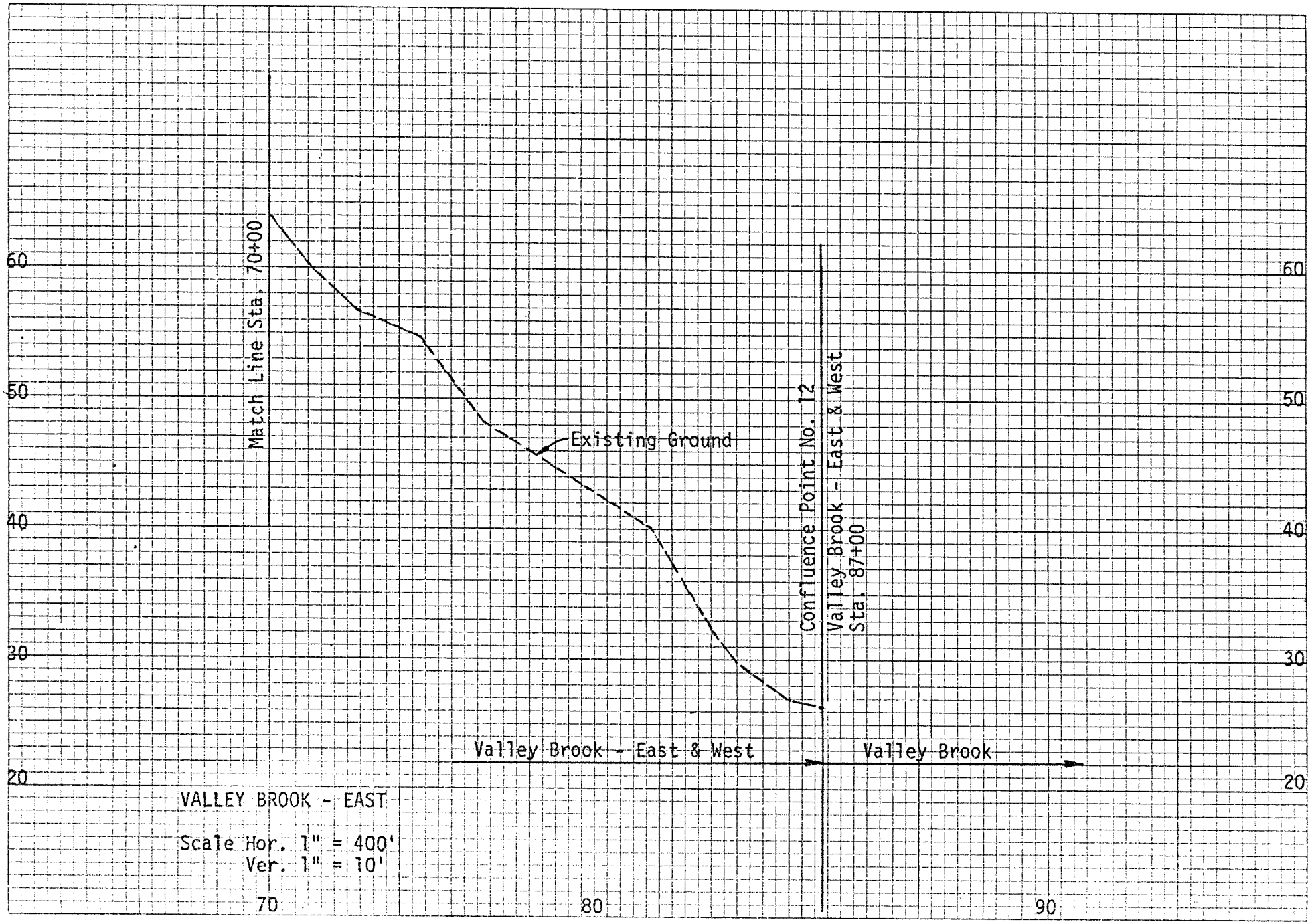
CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL		REMARKS
							Bottom Width	Water Depth	
1 Elm Street	10+0	72	139	36" 54"	132.3 132.0	137.5			Q = 90.0 Low
2 Mountain View Dr.	17+50	99	186	60"x33" 60"	128.1 126.0	131.5			Q = 129.0 Middle
3 West along Mtn. View Drive	32+00	146	262	36" 60"	110.1 109.0	118.0			Q = 143.0 High
4 Chapin Ave.	39+00	169	298	36" Add 60"	99.0 98.0	104.0			Q = 167.0 High
5 Silas Deane Hwy.	44+60	186	322	30" 2-60"	90.5 90.0	95.5			Q = 240.0 High
6 Silas Deane Hwy.	52+00	263	400	48" 2-60"	85.8 85.0	91.8			High
7 Parsonage St.	56+00	300	440	48" 2-60"	84.7 84.0	90.8			High
8 West Along Silas Deane Highway	60+40	310	455	72" Add 54"	82.7 83.0	90.0			Low

K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



70 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



VALLEY BROOK - EAST

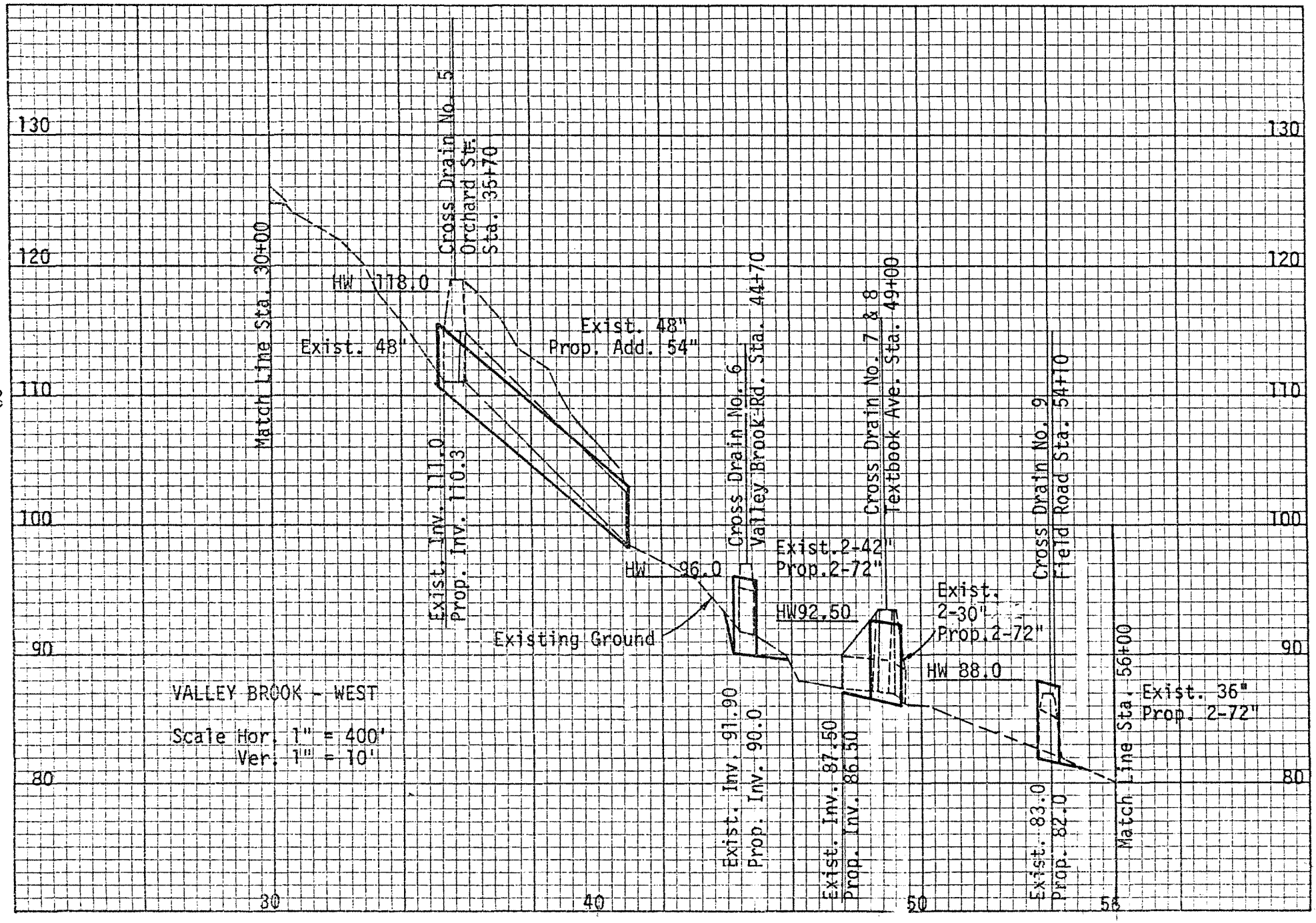
Scale Hor. 1" = 400'
Ver. 1" = 10'

STREAM ANALYSIS - VALLEY BROOK - WEST (TABLE NO. 22)

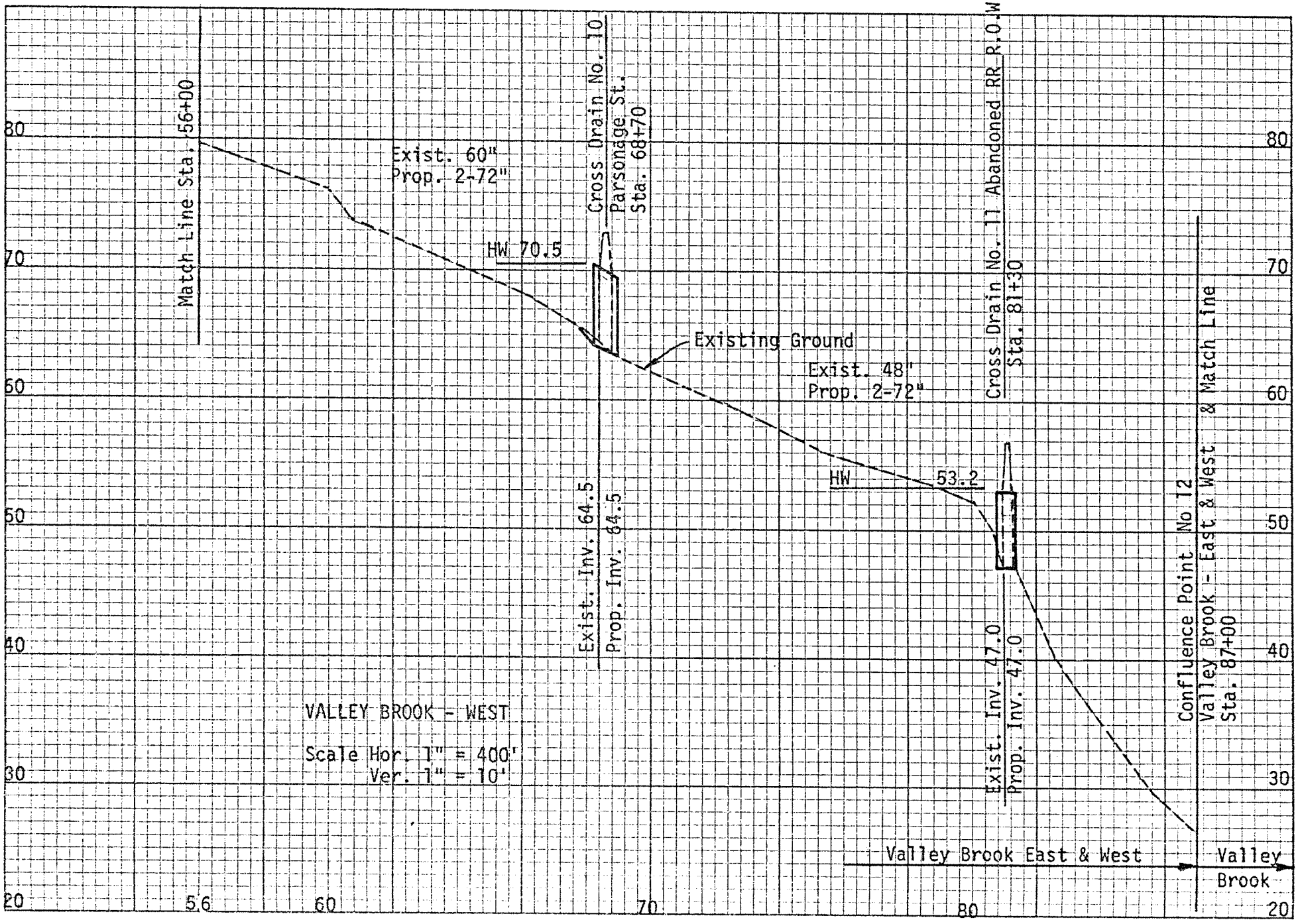
CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
1 Elm Street	10+00	74	140	36" 48"	167.7 166.0	172.4			Q = 96.0 Low
2 Elm Ridge Drive	15+30	91	170	42" 54"	156.7 155.0	161.7			Q = 124.0 High
3 Wright Rd.	22+00	123	216	36" 60"	139.3 136.5	144.0			Q = 167.0 High
4 Berkshine Rd.	27+40	134	226	36" 60"	128.8 125.5	133.0			Q = 173.0 High
5 Orchard St.	35+70	206	334	48" Add 54"	111.0 110.3	118.0			Q = 280.0 High
6 Valley Brook Rd.	44+70	319	440	2-42" 2-72"	91.9 90.0	96.0			High
7 & 8 Textbook Ave.	49+00	342	455	2-36" 2-72"	87.5 86.5	92.5			High
9 Field Crossing	54+10	365	470	36" 2-72"	83.0 82.0	88.0			High
10 Parsonage St.	68+70	437	510	60" 2-72"	64.5 64.5	70.5			High
11 Abandoned RR	81+30	482	540	48" 2-72"	47.0 47.0	53.2			High

10 X 10 TO THE INCH 46 0702
7 X 10 INCHES
KEUFFEL & ESSER CO.
MADE IN U.S.A.

K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



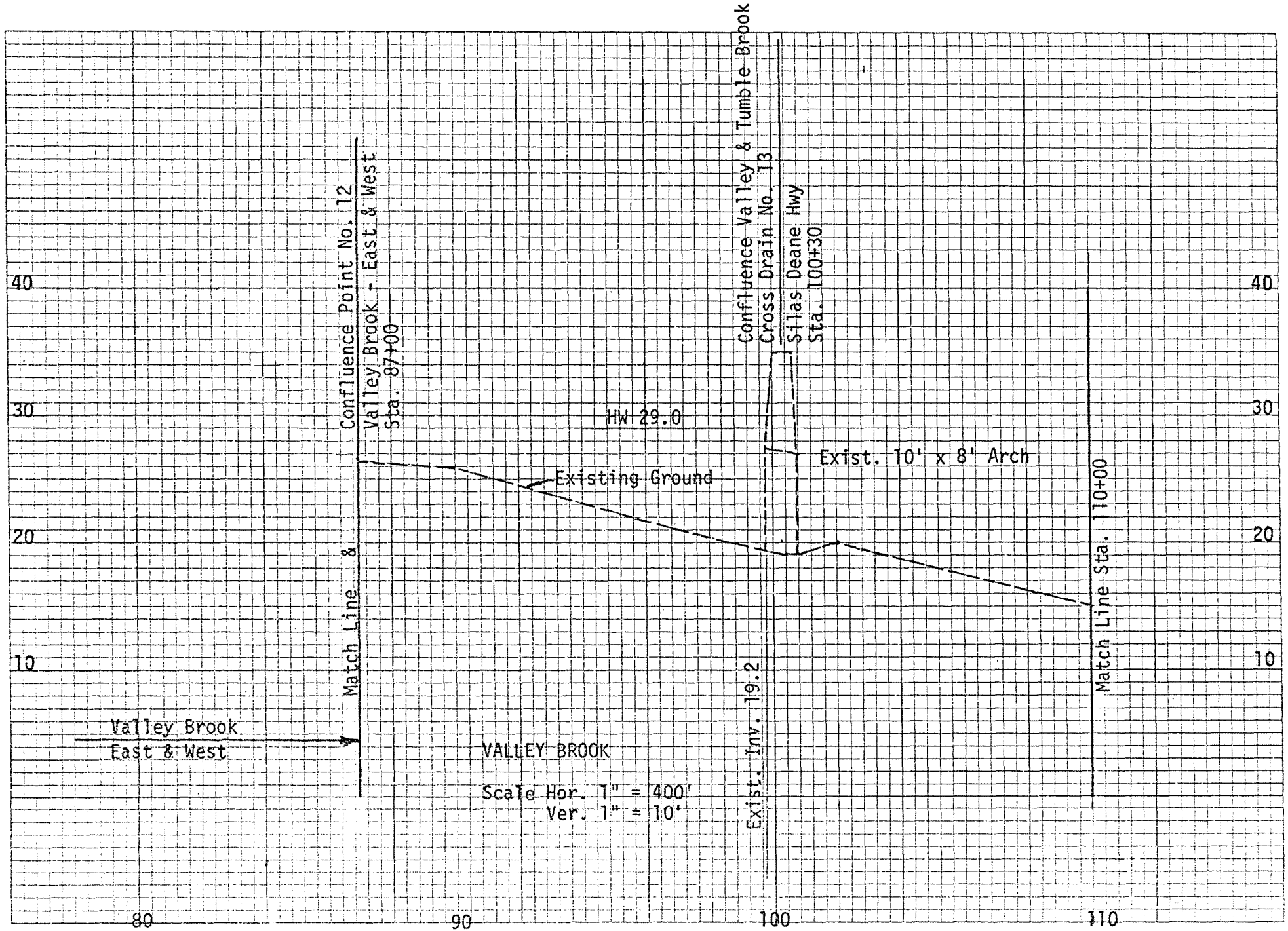
10 X 10 TO THE INCH 46 0732
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



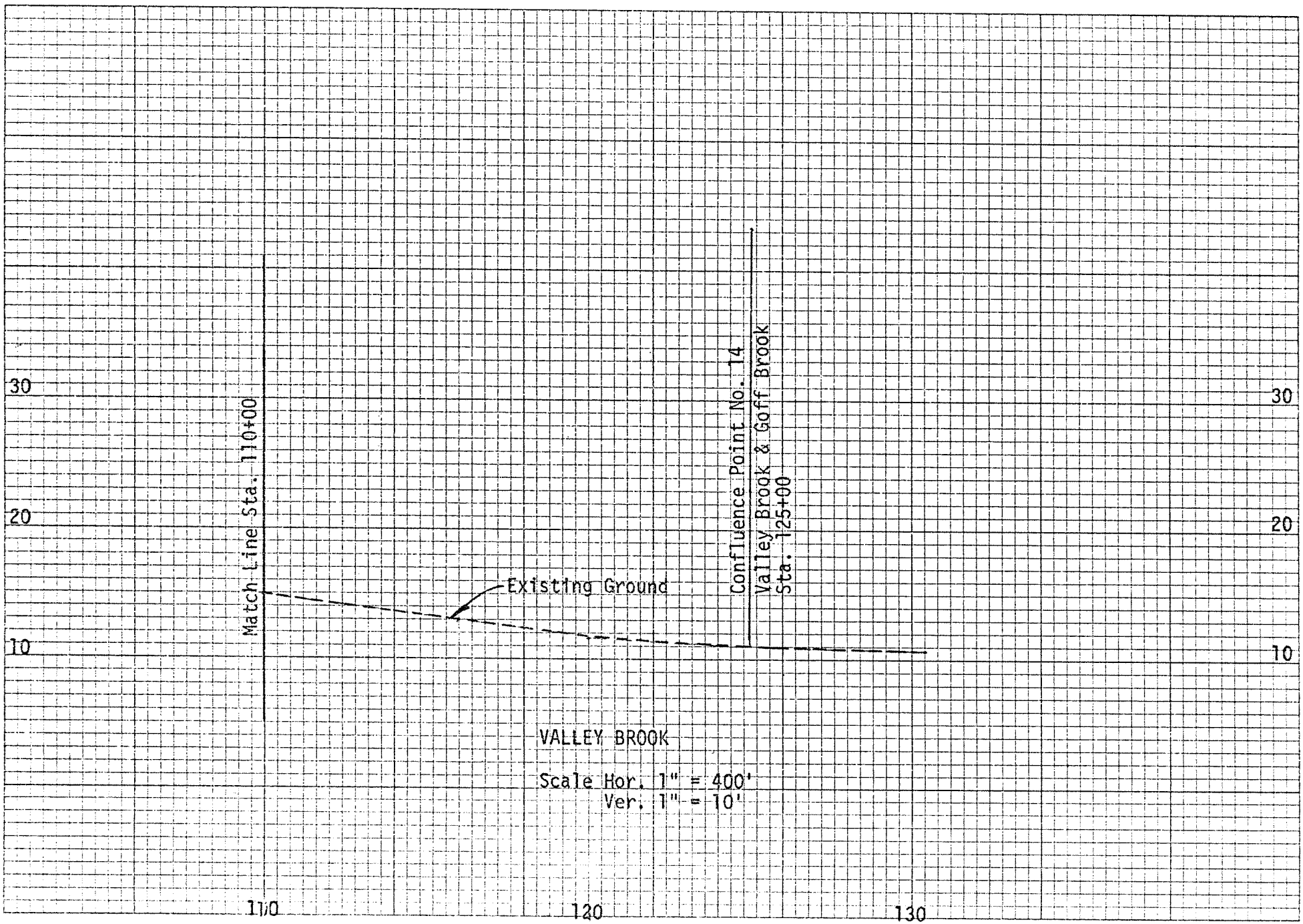
STREAM ANALYSIS - VALLEY BROOK (TABLE NO. 23)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL		REMARKS
							Bottom Width	Water Depth	
12 Confluence East and West	87+00	884	850.						
13 Confluence Valley & Tumble Brook				10' Arch	19.2				
Silas Deane Hwy	100+30	1507	1380	Same	Same	29.0			
14 Confluence Valley & Goff Brook	125+00	1743	1500	---	---	---	---		

10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



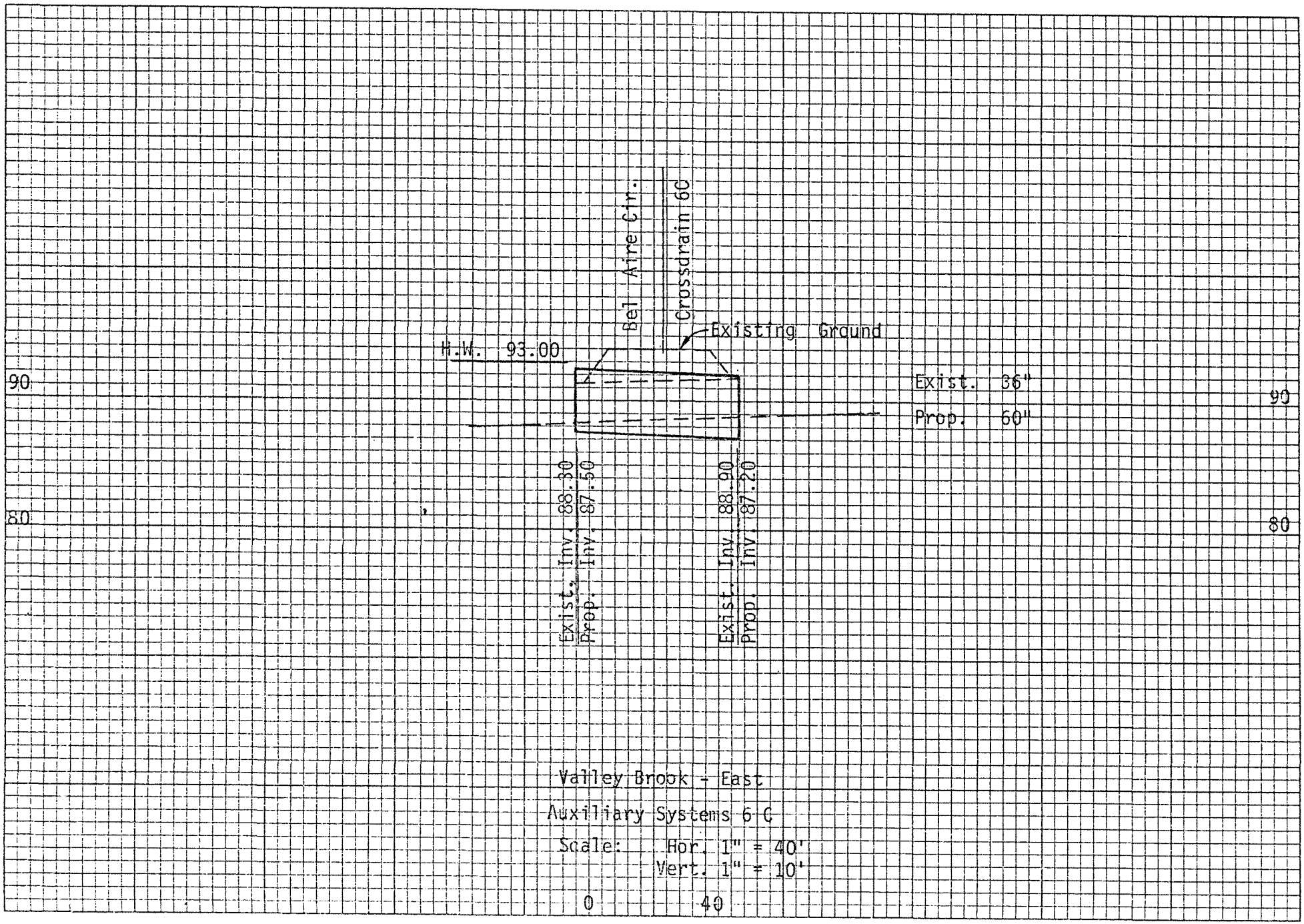
KEUFFEL & ESSER CO. MADE IN U.S.A.



STREAM ANALYSIS - AUXILIARY CROSS DRAIN
VALLEY BROOK EAST (TABLE NO. 24)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
1A Grimes Road	---	12.5	25.7	24" Same	139.6 Same	142.6			
4 A West of Mountain View Drive	---	13.4	26.6	24" Same	109.0 Same	112.0			
6A Silas Deane Hwy	---	15.6	40.0	18" 30"	95.1 95.1	99.0			Q = 40.0 High
6B Church St.	---	10.2	25.6	24" Same	96.2 Same	99.6			Shown as existing But proposed
6C Bel Air Circle	---	65.6	154.6	36" 60"	88.3 87.5	93.0			Q = 154.6 High
7A Silas Deane Hwy	---	27.0	64.0	24" 36"	88.6 88.6	93.7			Q = 64.0 High
8A Silas Deane Hwy	---	6.5	15.6	15" Same	84.4 Same	89.7			
12A Abandoned RR	---	21.4	53.0	36" Same	75.0 Same	79.0			
12B Abandoned RR	---	11.0	37.0	30" Same	59.0 Same	62.5			

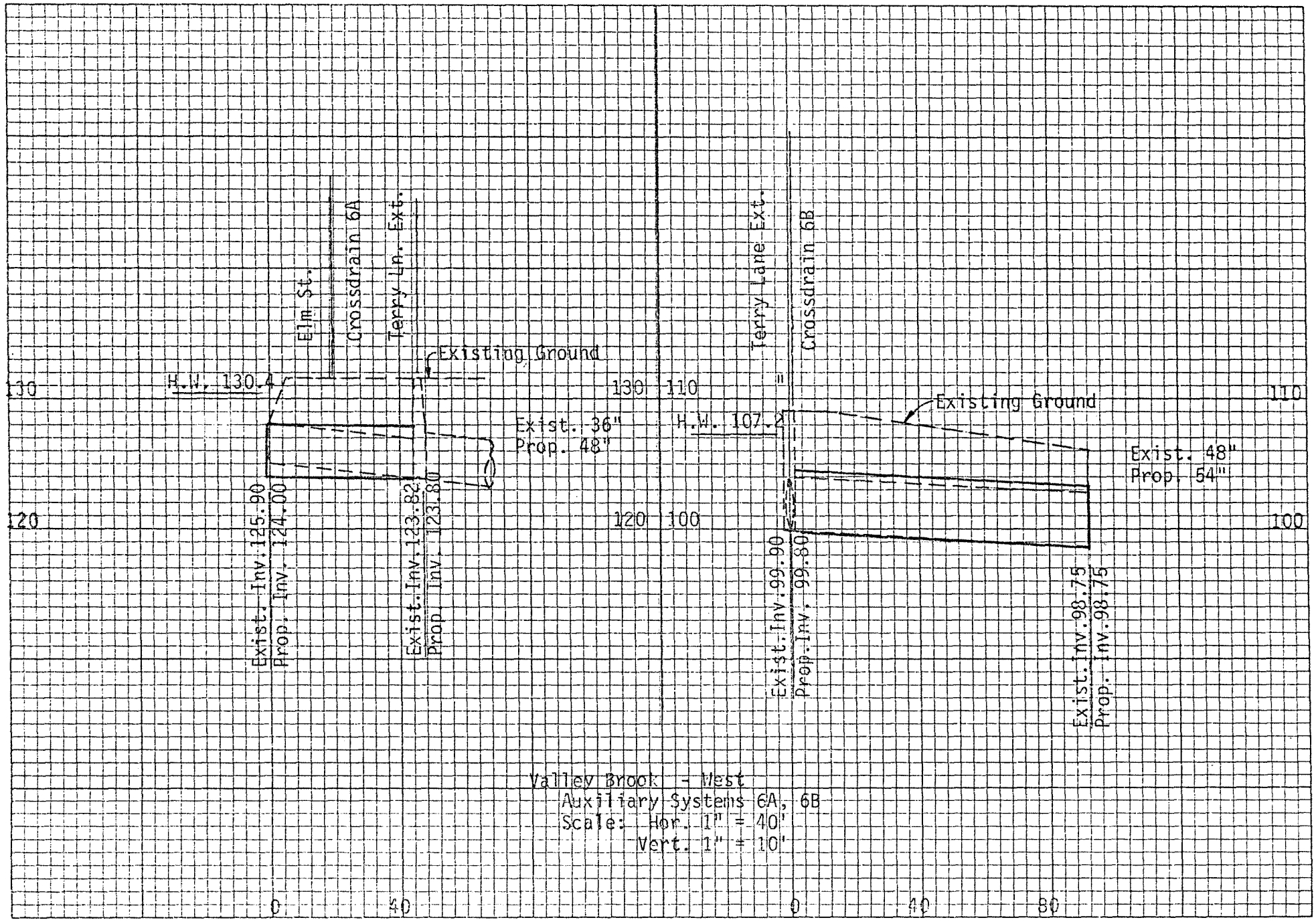
K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



STREAM ANALYSIS - AUXILIARY CROSS DRAIN
VALLEY BROOK WEST (TABLE NO. 25)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
1A Gilbert Ave.	---	8.2	22.5	24" Same	212.80 Same	216.0			
1B Gilbert Ave.	---	3.7	12.0	18" Same	208.80 Same	211.3			
1C Gilbert Ave.	---	4.0	14.0	18" Same	207.9 Same	210.5			
6A Elm Street	---	71.5	136.0	36" 48"	125.0 124.0	130.4			Q = 82.7 Low
6B At Terry Lane	---	103.1	184.0	48" 54"	99.9 99.8	107.2			Q = 127.0 Low
10A Orchard St.	---	12.7	25.6	18" 24"	85.8 85.8	89.2			Q = 17.0 Low

K&E X 10 E INC 10 IN
KEUFFEL & ESSER CO. MADE IN U.S.A.



Valley Brook - West
Auxiliary Systems 6A, 6B
Scale: Hor. 1" = 40'
Vert. 1" = 10'

100.

STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN VALLEY BROOK WATERSHED (TABLE NO. 26)

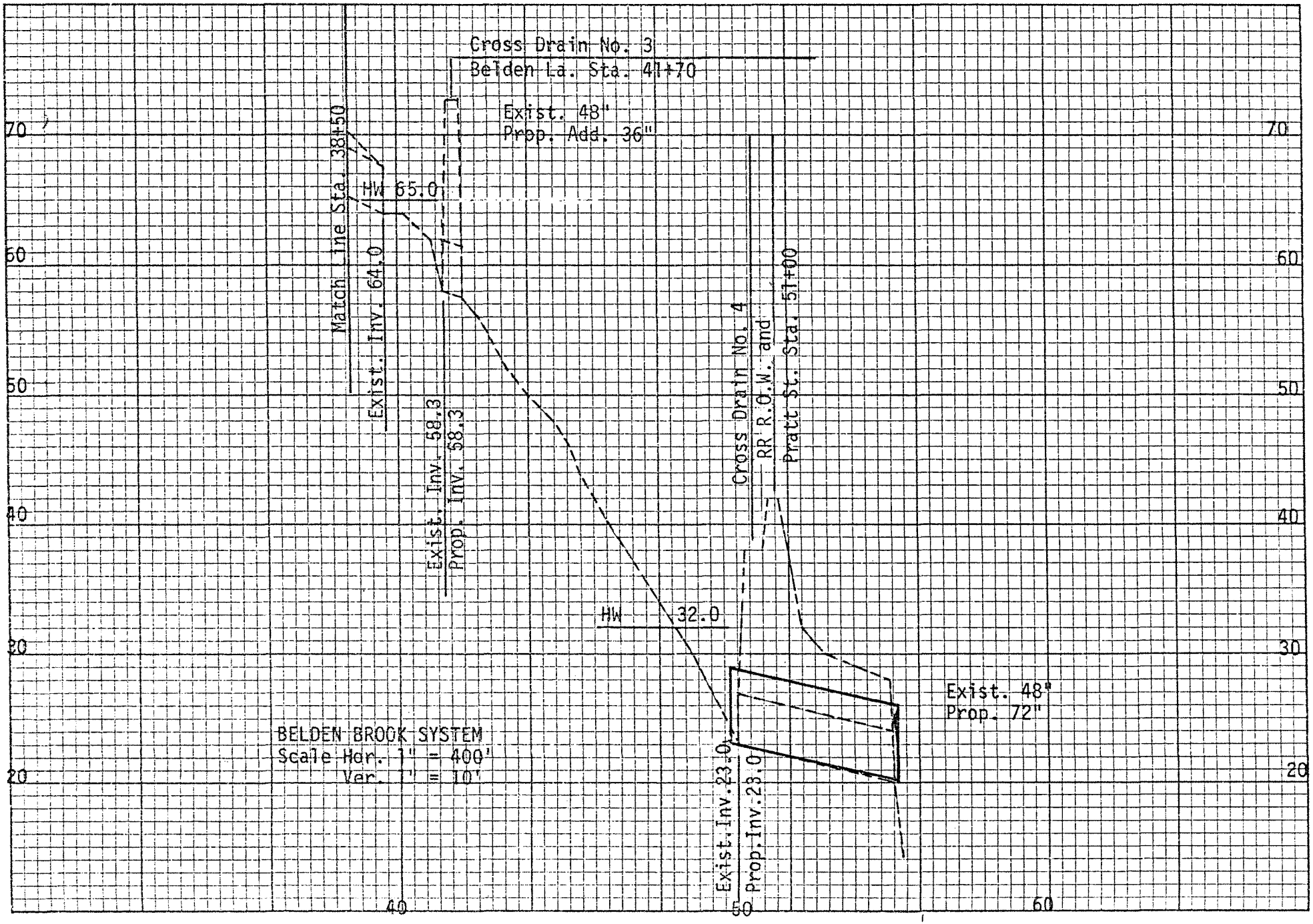
CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL		REMARKS
							Bottom Width	Water Depth	
14A Marshall Rd.	---	69.1	162	54" Same	30.6 Same	37.0	---	---	
14B Town Line Rd.	---	42.6	93	36" Same	22.4 Same	29.0	---	---	
14C Ramp I-91	---	76.9	176	60" Same	20.0 Same	26.0	---	---	
14D I-91	---	99.2	208	96" Same	16.0 Same	21.6	---	---	

STREAM ANALYSIS - BELDEN BROOK (TABLE NO. 27)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
1 Main Street	25+00	68	143	42" 48"	101.1 98.2	105.0			Q = 130 Middle
2 Begin 72"x44"	31+00	82	175	72" x 44" Same	76.3 Same	81.9			
3 Belden Lane	41+70	106	205	48" Add 36"	58.3 58.3	65.0			Q = 205 Low
4 Pratt St. & Railroad	51+00	200	352	48" 72"	23.0 23.0	32.0			Q = 300 Low

K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES
KEUFFEL & ESSER CO.
MADE IN U.S.A.

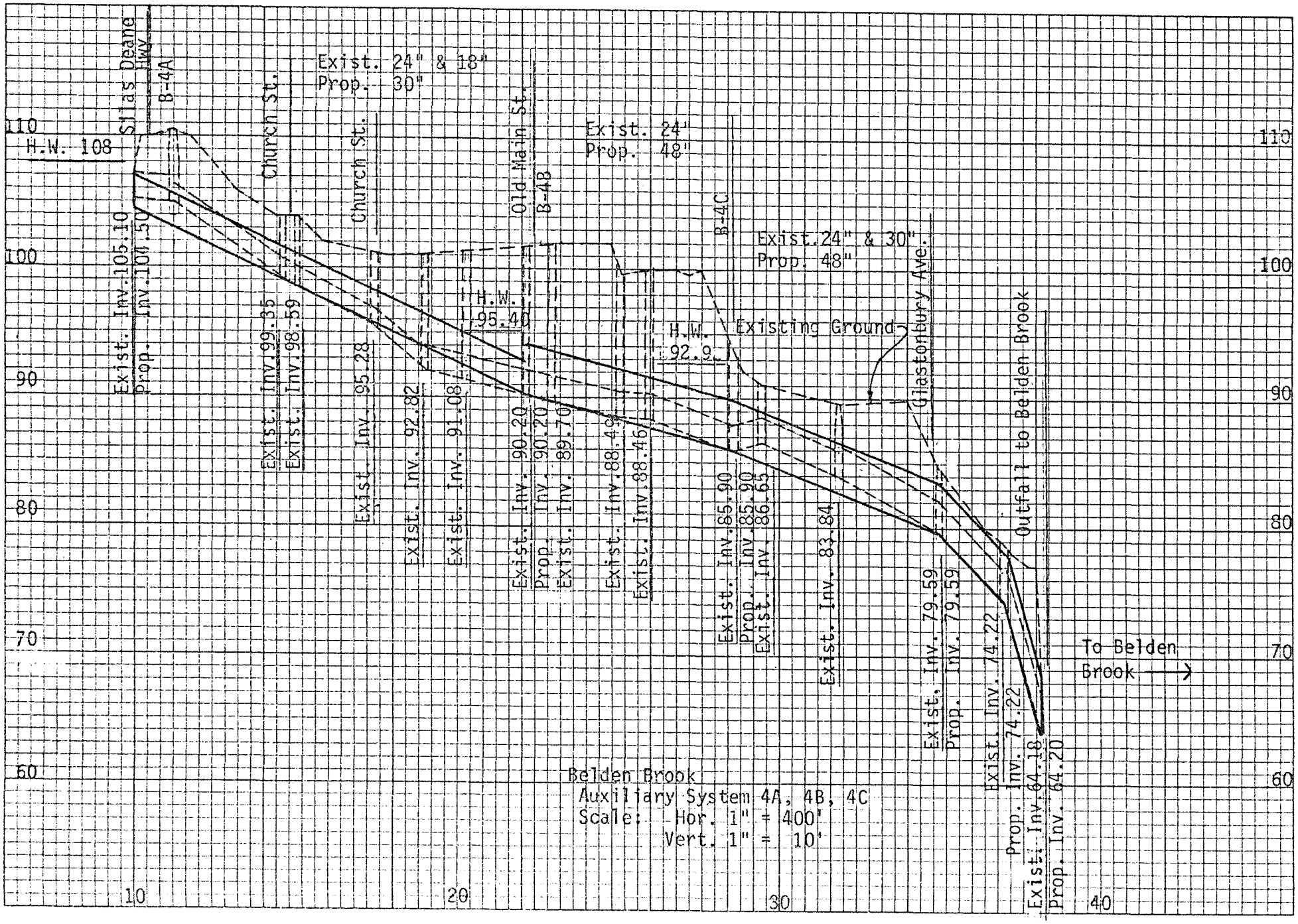
K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



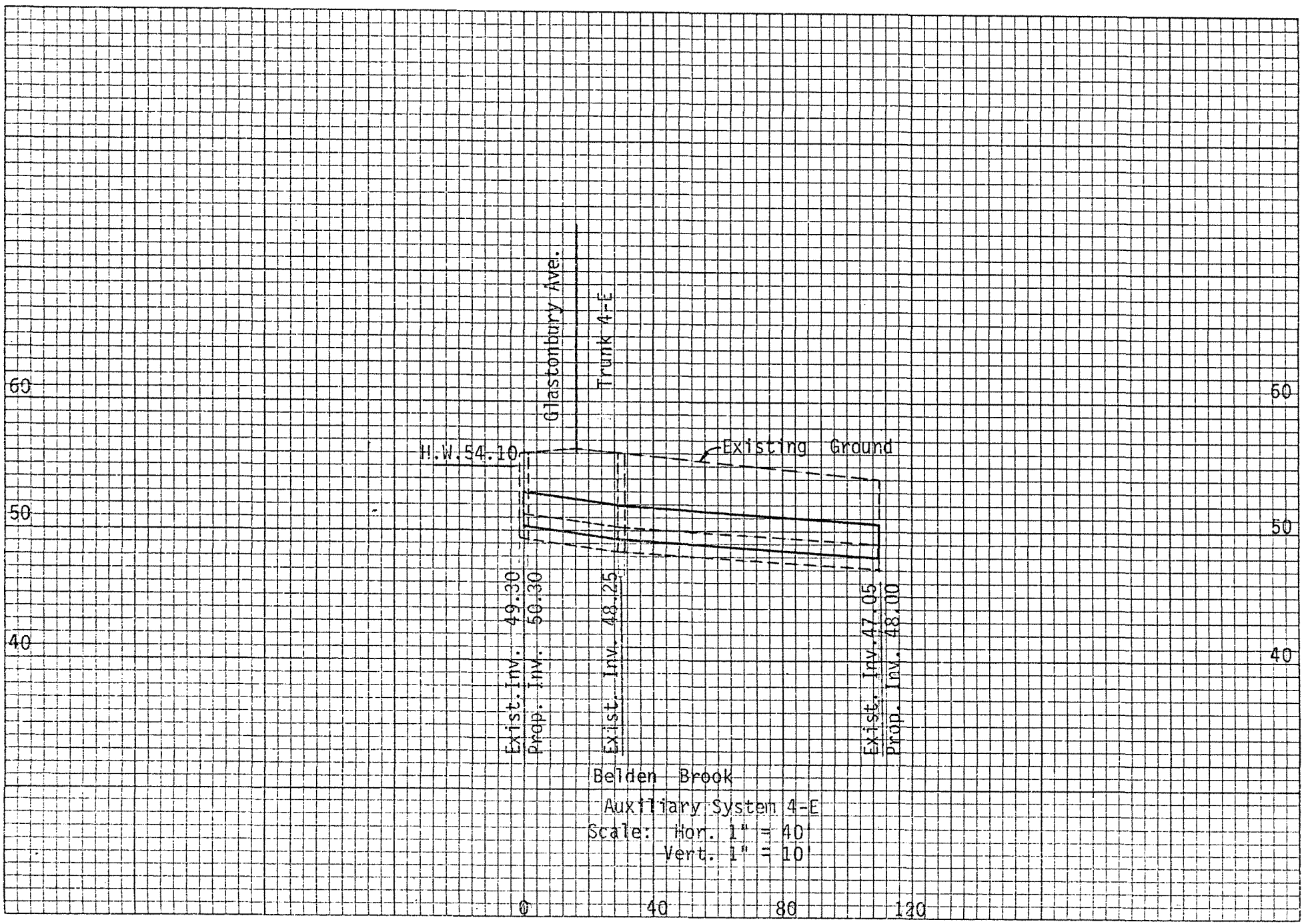
STREAM ANALYSIS - AUXILIARY CROSS DRAINS
IN BELDEN BROOK WATERSHED (TABLE NO. 28)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
4A Silas Deane Hwy	---	14.0	40.5	24" 30"	105.1 104.5	108.0			Q = 36.2 Middle
4B Old Main St.	---	45.8	100.0	24" 48"	90.2 90.2	95.4			Q = 100.0 Middle
4C North of Glastonbury Av.	---	57.3	128.0	24" 48"	85.9 85.9	92.9			Q = 128.0 Middle
4D Glastonbury Ave.	---	5.4	12.2	18" Same	67.9 Same	70.9			Q = 52.0 Middle
4E Glastonbury Ave.	---	23.7	52.0	24" 30"	49.3 50.3	54.1			

K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



K&E 10 X 10 TO THE INCH 10 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

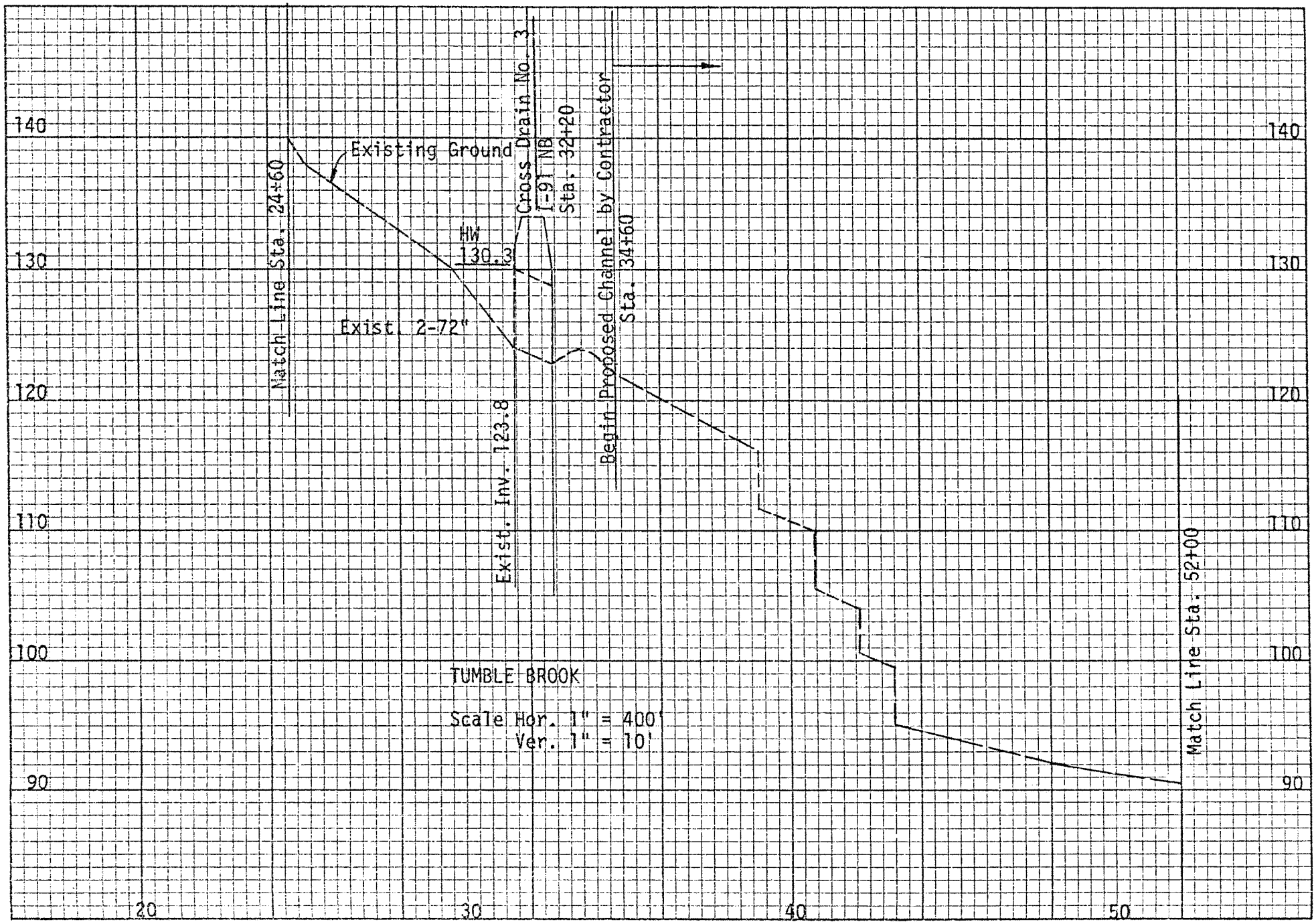


STREAM ANALYSIS - TUMBLE BROOK (TABLE NO. 29)

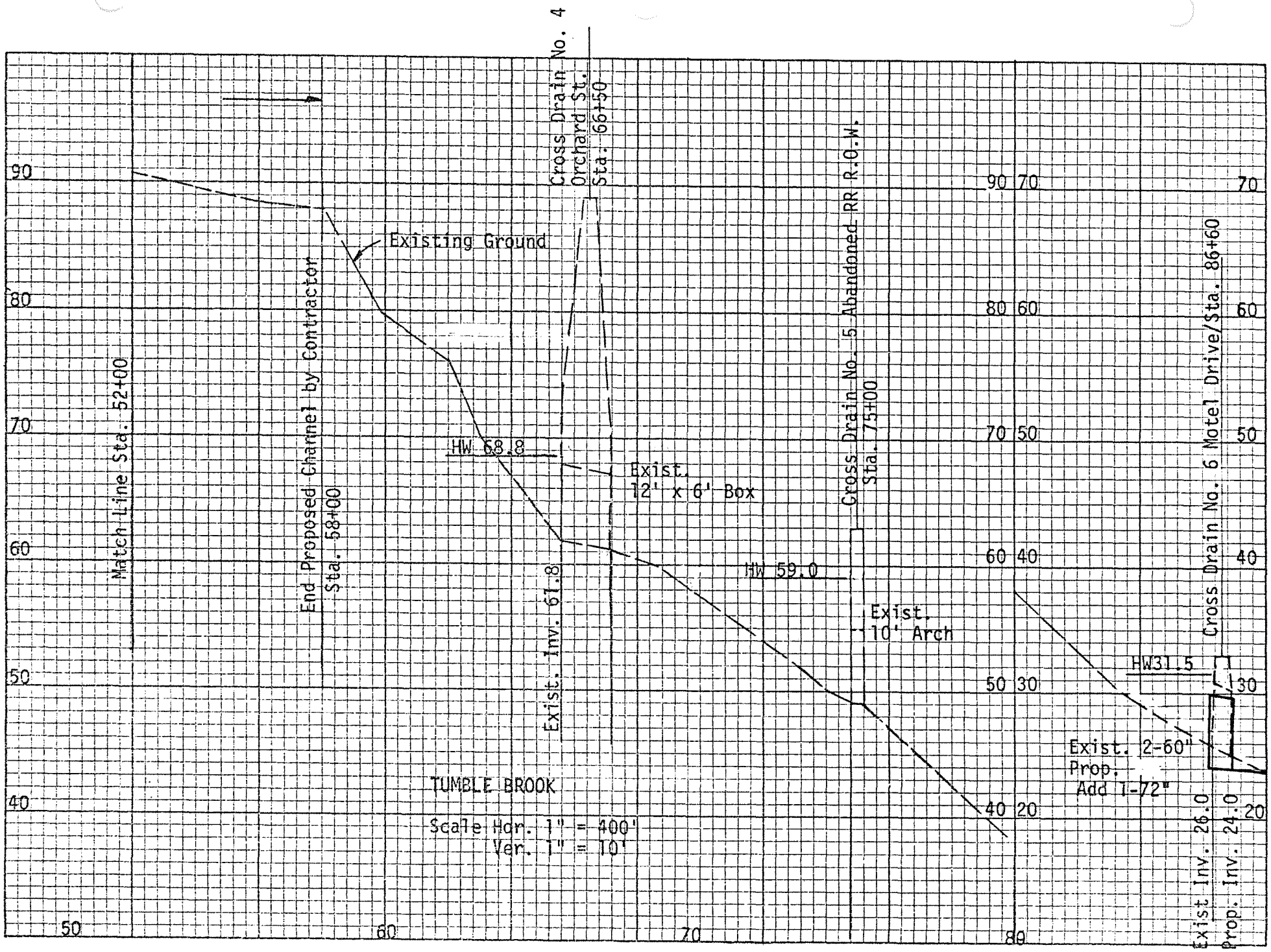
CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
1 Proposed I-291	10+00	174	370	84" Same	161.0. Same	169.0	---	---	
2 I-91	22+90	240	410	2-60" Same	141.4 Same	148.4	---	---	
3 I-91	32+20	311	462	2-72" Same	123.8 Same	130.3	---	---	
4 Orchard St.	66+50	498	570	12'x6' Box Same	61.8 Same	68.8	---	---	
5 Abandoned RR R.O.W.	75+00	603	630	10' Arch Same	09.0 Same	59.0	---	---	
6 Howard Johnson Motel Drive	86+60	623	645	2-60" Add 1-72"	26.0 24.0	31.5	---	---	Low

KE 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES
KEUFFEL & ESSER CO.
MADE IN U.S.A.

K&E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



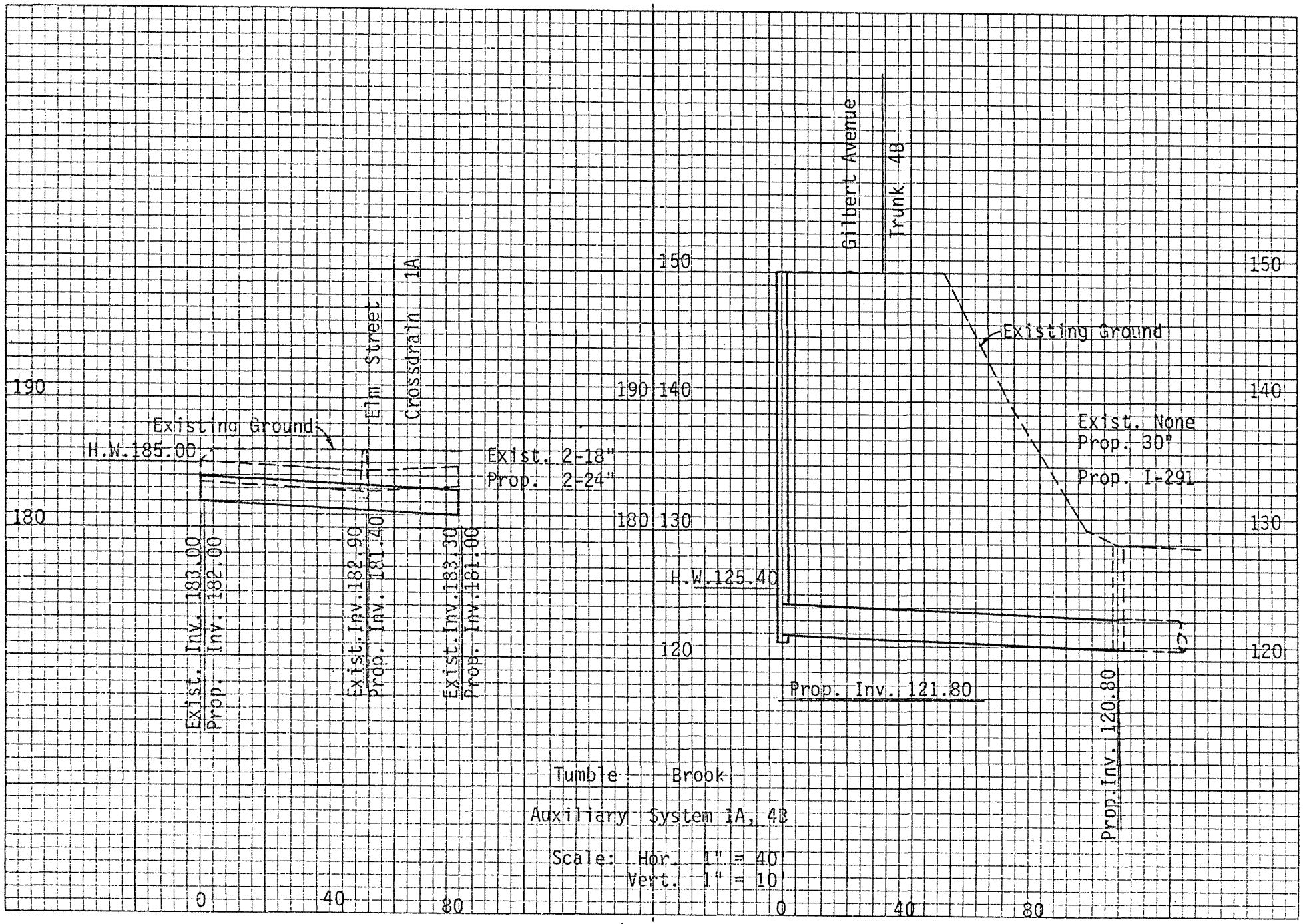
STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN TUMBLE BROOK WATERSHED (TABLE NO. 30)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
1A Elm Street	---	16	52	2-18" 2-24"	183.0 182.0	185.0	---	---	Q = 19 Low
1B Cromwell Ave.	---	38	105	24" 36"	190.4 188.5	197.5	---	---	Q = 92 Middle
1C Maple Street	---	11	22	15" 18"	189.5 189.5	195.5	---	---	Q = 22 Middle
1D Fernwood Dr.	---	31	59	36" Same	176.8 Same	180.7	---	---	
2A Prop. I-291	---	9	25	24" Same	169.0 Same	172.2	---	---	
2B Prop. I-291	---	11	21	24" Same	169.0 Same	172.0	---	---	
2C Prop. I-291	---	23	47	30" Same	164.0 Same	168.0	---	---	
3A I-91	---	44	90	54" Same	140.4 Same	144.4	---	---	
3B I-91	---	3	13	24" Same	139.8 Same	142.1	---	---	
4A I-91	---	15	38	48" Same	103.9 Same	106.7	---	---	
4B Gilbert Ave.	---	15	34	None 30"	None 121.8	125.40	---	---	Q = 28.0 Low
4C Prop. I-291	---	35	76	48" Same	126.1 Same	129.6	---	---	

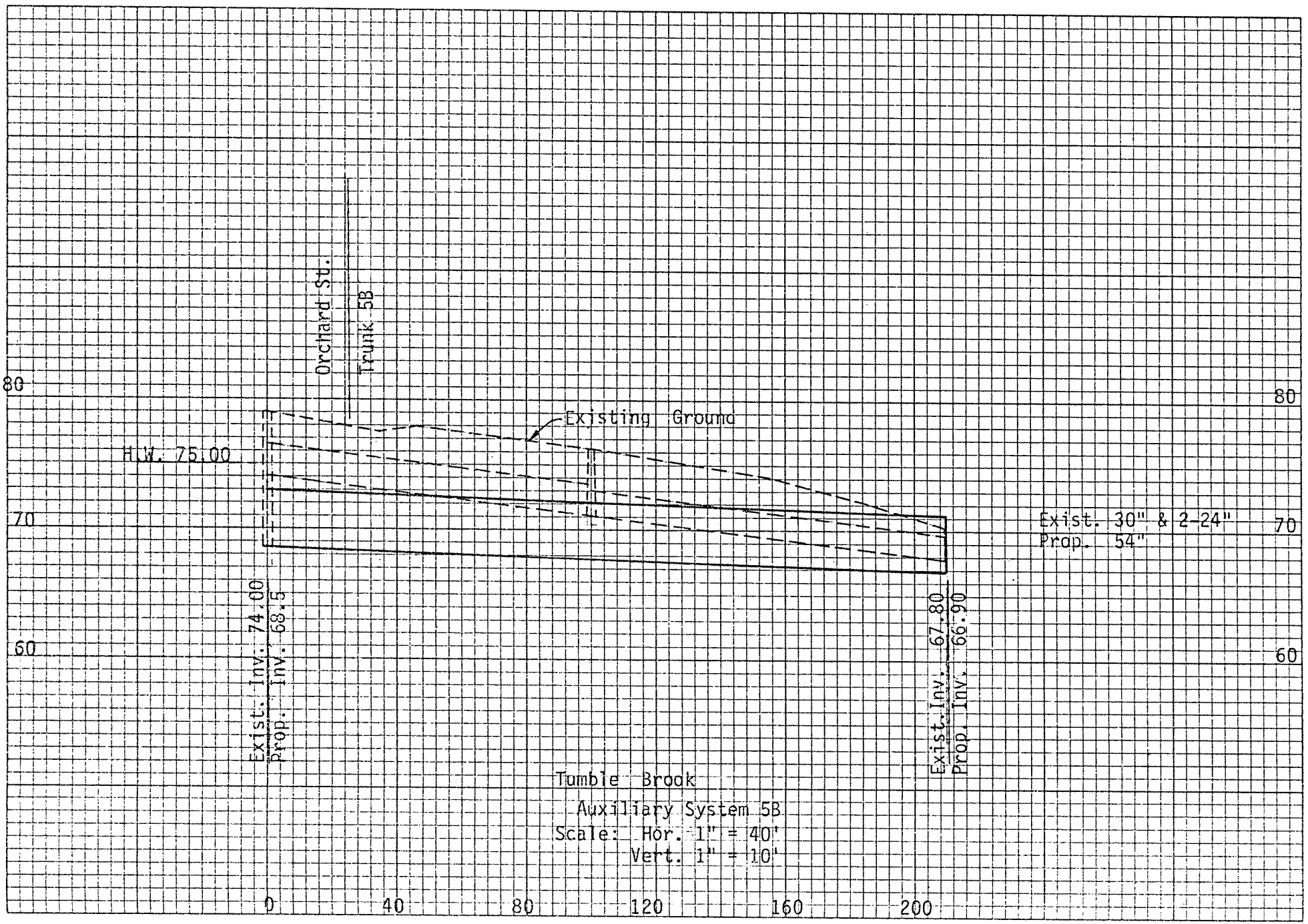
STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN TUMBLE BROOK WATERSHED (TABLE NO. 30)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
4D I-91	---	45	98	54" Same	99.7 Same	104.0	---	---	
4E I-91	---	43	93	48" Same	85.5 Same	90.0	---	---	
4F I-91	---	52	110	54" Same	69.4 Same	74.4	---	---	
5A Orchard St. I-91	---	12	24	30" Same	75.6 Same	78.1	---	---	
5B Orchard St.	---	81	160	2-24", 30" 54"	74.0 68.5	75.0	---	---	Q = 140 Middle
5C I-91	---	98	290	60" Same	62.0 Same	72.0	---	---	
6A I-91 Ramp	---	16	46	60" Same	39.0 Same	45.0	---	---	
6B I-91	---	18	51	60" Same	35.0 Same	41.0	---	---	

K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

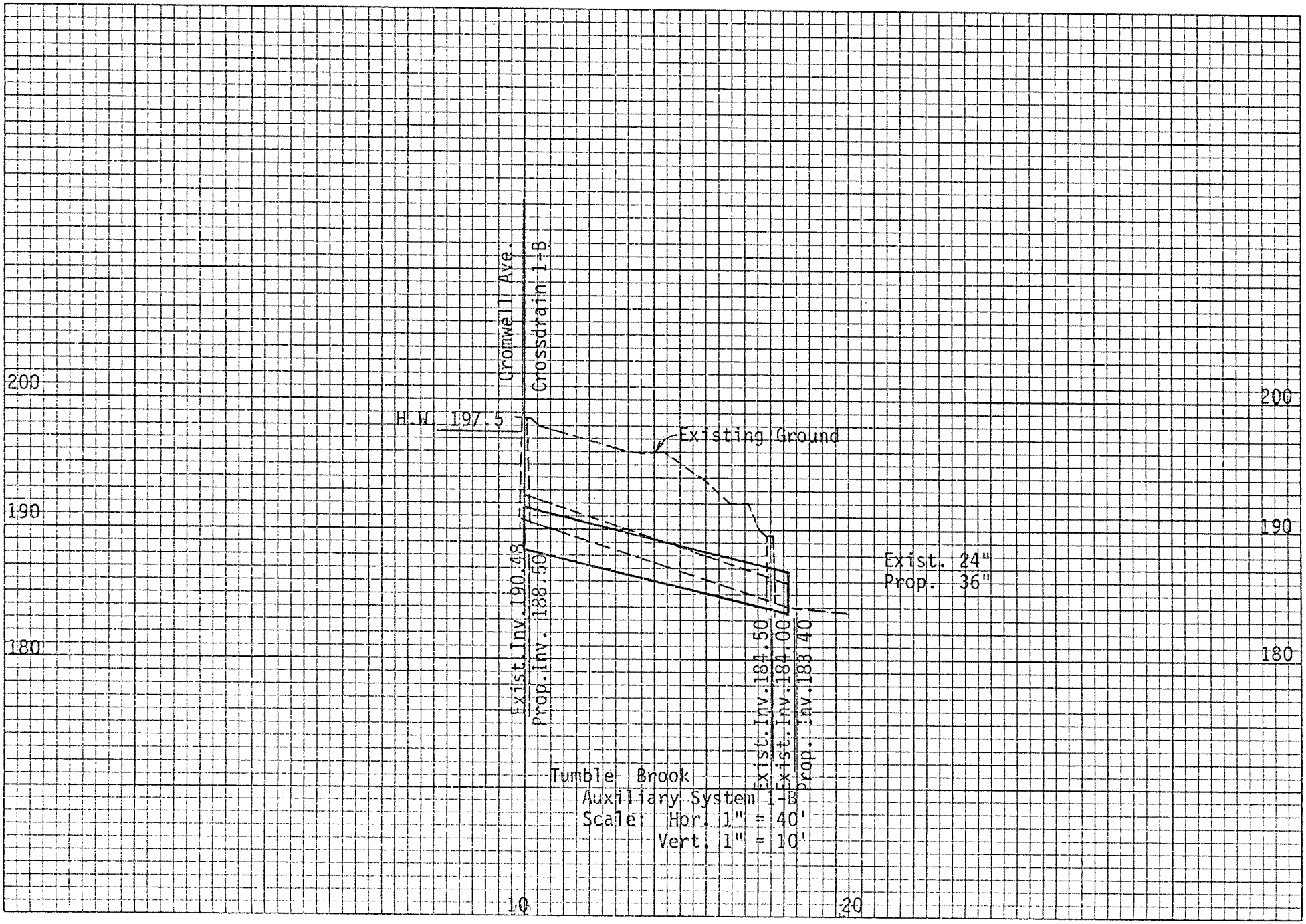


K&E 10 X 10 TO THE INCH 5 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



Tumble Brook
Auxiliary System 5B
Scale: Hor. 1" = 40'
Vert. 1" = 10'

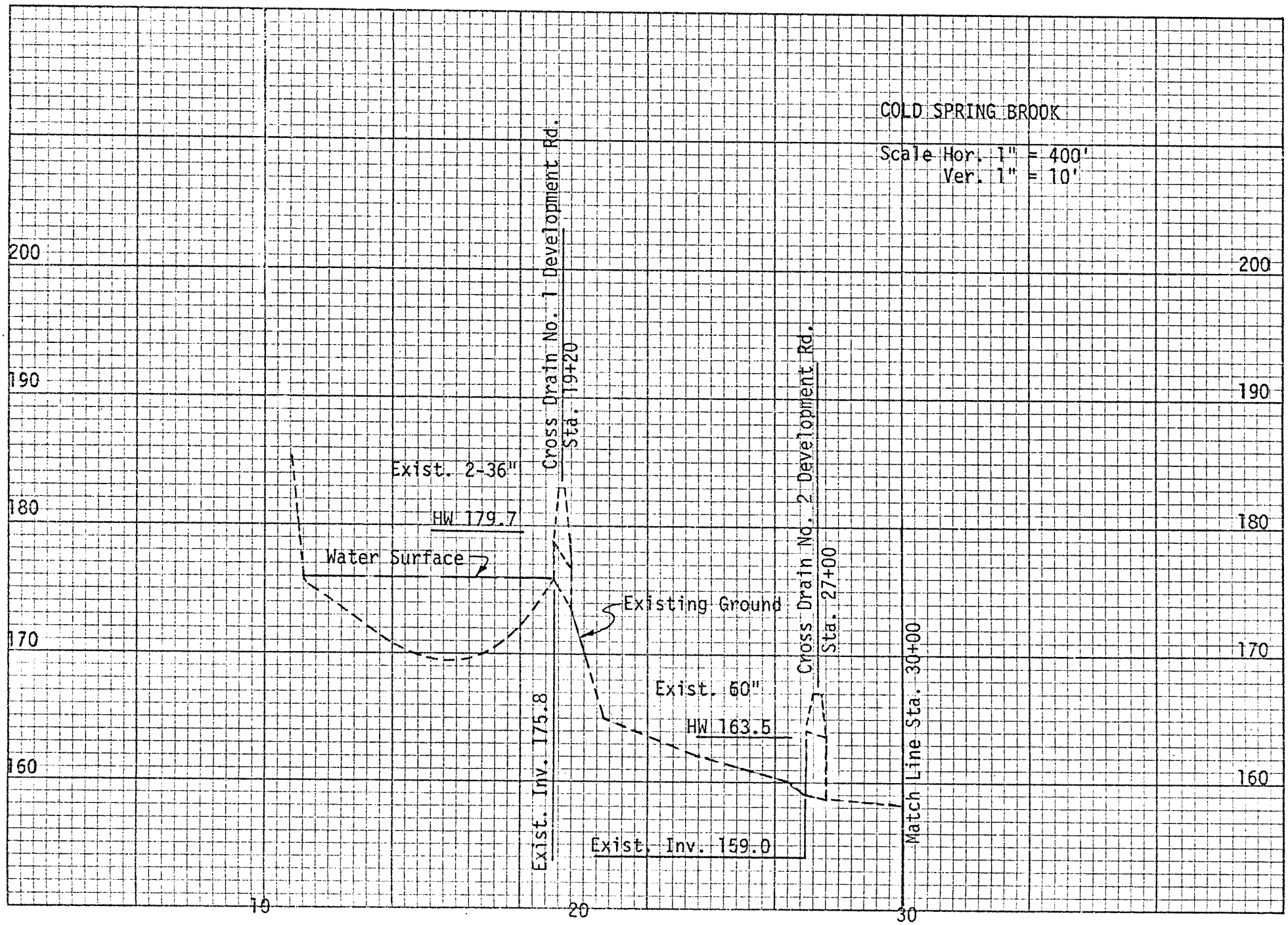
10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



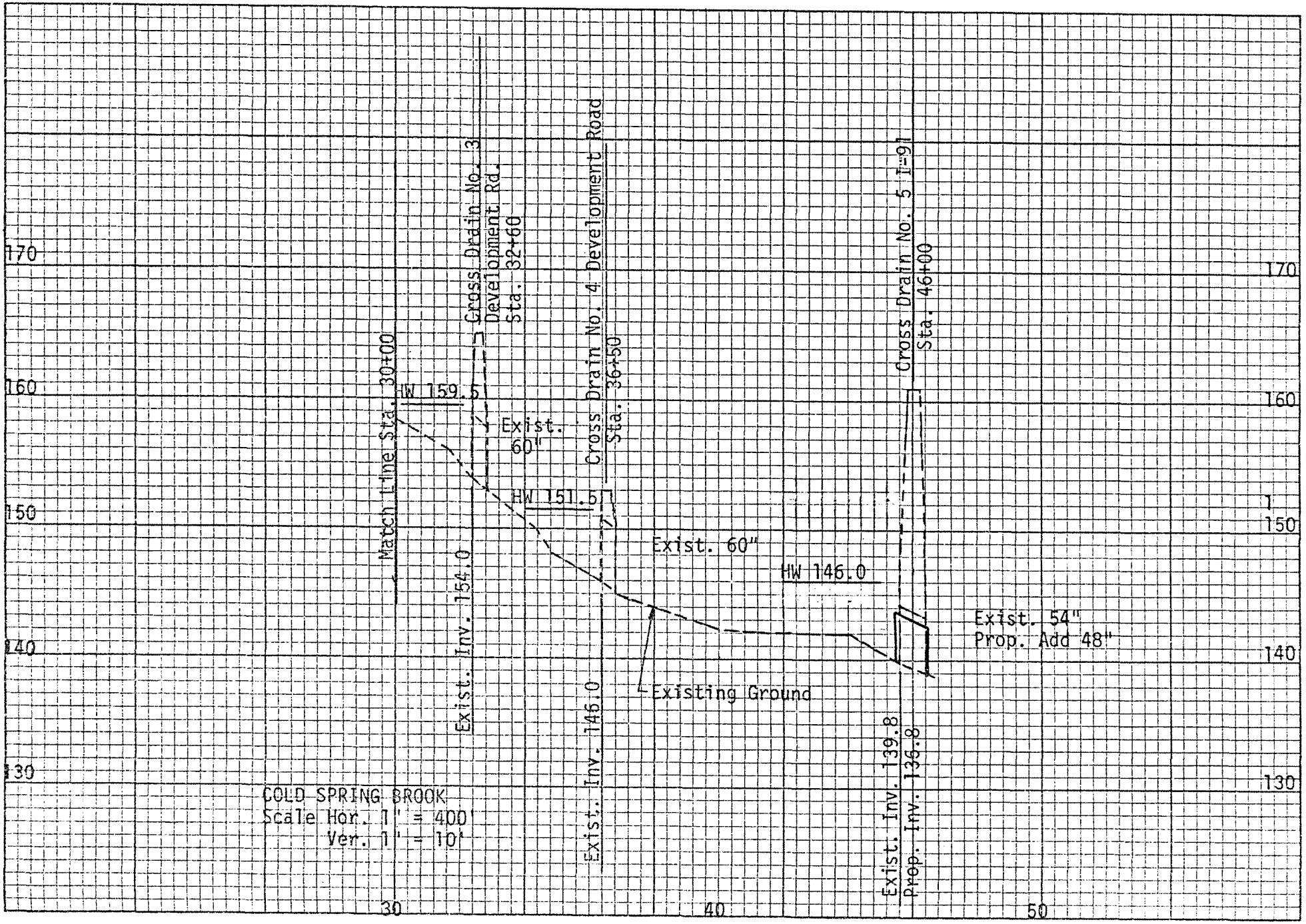
STREAM ANALYSIS - COLD SPRING BROOK (TABLE NO. 31)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL		REMARKS
							Bottom Width	Water Depth	
1 Development Rd.	19+20	51	100	2-36" Same	175.8 Same	179.7	---	---	
2 Development Rd.	27+00	65	125	60" Same	159.0 Same	163.5	---	---	
3 Development Rd.	32+60	75	144	60" Same	154.0 Same	159.5	---	---	
4 Development Rd.	36+50	86	163	60" Same	146.0 Same	151.5	---	---	
5 I-91	46+00	143	280	54" Add 48"	139.8 139.8	146.0	---	---	Q = 200.0 Low

10 X 10 TO THE INCH 46 0732
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



K+E 10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.



STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN COLD SPRING BROOK WATERSHED (TABLE NO. 32)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
1A Cold Spring Rd.	---	12	20	18" Same	187.0 Same	191.6	---	---	
1B Cold Spring Rd.	---	12	28	24" Same	206.5 Same	210.9	---	---	
1C Cold Spring Rd.	---	23	42	30" Same	196.0 Same	200.3	---	---	
3A Century Hills Dr.	---	4	11	18" Same	183.8 Same	186.5	---	---	
5A Century Hills Dr.	---	8	24	24" Same	168.3 Same	171.9	---	---	
5B Century Hills Dr.	---	4	13	18" Same	175.8 Same	178.9	---	---	
6A Cromwell Ave.	---	39	126	18" 54"	140.9 140.4	145.8	---	---	Q = 49.0 Middle
6B Inwood Rd.	---	58.1	176	24" 2-48"	137.6 137.0	141.6	---	---	Q = 72.0 Middle
6C I-91	---	83	204	2-42" Same	115.8 Same	123.0	---	---	
6D Cromwell Ave.	---	51.9	166	24" 54"	133.3 131.0	137.3	---	---	Q = 64.0 Middle

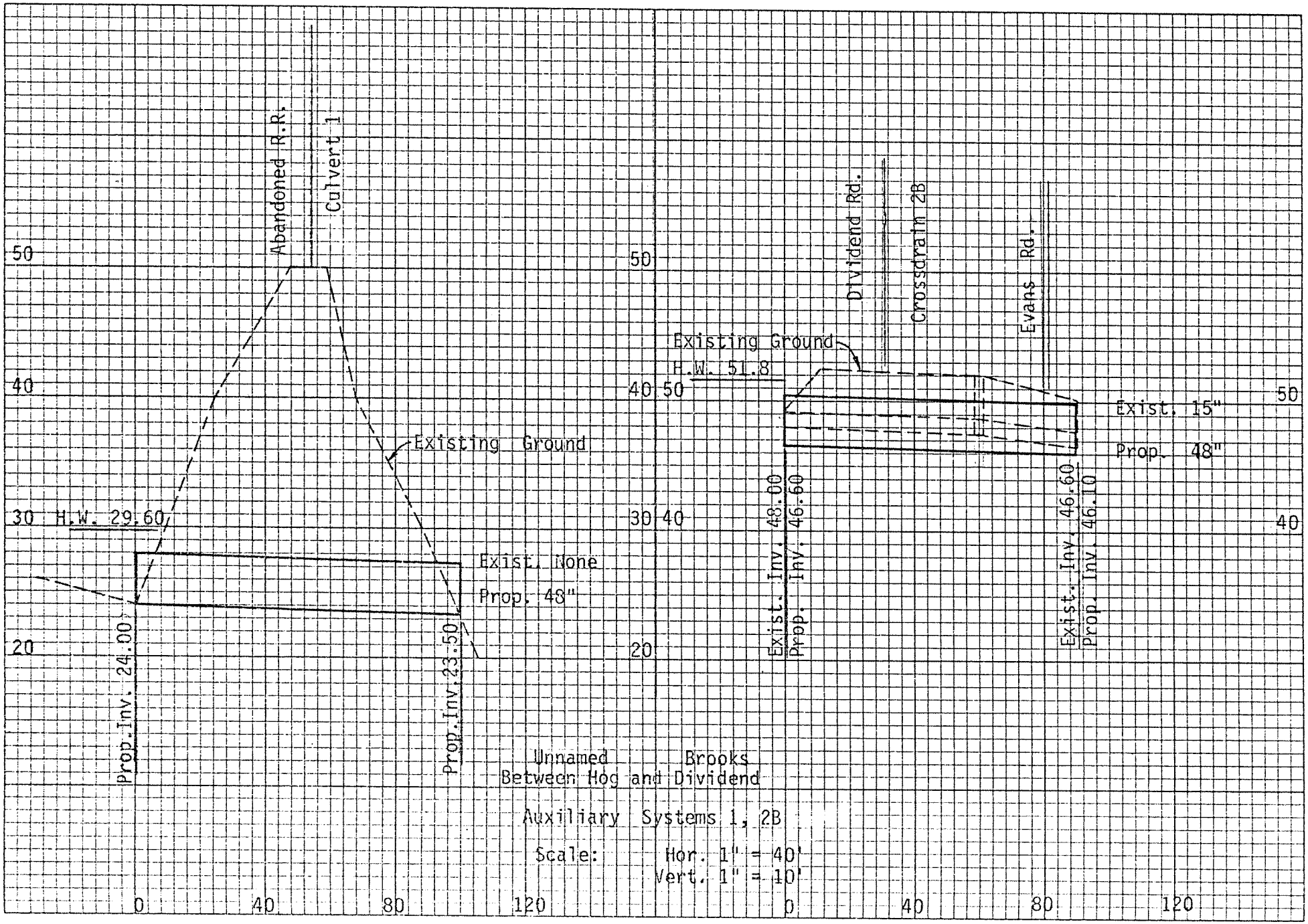
STREAM ANALYSIS - AUXILIARY CROSS DRAINS IN HANG DOG LANE BROOK AND WESTERLY TERRACE BROOK WATERSHEDS (TABLE NO. 33)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
Hang Dog Lane Brook									
1A Hayes Road	---	13.1	28	15" 24"	196.5 196.0	199.6	---	---	Q = 11.0 Low
1B Hayes Road	---	3.3	8	2-18" Same	192.3 Same	193.8	---	---	
1C Hayes Road	---	2.9	8	18" Same	192.5 Same	194.3	---	---	
1D Hayes Road		23.0	45	18" 36"	203.5 202.0	205.6	---	---	Q = 22 Middle
Westerly Terrace									
1 Westerly Terrace	----	80	130	48" Same	174.8 Same	180.8	---	---	
2 A Maple St.	---	37	15	24" Same	151.0 Same	153.4	---	---	Q = 8 Low

STREAM ANALYSIS - IN AREAS BETWEEN DIVIDEND AND HOG BROOK (BE) (TABLE NO. 34)

CROSS DRAIN NO. & LOCATION	STATION	AREA (Acres)	DISCHARGE (CFS)	STRUCTURE Exist./ Prop.	INVERT ELEV. Exist./ Prop.	HEAD-WATER ELEV.	PROPOSED CHANNEL Bottom Width	PROPOSED CHANNEL Water Depth	REMARKS
1A Dividend Rd.	---	8.3	18	18" 24"	103.9 103.9	106.3	---	---	Q = 12 Middle
1 At R.R.	---	48.3	118	None 48"	None 24.0	29.6	---	---	Q = 70.0 Low
2A Dividend Rd.	---	7.5	16	18" Same	92.1 Same	95.1	---	---	
2B Dividend & Evans Rd.	---	38.7	102	15" 48"	48.0 46.6	51.8	---	---	Q = 66.0 Middle
2 At R. R.	---	80.6	220	42" 54"	25.7 25.0	34.0	---	---	Q = 140.0 Low
3A Dividend Rd.	---	34.7	131	15" 2-30"	46.3 44.0	48.5	---	---	Q = 76.0 Middle
3B Belamose Ave.	---	66.1	218	None 60"	None 30.0	37.5	---	---	Q = 160.0 Middle
3 Divert to Dividend Br.	---	70.0	228	None Channel	None		---	---	Q = 166.0 Middle
4 RR East of Woodland Rd.	---	14.5	34	None 24"	None 31.0	35.4	---	---	Q= 20.0 Low

10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

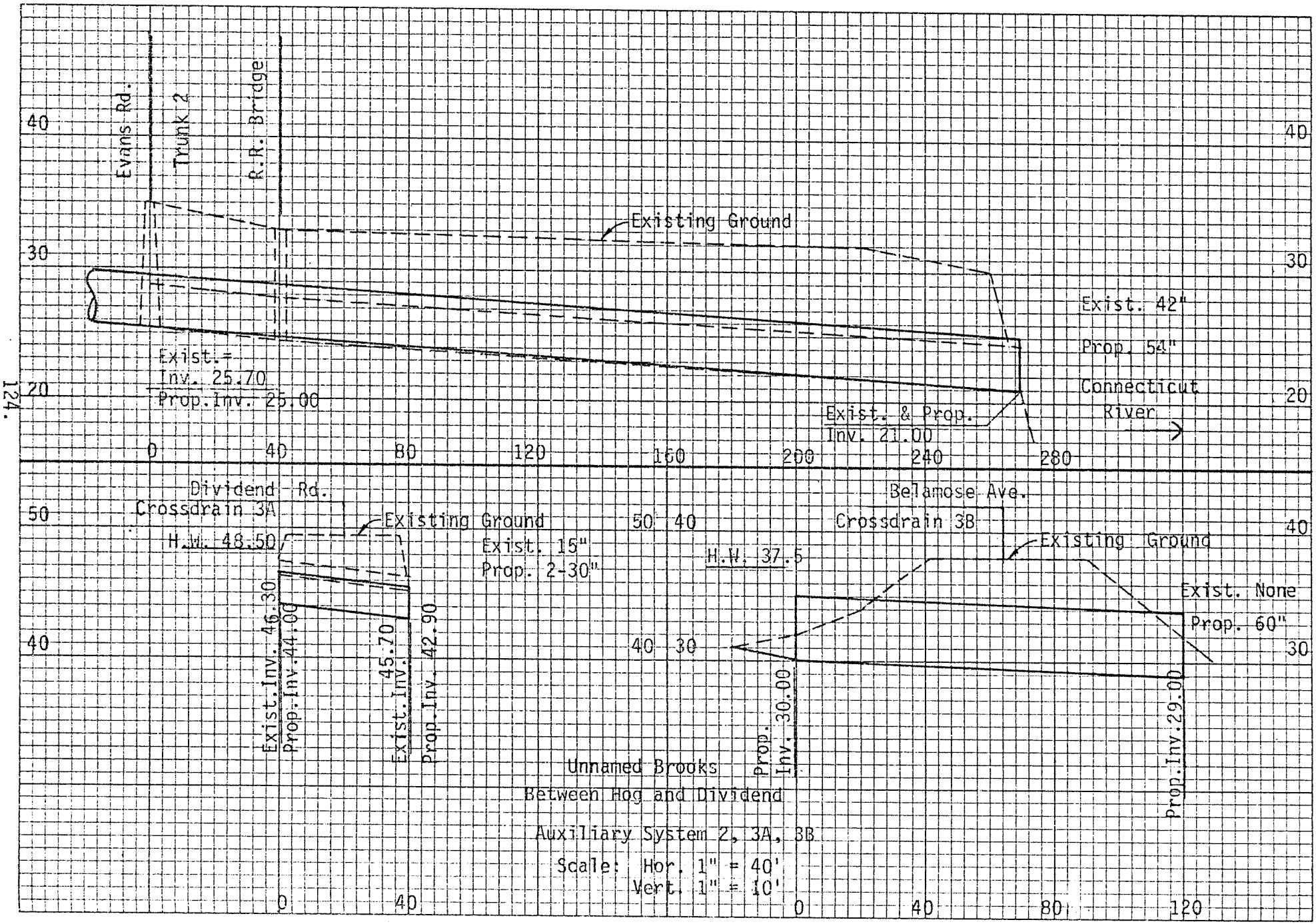


Unnamed Brooks
Between Hog and Dividend

Auxiliary Systems 1, 2B

Scale: Hor. 1" = 40'
Vert. 1" = 10'

K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



124.

ROADWAY DRAINAGE SYSTEMS

Studies of the following Roadway Drainage Systems are included in this report:

A. STATE HIGHWAYS		PAGE NO.
Silas Deane Highway and Main Street	Route 9	126, 127
Cromwell Street and Maple Street	Route 3	127, 128
Elm Street	Route 160	128, 129
New Britain Avenue	Route 160	129, 130
Glastonbury Avenue	Route 160	130, 131
West Street		131
B. TOWN STREETS		
Brook Street		132
Dividend Road		132, 133
Old Main Street		134, 135
Orchard Street		136, 137
Parsonage Street		137
Hayes Road		137
New Road		138

Study of the existing drainage and recommendations for improved drainage for the above listed roads follows.

The drainage systems which require a pipe size of 24" or larger, are shown on plans.

A. STATE HIGHWAYS

SILAS DEANE HIGHWAY AND MAIN STREET - Route 9

This road is located in Dividend Brook, Hog Brook, Belden Brook and Valley Brook Watersheds.

MAIN STREET

The southerly part is in the Dividend Brook Watershed (see drainage area D-6). There is no existing drainage system. A properly designed drainage system is recommended for this area with middle priority.

Following north in the drainage areas D-5 and D-7A, there is an existing drainage system. This system appears to be adequate under existing conditions. Following north in drainage area D-7B there is no existing drainage system. We recommend a system be provided for this area with middle priority. Following north in drainage area D-7E a drainage system which appears to be satisfactory for present conditions but should be upgraded for future conditions.

Northerly in drainage area D-7H and D-7I, the existing drainage system is adequate but the continuation of this system on School Street should be upgraded from 24" to 30".

Continuing northerly in the Hog Brook Watershed in drainage area H-9A and H-8, the existing drainage system, if it is to accommodate overland flow, should be upgraded to 30", 36", 42" and 48" pipe size. In drainage area H-8, the existing pipe should be extended and upgraded to 24" pipe size, as shown in the plans. Continuing northerly in

Belden Brook Watershed in drainage area B-1, the existing drainage system should be upgraded to 30" and 42" as shown in plans.

SILAS DEANE HIGHWAY

From Elm Street northerly, Route 9 becomes the Silas Deane Highway. Northerly along Silas Deane Highway in drainage area B-4A and following Valley Brook Watershed in drainage areas VE-6A, VE-5, VE-7, and VE-8, some drainage systems presently exist which will have to be upgraded for future conditions. Priority recommendation is low.

Following northerly in the drainage area V-13 some minor drainage system has been provided which is inadequate. In this area, the proper drainage system is highly recommended with 15", 18", and 24" pipe size as shown on the plans. Also, the drainage system crossing Marshall Road should be upgraded as shown on the plans.

Continuing north to the Town Line, the existing drainage system was found to be adequate.

CROMWELL AVENUE AND MAPLE STREET - Route 3

This highway is located in Cold Spring Brook, Dividend Brook, Saw Mill Brook and Tumble Brook Watersheds. The southern part of Cromwell Avenue is in drainage area CS-6D. The existing drainage system for this portion appears to be satisfactory. Continuing northerly in drainage area CS-6A, some catch basins and cross drains

are provided. A new properly designed drainage system is recommended for this portion with low priority. Continuing northerly passing Brook Street and I-91, the existing drainage system is adequate.

Continuing northerly in the Dividend Brook Watershed in drainage areas D-1, D-1A and northerly in Saw Mill Brook Watershed in the drainage areas SME-4D, SME-5G, SME-5 no surface drainage system presently exists. Cross drains are provided. The cross drains are discussed in the Stream Analysis contained in this Report. Installation of a properly designed drainage system is recommended. This project would have a low priority.

Continuing northerly in drainage area SME-5B and in Tumble Brook Watershed in drainage area T-1B, the existing draining system appears to be adequate.

Cromwell Avenue now becomes Maple Street and continues northerly and is located in drainage area T-1C. The existing drainage system in this area appears to be adequate. Continuing northeasterly in the Westerly Terrace Brook Watershed in drainage area WT-2A, the existing drainage system appears to be satisfactory for the present conditions. Future development will require upgrading of this system.

ELM STREET - Route 160

This highway is located in Belden Brook, Valley Brook, Tumble Brook, and Saw Mill Brook Watersheds.

The easterly portion of Elm Street is located in the Belden Brook Watershed, drainage area B-1, and in the Valley Brook Watershed in drainage area VE-1 and westerly portion of drainage area VW-6B. This section of road does not have any existing drainage system. Priority recommendation for this section is middle.

Further westerly in drainage area VW-6A some drainage system has been provided which appears adequate, provided flow from drainage area VW-5 is not diverted to this system. Thence westerly in the drainage area VW-5, a drainage system has been provided consisting of 15" and 18" pipes. To accommodate the overland flow from the south which reaches this road, this system should be upgraded to 18", 24" and 30" pipes crossing Elm Street, discharging to Orchard Street drainage system. Priority recommendation for this system is low.

Continuing westerly in the drainage area VW-2, the existing drainage system appears to be adequate.

Proceeding westerly through the Tumble Brook Watershed, drainage area T-1 and T-1A, the existing roadway drainage system appears to be adequate. The existing cross culvert just west of I-91, should be upgraded as shown on the plans and charts.

Proceeding westerly to Cromwell Avenue, the existing cross drain should be increased in size as shown on the plans and charts.

NEW BRITAIN AVENUE - Route 160

This avenue is located in Tumble Brook, Saw Mill Brook, and Little

Brook Watershed areas. A portion of this highway is located in Tumble Brook, drainage area T-1B. The existing drainage system appears to be adequate.

Continuing west in the Saw Mill Brook - West Watershed, in drainage areas SMW-1, SMW-2A, SMW-4A, and SMW-4B and in Little Brook Watershed in drainage areas L-3 and L-4A, L-4, L-5, L-6A and L-6B. The existing cross drains provided along this road should be increased in size as shown in the plans and charts. A surface drainage system should be provided in this area as development progresses. Priority recommendation for this portion is middle.

GLASTONBURY AVENUE - Route 160

This portion of this highway is located in the Belden Brook Watershed; east of Silas Deane Highway in drainage area B-2, B-3, and B-4D. There is no existing surface drainage system along this segment. Priority recommendation for installation of this drainage system is middle.

West in drainage area B-4E, the existing drainage system consists of 18" pipes. To this system is discharging the drainage system from Washington Street which includes overland flow from drainage area B-4E.

To accommodate this flow, the drainage system in Washington Street and Glastonbury Avenue should be upgraded from present 18" pipe size to 24" and 30" as shown on plan. Priority recommendation for this

portion of the drainage system is low.

WEST STREET

This street is located in Hog and Saw Mill Brook Watersheds.

The portion in drainage area H-9A does not have any existing drainage system. The flow is easterly to the intersection of Main Street where it is picked up in an existing system. Continuing westerly in drainage area H-6A, the existing drainage system appears adequate.

Following westerly in the drainage areas H-5, H-4C, H-4D, H-4A, H-1C, only cross drains are provided. Some of these cross drains should be increased in size as shown on the plans and charts.

In drainage area H-1A and H-1B, the existing drainage system of 15" and 18" pipe size appears adequate.

Proceeding westerly to the portion in Saw Mill Brook Watershed in drainage area SME-4A, the existing drainage system is adequate.

West of I-91 in drainage area SME-4, there is no existing roadway drainage system. An existing cross drain just east of the intersection of Cromwell Avenue should be increased in size as shown in the plans. The priority recommendation for the drainage systems in all of West Street is low.

B. TOWN STREETS

BROOK STREET

This street is located in Dividend Brook Watershed. The westerly segment from Main Street to the Dividend Brook Crossing (No. 4) there is an existing drainage system which should be further investigated. In the rest of Brook Street there is no existing drainage system. Overland flow is primarily discharged by the cross drains and existing drainage system receives roadway flow only. Priority recommendation for this road is low.

DIVIDEND ROAD

The road from just south of Pratt Street to just north of Lord Street, approximately 2,100 feet, is in the Hog Brook Watershed in drainage areas H-9 and H-10. Presently there is no existing drainage system. A drainage system along the east side of the street with an outlet at Hog Brook is recommended with middle priority.

Continuing south to Belamose Avenue, only cross drains are presently provided, the upgrading of which is discussed under the Stream Analysis for areas between Dividend and Hog Brook (Table No. 34).

The flow from drainage system along the portion of this road from Forest Street to Evans Street in the drainage area BE-2B which includes discharging flow from drainage area BE-2A should be provided for along Evans Road and discharge into the Connecticut River as shown on the plan with recommended pipe sizes. Since drainage area BE-2B is not heavily developed and there are existing drainage systems along Evans Street. The recommended priority is low.

Continuing southerly from Evans Road in the drainage area BE-3A there is no existing drainage system along Dividend Road. A drainage system is recommended which should discharge at Cross Drain 3A.

OLD MAIN STREET

The road is located in Valley, East Valley and Beldon Brook Watersheds. The part of the road in drainage area V-14A and V-14 has no existing roadway drainage system.

In the drainage area V-14A, approximately 10 ac. of overland flow is discharging to the road Q_{10} = 17 cfs. In drainage area V-14, no overland flow is discharging to the road. Therefore the total flow to be expected at the outlet will not significantly increase. Q = 22 cfs.

A drainage system should be provided in this segment of road with an outlet at the east side of Golf Brook Culvert. Sections of the road within this segment have steep grades and design utilization of these steep grades may reduce pipe size, in which case only the northern section of drainage system will require pipe size of 24".

Any additional discharge of storm flow to Marshall Road drainage system may overload this system. Consequently, detailed design investigation of this section will be necessary.

Proceeding southerly in the drainage area VE-7A, an existing drainage system is provided which appears to be too small to accommodate an overload from overland flow. This system is discharging into Parsonage Street drainage system which presently consists of 15" and 18" pipes, which should be upgraded to 24" pipe and from Colonial Drive westerly to Silas Deane Highway, 30" pipe.

Continuing southerly along Church Street in drainage area VE-6C, VE-6B, and B-4B an existing drainage system is along this road but it should be upgraded as it appears to be inadequate.

Provision for a drainage system in the northern part of this road in drainage areas V-14A and V-14, where approximately 3,600 feet of roadway does not have any drainage, should be given a high priority.

Upgrading of drainage system in drainage area VE-7A is recommended with middle priority.

ORCHARD STREET

This street is located in Valley Brook - West Watershed and Tumble Brook Watershed.

Part of this street from Elm Street northerly to Fern Street is in drainage area VW-5. There is an existing drainage system of 18" pipe. Into this system, drainage systems from Elm Street, Wright Road, Berkshire Road and overland flows are discharging. To accommodate this flow, the present 18" pipe should be upgraded to 30" pipe from Elm Street to its outlet into Valley Brook - West Watershed. North of Terry Lane there is an existing drainage system of 15" pipe. Discharging to this system is the drainage system from Fern Road. The existing 15" pipes should be upgraded to 24" on Orchard Street and part of Fern Street, as shown on the plan. Priority recommendation in this drainage area is low. Following north in the drainage area VW-10A and VW-11, there is an existing drainage system and it appears to be adequate.

Further north in the Tumble Brook Watershed drainage area T-5A and T-5B, there are existing drainage systems which appear to be adequate. In addition, the drainage system in this area was analyzed along Richard Road crossing Deming Road to cross drain 5B at Orchard Street. This existing drainage system should be upgraded as follows; from 24" pipes to 36" and 42", and pipe size 30" to 42" and 48" and cross drain 5B to 54" as shown on the plan. Priority recommendation for this upgrading is low.

Following in Valley Brook Watershed, drainage area V-14C, this road changes to Charter Road. There is one drainage system which seems to be adequate.

PARSONAGE STREET

The street is located in East and West Valley Brook Watersheds.

Part of the street east of Bailey Road to Chapin Avenue is in the drainage area VE-12A and part is in VE-7. The only drainage system is at the intersection of Bailey Road. Improvement and extension of this system is recommended with low priority.

Continuing easterly to Silas Deane Highway, the existing drainage system is provided by 18" pipe which appears to be adequate.

Drainage for Parsonage Street east of Silas Deane Highway in the drainage area VE-7A is described under Old Main Street.

The westerly portion of Parsonage Street from Bailey Road to Valley Brook - West crossing there is no existing drainage system. Priority recommendation for this section of road should be low.

HAYES ROAD

This road is located in Hang Dog Lane Brook Watershed and the Saw Mill-West Watershed. The part in Saw Mill - West Watershed drains southerly to New Britain Avenue. The remainder of the road drains northerly and is presently supplied with cross drains which are covered under the Stream Analysis for Hang Dog Lane Brook (see Table No. 33). As

development increases along this road, we recommend that a longitudinal storm drainage system be installed. The priority for this system is low.

NEW ROAD

This road is located in Saw Mill Brook Watershed. Presently there are only cross drains on this road which are covered under the Stream Analysis for Saw Mill Brook (see Table No. 18). The areas bordering this road are undeveloped so the installation of a longitudinal storm drainage system should have a low priority.

SECTION F

FINDINGS AND RECOMMENDATIONS

The complete drainage system of the Town of Rocky Hill contains two separate and distinct drainage systems. They are the Major System, or the Stream Drainage System, and the Minor System, or the Street Drainage System. The drainage has been reviewed for both these systems and where an increase in the storm sewer capacity is anticipated, a subsequent increase in stream capacity has been provided for. We advise that the Town follow the recommendations in this Report in order to minimize the possibility of future flooding in vulnerable areas.

ADEQUACY OF EXISTING SYSTEM:

Findings

Several areas in the developed portions of the Town are presently subject to flooding or are vulnerable to flooding due to anticipated increased runoff to full development. Flooding, here, would be largely due to inadequate design capacity in existing storm drains and channels to carry the anticipated storm runoff. In some places, this situation is also due to lack of a maintenance program and unintegrated storm drainage developments.

Recommendations

The following steps must be undertaken to eliminate the possibility of flooding in these areas.

1. Existing storm drains should be modified as outlined in this Report. The estimated cost to the Town to effect these drainage improvements is included. The design criteria and guidelines set forth in this report should be adhered to. All the detailed modifications to streams and auxiliary cross drains are

made within the framework of this Report (See Section E).

2. The existing Stream Drainage System should be improved to provide adequate capacity to accommodate the design discharge as shown on plans and in this Report (See Section E). Improvements may include widening, deepening, realigning or enclosing the channel in a conduit. Any or all of these improvements should be implemented by a detailed design within the framework worked out for virtually all the named and unnamed streams (See Section E).

3. Municipal maintenance programs for drainage systems should be revitalized. The cost of these programs should be included in the annual municipal budget for the removal of debris, silt and other obstructions in channels, drains, and catch basins. The cost of repairs to existing drainage systems should also be included in the maintenance budget.

4. The existing drainage system should be modified to relieve PROBLEM AREAS of the potential of flooding as detailed in this Report.

5. Existing drainage structures need additions, modifications and replacement in many locations and these should be done as detailed (See Section E).

PROPOSED NEW DRAINAGE SYSTEMS:

Findings

At present, the Town has no plans for storm drainage works in open areas expected to develop heavily in the near future. The potential effect of such developments on existing trunks or streams, although it will be tremendous, cannot be evaluated at this time.

Recommendations

1. The construction of various types of drainage lines should be staged according to the needs of particular areas and the availability of funds within the broad framework of priorities.

2. It must be emphasized that the actual pattern of development of the drainage system, particularly of street drains, will follow the pattern of development of residential, commercial and industrial areas and must be adjusted in the final design according to detailed topographic surveys for the proposed developments. Nevertheless, a preliminary layout of a future drainage system pattern is necessary now. Such a drainage system has been analyzed as a preliminary framework and is incorporated in this report (See Section E). This broad framework allows easy expansion of the system in the future.

3. The selected routes for drainage improvements generally follow the low points of existing drainage patterns in order to minimize excavation and to facilitate interception of storm flows by laterals. Modifications should be carried out within the framework and design criteria established.

4. As development in the Town increases, reconstruction of some of the culverts which now have inadequate waterways will become necessary. Reconstruction should be carried out according to changes in drainage lines, as recommended in this Report. The sequence and priorities of such culvert reconstruction should be according to needs and recommendations herein.

5. Improvements and modifications of brooks and their auxiliaries and roadway drainage systems should be carried out as recommended in this Report. Because of the expense to the Town there seems little chance of the State funding in the near future, except probably for short lengths where the water courses are crossing State roads or for drainage systems on State Roads.

All brooks flowing in and through the Town of Rocky Hill are originated in the Town of Rocky Hill. Due to ground configuration any drainage unimprovement in the other Towns downstream would have little flooding effect.

6. The Town should not undertake any drainage improvements around proposed I-291 until its drainage system is finalized by State Highway Department.

POLICIES AND PRIORITIES:

Findings

At present, no regular policies or specific priorities are followed in planning or constructing storm drainage lines in the Town. Rather, drainage improvement is made either as a result of public demand or to correct situations where flood damage is frequent and costly.

Recommendations

The priorities for implementation of storm drainage projects should be based on the following:

1. Where local flooding from overflow of streams is frequent, property damage is heavy, and inconvenience to the public is expected.

2. Where parts of a drainage line have already been improved, or improvement is anticipated due to a proposed development, the Town should complete the improvements so as to reduce flood damage.

The priorities as listed below were recommended by the Town of Rocky Hill. The estimated cost of these improvements is set out in the Capital Improvement Program in Section I of this Report.

CATEGORY I PRIORITY

1. Valley Brook area from Church Street north between the Silas Deane Highway and Old Main Street to Parsonage Street. From here Valley Brook East needs new culverts at four street intersections and should be included for Capital Improvement of this area.

2. Valley Brook area from Elm Street through the following streets: Elmridge Drive, Wright Road, Berkshire Road, Orchard Street, Valley Brook Road, Textbook Avenue to Parsonage Street.

3. Saw Mill Brook area from Elm Street south to West Street and east of Cromwell Avenue.

4. Saw Mill Brook area both east and west of New Road. This is a problem area for which we should have a solution but I do not feel it has a high priority as far as Capital Improvement at the present time.

5. Hog Brook, east of Route 99.

CATEGORY II
STATE AND TOWN ROADS

1. State Roads
   a. Main Street
   b. Glastonbury Avenue
   c. Elm Street
   d. Cromwell Avenue
   e. New Britain Avenue
   f. West Street

2. Town Roads
   a. Old Main Street
   b. Parsonage Street
   c. Dividend Road
   d. Brook Street
   e. Orchard Street
   f. Hayes Road
   g. New Road

SOURCE OF FUNDS FOR IMPLEMENTATION:

Findings:

State and Federal grants or loans are not normally available for street storm drainage construction except when drainage is for the abatement of water pollution or is a part of a community development program. However, in drainage of brooks and streams, Federal or State financial participation, in limited situations, is available.

Recommendations:

For Federal financial assistance, reference should be made to the "Catalog of Federal Assistance Programs". Specifically, the 1974 U. S. Housing and Community Development Act has made available Federal funds through the U. S. Department of Housing and Urban Development for improving and upgrading community facilities and services where necessary, especially where it assists in enhancing quality of housing in the community.

For State financial assistance, reference should be made to the Connecticut Department of Environmental Protection for possible financial aid.

It is to be noted that funds are rather limited for implementing Comprehensive Drainage improvements. Small flood control projects under State Statute Article Section 25-69 to 25-99 permits the Department of Environmental Protection to fund such projects. This funding is on a project by project basis and is especially authorized by the Legislature.

The basic formula for these funds is 100% funding for systems that benefit State Parks or State owned land and 2/3 of the development cost for systems that benefit a Municipality in Connecticut.

INLAND WETLANDS:

The inland wetlands are lands protected by the Inland Wetlands and Water Courses Act (P.A. #155 of 1972 as Amended by P.A. #73-571). This Act is designed to provide for the preservation, protection, maintenance, and use of the inland wetlands and water courses of the State of Connecticut with emphasis of municipal regulation as the preferred means for attainment of these goals.

Inland wetlands are defined by soils types designated as poorly drained, very poorly drained alluvial and flood plain by the U. S. Department of Agriculture's Soil Conservation Service.

The following are regulated activities on inland wetlands requiring a comprehensive permit application to the local agency which after specified review and hearing procedures has an option to grant a license to proceed:

a. Removal of material
b. Deposition of material
c. Effluent discharge (pollution)
d. Rerouting of watercourse (channel modification)
e. Draining
f. Building Up
g. Obstruction (dam construction)
h. Clearing of vegetation

DESCRIPTION OF INLAND WETLANDS:

The inland wetlands in the Town of Rocky Hill are under the jurisdiction of the Rocky Hill Inland Wetlands Commission and are located primarily along the

brooks (See Inland Wetlands and Water Courses Map of Town of Rocky Hill).

The value of these wetlands is indicated by the following list of functions they provide:

1. Flood storage.
2. Ground water recharge.
3. Natural filtration sedimentation and aeration of waters passing through them.
4. They provide: food, protection, and habitate for aquatic life fish, birds and other wildlife as well as unique plant species.
5. They have high recreational value.
6. They act as natural buffer zones.
7. They can be utilized as outdoor classrooms and for scientific research.
8. They are ideal open space areas.

Recommendations:

It is clear that even without the protection afforded by P.A. #155, the better (least disturbed, most ecologically stable) inland wetlands should be reasonably protected and maintained.

It may be necessary for the Town to purchase certain of these vital areas to maintain as open spaces and for limited (controlled) recreational and educational activities.

FLOOD PLAINS

Findings:

Flood-Plain areas exist presently along the Connecticut River and Goff Brook. These flood plains are providing valley storage, thereby reducing the flood peaks downstream of these streams. Furthermore, these flood plains provide aesthetic and recreational values to the Town population.

Recommendations

Normally, flood plains should not be reduced by filling operations but utilized in a restricted way for recreational and non-vital facilities, in accordance with Town laws for such uses.

Filling up flood plains outside floodways may be permitted after appropriate hydraulic studies as established in Design Criteria of Flood Plains.

We strongly advise against changing the contours of flood plains without first making the channel improvements recommended in this Report. The result of such action would be increased flood levels, and a bad situation would be made worse.

It may be necessary for the Town to purchase certain vital areas to maintain their use for flood plain and recreational purposes.

SUGGESTED SEQUENCE OF OPERATIONS

The suggested sequence of operations is listed on the following pages. They provide for present and future drainage needs which are apparent at this time. Unforeseen changes in conditions or situations will require modifications to these schedules.

SUGGESTED SEQUENCE OF OPERATIONS

IMMEDIATE

1. Adopt the recommended design criteria and guidelines set forth in this report. (See Section D). In planning, designing and reviewing all storm drainage and flood control projects and/or programs.

2. Reconstruct drainage lines or channel sections according to the priorities listed in Section F of this report. Correct deficiences in the presently existing drainage lines within the technical framework set forth in Stream Analysis Tables for the trunks and/or streams and following Roadway Drainage Analysis according to

SHORT RANGE

1. Initiate planning for reconstruction of drainage lines or channel sections for those projects whose priorities are suggested in in Section F.

2. Continue revitalizing maintenance programs for storm programs for storm drains and channels.

3. Meet with Capitol Region, Department of Environmental Protection and other authorities frequently to emphasize the early implementation of this report due to (A) Severe financial limitations of the Town of Rocky

LONG RANGE

1. Continue maintenance programs as outlined in this report.

2. Fill the areas outside flood plains and Inland Wetlands Areas thus established for suitable utilization.

3. Plan for revision of design criteria, if needed, in view of changed conditions as actually happens.

4. Prepare detail maps for each and every drain and/or streams as actually

SUGGESTED SEQUENCE OF OPERATIONS

IMMEDIATE

design criteria for local systems and laterals.

3. Do not undertake any drainage improvements in the near vicinity of proposed I-291 without consultation with State Highway Department.

4. Take necessary steps for appropriation of funds as listed under Sources of Funds for Implementation of this report for storm drainage improvements.

5. Initiate maintenance program for storm drainage facilities. Problem areas as listed should

SHORT RANGE

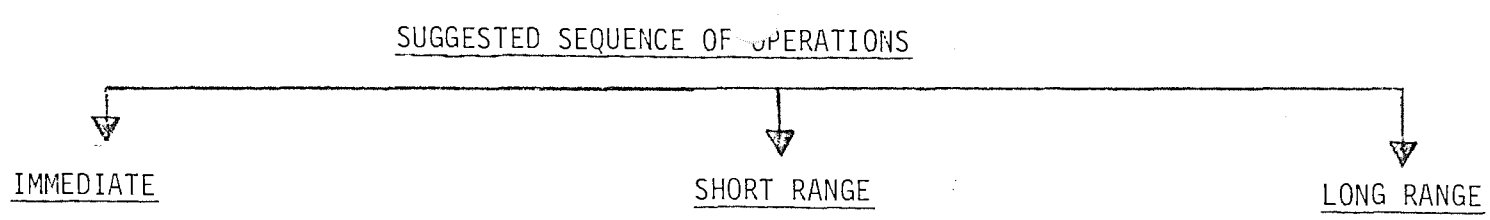
Hill for implementation of projects of such magnitude. B) Anticipated flood damages (direct and indirect) if improvements are not carried out. This will also include the damages due to partial ineffectiveness of storm drains in certain areas if streams in which they outfall are not functioning according to design discharges.

4. Plan in detail for implementation of filling and utilization of flood plains, Inland Wetlands Areas, in the Town of Rocky Hill according to criteria set forth in this report. Improvements as suggested in Section E and F should

LONG RANGE

constructed in field.

5. Initiate some observations of flood discharges and flood level at critical points for future analysis.



receive particular attention.

6. Plan utilization of Inland and Wetlands Areas on major brooks for non-vital uses.

serve as a guide.

SECTION G

A SUGGESTED ORDINANCE RELATING TO THE OBSTRUCTION OR POLLUTION OF ANY RIVER, STREAM, BROOK OR WATERCOURSE IN THE TOWN OF ROCKY HILL

1. For the purposes of this ordinance:

(a) The words "permanent obstruction" shall include any rock or earth fill, or any wall or building or structure of any kind, any bridge, pipe, culvert or any other activity which could alter natural drainage, and,

(b) The word "debris" shall include any wreckage or any organic or inorganic waste materials of any kind whatsoever.

2.

(a) No person or corporation shall place, erect or install any permanent obstruction within or on the visible natural banks of any stream, brook or watercourse, except the Connecticut River, within the Town of Rocky Hill, or within twenty-five (25) feet of the center line of any such stream, brook or watercourse whichever is the greater distance from the center line of any such stream, brook or watercourse, except when permission is granted in writing by the Council of the Town of Rocky Hill.

(b) No person or corporation shall place, erect or install any permanent obstruction within twenty-five (25) feet of the natural bank of the Connecticut River within the Town of Rocky Hill except when permission is granted in writing by

the Council of the Town of Rocky Hill, The State Flood Control and Water Policy Commission, or the State Board of Fisheries and Game.

(c) A request to the Town Council for such permission must be accompanied by sufficient engineering data, either in writing or drawings or both, to enable the Town Council or its agents to make a finding that the proposed permanent obstruction will not cause or aggravate any problem of flood hazard or pollution of the river, brook, stream or watercourse. Such data shall show with reasonable certainty the natural banks of any river, stream, brook or watercourse.

(d) Such request to the Town Council shall be referred to the Town Manager for consideration. He shall report to the Council within thirty (30) days his recommendations for approval or disapproval of the request. If the Town Manager recommends disapproval, the Council may nonetheless grant the request by a three-fourths (3/4) vote of the total membership of the Council. If the Town Manager recommends approval, or fails to return a recommendation within thirty (30) days of the referral by the Council, the Council may approve the request by vote of a simple majority of the members present at any lawful meeting.

3. No person or corporation shall deposit any debris whatsoever within the visible banks of any river, stream, brook or watercourse, or upon land adjoining any river, stream, brook or watercourse, from which land said debris may be carried away in the event of flooding or rainfall upon which land such debris

may tend to prevent or inhibit the free discharge of flood waters.

4. When any violation of Section 2 or 3 shall be discovered, the Town Council shall issue an order in writing to the person or corporation responsible for such violation to remove the obstruction or debris. If the person or corporation to whom such order is directed shall fail to comply therewith within thirty (30) days, or such longer time as the Council may permit, but in no case more than ninety (90) days, the Council shall instruct the Town Manager to cause the removal of such obstruction or debris and recover the cost of such removal by means of an assessment upon the property of said person or corporation to be collected in the manner provided by the general statutes of the State of Connecticut for the collection of taxes.

SECTION H

SUGGESTED CAPITAL IMPROVEMENTS PROGRAM

COST ESTIMATING GUIDELINES

The approximate cost of installed storm sewers complete without utility conflicts, pavement replacing and maintenance of traffic is shown below. These costs are approximate and are for planning guidelines only:

Pipe Size (Inches)	March 1975 Cost in Dollars/Foot	End Sections Cost in Dollars Each
15	$ 14.00	$ 130.00
18	16.00	170.00
21	17.00	190.00
24	20.00	200.00
27	25.00	230.00
30	30.00	250.00
36	40.00	375.00
42	51.00	550.00
48	68.00	600.00
54	81.00	700.00
60	98.00	800.00
66	111.00	950.00
72	118.00	1,200.00
84	138.00	1,500.00
Manhole	800.00	
Catch Basin	800.00	

NOTE: Unit cost includes bedding material and trench excavation.

For planning purposes, the approximate construction cost guidelines for trapezoidal open channels with 2:1 side slopes are as follows:

Bottom Width (Feet)	March 1975 Cost in Dollars/Foot/Foot Width	
	Grass	Riprap Lined
0 - 4'	1.50	7.00
5 - 8'	1.10	5.00
9 - 16'	0.80	3.50
17 - 20'	0.70	3.00
21 - 40'	0.60	2.50
41 - 60'	0.55	2.10

The cost for these channels is based on a four (4') foot deep channel. (Riprap is assumed 2' deep).

SUGGESTED CAPITAL IMPRC ENTS PROGRAM

For Identification of Improvements see Page 37 & 38 and the 400 Scale Plans

ME OF PROJECT	ESTIMATED EXPENDITURE BY FISCAL YEAR									
	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86
ATEGORY I										
Valley Brook - East Cross Drain										
6C	9,700.00									
5	23,800.00									
6	21,700.00									
7	35,200.00									
Valley Brook - West Cross Drain										
1						6,300.00				
2		36,100.00	25,000.00							
3		10,000.00								
4		25,000.00								
5		50,500.00								
6		28,400.00								
7 & 8	28,600.00									
9	15,200.00									
10	23,800.00									
aw Mill Brook - ast Cross Drain										
4						32,200.00				
5						15,700.00				
aw Mill Brook - est Cross Drain										
6A					4,700.00					
3					6,500.00					
4					13,500.00					
5					10,300.00					
TOTALS- Cat. I	158,000.00	150,000.00	25,000.00		35,000.00	54,200.00				

SUGGESTED CAPITAL IMPF :MENTS PROGRAM

AME OF PROJECT	ESTIMATED EXPENDITURE BY FISCAL YEAR									
	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86
CATEGORY II										
STATE ROADS										
Main Street										
D-6							21,000.00			
D-7B							26,000.00			
D-7E							2,000.00			
D-7H & D-7J							9,000.00			
H-8 & H9A			82,400.00							
B-1							18,000.00			
Glastonbury Ave.										
B-2,B-3, & B-4D				23,600.00						
B-4E				28,300.00						
Elm Street										
VE-2					23,000.00					
B-1							16,000.00			
VW-6B								10,700.00		
VW-5				29,000.00						
T-1A & T-1								3,600.00		
SME-5A & 5								5,300.00		
Cromwell Ave.										
CS-6B-CS 6A					22,100.00					
D-1A								18,600.00		
SME-4 & 4D								6,000.00		
SME-5G, 5 & 6					37,100.00					
SME-5 & 5E						4,000.00				
SME-5 & 5C						1,600.00				
SUB-TOTAL			82,400.00	80,900.00	82,200.00	5,600.00	92,000.00	44,200.00		

SUGGESTED CAPITAL IMPRC IENTS PROGRAM

ME OF PROJECT	ESTIMATED EXPENDITURE BY FISCAL YEAR									
	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86
ATEGORY II										
STATE ROADS										
New Britain Ave.										
SMW-1 & 2			5,600.00							
SMW-2A & 2				1,600.00						
SMW-4B & 4C									1,600.00	
L-4 & 4B							5,000.00			
L-6A & L-5									2,500.00	
West Street										
H-9A			5,800.00							
H-6 & H-5						8,700.00				
H-6 & H-4B						4,400.00				
SME-4 & 5									20,800.00	
TOWN ROADS										
Old Main Street										
V-14 & V-14A									16,500.00	68,600.
Parsonage Street										
VE-7A				24,500.00						
VE-12A & VE-7A										8,500.
VW-11 & VW-10										27,900.
Dividend Road										
BE-2B & BE-2								46,100.00	108,600.00	
BE-3A & 3B								17,100.00		
H-9 & H-10							30,700.00			
SUB-TOTAL			11,400.00	26,100.00		13,100.00	35,700.00	63,200.00	150,000.00	105,000.

SUGGESTED CAPITAL IMP EMENTS PROGRAM

NAME OF PROJECT	ESTIMATED EXPENDITURE BY FISCAL YEAR									
	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86
CATEGORY II TOWN ROADS										
Brook Street										
D-4 & D-5			31,200.00							
D-2				7,300.00						
D-1-2 & D-2C										4,000
D-4 & D-5										41,000
D-2 & 2D								27,100.00		
D-1-2 & D-2C								6,600.00		
D-1-2 & CS 6A								11,200.00		
Orchard Street										
VW-5-6 & 6B						72,600.00				
T-5B				35,700.00	42,800.00	8,400.00	22,300.00			
Hayes Road										
HD-1A							1,600.00			
HD-1D							3,600.00			
HD-1D								18,500.00		
HD-1C, B									18,500.00	
HD-1A, WT-1 & SMW-2A										24,080
New Road										
SMW-6A & 6				3,600.00						
SME-9					10,200.00					
SMW-6							8,600.00			
SMW-3 & 4						13,800.00				
TOTAL- Cat.II			125,000.00	153,600.00	135,200.00	113,500.00	163,800.00	170,800.00	168,500.00	174,080
GRAND TOTAL Cat. I and II	158,000.00	150,000.00	150,000.00	153,600.00	170,200.00	167,700.00	163,800.00	170,800.00	168,500.00	174,080

APPENDIX A

RATIONAL FORMULA[1]

The Rational Method of determining runoff is based on the premise that the peak rate of discharge from an area will be proportional to the rate of rainfall, modified by the size and characteristics of the area.

A field investigation of the drainage basin should be made in all cases and the time of concentration estimated. The time of concentration is the time it would take rain water, falling on the most distant part of the watershed, to reach the location of the drainage facility being designed. A nomograph, which may be of assistance in calculating this time, is shown on Figure 1. The factor for determining the total time of concentration should be computed by adding together the estimated times and the proportionate lengths of flow over the various conditions shown.

The rainfall intensity ("I") for the storm having the appropriate frequency and of duration equal to the total time of concentration should be selected from Figure 2 or 3.

The runoff coefficient ("C") may be estimated from the table on pages 16 to 17 in Section D of this report.

The peak discharge from an area, computed by this method, is the product of the number of acres times the rate of rainfall in inches per hour times the runoff coefficient. The product is expressed in cubic feet per second.

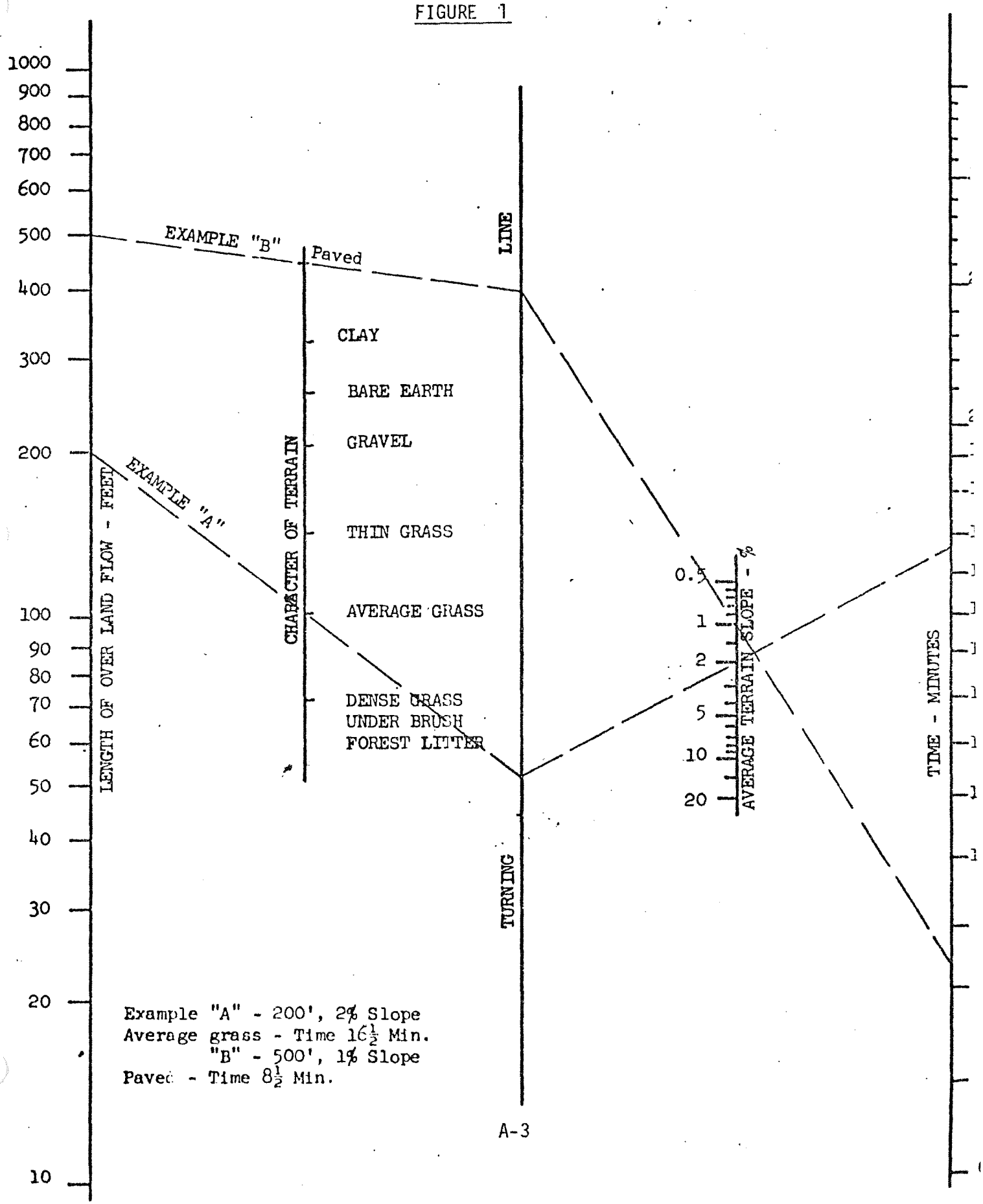
---

[1] From State of Connecticut Drainage Manual.

The procedure may be used for determination of the expectable runoff from highway surfaces and immediately adjacent overlying land areas.

SEELYE CHART
TIME OF CONCENTRATION
(OVERLAND FLOW)

FIGURE 1



Example "A" - 200', 2% Slope
Average grass - Time 16½ Min.
"B" - 500', 1% Slope
Paved - Time 8½ Min.

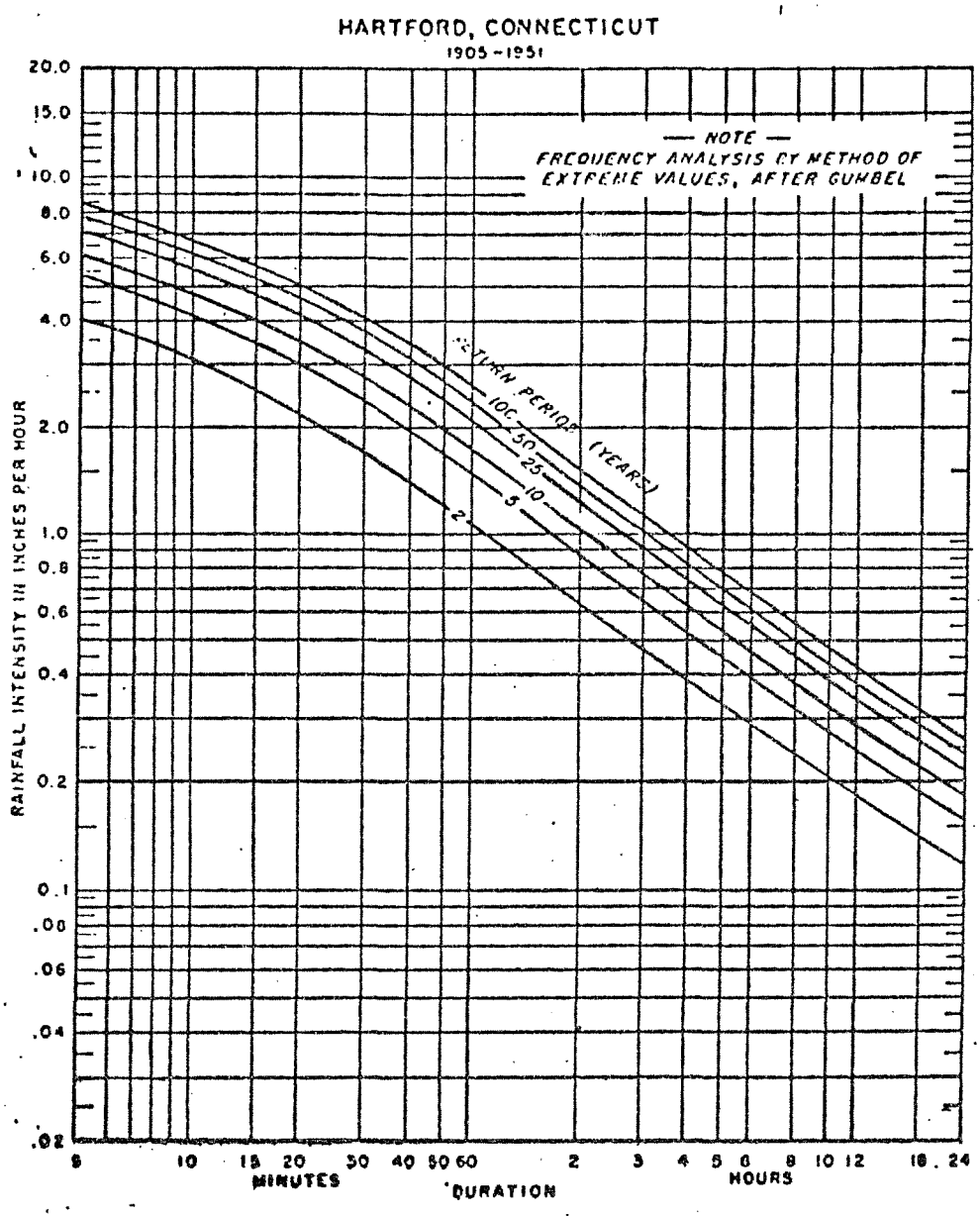


FIGURE 2 - INTENSITY OF RAINFALL

[From State of Connecticut Drainage Manual]

RAINFALL INTENSITY CHART IN INCHES PER HOUR
HARTFORD, CONN.

DURATION IN MINUTES

Return Period (Years)	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
10	6.2	5.6	5.4	5.3	5.0	4.7	4.5	4.4	4.3	4.1	4.0	3.9	3.8	3.7	3.5	3.4	3.3	3.3	3.2	3.2	3.1	3.0	2.9	2.9	2.8	2.7	2.6	2.6
25	7.1	6.7	6.4	6.1	5.7	5.6	5.4	5.2	5.0	4.9	4.7	4.5	4.4	4.3	4.2	4.1	4.0	4.0	3.9	3.8	3.7	3.6	3.5	3.5	3.4	3.3	3.2	3.2
50	7.7	7.4	7.0	6.7	6.5	6.1	6.0	5.8	5.6	5.4	5.2	5.1	5.0	4.9	4.7	4.6	4.5	4.4	4.3	4.3	4.2	4.1	4.0	3.9	3.8	3.7	3.6	3.6

DURATION IN MINUTES

Return Period (Years)	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
10	2.6	2.5	2.5	2.5	2.4	2.4	2.3	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8
25	3.1	3.1	3.0	3.0	2.9	2.9	2.8	2.8	2.7	2.6	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1
50	3.5	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.0	3.0	2.9	2.9	2.8	2.8	2.8	2.7	2.7	2.7	2.6	2.6	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.3

* NOTE:
This chart is a tabular representation of values taken from the Rainfall Intensity Curves shown on the previous figure. It is provided for consistency in interpolation of commonly used values.

FIGURE 3

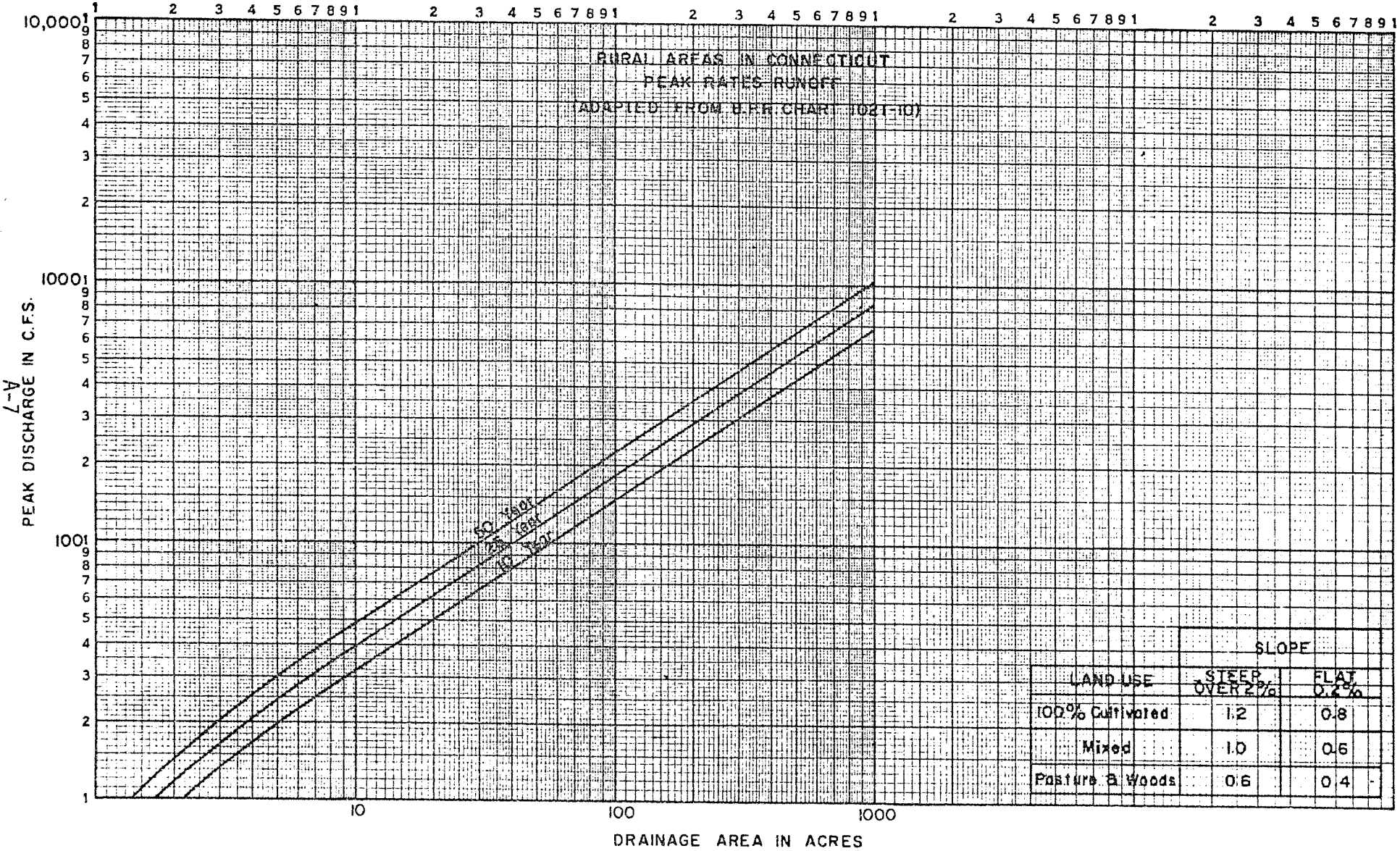
POTTER IZZARD FORMULA

The curves on the graph, Figure 4, may be used to estimate peak rates of runoff from small rural areas in Connecticut.

The procedure was developed from a statistical study of the runoff from small rural watersheds in the midwest and expanded to be generally applicable throughout the eastern part of the country. Its use in Connecticut should be restricted to rural areas where locally developed data or procedures do not apply and it is not recommended for areas less than approximately 200 Acres in size.

The basic discharge for the area, as read from the selected frequency curve, should be multiplied by the appropriate land use-slope coefficient taken or interpolated from the table.

POTTER IZZARD FORMULA



LAND USE	SLOPE: STEEP OVER 2%	SLOPE: FLAT 0 & 2%
100% Cultivated	1.2	0.8
Mixed	1.0	0.6
Pasture & Woods	0.6	0.4

FIGURE 4

N.B. NOT RECOMMENDED FOR AREAS LESS THAN APPROXIMATELY 200 ACRES.

SELECTION OF PIPE, CULVERT AND CHANNEL SIZES

A simplified procedure for sizing storm drainage pipes, culverts, and channels cannot be presented due to the number of interrelated variables that have to be considered.

Some, but not necessarily all, of the variable factors to be considered are:

1. Quantity of Discharge
2. Maximum and Minimum Velocities
3. Available Slope
4. Roughness Coefficient
5. Allowable Headwater
6 Degree of Protection Required
7. Types of Soils Encountered (in the case of channels and ditches)

As each of these factors can vary considerably, a detailed analysis of each specific location and/or system should be performed before pipes, culverts, or channels are sized. Reference is therefore made to the following publications which will aid the designer or reviewer in this matter:

1. "Design Charts for Open-Channel Flow", Bureau of Public Roads, Hydraulic Design Series No. 3.
2. "Hydraulic Charts for the Selection of Highway Culverts", Bureau of Public Roads, Hydraulic Engineering Circular No. 5.
3. "Capacity Charts for the Hydraulic Design of Highway Culverts", Bureau of Public Roads, Hydraulic Engineering Circular No. 10.
4. "Hydraulic Design of Improved Inlets for Culverts", Federal Highway Administration, Hydraulic Engineering Circular No. 13.

GUTTER FLOW ANALYSIS[1]

Catch basins should be constructed at all low points and street intersections. They are also required at intermediate points along streets where the curb and gutter capacity would be exceeded without them. In order to determine the capacity of the curb and gutter and the required catch basin spacing, an analysis of gutter flows should be performed.

Pending completion of full scale field testing and the development of a reasonably accurate method of determining inlet capacity of the standard catch basin and drop inlet structures, inlet capacity for structures on grades will be determined on the assumption that the portion of the gutter flow within the width of the grate will be intercepted. The remainder of the flow in the width of gutter outside the grate will be assumed to bypass the structure, except in certain instances involving flat grades.

For highways conforming to normal State Highway design classification, the inlet spacing should be such that the design gutter flow will be confined to the shoulder area. For highways classified as "Urban Streets" and for local roads, it will be permissable to allow for a certain amount of storm water to flow in the travel lanes. For this purpose, the following gutter flow design criteria should apply:

A. On two-lane streets with normal crown not more than half (1/2) of one (1) travel lane on each side shall be available for flow.

[1] From State of Connecticut Drainage Manual.

B. On banked streets not more than one (1) travel lane on one side shall be available for flow.

C. On four-lane streets with normal crown not more than one (1) travel lane on each side shall be available for flow.

The following Drainage Design forms and directions for their use are provided. The format of these sample forms is similar to that required by the Connecticut Department of Transportation, Division of Hydraulics and Drainage, and therefore most commonly utilized in all storm sewer analysis and design.

A. Directions for Gutter Flow Analysis Form.

B. Flow Characteristic Curves (based on Chart 29 in U.S.B.P.R. Hydraulic Design Series #3 entitled "Design Charts for Open Channel Flow").

C. Gutter Flow Analysis Tabulation Form.

D. Directions for Storm Sewer System Design Form.

E. Storm Sewer System Design Tabulation Form.

F. Directions for "Hydraulic Capacity of Grate Inlet in a Sump" Chart.

G. Hydraulic Capacity of Grate Inlet In A Sump Chart.

H. Areas and Perimeters for various combinations of Standard Connecticut Steel Frame and Grate (for use with Item G above).

In trial use of this method, it has been found that certain combinations of shoulder width and cross slope on very flat grades result in an unreasonably low interception volume because of ignoring the lateral flow into the inlet along the side of the grate paralleling the roadway. Model tests on grades of 0.5% indicate that the standard grate should intercept somewhere between 1.5 and 2 c.f.s. Therefore, on flat grades, it should be assumed that each inlet will intercept at least 1.8 c.f.s., or the full gutter flow if less than 1.8 c.f.s.

Highway Surface Drainage

Directions for Gutter Flow Analysis Form

1. Inlet Number - Identifying symbol for inlet.
2. Time to Inlet - Time required for surface flow to concentrate at inlet.
3. Area in Acres - Area contributing runoff to inlet (A)
4. Runoff Coefficient - Coefficient of area contributing to inlet (C).
5. AC - The product of the area and the runoff coefficient.
6. Sum of AC - The sum of the AC for the inlet.
7. Total AC - The AC bypassing the previous inlet and the AC for the inlet.
   6 + 15 = 7
8. Rainfall Intensity - The intensity (I) determined by the Time to inlet, 2.
9. Q to inlet - The product of the Total AC, 7, and the Rainfall Intensity, 8.
   Q = CIA
10. Grade of gutter - Longitudinal grade to be expressed in feet per foot.
11. Cross slope of Shoulder - slope to be expressed in feet per foot (Transverse Slope).
12. Depth of flow - depth of water at gutter.
13. Width of flow - the width the water will flow in the shoulder or travelway. The entire shoulder width may be utilized for flow on all highways. For urban streets with normal crown not more than 1/2 of one travel lane on each side shall be utilized for flow.
14. Q bypassing Inlet - the portion of flow that is beyond the width of the grate will be used to determine the bypass Q.
15. AC bypassing Inlet - determined by dividing the "Q bypassing inlet" (14), by "Q to inlet" (9), and multiplying the result by the "Total AC" (7); i.e. $\frac{(14)}{(9)}(7)$ = AC bypassing Inlet

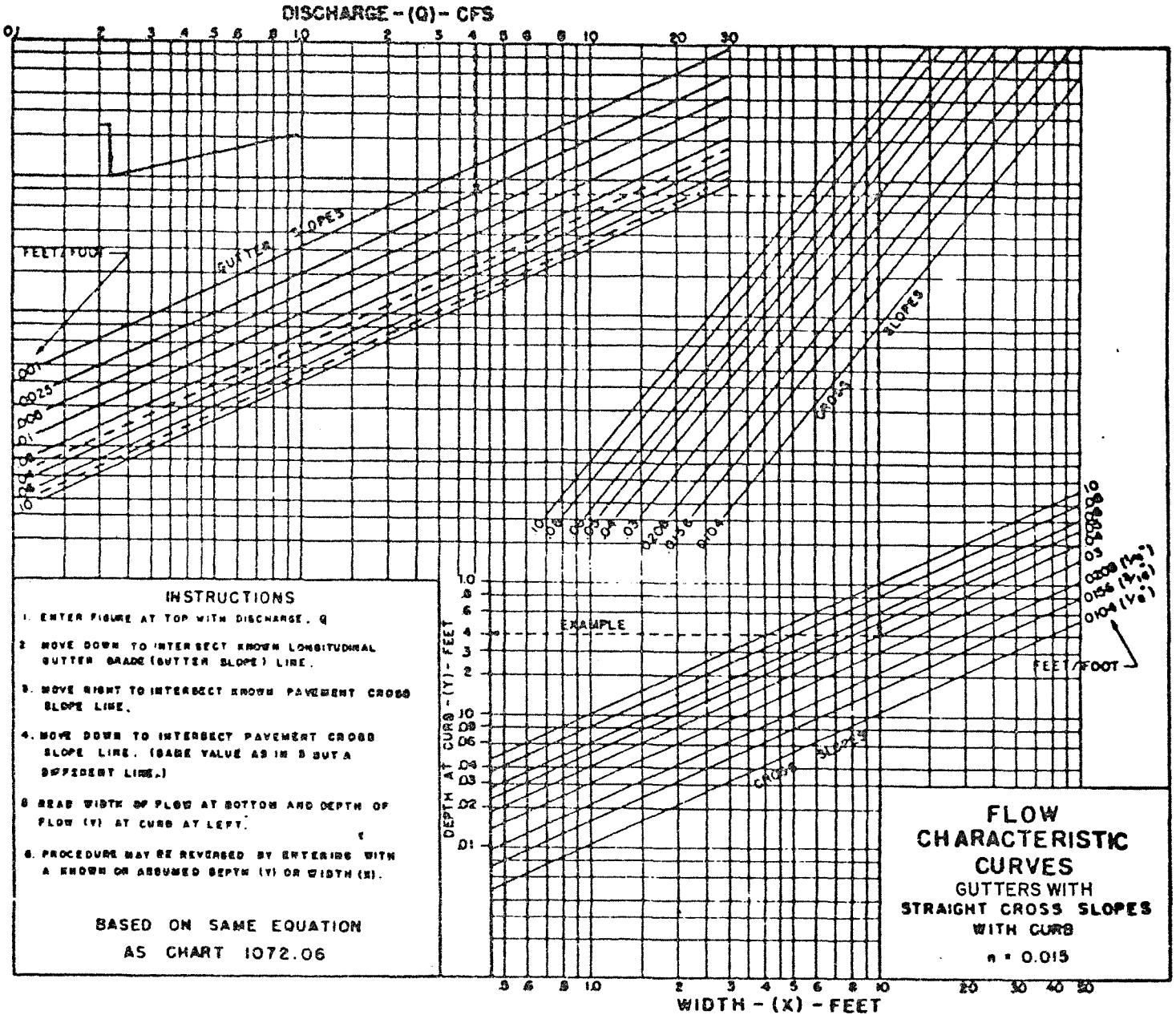

DISCHARGE - (Q) - CFS
FEET/FOOT
GUTTER SLOPES
INSTRUCTIONS
1. ENTER FIGURE AT TOP WITH DISCHARGE, Q
2. MOVE DOWN TO INTERSECT KNOWN LONGITUDINAL GUTTER GRADE (GUTTER SLOPE) LINE.
3. MOVE RIGHT TO INTERSECT KNOWN PAVEMENT CROSS SLOPE LINE.
4. MOVE DOWN TO INTERSECT PAVEMENT CROSS SLOPE LINE. (SAME VALUE AS IN 3 BUT A DIFFERENT LINE.)
5. READ WIDTH OF FLOW AT BOTTOM AND DEPTH OF FLOW (Y) AT CURB AT LEFT.
6. PROCEDURE MAY BE REVERSED BY ENTERING WITH A KNOWN OR ASSUMED DEPTH (Y) OR WIDTH (X).
BASED ON SAME EQUATION AS CHART 1072.06
EXAMPLE
DEPTH AT CURB - (Y) - FEET
WIDTH - (X) - FEET
FLOW CHARACTERISTIC CURVES
GUTTERS WITH STRAIGHT CROSS SLOPES WITH CURB
n = 0.015

FIGURE 5

1	Inlet Number
2	Time to Inlet
3	Area in Acres
4	Runoff Coefficient (C)
5	AC
6	Sum of AC
7	Total AC
8	Rainfall Intensity(I)
9	Q to Inlet
10	Grade of Gutter
11	Cross Slope of Shoulder
12	Depth of Flow at Gutter
13	Width of Flow
14	Q Bypassing Inlet
15	AC Bypassing Inlet
16	AC Entering Catch Basin

Project _____ Route _____ Town _____

Designed by _____ Checked by _____ Sheet No. _____

Gutter Flow Analysis

Figure 6

Highway Surface Drainage
Directions for Storm Sewer System Design Form

1. Line Segment - Identification of line usually between inlets by numbers.
2. Time to inlet - Time for surface flow to concentrate for first inlet. If the area is such that it takes less than the minimum time of 5 minutes, then 5 minutes shall be used until the accumulated time exceeds 5 minutes.
3. Time in pipe - time required to pass through line segment.
4. Accumulated Time - Time of concentration effective at location. The longest time is to be used. This can be overland flow to an inlet; accumulation of time in pipe; or a branch line entering a system.
5. AC entering Catch Basin - AC determined by "Gutter Flow Analysis Form".
6. Sum of AC in system - sum of the AC's entering inlets effective at location.
7. Rainfall Intensity - The intensity determined by the Accumulated Time (4).
8. "Q" in system - the product of sum of AC in system, 7, and the Rainfall Intensity, 5.
9. Pipe size - self-explanatory.
10. Length of Pipe - self-explanatory.
11. Slope - to be expressed to the nearest thousandths of a foot/foot.
12. Average velocity - that which will be obtained in pipe of size, type and slope specified at design discharge (Q in system).
13. Full Capacity - discharge which can be carried by pipe of size and type specified, flowing full.
14. Headwater - height water will reach above the flowline that will develop at the design discharge in the structure (refer to Bureau of Public Roads, Hydraulic Engineering Circular No. 5, "Hydraulic Charts for the Selection of Highway Culverts").
15. "n" - roughness Coefficient: n = .015 for R.C.P.; n = .019 for A.C.C.M.P. with paved invert.

	1	Line Segment
	2	Time to Inlet
	3	Time in Pipe
	4	Accumulated Time
	5	AC Entering Catch Basin
	6	Sum of AC in System
	7	Rainfall Intensity(I)
	8	Q in System
	9	Pipe Size
	10	Length of Pipe
	11	Slope
	12	Average Velocity
	13	Full Capacity
	14	Headwater
	15	'n'

Project _____ Designed by _____

Town _____ Route _____ Checked by _____ Sheet No. _____

Storm Sewer System Design

Figure 7

DIRECTIONS FOR USE OF HYDRAULIC CAPACITY OF GRATE INLET IN A SUMP CHART

This chart applies only when the grate is located in a low point or sump where the water will pond at the grate.

The capacity of the grate depends upon either the exposed perimeter or the area of the openings and the depth of water at the grate. Experiments (2) have determined that a grate will act as a weir and follow the weir formula for depths (heads) on the grate up to 0.4 ft. It will act as an orifice and follow the orifice formula for heads of 1.4 ft. and over. For heads between 0.4 and 1.4 ft. the operation is indefinite because of vortices and eddies over the grate.

In the usual analysis and design the following are given:

1. A particular design of grate with dimensions.
2. A design discharge (Q) or information as to drainage area, rainfall intensities and runoff coefficients from which a design discharge can be estimated.

PROCEDURE:

1. Compute the perimeter of grate opening (P) ignoring the bars and omitting any side over which the water does not enter, such as when one side is against the face of a curb. Divide the result by 2. This allows for partial clogging of the grate by assuming that only half of the perimeter will be effective.

2. Compute the Q/P ratio, using effective perimeter after allowing for clogging.

3. Compute the total area of clear opening (A), excluding area taken up by bars, and divide by 2. This allows for partial clogging of the grate by assuming that only half of the area will be effective.

4. Compute the Q/A ratio, using effective area after allowing for clogging.

5. Enter the chart at the bottom scale, using curve (A) with the Q/P value and curve (B) with the Q/A value, and read the required head in feet at the left margin.

6. If the required head falls below 0.4, curve A only will apply. This is the usual case.

7. If the required head falls above 1.4 ft., Curve B only will apply.

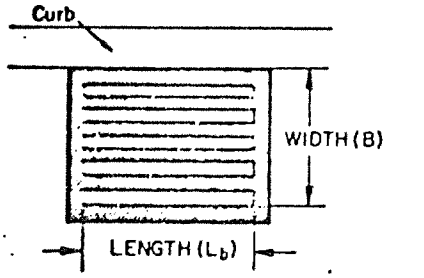
8. If the required head falls between 0.4 ft. and 1.4 ft. the actual head may be anywhere between the values from curves (A) and (B). Use the value that gives the most conservative result, being sure to use curve (A) with Q/P and Curve (B) with Q/A.
   Vortices and eddies over the grate may cause the actual head to differ from the indicated head in this case (see second paragraph).

9. If the inlet is a combination type with grate and curb opening, the recommended procedure is the same as with a grate alone except the perimeter and area are not divided by 2. The reason for this is that the curb opening will serve as a relief in event the grate becomes clogged.

With the grate operating freely it is questionable whether much water will get to the curb opening until the discharge is sufficient to submerge the entire grate.

10. If the grate has an appreciable cross slope so the side away from the curb is higher than that next to the curb the inflow over the side should be determined separately from that over the ends. Use the depth at the middle of the grate for end inflow and depth at edge away from the curb for side inflow.

(2) Airfield Drainage Structure Investigation (Final Report)
Hydraulic Laboratory Report No. 54
U.S. Corps of Engineers, St. Paul District Suboffice, April 1949

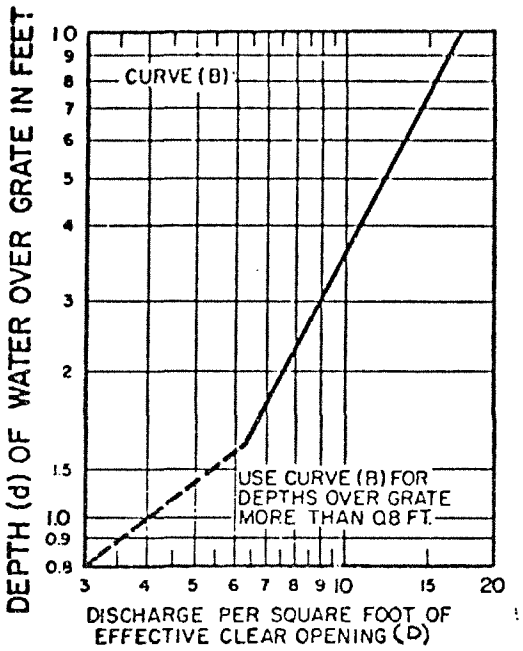


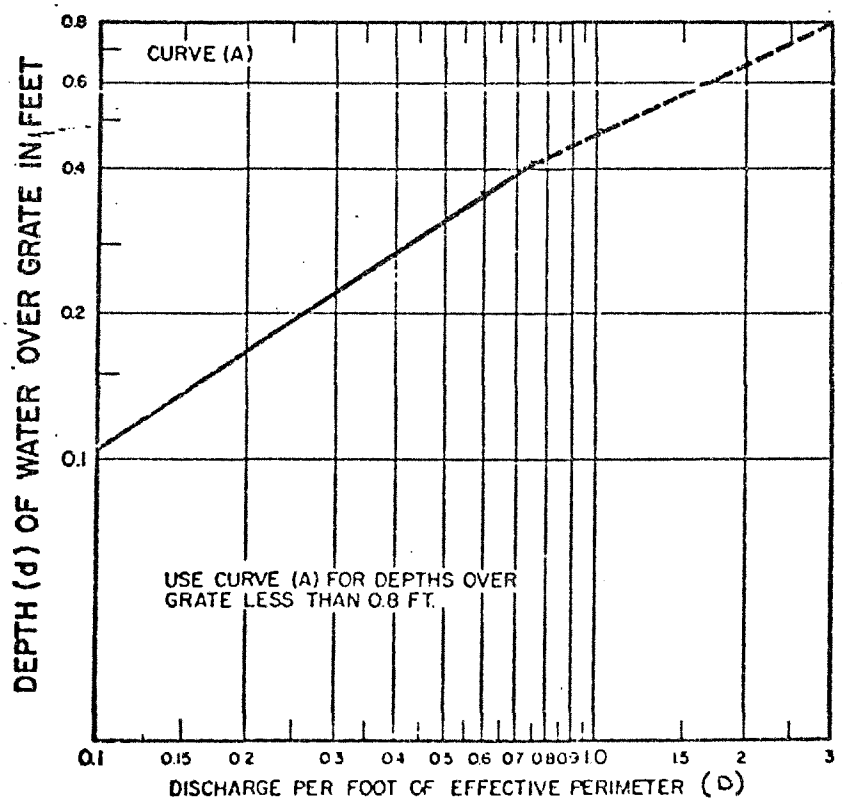
$P = 2B + L_b$

A = AREA OF CLEAR OPENING IN GRATE

TO ALLOW FOR CLOGGING DIVIDE P OR A BY 2 BEFORE OBTAINING d.

WITHOUT CURB $P = 2(B + L_b)$





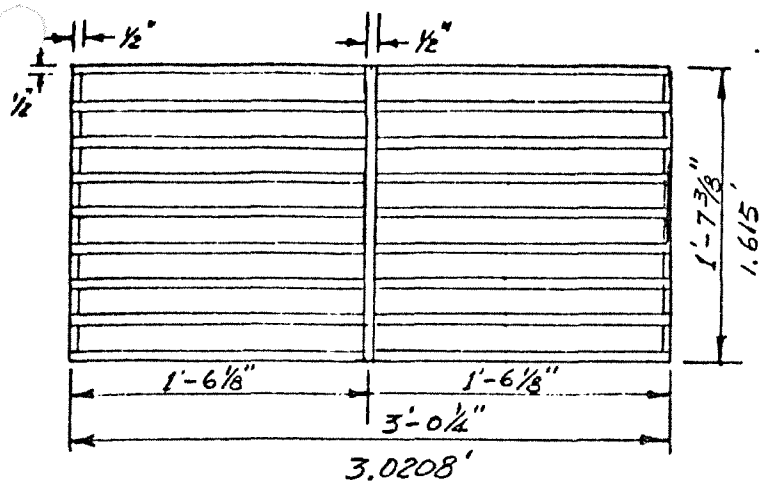
BUREAU OF PUBLIC ROADS
REV. AUG. 1968

HYDRAULIC CAPACITY OF GRATE INLET IN SUMP

FIGURE 8

FIGURE 9

AREAS AND PERIMETERS FOR STANDARD CONNECTICUT STEEL FRAME AND GRATE



$9 @ \frac{1}{2}" = 4\frac{1}{2}" = 4.5"$

$3 @ \frac{1}{2}" = 1\frac{1}{2}" = 1.5"$

$1'-6\frac{1}{8}" = 18.125"$

$3'-0\frac{1}{4}" = 36.25"$

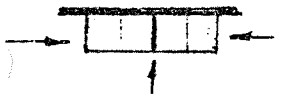
NET AREA =
$(18.125" - 4.5") \times (36.25" - 1.5")$
$= 13.625 \times 34.75 = 473.46875^{\square"}$
$= 3.288^{\square'}$

For Type "C" C.B. (single)

A = 3.288 S.F.
A/2 = 1.644 S.F.

P = 3.021 + 2 x 1.615 = 6.25'
P/2 = 3.125' (For clogging)

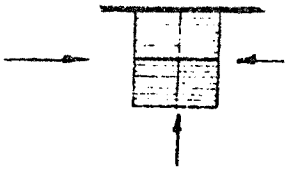
For Type "C" C.B. (double - Tandem)



A = 6.576 S.F.
A/2 = 3.288 S.F.

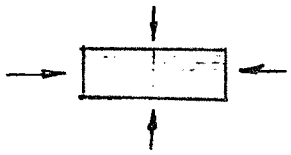
P = 2 x 3.021 + 2 x 1.615 = 9.27'
P/2 = 4.635' (For clogging)

For Type "C" C.B. (double - Colateral)



A = 6.576 S.F.
A/2 = 3.288

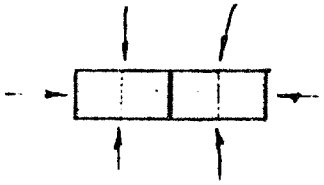
P = 3.021 + 4 x 1.615 = 9.48'
P/2 = 4.74' (For clogging)



For Type "C-L" C.B. (single)

A = 3.288 S.F.
A/2 = 1.644 S.F.

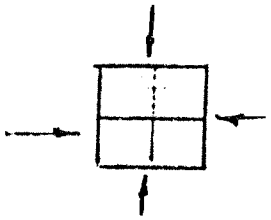
P = 2 x 3.0208 + 2 x 1.615 = 9.27'
P/2 = 4.635' (For Clogging)



For Type 'C-L' C.B. (double - Tandem)

A = 6.576 S.F.
A/2 = 3.288 S.F.

P = 4 x 3.0208 + 2 x 1.615 = 15.314'
P/2 = 7.657' (For Clogging)



For Type 'C-L' C.B. (double - Colateral)

A = 6.576 S.F
A/2 = 3.288

P = 2 x 3.0208 + 4 x 1.615 = 12.502'
P/2 = 6.251' (For Clogging)

RIPRAP[1]

When open channels are used to convey flows, care should be taken to insure that the velocities expected with the design discharge do not create erosion problems. To prevent erosion, one of the three types of Riprap (Modified, Intermediate or Standard) is commonly used.

The two attached Design Charts for Riprap which were developed from National Cooperative Highway Research Program Report 108, Tentative Design Procedures for Riprap Lined Channels, should be used in conjunction with the "Design Charts for Open Channel Flow" - Hydraulic Design Series #3 of the Federal Highway Administration to determine the type of riprap necessary for ditch or channel protection.

In order to determine the type of riprap to be used, enter the Design Chart for Riprap, Discharge vs. Slope, and select the type of riprap to be used from the appropriate zone. Using the "n" value of the selected riprap (see below) compute Qn, select a channel width and find in the "Design Charts for Open Channel Flow" the depth of flow and Vn.

The following roughness coefficients are to be used:

Modified Riprap	n = .034
Intermediate Riprap	n = .037
Standard Riprap	n = .041

[1] From State of Connecticut Drainage Manual.

After computing "V", confirm using the Design Chart for Riprap, Velocity vs Slope, that the design velocity is within the range of the selected riprap. If it is not within the range, reanalyze the design using a different riprap.

Example

Given: Q = 100 S = 0.02 ft/ft

Find: Type of riprap, Qn, channel width, d, Vn and V

1. On the design Chart for Riprap, Discharge vs Slope, Intermediate Riprap is found to be required.
2. Qn = (100) (.037) = 3.7
3. Select channel width from the Design Chart for Open Channel Flow. The width is dependent on the allowable depth of flow - use 2' for this example.

   b = 4' d = 2.0'; b = 5' d = 1.8'; b = 6' d = 1.75'

   In most cases, a freeboard is desired so a channel width of 6' is selected with a depth of flow equal to 1.75'.
4. From the Design Chart for Open Channel Flow:

   $Vn = 0.23 \quad V = \frac{Vn}{n} = \frac{0.23}{.037} = 6.2$
5. Confirming the velocity on the Design Chart for Riprap, Velocity vs Slope, it is found that Intermediate Riprap with a slope of 0.02 ft/ft can withstand velocities equal to 7.1 fps.
6. This confirms that Intermediate Riprap is to be used.

The height of riprap will be determined by the Engineer after considering a reasonable freeboard, as shown in the example. For large channels carrying major flows the riprap protection should extend 1.0' above the designed water surface.

These charts are based on essentially straight channels with 2:1 side slopes and a $\frac{WP}{R} = 10$. When curves are encountered, additional height of protection and possible increase in size of riprap should be considered to allow for the increase in the depth of flow and velocity.

For larger discharges, beyond the limits of these charts, the riprap will have to be designed using the following formulas:

$$Q = \frac{1}{118} \frac{d_{50}^{5/2}}{S^{13/6}} \frac{WP}{R}$$

$$V = 4.6 \frac{d_{50}^{1/2}}{S^{1/6}}$$

d_{50} = particle size, of which 50 percent is finer by weight or size.

S = bed slope ft/ft.

WP = Wetted Perimeter, ft.

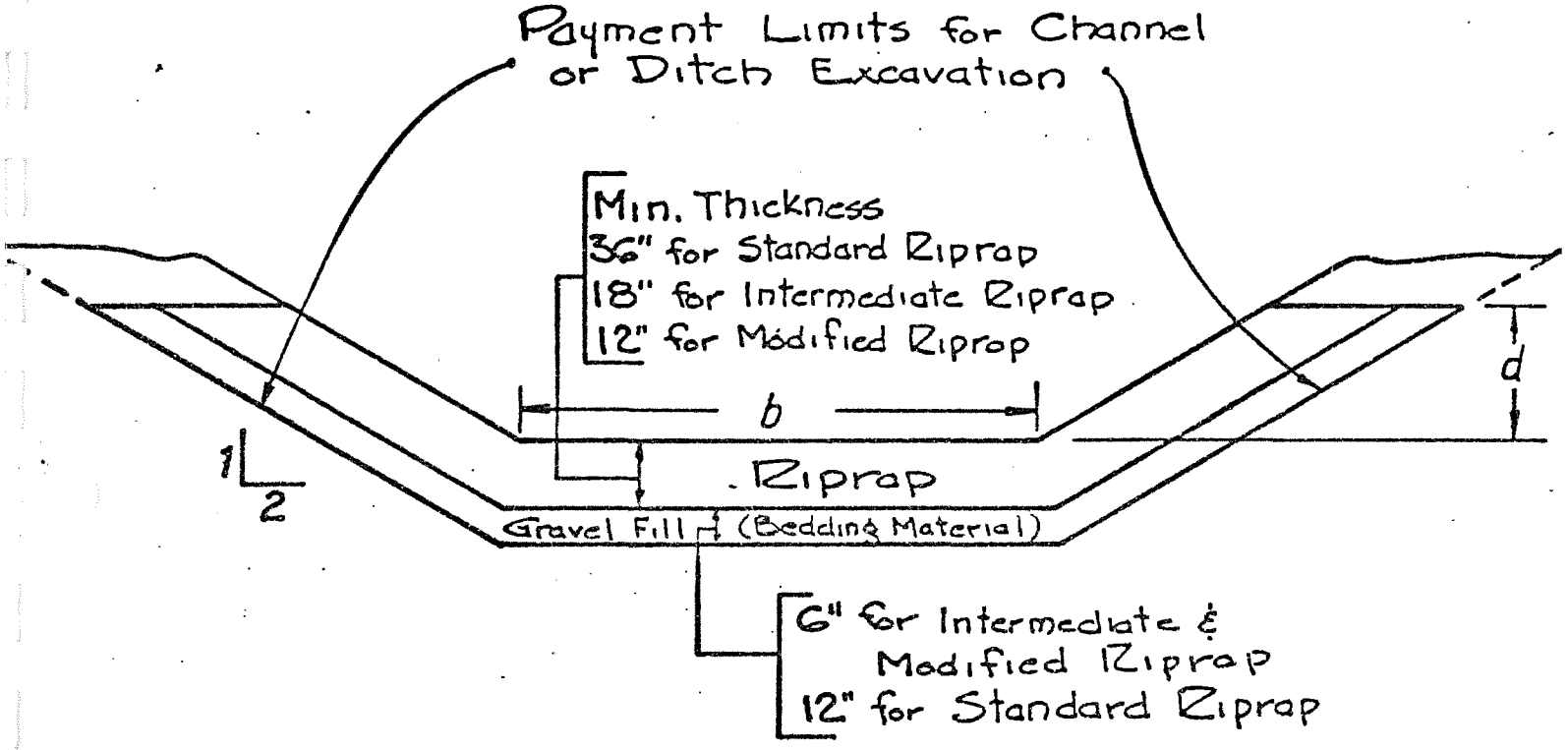
R = Hydraulic Radius, ft.

After the riprap is designed for sizes not covered by the Charts, a special provision is to be prepared and incorporated in the contract to define the gradation required.

Erosion Prevention at Storm Sewer and Culvert Outlets

Caution should be used to determine that the velocities at culvert or storm system outlets do not exceed the allowable velocity for the type of riprap being used. When the limit of Standard Riprap is exceeded a more stable type lining, or energy dissipators will be required.

The attached typical section will be included, with appropriate dimensions, in the project plans. Gravel fill will be placed as bedding material to the appropriate depth under all riprap installations unless the Engineer responsible for Soils and Foundations recommends otherwise.



RIPRAP CHANNEL OR DITCH

NOTE:

'd' – depth as shown on plans.

'b' – width as shown on plans.

FIGURE 10

DESIGN CHART FOR RIPRAP
VELOCITY VS SLOPE

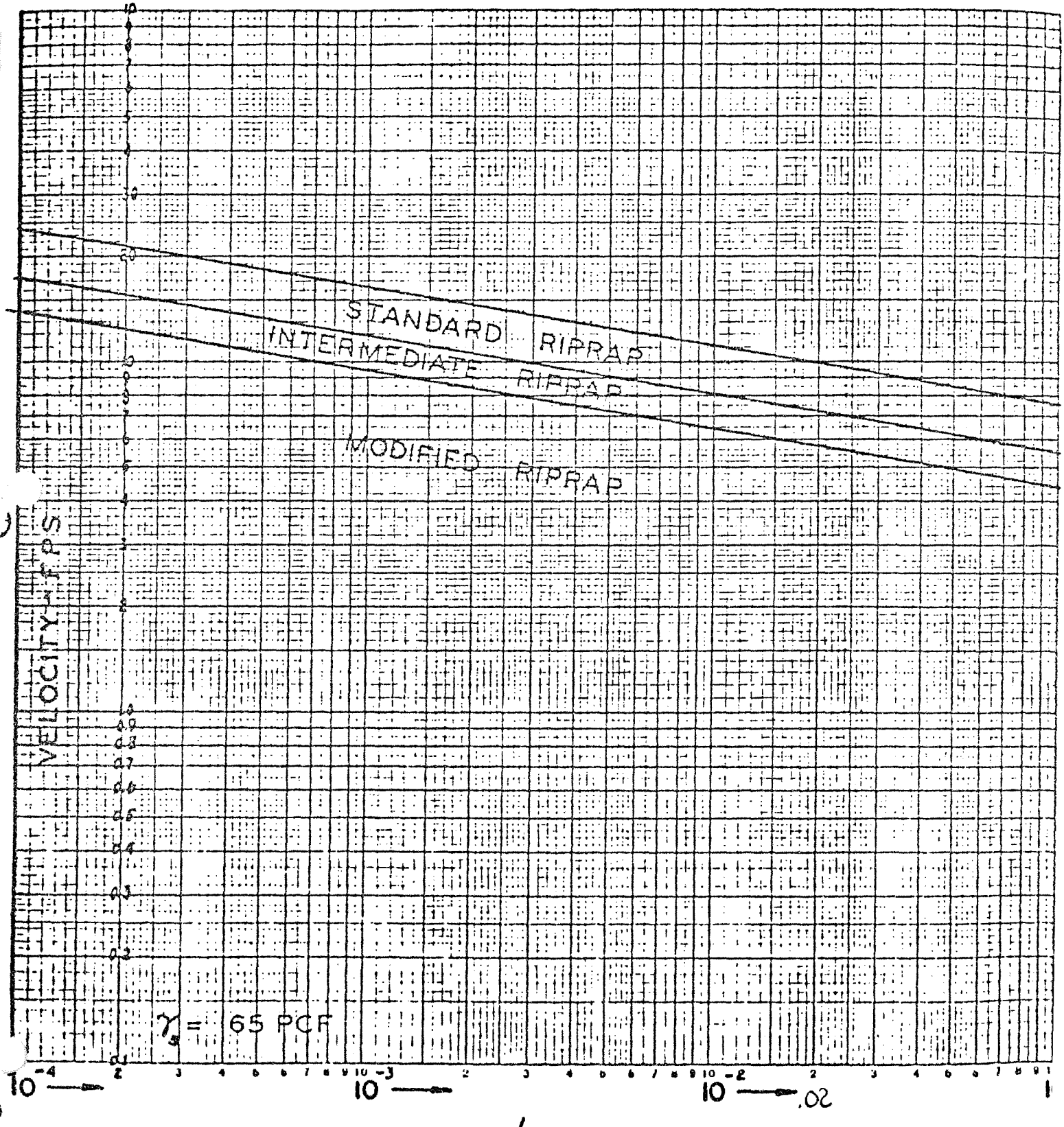


FIGURE 11

DESIGN CHART FOR RIPRAP

DISCHARGE VS SLOPE

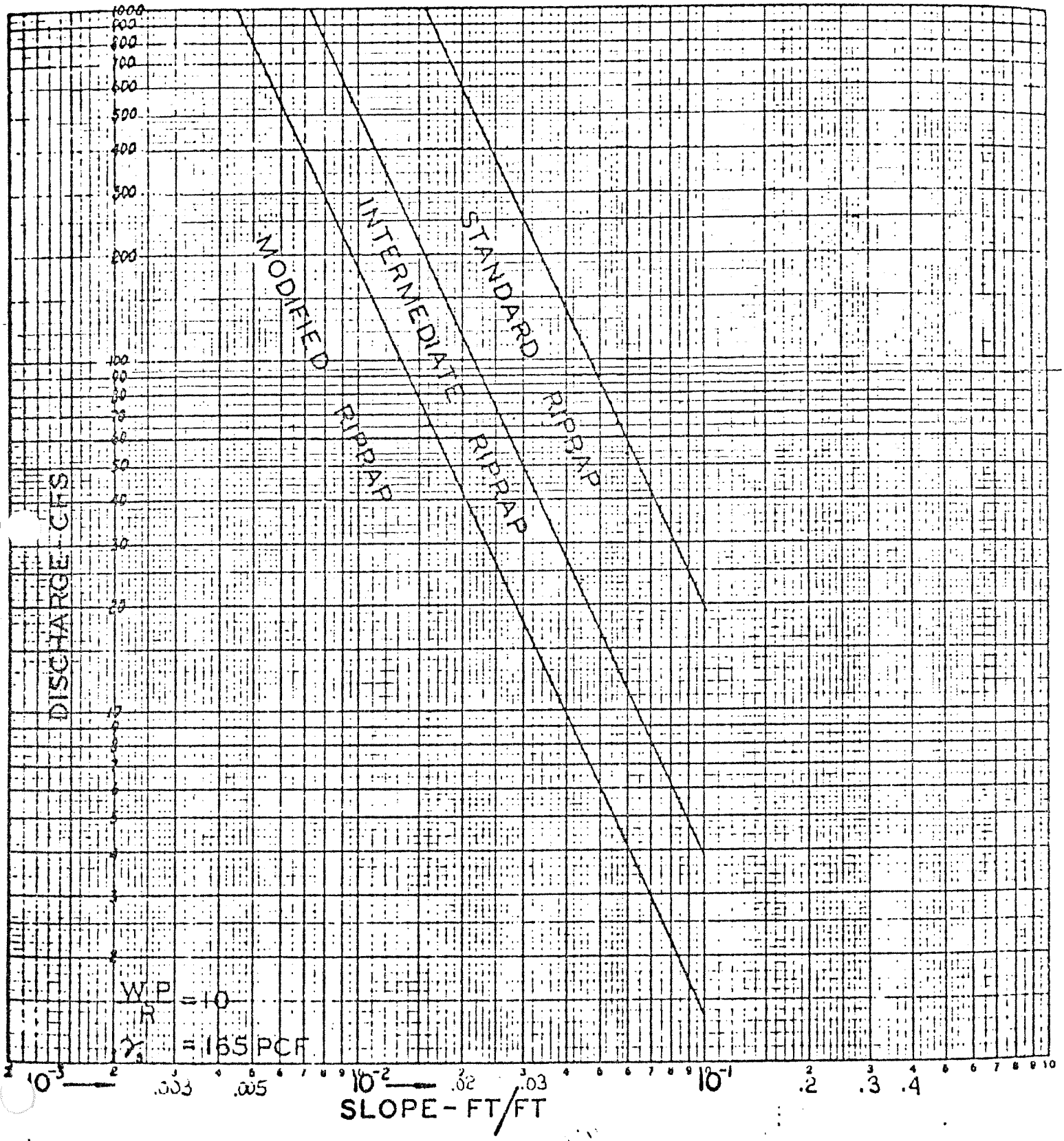
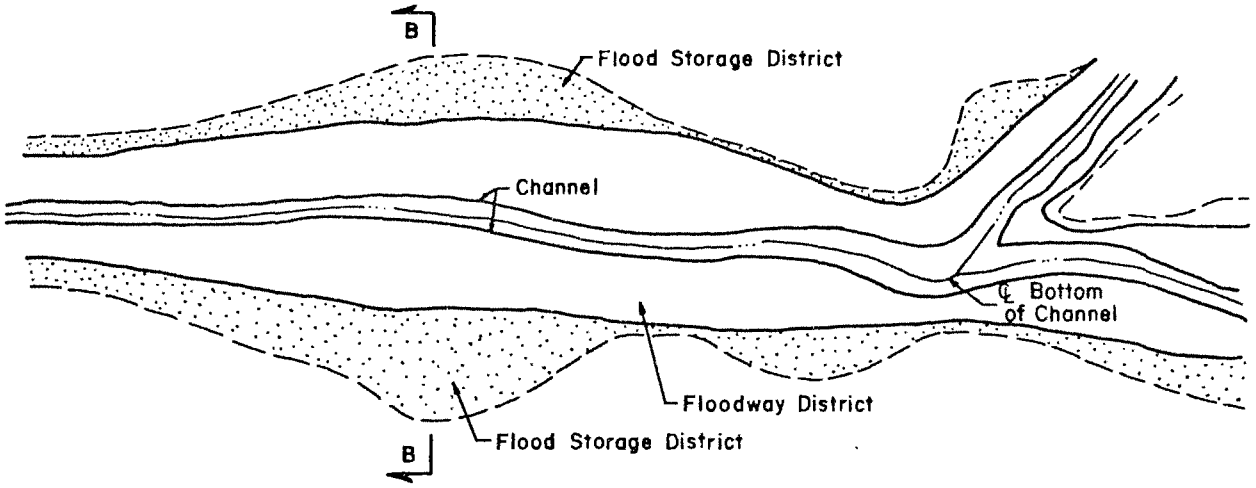
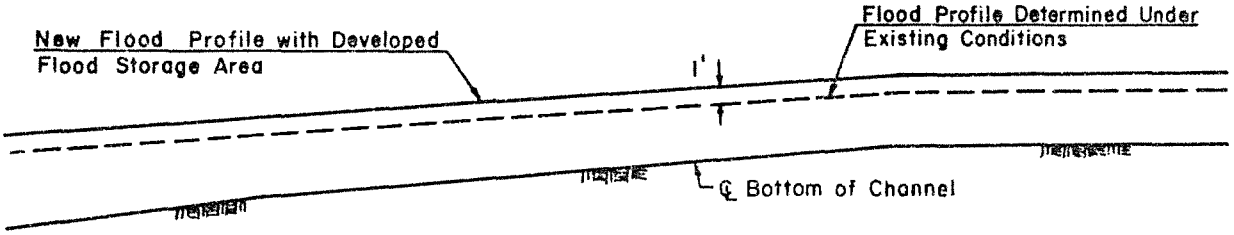


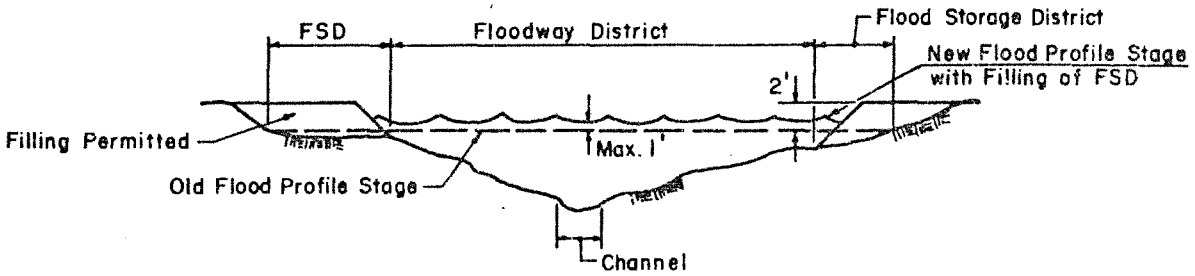
FIGURE 12



PLAN



PROFILE



SECTION B-B
CROSS SECTION

GRAPHIC REPRESENTATION

FIGURE 13 - FILLING OF FLOOD PLAIN

APPENDIX B

LIST OF REFERENCES

1. Storm Drainage Guide for the Town of Rocky Hill, Connecticut by W. G. Weaver and Associates, November 1967.

2. Study and Development Plan of Storm Water Drainage "Drum Hill" Sub-Drainage Basin for the Town of Rocky Hill, Connecticut by W. G. Weaver and Associates, July 1968.

3. Plan of Development for Rocky Hill, Connecticut by Brown, Donald and Donald, May 1972.

4. Zoning Regulations for the Town of Rocky Hill. Amemded to January 21, 1975.

5. Inland Wetland and Water Course Regulations, Town of Rocky Hill, Connecticut.

6. "A Flood-Flow Formula for Connecticut" by B. L. Bigwood and M. P. Thomas published by U. S. G. S. Circular No. 365, Washington, D. C., 1963.

7. "Rainfall Frequency Atlas of United States" Technical Paper No. 40, Department of Commerce, Washington, D. C., 1961.

8. "Design Manual Concrete Pipe" prepared by American Concrete Pipe Association, 1970.

9. "Handbook of Steel Drainage and Highway Construction Products" prepared by American Iron and Steel Institute, 1971.

10. "Drainage Manual" State of Connecticut, Highway Department, February 1966.

11. "Pressure Changes at Storm Drain Junctions" by W. M. Sangster, Engineering Bulletin No. 41, University of Missouri, Columbia, 1958.

12. "State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction, Form 811, 1974".

13. "Design and Construction of Sanitary and Storm Sewers: ASCE Manuals and Reports on Engineering Practice - No. 37", 1970.

14. "Comprehensive Drainage Study; Newington, Connecticut, July 1970", by Charles A. Maguire and Associates, Inc.

15. "Peak Rates of Runoff from Small Watersheds, Hydraulic Design Series No. 2" by U. S. Department of Commerce, Bureau of Public Roads, 1961.

16. "Peak Rates of Runoff for New England, New York and New Jersey, BPR Region 1", October 1960.

17. "SCS National Engineering Handbook, Hydrology" by Soil Conservation Service, U. S. Department of Agriculture.

18. "Hydraulic Charts for the Selection of Highway Culverts" HEC No. 5, December 1965 by U. S. Department of Commerce BPR.

19. "Capacity Charts for the Hydraulic Design of Highway Culverts" HEC No. 10, March 1965 by U. S. Department of Commerce BPR.

20. "Use of Riprap for Bank Protection" HEC No. 11, June 1967 by U. S. Department of Transportation FHWA, BPR.

21. "Drainage of Highway Pavements" HEC No. 12, March 1969 by U. S. Department of Transportation FHWA, BPR.

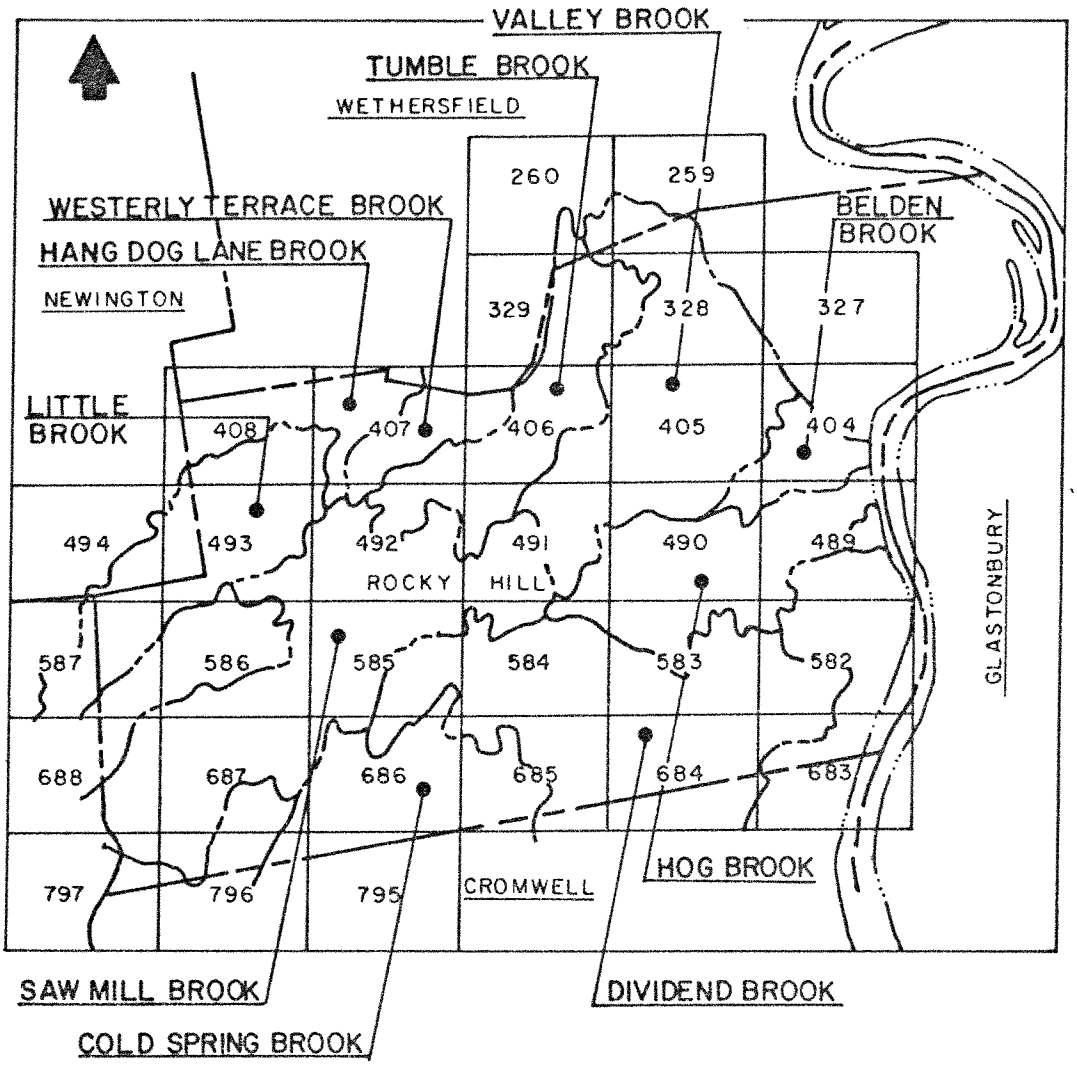
22. "Hydraulic Design of Improved Inlets for Culverts" HEC No. 13, August 1972 by U. S. Department of Transportation FHWA.

23. "Design Charts for Open-Channel Flow HDS No. 3" by U. S. Department of Transportation FHWA, 1973.

24. Town of Rocky Hill, Connecticut, Street Classification and Standard Roadway Details by W. G. Weaver and Associates, February 1968.

APPENDIX C

INDEX TO 400 SCALE PLANS



INDEX PLAN

LEGEND

MAJOR WATERSHED ——— · ———

MINOR WATERSHED ———————

WATERSHED SUB-AREA NUMBER □

NUMBER CROSSDRAIN AND LOCATION △

EXISTING SYSTEM —o— 15" R —o—

PROPOSED SYSTEM —o— 30" R —o—

TYPE OF PIPE

ASPHALT COATED CORREGATED METAL	A
CORREGATED METAL	C
CAST IRON	C.I.
REINFORCED CONCRETE	R
TILE	T

COMPREHENSIVE DRAINAGE STUDY

COMPUTATIONS – 1974

BY

CE MAGUIRE, INC

DIVIDEND BROOK

1.50 — 60

1 D

5.17.74

Divided Brook

Cross drain No 1A — Sheet 585 — Cornwall Ave (State) — Exist. 18" RCP

Inv. El 160.51 OK
Row 163.50

A_c = 3.4 × 0.60 = 2.0

Q_{50} = 2.0 × 5.1 = 10.2 cfs.
Q_{25} = 2.0 × 4.5 = 9.0 cfs.

ΔH = 190 − 164 = 26 ft. L = 1100 ft S = 2.4%
Tc = 15 min
HW 1.5 × 1.5 + 160.5 = 162.75 / 163.50 (2.25)
1.5 × 1.2 = 162.30

Cross drain No 1B — Sheet 585 — Cobal Spring Rd — Exist 24" RCP

Inv. 158.70 OK
Row, 163.0

A_c = 8.3 × 0.60 = 5.0

Q_{50} 5.0 × 5.1 = 25.5 cfs.
Q_{25} 5.0 × 4.5 = 22.5 cfs.

ΔH = 190 − 164 = 26 ft L = 1000 ft S = 2.6%
Tc = 15 min
HW 1.6 × 2.0 + 158.70 (3.6) = 162.30 / 163.
1.5 × 2.0 = 161.70

1D

Cross drain No 1C — Sheet 686 — Cobal Spring Rd — Exist. 24" RCP

lower Inv 173.40
ok? Row 176.20

A_{R-20} 9.3 × 0.45 = 4.2

Q_{50} 4.2 × 5.1 = 21.4 cfs.
Q_{25} 4.2 × 4.5 = 19.0 cfs.

ΔH = 240 − 178 = 62 ft. L = 900 ft S = 6.9%
Tc = 16 min

HW = 173.40 + 1.5 × 20 = 176.40 / 176.
172.80 + 3.0 = 175.80

Cross Drain No 1D, Cobb Spring Rd — Exist 42" RCP

Sheet 686 & 585 — OK & 15" RCP

42" INV. 157.90

15" INV. 158.80

Rdwy 164.70

A2-2a 2.2 + 7.1 = 9.3 × 0.45 = 4.2.

Ac 2.2 + 22.4 = 24.6 × 0.60 = 14.8.

33.9 × 0.56 = 19.0.

ΔH = 235 − 164 = 71 ft L = 1411 ft

S = 71/14 = 5.1%

Q50 19.0 × 4.3 = 82.0 cfs.

Q25 19.0 × 3.8 = 72.0 cfs.

Tc = 24 min.

HW 157.90 + 1.5 × 3.5 (5.3) = 163.80

Cross Drain No 1E — Cobb Spring Rd — OK Exist 42" RCP

Sheet 585 & 685

42" INV 156.90

Rdwy 164.70

No 1C	9.3.	4.2.
1D,	33.9.	19.0.
No 1D2 E	43.2.	23.2.

Tc = 24 min

Q50 23.2 × 4.3 = 100.0 cfs.

Q25 23.2 × 3.8 = 88.0 cfs.

HW 156.90 + 3.5 × 1.8 (6.80) = 163.20

Cross Drain No 1F — Gromwell Ave (State) — Exist 42" RCP

Sheet 686 & 585

INV 154.10

Rdwy 166.00

Use 48" RCP

Ac = 2.6 + 4.9 = 7.5 × 0.60 = 4.5.

No 1A	3.4.	2.0.
1B	8.3.	5.0.
1D2 E	43.2.	23.2.
	62.4.	34.7.

L = 4m V = 6.0

Tc = 24 + 1 = 25 min

Q50 34.7 × 4.2 = 146.0 cfs. — 42" HW 154.10 + 3.5 × 4 (14.0) = 168.10

Q25 34.7 × 3.7 = 128.0 cfs. — 48" HW 154.10 × 2.2 × 4 (8.8) = 162.90 S = 1.4%

54" HW 154.00 × 1.3 × 4.5 (5.80) = 159.80 S = 0.8%

Cross Drain No 1 — I-91 (State) — Exist 48" RCP

Sheet 585 & 584

		32.2			
A Hc	23.1 + 2.0 =	25.1	x 0.65 =	16.3	
I-91	1.6 + 5.1 =	7.1	x 0.48 =	3.4	
No IF		62.4		34.7	
		94.6		54.4	

Q 50 — 54.4 x 3.9 = 212.0 — 48" — 54"

Q 25 — 54.4 x 3.5 = 190.0

OK — INV 149.58 — Road ~~149.70~~ 161.00 ~~13.70~~ — 54" will Bur. EL. 146

L = 8m — V = 5 — Tc = 25 + 3 = 28 min

HW 149.6 + 11.2 x 1.2 x 2.0 = 160.80 OK

HW 149.60 + 1.9 x 4.5 = 158.20

HW 146.0 + 157.70

Cross Drain No 2A — Comm Fry Drive — No Exist 12" RCP

Sheet 584

INV 182.0

Ac = 19.4 − (Gun Storage 5.0) = 14.4 x 0.60 = 8.7

Q 50 = 8.6 x 5.4 = 46.5 cfs

Q 25 = 8.6 x 4.9 = 42.0 cfs

Reused 36" RCP

ΔH = 250 − 184 = 66 ft. L = 1300 S = 5.1%

Tc = 14 min

30" S = 1.3% HW 182.50 + 2.5 x 2.1 = 187.75

36" S = 0.6% 182.50 + 3 x 1.3 = ~~186.40~~ 185.9

Cross Drain No 2B — Comm Fry Drive — Exist None

Sheet 584

Use 24" RCP

A Hc = 6.7 x 0.65 = 4.4

Q 50 = 4.4 x 5.6 = 24.6 cfs

Q 25 = 4.4 x 5.0 = 22.0 cfs

ΔH = 234 − 180 = 54 ft. L = 1m S = 5.4%

Tc = 13 min

HW 1.8 x 20 + 157.0 = 160.60

Cross Drain No 2C — Book Sheet — East Home

Sheet 685

Fuse 36" RCP

Rdwy 149.00

A_M = 13.2 × 0.70 = 9.3 — ΔH = 156 − 149 = 7 ft — L = 1000 ft

Tc = 16 min — S = 0.7%

Q_{50} = 9.3 × 5.1 = 47.5

R_{25} = 9.3 × 4.5 = 42.0

36" RCP — HW 3 × 1.2 + 145.5 = 149.4 — S = 0.5%

30" RCP — HW 2.5 × 2. + 145.5 = 150.5

Cross Drain No 2D — Book Sheet — Exist 12" RCP

Sheet 685

Fuse 48" RCP

Rdwy 141.0

A_{HC} 30.2 × 0.65 = 19.6 — ΔH = 158 − 140 = 18 ft — L = 1400

Tc = 18 min — S = 1.3%

Q_{50} = 4.9 × 19.6 = 96.0 cfs

Q_{25} = 4.3 × 19.6 = 84.0 cfs

$\frac{4.8 + 136.0}{4.8} = 140.8$

48" RCP — S = 0.45% — HW = 1.2 × 4.0 + 138.60 = 143.40

Remarks: Drn 2D can be eliminated & Catch Spring on Depressed Road

Cross Drain No 1-2 — Ebert Rd — Exist 24" RCP

Sheet 585 & 584

AC	10.0 × .60 = 6.0	
A_{HC}	53.5 × .65 = 34.8	
A_{Q1}	21.0 × .48 = 10.0	
No 2C	13.2	9.3
No 1	94.6	54.4
	192.3	114.5

Q_{50} = 114.5 × 3.4 = 390 cfs — Tc = 28 + 6 = 34 min

H.W

Use 2-60" S=0.9% — 6.5 × 1.3 + 132.0 = 138.50

2-54 — 7.8 × 1.7 + 132.0 = 139.80

2-72' — 5.7 × 2.3 + 132.0 =

Cross Channel No 2 — New Rd — 36" RCP

Sheet 584

INV 126.0

Rdw 130.0

	Ac		
Ac =	8.0	x .60	4.8
AH =	69.7	x .65	45.5
No 2A =	19.4		8.7
2B =	6.7		4.4
2D =	30.2		19.6
	134.0		83.0
No 1-2	192.3		114.5
	326.3		197.5

Use 2-72"

ΔH 140 - 128 = 12 S = 0.33%

L = 295 V = 3.5

Tc 28 min + 15 = 43 min

Pavement

Rational M

Q50 197.5 x 2.9 = 575 cfs

Q25 197.5 x 2.5 = 500 cfs

N/A

S = 165 - 128 / 140 + 400 + 8m + 295 = 37 / 5600 = 0.66%

Pitts - 332

Q50 = 470 x 1.0 = 470 cfs

Q25 = 380 x 1.0 = 3 cfs

NEHC 326 Ac = 054 Mi

Q 10 = 185

Q 50 = 340 cfs

Q 100 = 460 cfs

P.R.O.S.W.

Q 10 210 cfs

Q 50 300 cfs

Q 100 405 cfs

Use AH: 470 + 460 + 405 = 1360/3 = 440 cfs

2-60"RCP HW 126.0 + 7.5 = 133.5

~~124.3 + 5 x 1.5 = 132.8~~

2-72"RCP HW ~~126.0~~ ~~124.3~~ + 6 x 1.1 ~~132.9~~ ~~130.9~~

S = 0.4%

Channel S = 0.35% Bottom 4'-0 V = 5.2 H = 4.8

Peak Rates of Runoff from Small Watersheds

EXHIBIT A

Cross Drain No 2 - Dividend Brook

5a D

TABULATION SHEET

1. Name of map Town Rocky Hill Conn.

   a. Coordinates of Crossing

   Latitude 41-37-30

   Longitude 72-37-30

   b. Drainage area, A = 326 acres or 0.326 x 1000 acres
   (640 acres = 1 sq. mi.)

   c. Length of stream L = 5"x 8th = 4000 Ft = 0.76 miles

   .3L = 1200 = 0.23 miles

   .7L = 2800 = 0.53 miles

   Elevation (a) at headwater ~~165.0~~ 154.0 ft.

   Elevation (b) at .7L above crossing 138.0 ft.

   Elevation (c) at crossing 126.0 ft.

   $S_1 = \frac{EL(a) - EL(b)}{.3L}$ (16.0 / 0.23) = 70 ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L}$ (12.0 / 0.53) = 22.6 ft./mi.

   $\sqrt{S_1}$ = ~~10.4~~ 8.3 $\sqrt{S_2}$ = 4.8

   $T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{0.23}{8.3} + \frac{0.53}{4.8}$ = ~~0.027 + 0.11~~ = 0.13

2. From Figure 1

   a. P-index = 1.9 Zone I

3. Find Q_{10} using:
   (fig. 2, 3, or 4)

   Zone I

   Area 307

   P-index 1.9

   T 0.132

   a. First estimate of Q_{10} = 0.075 in 1000 cfs = 75 cfs.

b. Refer to figure 4 or (5)

Using Zone I Find $\hat{T}$ = 0.063

Area 326 Ac

P-index 1.9

T 0.13

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{0.06 - 0.13}{0.06}$ % = 0.07 / 118.%

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.13}{0.06}$ = 2.16 c = 2.8 (fig. 7/8)

(2) C x Q_{10} of 3a = 2.8 x 75 = 210 cfs

4. Final Q_{10} = _____ cfs

Q_{25} = _____ cfs

Q_{50} = 300 cfs

Q_{100} = 350

Q_{200} = 400 cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Zone Between envelope curves Yes No

Cross Drain No 3 — Loco Rd — 48" RCP

Sheet 584

INV ~~124.0~~ 123.0

A_{HC} = 31.1
N_{02} = 326.3
Σ 357.4 Ac = .56 M_i^2

Points
Q_{SR} = 500 x 1 = 500 cfs
Q_{25} = 420 x 1 = 420 cfs

NEHL
Q_{10} = 190
Q_{50} = 360
Q_{100} = 450

Use Av 500+450 = 470 cfs

Channel No 2-3 W = 4'-0 ; S = 0.3%
2-72" RCP INV 123.0 + 6.0 x 1.05 = 129.30

Cross Drain No 4 — Brook Street — 48" RCP

Sheet 583

Ex INV ~~114.0~~
Prop. INV 113.0
Road 122.0

A_{R-20} = 144.7 Ac
A_{HC} = 10.7
No 3 = 357.4
512.8 Ac = 0.80 M_i^2

ΔH 165 - 114 = 51 ft

Points Isaak
Q_{50} = 680 x 0.9 = 610 ✓

$S = \frac{51}{1600 + 6700} = 0.61\%$

NEHL
Q_{10} = 240 cfs ✓
Q_{50} = 440 cfs
Q_{100} = 590 cfs

Use Av 610 + 590 + 501 = 1700/3 = 570 cfs

P.R. S.W. ✓

Channel 3-4 W = 6.0 S = 0.4% H = 5.5 Y = 6.0
2-72" RCP INV 113.0 HW 113.0 + 6.0 x 1.5 = 120.4
S = 0.5% V = 9.0

Q_{10} = 280 ✓
Q_{50} = 420 ✓
Q_{100} = 501 ✓

P.R. of R. from J.W

6.2.D

EXHIBIT A

Cross Town No 4 Brook Street

TABULATION SHEET

1. Name of map Town Rockville Conn.

   a. Coordinates of Crossing

      Latitude 41-37-30

      Longitude 72-37-30

   b. Drainage area, A = 512 acres (640 acres = 1 sq. mi.) or 0.512 x 1000 acres

   c. Length of stream L = 5100+2600= 7700 ; 1.46 miles

      .3L = 2300 .44 miles

      .7L = 5400 1.02 miles

      Elevation (a) at headwater 163.0 ft.

      Elevation (b) at .7L above crossing 132.5 ft.

      Elevation (c) at crossing 112.0 ft.

      $S_1 = \frac{EL(a) - EL(b)}{.3L} = \frac{30.5}{0.44} = 69.5$ ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L} = \frac{20.5}{1.02} = 20.1$ ft./mi.

      $\sqrt{S_1} = 8.33$ $\sqrt{S_2} = 4.48$

      $T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{.44}{8.33} + \frac{1.02}{4.48} = 0.053 + 0.224 = .277$

2. From Figure 1

   a. P-index = 1.9 Zone I

3. Find Q_{10} using: (fig. 2, 3, or 4)

   Zone I

   Area 512

   P-index 1.9

   T .28

   a. First estimate of Q_{10} = 0.07 in 1000 cfs = 70 cfs.

No 4

b. Refer to figure 4 or (5)

Using Zone I Find $\hat{T}$ = 0.09

Area 512

P-index 1.9

T .28

$\left[\frac{\hat{T} - T}{\hat{T}}\right] 100 = \frac{0.09 - 0.28}{0.09} \% = 210\%$

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = .28 / 0.09 = 3.12 c = 4.0 (fig. 6)

(2) C x Q_{10} of 3a = 4.0 x 70 = 280 cfs

4. Final Q_{10} = 280 cfs

Q_{25} = _____ cfs

(8) Q_{50} = 420 cfs

Q_{100} = 485

Q_{200} = 550 cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Zone Between envelope curves Yes No

Cross drain No 5 Local Rd 66" RCP

Sheet 684

Ex INV 103.0

Prop INV 102.0

No4 512

207

No5 719 Ac. = 1.12 M²

Porter

Q = 800 x 0.9 = 720 cfs S = 62/16m + 94m = 0.56%

NEHL

Q 10 = 300 cfs

Q 50 = 550 cfs

Q 100 = 745 cfs

P.R.O.S.W

Use Q 100 720 + 745 + 520 = 1985/3 = 665 cfs

Q 10 = 290 cfs

Q 50 = 450 cfs

Q 100 = 540 cfs

Channel 4.5' W = 8.0 ft S = 0.4% N = 5.3 V = 6.7

12-72"

HW = 102 + 6 x 8.4/1.4 = 110.4

Cross Channel No 5 Local Rd

EXHIBIT A
66 "WCP

79

TABULATION SHEET

1. Name of map _____

   a. Coordinates of Crossing

      Latitude _____

      Longitude _____

   b. Drainage area, A = 719 acres or 0.701 x 1000 acres
      (640 acres = 1 sq. mi.)

   c. Length of stream L = 11000 Lf ; 2.06 miles

      .3L = 3300 ft ; .62 miles

      .7L = 7700 ; 1.44 miles

      Elevation (a) at headwater 163.0 ft.

      Elevation (b) at .7L above crossing 134.0 ft.

      Elevation (c) at crossing 103.0 ft.

      $S_1 = \frac{EL(a) - EL(b)}{.3L} = \frac{32}{0.62}$ = 52 ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L} = \frac{28}{1.44}$ = 19.5 ft./mi.

      $\sqrt{S_1}$ = 7.2 $\sqrt{S_2}$ = 4.40

      $T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{0.62}{7.2} + \frac{1.44}{4.4} = \frac{0.0861 + 0.33}{412} = 0.415$

2. From Figure 1

   a. P-index = 1.9 Zone I

3. Find Q_{10} using:
   (fig. (2), 3, or 4)

   Zone I

   Area 719

   P-index 1.9

   T 0.415

   a. First estimate of Q_{10} = .065 in 1000 cfs = 65 cfs.

No 5

b. Refer to figure 4 or (5)

Using Zone I Find $\hat{T}$ = 0.125

Area 719

P-index 1.9

T 0.425

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{0.12 - 0.42 = 0.30}{0.125}$ = 2.40 %

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.42}{0.125}$ = 3.38 c = 4.4 (fig. 6)

(2) C x Q_{10} of 3a = 4.4 x 65 = 286 cfs

4. Final Q_{10} = 286 cfs

Q_{25} = _____ cfs

Q_{50} = 450 cfs

Q_{100} = 520 / 580 cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Zone Between envelope curves Yes No

Corps drainage No 6 — Storm Sheet/Gunnedah 72"

Sheet 684

Ex. INV 100.50/98.70
Prop INV 98.50
R.L.N. 113.0

No 5 719.2c
in Rocky Hill 108.8c
Gunnedah 176
1003.2c = 1.54 Mi

Potter

Q = 1020 c/s x 0.9 = 920 c/s S = 61/11m+1m = 0.52%

NEHL

Q10 = 390 c/s
Q50 = 690 c/s
Q100 = 930 c/s

P.R.O.S.W.

Q10 = 360
Q50 = 590
Q100 = 620

USE Qr 920 + 930 + 620 = 2470/3 = 820 c/s

Channel 5-6 W = 10.0, S = 0.35% H = 5.6; V = 6.6

12-72" S = 1.2%, HW 98.5 + 6.0 x 1.7 = 108.7
1-84 S = 0.5%, V = 10; HW 98.5 + 7 x 1.2 = 106.9

Culvert 10x10; V = 10; S = 1.2 HW = 106.9

EXHIBIT A

8a D

TABULATION SHEET

Cross drain No 6 Main Street

1. Name of map Dividend Brook El 102.0

a. Coordinates of Crossing

Latitude _____

Longitude _____

b. Drainage area, A = 1003 acres or 1.003 x 1000 acres
(640 acres = 1 sq. mi.)

c. Length of stream L = 12000 ft 2.28 miles

.3L = 3600 0.68 miles

.7L = 8400 1.60 miles

Elevation (a) at headwater 163 ft.

Elevation (b) at .7L above crossing 131 ft.

Elevation (c) at crossing 102.0 ft.

$S_1 = \frac{EL(a) - \overset{32}{EL(b)}}{.3L\ 0.68} = 47$ ft./mi. $S_2 = \frac{EL(b) - \overset{29}{EL(c)}}{.7L\ 1.6} = 18$ ft./mi.

$\sqrt{S_1} = 6.8$ $\sqrt{S_2} = 4.3$

$T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{.68}{6.8} + \frac{1.6}{4.3} = 0.1 + 0.37 = 0.47$

2. From Figure 1

a. P-index = 1.9 Zone I

3. Find Q_{10} using:
(fig. (2), 3, or 4)

Zone I

Area 1003

P-index 1.9

T 0.47

a. First estimate of Q_{10} = 0.092 in 1000 cfs = 92 cfs.

8a D

No 6

b. Refer to figure 4 or (5)

Using Zone I Find $\hat{T}$ = 0.16

Area 1003

P-index 1.9

T 0.47

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{0.16 - 0.47}{0.16}$ % = 194% (1.94)

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.47}{0.16}$ = 2.94 c = 3.9 (fig. 7)

(2) C x Q_{10} of 3a = 3.9 x 92 = 359 cfs

4. Final Q_{10} = 359 cfs

Q_{25} = _____ cfs

Q_{50} = 540 cfs

Q_{100} = 615 (690) cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Between envelope curves Yes No

Zone

Cross drain No 7A Main St — EXIST 15" RCP OK

Sheet 684

Sheet 684

$A_{R-20} = A_c \times .45 = A_I$

$A_{R-20} = 6.00 \times .45 = 2.7$

$\Delta H = 210 - 150 = 60$ ft $L = 1000$ ft $S = \frac{60}{1000} = 6.0\%$

$T_c = 16$

$Q_{25} = 2.7 \times 4.5 = 12.2$ cfs

$Q_{10} = 2.7 \times 3.9 = 10.5$ cfs

Q_{25} Rdwy. EL 150.0 INV 143.70 HW 143.70 + 1.25 + 2.0 = 147.00

Cross drain No 7B Main St — EXIST 15" RCP; Req 24" RCP

Sheet 684 & 583

$A_{R-20} = (3.90 + 11.80)0.45 = 15.70 \times 0.45 = 7.1$ (A_c → A_I)

$\Delta H = 184 - 150 = 34$ ft $L = 1100$ $S = \frac{34}{1100} = 3.1\%$

$T_c = 19$

$Q_{25} = 7.10 \times 4.2 = 30.0$ cfs

$Q_{10} = 7.10 \times 3.5 = 25.0$ cfs

Q_{25} Rdwy 153.0 24" RCP INV 146.40 HW = 146.40 + 2.0 + 2.0 = 150.40

Cross drain No 7C — Reasnut Valley Rd. (7B + 7C) — EXIST 36" RCP OK

Sheet 684

7B

$A_{R-20} = 7.0 \times 0.45 = 3.1$ (A_I)

15.7 (A_c)

22.7 (A_c) 7.1

10.2

$\Delta H = 150 - 90 = 60$ $L = 1000$ $S = 6.0\%$

$V = 7.0$ $T_t = \frac{1000}{60 \times 7} = 2.4$

$T_c = 19 + 2.4 = 21.4$

$Q_{25} = 10.2 \times 4.0 = 41.0$ cfs

$Q_{10} = 10.2 \times 3.3 = 34.0$ cfs

Q_{25} Rdwy 91.0 INV 85.40 HW = 85.40 + 3.0 + 1.7 = 89.10

Cross drain 7D Pleasant Valley Rd. EXIST 24" RCPK

Sheet 684 & 583

	Ac		Al
A_{A-20} =	5.30 + 8.5 = 13.80	x 0.45 =	6.20

ΔH = 160 - 85 = 75 ft
L = 1400 S = 75/1400 = 5.3%
Tc = 21

Q_{25} = 6.2 x 4.0 = 25.0 cfs
Q_{10} = 6.2 x 3.3 = 20.6 cfs
Q_{25} Rdwy EL 87.0 INV 82.0 HW 82.0+2.0+1.25 = 85.25

Cross drain 7E Main Street EXIST 24" OK

Sheet 583

	Ac		Al
A_{A-20} =	17.8	x 0.45 =	8.0

ΔH = 210 - 160 = 50 ft
L = 1000 S = 5.0%
Tc = 17

Q_{25} = 8.0 x 4.4 = 35.0 cfs
Q_{10} = 8.0 x 3.8 = 30.0 cfs

Q_{25} Rdwy EL 162.0 INV 155.50 HW 155.50+4.80 = 160.30

Cross drain 7F (7C+7D) Sawmill Road EXIST 30" - OK

Sheet 583

			Al
A_{A-20} =	12.6	x 0.45 =	5.7
A_{NB} =	4.0	x 0.60 =	2.4
A_{CM} =	7.0	x 0.50 =	3.5
	22.6		11.2
7E	17.8		8.0
Σ A =	40.4 Ac		19.2

L = 1100 ΔH 165 - 120 = 45 ft
S = 4.0%
Tc = 1100/7 x 60 = 2.6 min
Tc = 17 + 3 = 20 min

Q_{25} = 11.2 + 8.0 = 19.2 x 4.1 = 80 cfs
Q_{10} = 19.2 x 3.4 = 67 cfs

Q_{25}; 30" S > 4.0% H.W = 5.0 + 2.5 + 111.0 = 118.50

Pleasant Valley Rd.

✓ Cross Drain 7G (7E+F+G) Exist 36" OK

Sheet 684 + 583

Ac A1

A_{R-20} = 2.7 + 9.4 = 12.1 × 0.45 = 5.4

7F 40.4 19.2

32.5 Ac 24.6

Q_{25} = 5.4 + 19.2 = 24.6 × 4.0 = 100 cfs

Q_{10} = 25.0 × 3.3 = 83 cfs

L = 700 Tc = 1.5 min Tc = 21.5 min

Slopes V = 7

Q_{25} Rdw 88.0 Inv. 82.50 Ex 15" HW 82.50 + 3.0 + 3.9 = 89.40

Q_{10} 82.50 + 3.0 + 2.8 = 88.30 OK

✓ Cross Drain 7H Main Sheet Exist 36"x24" OK

Sheet 583

Ac A1

A_{R-20} = 11.7 × 0.45 = 5.3

Q_{25} = 5.3 × 4.3 = 23.0 cfs ✓

Q_{10} = 5.3 × 3.7 = 19.5 cfs

ΔH = 210 − 170 = 40 ft

L = 1000 S = 4.0 %

Tc = 18 min

Q_{25} Rdw. EL. 174.0 S = 2% HW 2.70 + 169.0 = 171.70

Exist. 36"x22" OK Out Exist 24" ok

✓ Cross Drain 7I School St. Outlet (7H + 7I) Exist 42" OK

Acc. B 583 + 582

A1

A_{RM} = = 6.8 × 50 3.4

A_{R-20} = (12.2 + 17.6) = 28.3 × 0.45 = 12.6

7H 11.7 16.0

46.8 Ac

L = 1300 Tc = 1300/7×60 = 3 min

Q_{25} = 16.0 + 5.3 = 21.3 × 4.0 = 85 cfs Tc = 18 + 3 = 21 min

Q_{10} = 21.3 × 3.3 = 71 cfs

Q_{25} 42" RCP Rdw 131.0 HW 1.6 + 3.5 = 5.1 + 125.60 = 130.70 OK

Cross stream 7J — Walnut Rd — EXIST 18" INV 130.70

Rdwy 139.0 ± OHC

Sheet 583 + 582

A_{R-20} = 3.90 + 7.10 = 10.90 × 0.45 = ~~4.20~~ 5.0 ac

Q_{25} = ~~4.20~~ 5.0 × 4.0 = ~~17~~ 20 cfs

Q_{10} = × 3.3 = ~~14~~ cfs

Q_{10}

Rdwy EL. 139.0

ΔH = 208 − 138 = 70 ft, L = 1500

S = 70/1500 = 4.6%

Tc = 21 min

EXIST 18" RCP → 24" RCP

INV 130.70 / 134.0 / 133.5?

H.W 128.0

Outlet EL. 130.0 ±

Cross stream 7K — 17I + 7J — Pleasant Valley Rd

Invert none

Sheet 583 + 582

7K	A_M	13.0 × .70 = 9.1 ac		
	A_{R-20}	11.6 × .45 = 5.2		
	A_{RM}	9.6 × .50 = 4.8	19.1	
	7I	34.2 / 46.8	16.0	
	7J	10.9 / 91.9 c	8.2 / 43.3	

Q_{25} = 43.3 × 3.9 = 168 cfs

Q_{10} = 43.3 × 3.2 = 138 cfs

Q_{25}

L = 800 ; Tc = 2

Tc = 21 + 2 = 23 min

INV 60.0

use 54" RCP S = 1.5% ; L = 2.40 H.W 67.0

48" S = 2.0% ; L = 3.90 H.W 68.0

Cross stream 7M — Old Dinsdale Rd

Sheet 582

A_M = 22.6 × .70 = 15.8 ac

Q_{25} = 15.8 × 5.0 = 79.0 cfs

Q_{10} = 4.3 = 68.0 cfs

Q_{25}

ΔH = 136 − 46 = 90 ft

Tc 13 min

Rdwy EL 45.0 ±

42" RCP S = 1%

use 36" RCP S = 2%

L = 1500

INV 38.0

L = 160

L = 2.80

S = 6.0%

H.W. 44.0

Cross drain 7L Pleasant Valley Rd

Shed 682 N1

$A_M = 2.7 \times .7 = 1.9$

$A_{RM} = .60 \times .5 = 3.0$

$A_{R20} = \frac{0.9}{9.6} \times .45 = \frac{0.4}{5.3}$

$Q_{25} = 5.3 \times 5.4 = 28.6$ cfs

$Q_{10} = 5.3 \times 4.5 = 24.0$ cfs

ΔH 143 - 80 = 63 L = 810

S = 8.0% Tc = 11

Q_{25} 24" RCP INV. 70.0 H.W.EL. 74.0

No 7 DRM at Road 2-36" INV 23.0

582 Lake EL 23/ 24.0

Roadway 32.0

Discharge as No 8

For Future Loss 7L 7L 8 shall be designed together based on Exist or proposed Pond Elevation.

Dividend Brook

14D

Cross drain No 8 (END) R. ROAD 3-0 x 3-0 Box

582 INV 12.0

Connecticut River H. Water EL 16.0

No 6		1003.0 Ac
No 7A		6.0
7B	15.7	
7C	7.0	22.7
7D		13.8
7E	17.8	
7F	22.6	
7G	12.1	52.5
7H	11.7	
7I	35.6	
7J	7.0	
7K	34.2	88.5
7L		9.6
7M		22.6
		1188 Ac
Cumwell		187.3
684, 683, 582		162.0
		1568.0 Ac = 2.38 Mi²

Potter

Q = 1320 x 0.95 = 1250 cfs $S = \frac{163 - 12}{173 + 1.6} = \frac{151}{17460} = 0.86\%$

NEHL

Q 10	560	
Q 50	1000	
Q 100	1350 cfs	12 cm Flange

USC Dr 1250 + 1200 + 1030 = 3480/3 = 1160 cfs

H. Tied - Connecticut EL 16.5 7+3.5 8+3

P.R.D. S.W

Q 10	590	
Q 50	860	
Q 100	1030 cfs	

Box 10x 10 S= V=13 HW 12.0 H11 = 230

12 x 10 S=

EXHIBIT A

14a D

TABULATION SHEET No 7

1. Name of map Dividend Brook 'END' R.ROAD

a. Coordinates of Crossing

Latitude _____

Longitude _____

b. Drainage area, A = 1568 acres or 1.568 x 1000 acres
(640 acres = 1 sq. mi.)

c. Length of stream L = 17460 = 3.3 miles ✓

.3L = 5200 = 1.0 miles ✓

.7L = 12260 = 2.31 miles ✓

Elevation (a) at headwater 163 ft. ✓

Elevation (b) at .7L above crossing 121 ft. ✓

Elevation (c) at crossing 12 ft. ✓

$S_1 = \frac{EL(a) - EL(b)}{.3L} = \frac{163 - 121 = 42}{.3L}$ = 42 ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L} = \frac{121 - 12}{.7L}$ = 109 47 ft./mi.

$\sqrt{S_1}$ = 6.5 $\sqrt{S_2}$ = 6.85

$T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{1.0}{6.5} + \frac{2.30}{6.9} = 0.17 + 0.33 = 0.50$ ✓

2. From Figure 1

a. P-index = 1.9 ✓ Zone I ✓

3. Find Q_{10} using:
(fig. 2, 3, or 4)

Zone I

Area 1568

P-index 1.9

T 0.50 ✓

a. First estimate of Q_{10} = .20 in 1000 cfs = 200 cfs.

Q_{10} (ATP) = 200 cfs

N.7 14a D

b. Refer to figure 4 or (5)

Using Zone 1 Find $\hat{T}$ = 0.23

Area 1568

P-index 1.9

T 0.50

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{0.23 - 0.50}{.23}$ % 1.20%

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.50}{0.23}$ = 2.18 C = 2.9 (fig. 6)

(2) C x Q_{10} of 3a = 2.95 x 200 = 590 cfs

4. Final Q_{10} = 590 cfs

Q_{25} = _____ cfs

Q_{50} = 860 cfs ✓

Q_{100} = 1030 cfs ✓

Q_{200} = 1200 cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Zone Between envelope curves Yes No

10 X 10 TO THE INCH
7 X 10 INCHES
BUFFALO EYSER CO.

Drainage

S = .35% Sta 22 131.0

40
12
16.7
77.4

131.0
+24.7
129.50
N2.00
N1.40

9.3

INV 139.8

S = 0.9%
CR 4.0
W.H =
V =

INV 131.00
H

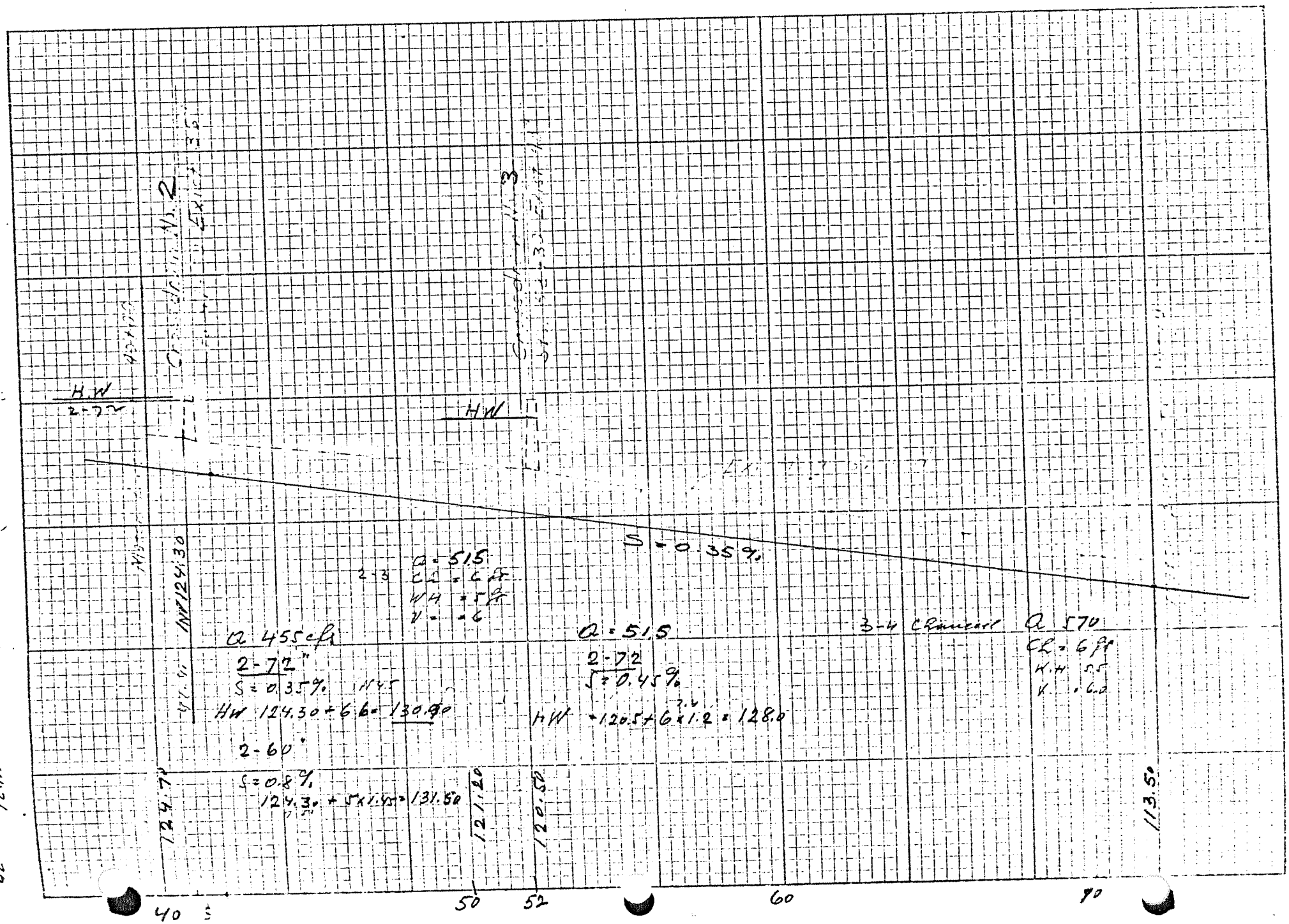
S = 0.35%
CR 4.7
W.H 4.7
V = 5.8

2 Channel
Q2 = 6.0
W = 4.8
V2 = 5.5
Q2 = 455

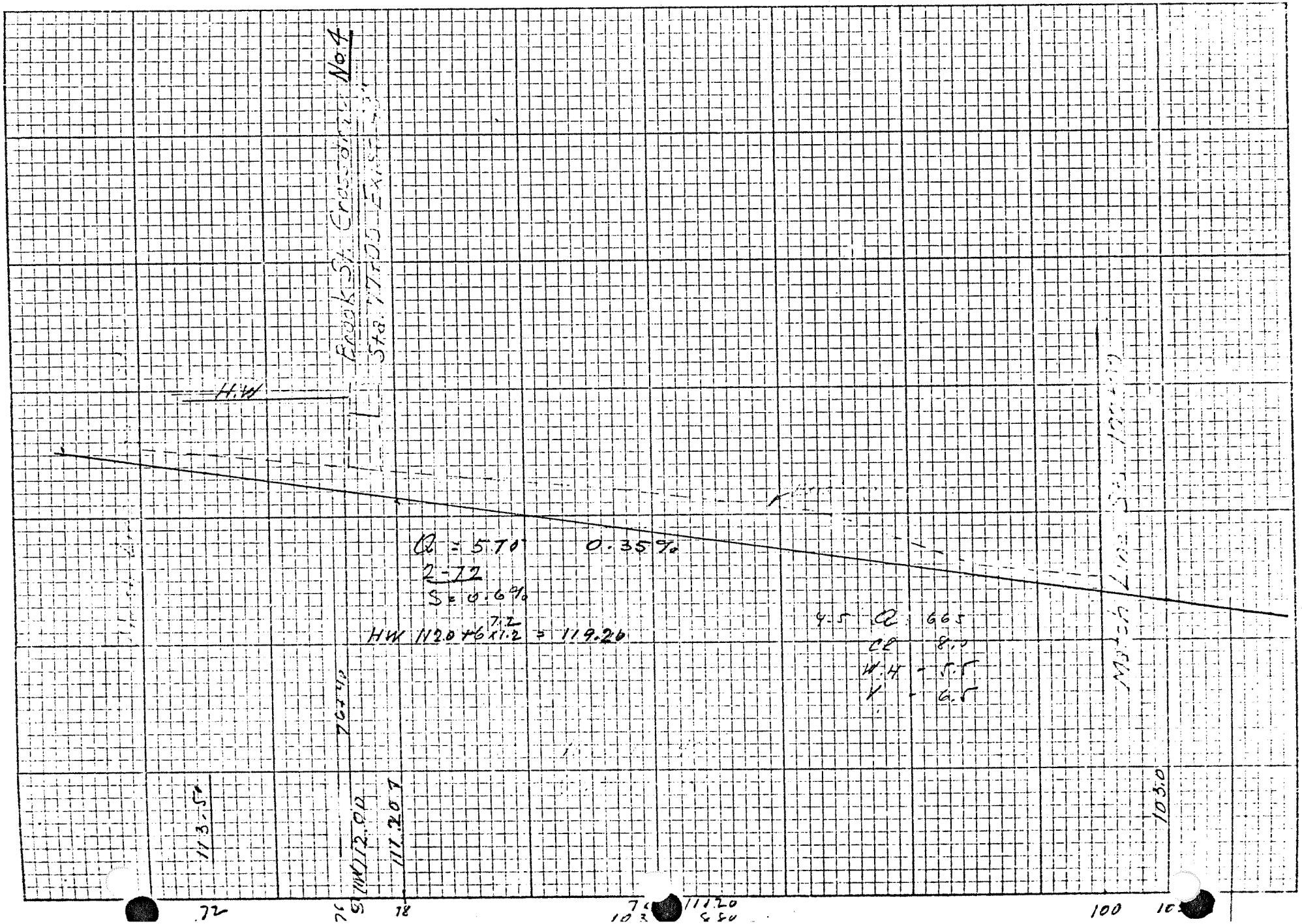
D = 95-
Q 212
1-54"
H.W 157.7

A = 193 Ac
Q 50 = 390
2-60"
H.W 137.5

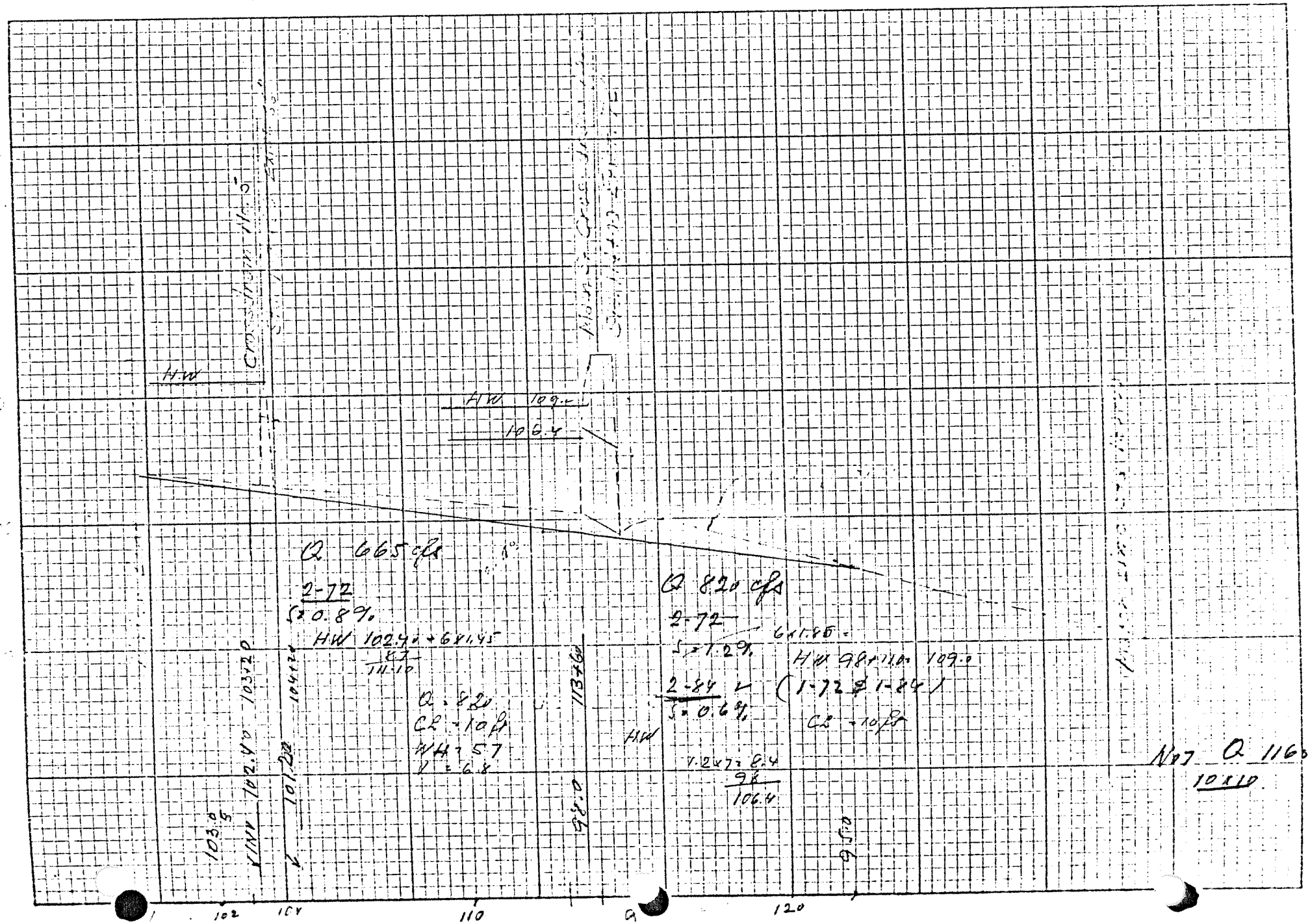
KEUFFEL & ESSER CO.

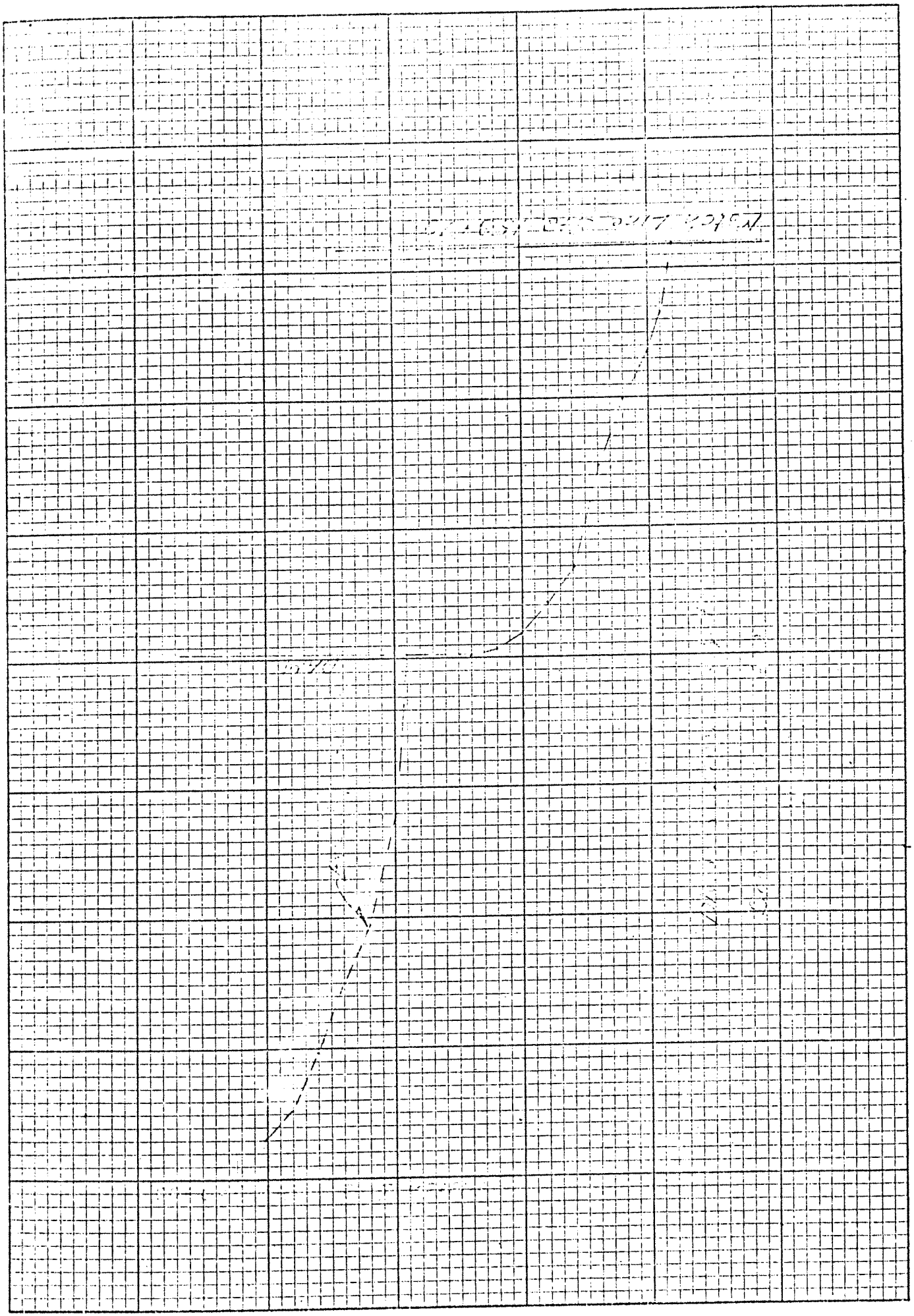


10 X 10 TO THE INCH 359 0702
KEUFFEL & ESSER CO.



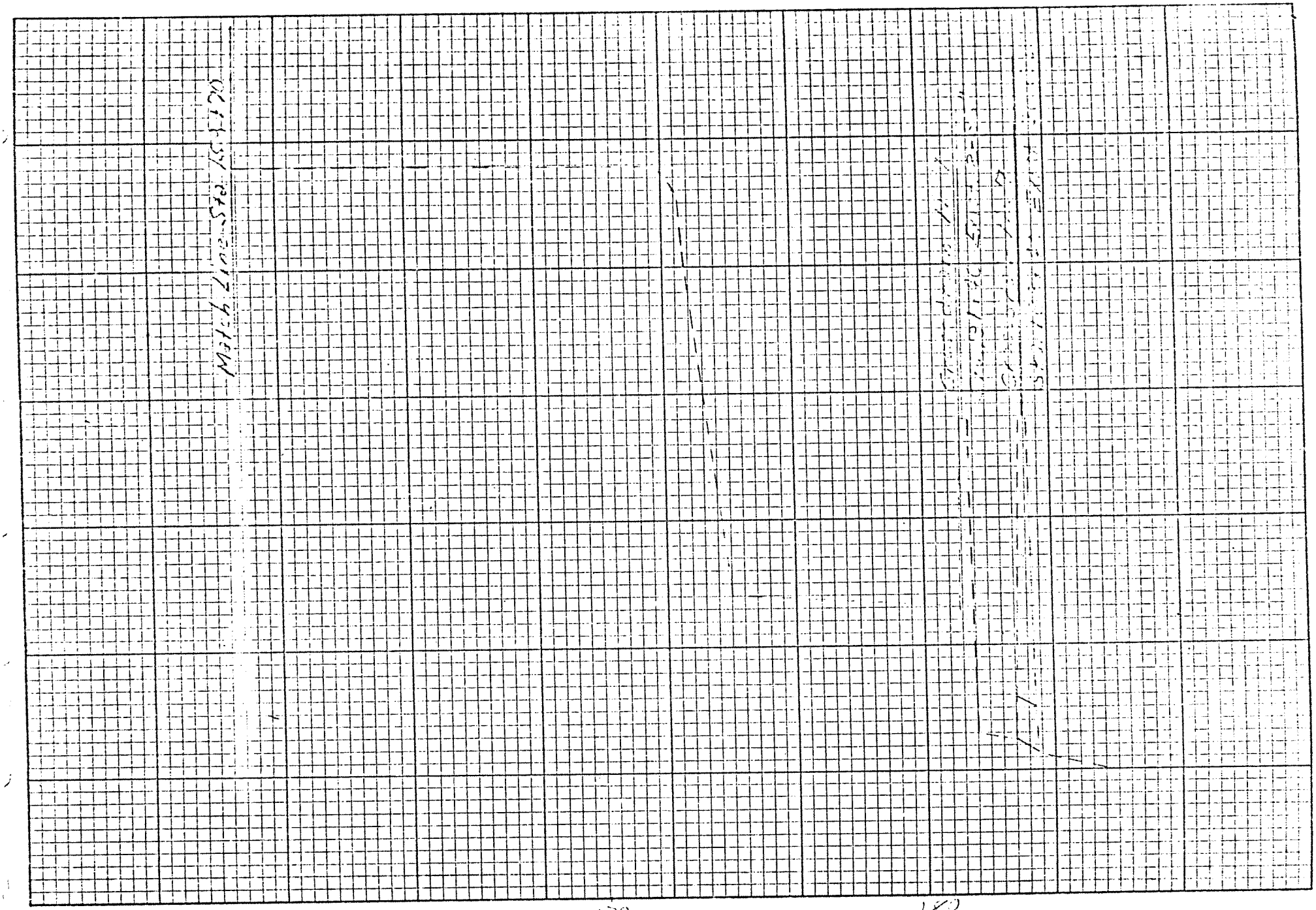
10 X 10 TO THE INCH 46 0702
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.





PFEIFFER & FISHER CO

GD



L = 3.3 Mi

Characteristics
H. 180. 1000 ft. 0.4% EL 130 - 100

Steps 12

DIVIDEND BROOK

Cross No	H L Sq.	Acres I Ax I	Storage	0.3 0. T	0.3 L 0.7 L T	R Q.50	P-1	NEHL	E.P.R. S.W	Q used Dy.			
1.		75 0.57 43	-			168.				168			1-48" Ex
1-2						480				475			2-60"
2.	0.23 .53					486	420	405		415			
3.		307				(—)	460	430		495			
4	M. 1.46 1.44 1.02	463	70.0 20.0	T /0.28			0.9 560	570	T = .28 510	535			
5		670	2.06 1.3 1.0	52 20/0.42			0.9 710	675	530	665			
6		954		47 18/0.47			0.9 900	920	620	820			
7		1519					0.95 1230	1350	1030	1160			

Characteristics

L = 3.3 Mi A = 1550 = 2.4 Mi² Elev 175 - 14

Flow area inside Lin 1000 ft at 0.4% EL 130 - 100

Developed Lines and forms of Reports

Analysis of Existing Conditions

G.D.C.

Dividend Brook

Cross drain No. 1A Cromwell Ave

Exist 18" RCP
Inv. El. 160.51
Rdwy = 163.50

70% Devel. A_c, 30% Grass

$A_c = 0.6 \times 0.7 = 0.42$
Grass $= 0.3 \times 0.3 = 0.09$
0.51

$L = 1100$ ft $S = 2.4\%$

$A_c = 3.4 \times 0.51 = 1.74$

$T_c = 18$ Min

$Q_{10} = 1.74 \times 3.5 = 6.1$ cfs

$H.W. = 1.5 \times 0.9^{1.35} + 160.5 = 161.9$

Cross drain No 1B Cold Spring Rd.

Exist 24" RCP
Inv. El. 158.70
Rdwy = 163.0

0% Devel. A_c, 100% Grass

$A_c = 0.6 \times 0.0 = 0.0$
Grass $= 0.3 \times 1.0 = 0.3$
0.3

$L = 1000$ ft $S = 2.6\%$

$A_c = 8.3 \times 0.3 = 2.5$

$T_c = 30$ Min

$Q_{10} = 2.5 \times 2.7 = 6.8$ cfs

$H.W = 2.0 \times 0.65^{1.3} + 158.7 = 160.0$

Drainage Basin Map 1D
1, 1A

Cross drain No. 1C Cold Spring Rd.

Exist 24" RCP
Inv. El. 173.40
Road 176.2±
at C

23% Devel. A_{R20}

A_{R20} = 0.45 × 0.23 = 0.10
Grass = 0.30 × 0.77 = 0.23
0.33

L = 900 ft. S = 6.9 %

A_{R20} = 9.3 × 0.33 = 3.1

T_c = 21 Min.

Q_{10} = 3.1 × 3.3 = 10.0 cfs

H.W. = 2.0 (1.6) × 0.8 + 173.4 = 175.0

Cross drain No. 1D Cold Spring Rd.

Exist 42" RCP
15" RCP
Inv. El. 42" = 157.90
Inv. El. 15" = 158.80

2% Devel. A_c, 0% Devel. A_{R20}

A_c = 0.6 × 0.02 = 0.01
Grass = 0.3 × 0.98 = 0.29
0.30

A_{R20} is 100% Grass Use 0.3 For (I)

A_{R20} = 9.3 × 0.3 = 2.8
A_c = 24.6 × 0.3 = 7.5
(0.3) 10.3

L = 1400 ft S = 5.1 %

T_c = 30 Min

Q_{10} = 10.3 × 2.6 = 26.8 cfs

H.W. = 3.5 (2.2) × 0.63 + 157.9 = 160.1

1.2.74
D P. 1

Present development – DIVIDEND BROOK

Cross. drain No 1E Cumwell Rd Exist. 42"

OK

		7.5	× .30	= 2.3		
No	1A	3.4	× .50	= 1.7	.30+.70×.3	= .50
	1B	8.3	× .30	= 2.5		
	1C	9.3	× .33	= 3.1	.30+.23×.15	= .33
	$1D_2$	33.9	× .30	= 10.2		
		62.4		19.8		

Q_{50} 19.8 × 4.2 = 83.0 cfs 42" H.W = 154.10 + 1.8 × 3.5 × 6.8 = 160.40

C.D. No 1 I-91 Exist 48"

OK

No	1E	62.4		19.8	
No	AC	25.1	× .30	= 7.4	
No	A91	7.1	× .48	= 3.4	
		94.6		30.8	

Q_{50} 30.8 × 3.9 = 120 cfs H.W 149.60 + 4 × 1.8 × 7.2 = 156.80

Sheet 1 D

Dividend Brook - Present Condition

Cross Drain No. 1 F Cromwell Ave

Sheet 686 & 585

CDC

Exist 42"
Inv. El. 154.10
Rdwy. El. 166.00
OK L = 400

1F A_c - 0% Devel., Grass - 100%,
Use Coef. of 0.3
0.3

1A A_c - 70% Devel., Grass 30%

$A_c = 0.6 \times 0.7 = 0.42$
Grass $= 0.3 \times 0.3 = 0.09$
0.51

L = 1100 ft
S = 2.4%
T_c = 18 Min

1B A_c - 0% Devel, Grass - 100%
Use Coef. of 0.3
0.3

L = 1000 ft
S = 2.6%
T_c = 30 Min

1E Combination of 1C & 1D

1C A_{R20} - 23% Devel., Grass - 77%

$A_{R20} = 0.45 \times 0.23 = 0.10$
Grass $= 0.30 \times 0.77 = 0.23$
0.33

L = 900 ft
S = 6.9%
T_c = 21 Min

1D A_c - 2% Devel, R_{20} 0% Say All Grass
Use Coef. of 0.3

L = 1900 ft
S = 5.1%
T_c = 30 Min

1C 9.3 Ac × 0.33 = 3.1
1D 33.9 Ac × 0.30 = 10.3
1E 93.2 Ac (0.30) = 13.4

1F	7.5	× 0.30	2.3
1A	3.4	× 0.51	1.7
1B	8.3	× 0.30	2.5
1E	43.2	× 0.30	13.4
	62.4	(0.32)	19.9

V = 3.0

T_c = 30 + 2 = 32 Min

$Q_{10} = 19.9 \times 2.6 = 51.7$ cfs
$Q_{25} = 19.9 \times 3.2 = 64.0$ cfs
$Q_{50} = 19.9 \times 3.6 = 72.0$ cfs

25 Yr. Lag Hill

Rdwy - 166.0

3.3

42" H.W = 3.5 × 0.94 + 154.1 = 157.4
3.5 × 1.2 + 154.1 = 158.3

Cross Drain No. 2A Country Drive

Exist. 12"
Inv. El. 182.0
Rdwy - 185.5

A_{R20} - 0% Devel., A_M - 0% Devel, Grass 100%
Use Coef. 0.3

A_{R20}	= 18.6 - 5.0 (Storage)	= 13.6 × 0.3 =	4.1	
A_M	=	0.8 × 0.3 =	0.2	
		14.4 (0.3)	4.3	

L = 1300 ft
S = 5.1%

Q_{10} = 4.3 × 2.8 = 12.2 cfs

T_c = 28 Min

H.W. = 1.0 × 7.0 + 182.0 = 189.0

Not Adequate

Cross Drain No. 2B Country Drive

Exist. - None
Rdwy. - 159.5

A_{HC} - 0% Devel., Grass 100%
Use Coef. 0.3

A_{HC} = 6.7 × 0.3 = 2.1

L = 1000 ft. S = 5.9%
T_c = 26 Min.

Q_{10} = 2.1 × 2.9 = 6.1 cfs

Cross Drain No. 2C Brook St.

Exist. - None
Rdwy = 199.00

A_M - 0% Devel., Grass 100%
Use Coef. 0.3

A_M = 13.2 × 0.3 = 3.9

L = 1000 ft. S = 0.7%
T_c = 40 Min

Q_{10} = 3.9 × 2.3 = 9.0 cfs

CDC

Cross Drain No. 2D Brook St.

Exist 12"
Inv. El. 138.60
Rdwy - 141.0

A_{HC} - 0% Devel., Grass 100%
Use Coef. 0.3

A_{HC} = 30.2 x 0.3 = 9.1

Q_{10} = 9.1 x 2.2 = 20.0 cfs

L = 1400 ft. S = 1.3%
T_c = 42 Min

Not Adequate

Cross Drain No 1-2 Country Drive

Exist 24"
Inv. El. 132.5
Rdwy 135.0

1 — 1F (See Sheet 1) T_c = 32 Min
A_{91} - 100% Devel, A_c - 25% Devel.

A_{91} = 0.98 x 1.0 = 0.98
Grass = 0.30 x 0.0 = 0.00
0.98

A_c = 0.65 x 0.25 = 0.16
Grass = 0.30 x 0.75 = 0.23
0.39

A_{91} = 7.1 x 0.98 = 3.5
A_c = 25.1 x 0.39 = 9.8
1 — 32.2 (0.41) = 13.3

1F — 62.4 x 0.32 = 19.9
2 — 32.2 x 0.41 = 13.3
94.6 (0.35) = 33.2

L = 800 ft. V = 3.0
T_c = 32 Min + 5 = 37 Min.

2C — See Sheet 1 13.2 Ac, ΣAI = 3.9 T_c = 40 Min
Coef. 0.3

(Continued Next Page)

(1-2 Continued)

1-2 A_{91} - 100% Devel., A_C - 0% Devel, A_{HC} - 40% Devel.

A_{91} = 0.48 x 1.0 = 0.48
Grass = 0.30 x 0.0 = 0.0
0.48

A_C = 0.6 x 0.0 = 0.0
Grass = 0.3 x 1.0 = 0.3
0.3

A_{HC} = 0.65 x 0.4 = 0.26
Grass = 0.30 x 0.6 = 0.18
0.44

A_{91} = 21.0 x 0.48 = 10.0
A_C = 10.0 x 0.30 = 3.0
A_{HC} = 53.5 x 0.44 = 26.5
1-2 84.5 (0.47) = 39.7

1E	94.6	x 0.35	= 33.2
2C	13.2	x 0.30	= 3.9
1-2	84.5	x 0.47	= 39.7
	192.3	(0.40)	76.8

T_c = 40 + 9 = 49 Min

Q_{10} = 76.8 x 2.0 = 153.6 cfs

Exist 24" — Not Adequate

Cross Drain No 2 Country Drive

Exist 36"
Inv. El. 126.0
Rdwy 130.0

2A See Sheet 2
19.4 Ac. (0.3) coef. ΣAI 4.3 — T_c 28 Min

2B See Sheet 2
6.7 Ac. Coef. (0.3) ΣAI 2.1 — T_c - 26 Min

2D See Sheet 3
30.2 Ac. (0.3 coef.) ΣAI 9.1 — T_c - 42 Min

1-2 See Sheet 4
192.3 Ac. Coef. (0.4) ΣAI 76.8 — T_c - 49 Min

2 A_{HC} - 15% Devel., A_c - 10% Devel.

A_c = 0.6 × 0.10 = 0.06
Grass = 0.3 × 0.90 = 0.27
0.33

A_{HC} = 0.65 × 0.15 = 0.10
Grass = 0.30 × 0.85 = 0.26
0.36

A_c = 8.0 × 0.33 = 2.6
A_{HC} = 69.7 × 0.36 = 25.1
77.7 (0.35) 27.7

2 -	77.7 ×	0.35	= 27.7
2A -	19.4 ×	0.3	= 4.3
2B -	6.7 ×	0.3	= 2.1
2D -	30.2 ×	0.3	= 9.1
1-2 -	192.3 ×	0.4	= 76.8
	326.3	(0.37)	120.0

L = 2750' V = 3 fps

Rational Method
Q_{10} = 120 × 1.7 = 204 cfs

T_c = 49 + 16 = 65 Min

No 2
Potter - Izzard Formula

EA = 326.3 Acres

Q_{10} = 330 cfs x ~~1.0~~ 0.6 = ~~330~~ 198 cfs

NEHL

A = 0.5 P = 1.9 Q_{10} = 180 cfs (chart A-4-3)

JDB

Not Adequate

Cross Drain No. 3 Country Drive

Exist 48"
Inv. El. 124.0
Rdwy - 129.0

2 See Sheet 5
326.3 Ac. coef 0.37 EAI = 120.0

3 A_{HC} - 0% Devel., Grass 100%
Use Coef 0.3

3 - 31.1 x 0.3 = 9.4
2 - 326.3 x 0.37 = 120.0
357.4 (0.36) = 129.4

Potter - Izzard Formula

Q_{10} = ~~290~~ 350 x 0.6 = ~~290~~ 210 cfs

NEHL

A = 0.56 P = 1.9 Q_{10} = 190 cfs

Avg - (290 + 190) ÷ 2 = 240 cfs

H.W. = 4.0 x 3.9 + 124.0 = 139.6 Not Adequate

Cross Drain No. 4 Brook St.

Exist. 48"
Inv. El. 114.0
Rdwy 121.5

3 See Sheet 7 357.4 Ac.

4 A_{HC} = 10.7
A_{R20} = 144.7
155.4 Ac.

4 - 155.4
3 - 357.4
512.8 Ac.

Potter Izzard Formula

Q_{10} = 340 x 1.0 = 340 cfs

NEHL
A = 0.8 P = 1.9
Q_{10} = 240 cfs

Avg Q_{10} = (340 + 240) ÷ 2 = 290 cfs

H.W. = 4.0 x 4.6 + 114.0 = 132.4 (18.4)
Max 120 cfs

Not Adequate

Cross Drain No. 5 Country Drive

Exist 66"
Inv. El. 103.0
Rdwy 110.0

4 - 512.8 Ac
5 - 207.0 Ac.
719.8 Ac.

Potter - Izzard Formula

Q_{10} = 550 x 1.0 = 550 cfs

(CONTINUED NEXT PAGE)

NEHL

$A = 1.12 \quad P = 1.9$

$Q_{10} = 300$ cfs

$Avg = (550 + 300) \div 2 = 425$ cfs

$H.W. = 5.5 \times \overset{12.7}{2}3 + 103.0 = 115.7$ Not Adequate

Max 290 cfs

Cross Drain No. 6 Main St. (Cromwell) Exist. 72"
Rdwy 112.5

5 - 719.8 Ac.
6 - 284.0 Ac.
1003.8 Ac.

Potter-Izzard Formula

$Q_{10} = 670 \times 1.0 = 670$ cfs

NEHL

$A = 1.61 \quad P = 1.9$

$Q_{10} = 400$ cfs

$Avg = (670 + 400) \div 2 = 535$ cfs

$H.W. = 6.0 \times \overset{19.8}{3}.3 + 100.5 = 120.3$ Not Adequate

Max. 375 cfs

Cross Drain No. 7B Main St.

Exist 15"
Inv. El. 146.40
Rdwy 153.0

A_{R20} 25% Devel, 75% Grass

$A_{R20} = 0.45 \times 0.25 = 0.11$
Grass $= 0.30 \times 0.75 = 0.23$
0.34

$A_{R20} = 15.6 \times 0.34 = 5.3$

$L = 1100$ $S = 3.1\%$

$Q_{10} = 5.3 \times 2.8 = 14.9$ cfs

$T_c = 28$ Min

H.W. $= 1.25 \times 4.0 + 196.4 = 151.4$ (5.0)

OK

Cross Drain No. 7K Pleasant Valley Rd.

Exist None

7I (7H + 7I)

7H A_{R20} 95% Devel., Grass 5%

$A_{R20} = 0.45 \times 0.95 = 0.43$
Grass $= 0.30 \times 0.05 = 0.02$
0.45

A_{RM} 100% Devel. Coef. 0.50

$A_{RM} = 6.8\ A_c \times 0.50 = 3.4$

$A_{R20} = 11.7\ A_c \times 0.45 = 5.3$
$A_{RM} = 6.8\ A_c \times 0.50 = 3.4$
$18.5 \quad (0.47) \quad 8.7$

7I R_{20} 55% Devel, Grass 45%

$R_{20} = 0.45 \times 0.55 = 0.25$
Grass $= 0.30 \times 0.45 = 0.14$
0.39

(CONTINUED NEXT Page)

Runoff Coef. Determined on Sheet 9 (0.39)

$A_{R20} = 28.3 \times 0.39 = 11.1$

7H - 18.5 Ac. × 0.47 = 8.7
7I - 28.3 Ac. × 0.39 = 11.1
46.8 (0.42) 19.8

$T_c = 18 + 3 = 21$ Min.

7J A_{R20} - 90% Devel., Grass 10%

A_{R20} - 0.45 × 0.90 = 0.41
Grass - 0.30 × 0.10 = 0.03
0.44

$T_c = 21$ Min.

$A_{R20} = 10.9$ Ac × 0.44 = 4.8 (1HA)

7K A_M - 0% Devel, A_{RM} - 0% Devel, A_{R20} - 60% Devel.

A_M - 0% Devel, 100% Grass
Use Coef. 0.3

$A_M = 13.0 \times 0.3 = 3.9$

A_{RM} - 0% Devel, 100% Grass
Use Coef. 0.3

$A_{RM} = 9.6 \times 0.3 = 3.0$

A_{R20} - 60% Devel., Grass 40%

A_{R20} - 0.45 × 0.60 = 0.27
Grass - 0.30 × 0.40 = 0.12
0.39

$A_M = 13.0 \times 0.30 = 3.9$
$A_{RM} = 9.6 \times 0.30 = 3.0$
$A_{R20} = 11.6 \times 0.39 = 4.5$
34.2 (0.33) 11.4

(continued on NEXT PAGE)

7K Continued

7I	46.8	x 0.42 =	19.8
7J	10.9	x 0.44 =	4.8
7K	34.2	x 0.33 =	11.4
	91.9		36.0

$L = 800'$ $T_c = 3$

$T_c = 21 + 3 = 24$ Min

$Q_{10} = 36.0 \times 3.2 = 115.0$ cfs

Presently Not Adequate

Cross Drain 7M Old Dividend Rd. Exist. None Rdwy El. 45.0

A_M - 0% Devel, Grass - 100%
Use Coef 0.3

$A_M = 22.6\ A_c \times 0.3 = 6.8$

$L = 1500$ ft $S = 6.0\%$

$T_c = 47$ Min

$Q_{10} = 6.8 \times 2.0 = 13.6$ cfs

Presently Not Adequate. Use a 18" at 2.3%

18" H.W. $= 1.5 \times \overset{2.7}{1.8} + 41.3 = 44.0$ Inv. 41.3

Cross Drain No. 7L Pleasant Valley Rd. Exist. None

A_M - 0% Devel., A_{PM} - 0% Devel., A_{B20} - 100% Devel

A_M - 0% Devel., Grass 100%
Use Coef. 0.3

A_{PM} - 0% Devel., Grass 100%
Use Coef. 0.3

(Continued on Next Page)

7L Continued

A_{R20} - 100 % Devel., Use Coef. 0.45

A_M	= 2.7 Ac.	× 0.30	= 0.8
A_{RM}	= 6.0 Ac.	× 0.30	= 1.8
A_{R20}	= 0.9 Ac.	× 0.45	= 0.4
	9.6	(0.31)	3.0

L = 800 ft. S = 8.0 %

Q_{10} = 3.0 × 3.3 = 9.9 cfs

T_c = 21 Min

Presently Not Adequate

A 24" RCP IS RECOMMENDED FOR PRESENT & FUTURE DEVELOPMENT.

24" RCP Inv. 70.0

HOG BROOK

Hog Brook

J Cross drain No. 4A (West Street) — Exist 30"

Ex. INV 192.30 — use 36" — Road 197.0

Sheet 490, 583

A_{R-20} 31.1 + 2.4 = 33.4 × 0.45 = 15.0 (A×I)

ΔH = 234 − 194 = 40 ft L = 1810 $S = \frac{40}{1810} = 2.2\%$

T_c = 26 min

Q_{50} = 15.0 × 4.1 = 61.5 cfs

Q_{25} = 15.0 × 3.6 = 54.0 cfs

Q50 R.W. EL 197.0 Ex. INV 192.30 HW = 190.0 + 2.5 + 2.40 = 196.0

use 36" RCP INV 191.60 HW = 191.60 + 3.0 + 1.40 = 196.0

Cross drain No. ~~2A~~ 4C West Street — Exist. 18" RCP

Road 187 OK

Sheet 490

A_{R-20} 3.7 × 0.45 = 1.7 (A×I)

ΔH = 222 − 186 = 36 ft L = 600 $S = \frac{36}{6} = 6.0\%$

T_c = 14 min

Q_{25} = 1.7 × 4.9 = 8.4 cfs HW

Q25 Road EL. 187.00 INV 182.10 HW 182.0 + 1.5 + 0.5 = 184.0

4B See pg H3

Cross drain No. 2B South of Rose Street — Exist 2-18"

use 2-30"

Sheet 583

A_{R-20} 6.0 × 0.45 = 2.7 (A×I)

No. X 4A 33.4 — 15.0

No. ~~2C~~ 4B 39.4 — 17.7

T_c = 26 + 0.5 = 26.5 min

Road 193.0

Q_{50} 17.7 × 4.0 = 71.0

Q_{25} 17.7 × 3.5 = 62.0 cfs

INV 190.50

2-30"

HW + 2.5 + 1.0 + 190.5 = 194

188.0 = 191.5

✓ Cross drain No 2 4dl Southbound West Street Exist. 30" x 24"

Street 583

use 42" RCP

+ Horiz 179.50

Exist Inv. 177.0

	6.2	1 x 1	
A2-20	5.8 x 0.45 =	2.6	
4B	39.4	17.7	L = 800
4C ~~4.7~~	3.7	1.7	
4dl ~~No 2~~	~~48.1~~ 49.3	22.2	Tc 26.5 + 2.5 = 29.0 min

Q50 22.0 x 3.8 = 84.0 cfs

Q25 22.0 x 3.4 = 75.0 cfs

Control EL 179.50

Q50 = 42" RCP INV. 173.50

HW = 173.50 + 3.50 + 1.40 = 178.40

4.5

4.9

✓ Cross Drain No ~~3a~~ 1A West Street Exist 18" RCP

Street 584

INV 209.1 OK

Rdwy 214.0

A2-20	3.9 x 0.45 =	1.75	
AC	3.4 x 0.60 =	2.05	
No 3a	7.3	3.80	DH = 246 - 216 = 30 ft L = 570 S = 30/570 = 6%

Tc = 12 min

Q25 = 5.2 x 3.80 = 19.8 cfs

Rdwy EL. 215.0 INV. 209.1 HW. 209 + 4.0 = = 213.00

✓ Cross drain No ~~3b~~ 1B West Street Exist 18" RCP

INV 202.10 OK

Rdwy 208.50

		4 x 1	
A2-20	2.5 x 0.45 =	1.1	Tc = 10 min

Q25 5.7 x 1.1 = 6.4 cfs

INV 202.10 HW 202.1 + 1.5 + 0.2 = 203.80

Relief 203.0

J Cross Alum No 2C 1C — INV 199.6 Exist 18" RCP

Sheet 491, 584 — use 30" RCP

A_{R-2C} 17.6 × 2.0 = 19.6 × 0.45 = 8.8; 4.0 × = 1.9; 15.5 × 0.45 = 7.0

ΔH 221-200 = 21' L min S_{min} = 2%

Tc = 18 min

Q_{25} = 8.8 × 4.3 = 38.0 cfs; 11.9 × 4.3 = 8.0 cfs

~~Q_{50} 4.9 × 8.8 = 43 cfs~~

Relief El. 203.0

∴ EL 201.50 Ex. INV 199.60

Bypassing 15.5 Ac - 30 cfs. to No 1

~~HW 199.60 + 1.5 + 0.40 = 201.50~~

~~Q_{50}~~ 24" RCP S = 4% INV 196.0 — HW = 196.0 + 2.00 + 3.00 = 201.00

Q_{25} 30" RCP S = 1% INV 198.0 — HW = 198.0 + 1.4 × 2.5 (3.5) = 201.60

Cross Alum No 1, West Street - Continuation w/ EL No 3C - Exist 30"

Sheet 583 — use 42" RCP

From No 3C $\frac{30}{4.3}$ = A × I = 7.0 × 15.5 = Ac

No 1 — 15.0 × 33.4

22.0 — 48.9 Ac

Q_{50} 22 × 4.1 = 91 cfs — Tc = 26 min — Void

Q_{25} 22 × 3.6 = 80 cfs

Q_{50} 42" INV 191.0 — HW = 191.0 + 3.5 + 1.6 = 196.0

4B

↓ Cross Alum No ~~2B~~ South of ~~West~~ Field Rd — Exist 2-18" RCP

Sheet 583 — ~~Exist INV~~ Relief 1930

use 1-42"

A_{R-2} 6.0 × .45 = 2.7

No 4A 33.4 — 15.0

No 4B 39.4 — 17.7

Tc = 27 min

Exist. Inv. 189.0

Q_{50} 17.7 × 4.0 = 71.0 cfs

Q_{25} 17.7 × 3.5 = 62.0 cfs

Q_{50} 1-42" INV 189.0 — HW 188.3 + 1.2 × 3.5 (4.2) = 192.5

Road 30.74

✓ Cross drain ~~3a~~ No 1. Frost Rd INV 183.0 EXIST 18" RCP

Sheet 583 — Ax1

AR-20	= 41.0 x 0.45 =	18.4	
No 3a 1A	7.3	3.8	
No 3b 1B	2.5	1.1	
No 3c 1C	19.6	8.8	
No 3a1	70.4	32.1	

MSC 48" RCP
Rdw 186.60

ΔH 186 - 184 = 2 ft L = 1200 ft S = 2/120 = 0.17%
V = 2 ft/s
Tc = 18 + 10 = 28 min

Q 50 = 32.1 x 3.9 = 125.0 cfs.
Q 25 = 32.1 x 3.5 = 11.2 cfs.

Control EL 188.0

Q 50 — 48" RCP S 1.0% INV 180.0 — 2-30° — HW 182.0 + 1.4 x 5.6/4.0 = 187.6 (2.6 x 25)

✓ Cross drain ~~3e~~ No 2 EXIST 22"

Sheet 583 — Ax1

AR-20	11.5 x 0.45 =	5.2	
No 3a1	70.4	32.1	
No 2e2	81.9	37.3	

MSC 54" RCP
INV 174.0

Q 50 37.3 x 3.7 = 138 cfs
Q 25 37.3 x 3.3 = 122 cfs

ΔH = 4.0 ft; L = 700 ft S = 4/7 = 0.6%
Tc = 28 + 2 = 30 min V = 5 ft/s
Control EL 183.0

Q 50 — 54" RCP S 0.6% INV 174.0 — HW 174.0 + 4.5 + 1.6 = 180.0 ✓

✓ Cross drain 3 Westbrook Road EXIST 30" RCD

Sheet 583 — Ax1

AR-20	15 x 0.45 =	6.8	
No 3c 2	81.9	37.3	
No 3	96.9	44.1	

ΔH 173.0 - 160.0 = 13 ft L = 12m ft
S = 0.9% V = 6 ft/s
Tc 30 + 2 = 32 min

Q 50 4.41 x 3.6 = 158 cfs
Q 25 44.1 x 3.2 = 141 cfs

Ex. INV. 157.10
HW 157.10 + 2.5 + 0.40 = 160.0
Clearance 28 cfs by EXIST 30" RCP

Temporary channel to be removed after construction to No 4.

Cross drain 3 Cont'd — EXIST 30" RCP

Sheet 583

use EXIST 30" RCP and by passing ditch to Northern Stream : Ditch EL 160.00

			A x I	Ac
Discharge {	30" RCP	Q = 28 cfs	7.8	17.3
	by passing DITCH	130 cfs	36.3	79.2

Confluence of two Streams No 4B — EXIST 48" RCP

Sheet 583 — Adopt. 42" RCP

		A x I	Ac
A R-20 = 14.5 x 0.45 =		6.5	14.5
No 2		22.0	48.9
3	By passing Ditch	136.3	79.2
No 4A		11.8	26.3
		76.6	168.9

Tc 32 + 1 = 33 min

Q_{50} 76.6 x 3.5 = 257 cfs

Q_{25} 76.6 x 3.1 = 237 cfs

EXIST 48" Ex. INV 153.18 HW 153.18 + 4.00 + 2.80 = 160.0 — 150 cfs

Road 161.0

Adopt 42" INV 153.40 HW 153.40 + 3.50 + 2.40 = 159.30 — 110 cfs

59

Cross drain No 4A West Brook Road — EXIST 36" RCP OK

Sheet 583

Discharge from drainage system

ARM			
A R-20	9.0 x 0.45	=	4.00
No 3	17.3 x 0.45	=	7.80
	26.3		11.80

Tc = 32 min

Q_{50} 11.80 x 3.6 = 42.5 cfs — EXIST 36" RCP ok

Long. Stream No 4E West Brook Rd Exist 24" RCP

Inv 155.40 OK
Inv 158.70
Road 163.0
Exist Inv. 158.5

Sheet 583

from Divide AR-10 5.2 x 0.45 = 2.40
AR-20 9.0 x 0.45 = 4.00
14.2 6.4 Tc = 18

Q_{50} = 6.4 x 4.9 = 32 cfs
Q_{25} = 6.4 x 4.3 = 27 cfs

158.5 3.2 = 161.7 OK
HW 158.7 + 1.6 x 2.1 = 161.9
32

Confluence of two Stream No 4 North of West Brook Road Exist 48" RCP
Sheet 583 could at Inv 151.20 = 54" RCP
Road 158.0

AR-20	14.5 x	0.45 =	6.5
AR-20	11.1 x	0.45 =	5.0
ARM	2.7 x	0.50 =	1.4
No 4E	14.2		6.4
No 3	96.9		44.1
No 4D	49.3		22.2
No 4	188.7		85.6

By passing By Pumped Ditch

Tc = 32+1 = 35 min

Q_{50} = 85.6 x 3.5 = 300 cfs
Q_{25} = 3.1 = 265 cfs

Exist 48" HW 153.20 x 4.80 = 158.0 EL 1.5 7.80 = 100 cfs
Could 54" HW 151.20 + 1.5 x 4.5 = 158.0 EL = 200 cfs
6.8

Portion
Q_{50} = 330

H 168

Cross Storm No 5 West Street — EXIST 48"RCP add 54"RCP

Street 583, 490

AR-20	17.3 x 0.45 =	7.8	
No 4	188.7	85.6	
No 5	206.0 = .32 Mi	93.4	Tc = 33+1 = 34 min

Q50 93.9 x 3.4 = 316 cfs — use Q50 = 316 cfs

Q25 93.4 x 3.1 = 288 cfs

NEHL Q50 240 cfs — Reformed Q50 350

Cross Storm No 6A WEST STREET — EXIST 18"&30"RCP OK

Street 583, 490 — Rdw 152.0, INV 142.2

ARM	7.30+6.70 = 14.0 x 0.50 =	7.0	
AR-20	1.5 x 0.45 =	.7	
	15.5	7.7	

4H 202-146 = 56 ft; L=INV & S = 5.6%; Tc = 15 min

Q50 = 7.7 x 5.2 = 40 cfs

Q25 = 7.7 x 4.7 = 36 cfs

Rdw EL 146.0

EXIST 30" RCP INV 141.80 — HW 141.80 + 2.50 + .40 (4.80) = 144.60

18" RCP — 141.80 + 1.50 + 1.30 = 144.60 OK

Cross Storm No 6 — Field ~~Rd~~ Crossing ~~Head of West Street~~ — EXIST 30"RCP 2-60"RCP INV 118.0 / 124.5

Street 490

	Dc		Ai
AR-20	53.5	x 0.45 =	24.0
No 6a	15.5		7.7
No 5	206.0		93.4
	275.0 = 0.43 Mi		125.1

L = TOW

Tc 34+1 = 35 min

Q50 = 125.1 x 3.3 = 412 cfs

Q25 125.1 x 3.0 = 375 cfs

C.D. No 6

N.EHL Q 50 = 300 cfs

Potter Branch

Ac 275.- = 0.43 Mi

Q 50 = 440 x 1.0 = 440 cfs

Cross drain No 7

No 6	275		124.0
R 20	94	0.45	41.5
	369		165.5

Q_{50} = 165 x 3 = 495 cfs

Ac 369.0 = 0.57 Mi

Potter Branch

Q 540

NEHL

Q_{10} 190 Q_{50} 350 Q_{100} 472

Cross drain No 8

Ac	369.0		
	18.2		
	387.8	=	0.60 Mi

Potter Branch

Q 560

NEHL

Q_{10} 195 cfs Q_{50} = 360 Q_{100} = 465

Field Road Culvert

NEHL 1/2 West Street

Exist 30"

use 2-60"

ΔH 220 - 120 = 100 ft

L = 5 Culv lgth

S = 1.6 %

HW - Exc fig 8H

use Q = 1/2 (370 + 420 + 412) = 386 cfs

11'x10' elk

T = 35 + 7 = 42 min

HW Exc fig 8H

use Q = 1/4 (540 + 350 + 370 + 572) = 458

use 450 cfs

13'x5' elk

use = 560 + 360 = 460 cfs

EXHIBIT A. 73

J/93

TABULATION SHEET

1. Name of map Hog River No 7

a. Coordinates of Crossing

Latitude _____

Longitude _____

b. Drainage area, A = 369 acres or 0.36 x 1000 acres
(640 acres = 1 sq. mi.)

c. Length of stream L = 7500 = 1.43 miles

.3L = 2250 = 0.48 miles

.7L = 5250 = 0.95 miles

Elevation (a) at headwater 250 - ft.

Elevation (b) at .7L above crossing 185 ft.

Elevation (c) at crossing 96 ft.

$S_1 = \frac{EL(a) - EL(b)}{.3L} = \frac{250 - 185 = 65}{.48} = 135$ ft./mi.

$S_2 = \frac{EL(b) - EL(c)}{.7L} = \frac{185 - 96 = 90}{.95} = 95$ ft./mi.

$\sqrt{S_1} = 11.6$

$\sqrt{S_2} = 9.7$

$T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{0.48}{11.6} + \frac{0.95}{9.7} = \frac{0.042 + 0.098}{0.140} = 0.14$

2. From Figure 1

a. P-index = 1.9 Zone I

3. Find Q_{10} using: (fig. 2, 3, or 4)

Zone I

Area 361

P-index 1.9

T 0.14

a. First estimate of Q_{10} = .080 in 1000 cfs = 80 cfs.

Hog River No 7.

b. Refer to figure 4 or 5

Using Zone I

Area 369

P-index 1.9

T 0.14

Find $\hat{T}$ = 0.07

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{0.07 - 0.14}{0.07}$ = -0.07 % 100 %

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.14}{0.07}$ 2.0 c = 2.6 (fig. 6)

(2) C x Q_{10} of 3a = 2.6 x 80 x _____ = 210 cfs

4. Final Q_{10} = 210 cfs

Q_{25} = _____ cfs

Q_{50} = 320 cfs

Q_{100} = Q=100. 370 cfs

Q_{200} = _____ cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Between envelope curves Yes No

Zone

Cross Drain No 6 Cont

Check Elevation on Map

78" RCP INV 118.00 HW 118.00 + 6.5 x 1.3 = 126.50

use 2-60" RCP 8.72 HW 118.00 + 5.0 x 1.3 = 124.50

Cross Drain No 7 EASTVIEW TERRACE EXIST. 11'x10' Culvert

Shed 490

A_{R-20}	66.0	x 0.45 =	29.7
A_{RM}	28.0	x 0.50 =	14.0
No 6	275		124.0
	369.0		167.7

Q_{50} 167.7 x 3.0 = 500 cfs

Q_{25} 167.7 x 2.6 = 435 cfs

$H = 500 \times \frac{1}{8.2} \times \frac{1}{11} = 5.5$ ft

HW = 95.0 (INV) + 5.5 = 100.50 ~~99.50~~

INV 95.0 OK

Rdwy 116.0

L = 1900 ft ΔH 120 - 95 = 25

Av. S = 1.3% V = 5 fps

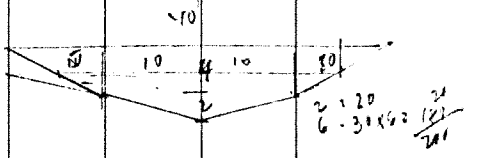
Tc 35 + 7 = 42 min

Channel Vel. at Culvert

S = 2% n = 0.045 R = 2.5

V = 8.2 cfs

use Q = 450 cfs



Cross Drain No 8 MAIN STREET EXIST 13'x5' ARCH Culv.

Shed 489 = 490 Rdwy 88.50 INV 80.70 OK

A_{R-20} =	16.9	x 0.45 -	7.6
A_{RM} =	1.9	x 0.50 -	1.0
	18.8		8.6
No 7	369.0		166.2
No. 8	387.8		174.8

$A_{ARCH} = \frac{1}{2} \pi r^2 = 5 \times 6.5 \times 3.14 \times \frac{1}{2} = 51$ ft²

L = 600 V = 5

Tc 42 + 2 = 44 min

44 min

$\frac{469}{141} = 10.5$

$V = \frac{470}{51} = 10.75$ N = 1.95

Q_{50} = 174.8 x 2.9 = 510 cfs

Rdwy 89.0

HW = 80.68 (INV) + 5.0 + 1.95 = 87.70

use Q = 460 cfs

Hog

Long drain: No 9A Main Street Exist. 18"
INV 90.5
Rim 96.0

$A_{R20} = 64.4 \times 0.45 = 29.0$

$A_{NB} = \frac{4.9}{69.3} \times 0.50 = \frac{2.5}{31.5}$

ΔH 170 - 150 = 70

L 2200 $S = \frac{70}{2200} = .32$ $T_c = 26$

$Q_{50} = 31.5 \times 4.1 = 128$ cfs

48" HW $1.5 \times 4' + 88.0 = 94.0$

Cross Drain No 9 — Inside Ditch East — 8'x12" Box

Ac 489

A_{R20} = 69.3
H_{R20} = 40.30 Ac
No 8 = 387.80
No. 9 497.40 Ac = 0.67 Mi

INV 52.90
Road 70.0 ok

Pothead

Q = 580 cfs

560/84 6.7

HW 52.90 + 7 + 1 = 60.90

Nohl

Q_{10} = 220
Q_{50} = 400
Q_{100} = 540 cfs

use Q = 560 cfs

Cross Drain No 10 — Field Earth Rd — East 96" ACCP

489

A = 56 Ac
No 9 497.4
No. 10 553.4 Ac = 0.85 Mi

INV 27.75 ok
Road 40.0

Pothead

Q = 670 cfs

HW = 27.75 + 1.25 x 8 = 37.75

NEHL

Q_{10} = 250 cfs
Q_{50} = 450 cfs
Q_{100} = 610 cfs

670 + 610 + 540 = 1820

use Q = 610 cfs

EXHIBIT A 9 A H

7 B

TABULATION SHEET

1. Name of map Hog River No 9

   a. Coordinates of Crossing

      Latitude _____

      Longitude _____

   b. Drainage area, A = 491 acres (640 acres = 1 sq. mi.) or 0.67 x 1000 acres

   c. Length of stream L = 9500 = 1.80 miles

      .3L = 2800 = 0.53 miles

      .7L = 6700 = 1.27 miles

      Elevation (a) at headwater 250 ft.

      Elevation (b) at .7L above crossing 180 ft.

      Elevation (c) at crossing 60 ft.

      $S_1 = \frac{EL(a) - EL(b)}{.3L} = \frac{70}{0.53} = 132$ ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L} = \frac{120}{1.27} = 94$ ft./mi.

      $\sqrt{S_1} = 11.5$ $\sqrt{S_2} = 9.7$

      $T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{0.53}{11.5} + \frac{1.27}{9.7} = .046 + .131 = 0.177$

2. From Figure 1

   a. P-index = 1.9 Zone I

3. Find Q_{10} using: (fig. 2, 3, or 4)

   Zone I

   Area 491

   P-index 1.9

   T 0.177

   a. First estimate of Q_{10} = 0.12 in 1000 cfs = 120 cfs.

Hog Ranch No. 9

b. Refer to figure 4 or 5 Find $\hat{T}$ = 0.090

Using Zone I

Area 491

P-index 1.90

T 0.177

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{0.090 - 0.177}{0.090}$ % $\frac{0.087}{0.09}$ = 97%

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.177}{0.09}$ = 1.97 c = 2.6 (fig. 6)

(2) C x Q_{10} of 3a = 2.6 x 120 = 312 cfs

4. Final Q_{10} = 312 cfs

Q_{25} = _____ cfs

Q_{50} = 460 cfs

Q_{100} = Q 100 · $\frac{540}{600}$ cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Between envelope curves Yes No

Zone

Cross Channel No 11 R. Road Double 10 ft combined 2-3'6' Box

Sheet 489

Ac 21.9 Ac

No 10 553.0

574.0 Ac = 0.89 Mi

Inv 11.70

Rdw 40.0

Ritter Board

Q = 700 cfs

Y $\frac{630}{2 \times 36 = 36}$ 17.5

HW $\frac{11.7}{12.5} + 6 + \frac{31.0}{64} \times 1.3 = \frac{24.0}{24.1}$

NEHL

Q_{10} = 280 cfs

Q_{50} = 470 cfs

Q_{100} = 630 cfs

$Q = (700 + 630 + 560)^{\frac{1}{3}} = 1970$

Use Q = 630 cfs

EXHIBIT A.

10 A H

TABULATION SHEET

1. Name of map Hog River No 11

   a. Coordinates of Crossing

      Latitude _____

      Longitude _____

   b. Drainage area, A = 570 acres or 1.12 x 1000 acres
      (640 acres = 1 sq. mi.)

   c. Length of stream L = 11500 = 2.20 miles

      .3L = 3450 = 0.65 miles

      .7L = 8050 = 1.55 miles

      Elevation (a) at headwater 250 ft.

      Elevation (b) at .7L above crossing 168 ft.

      Elevation (c) at crossing 18 ft.

      $S_1 = \frac{EL(a) - EL(b)}{.3L} = \frac{82}{0.65} = 127$ ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L} = \frac{150}{1.55} = 97$ ft./mi.

      $\sqrt{S_1} = 11.3$ $\sqrt{S_2} = 9.8$

      $T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{0.65}{11.3} + \frac{1.55}{9.8} = 0.058 + 0.158 = 0.216$

2. From Figure 1

   a. P-index = 1.9 Zone I

3. Find Q_{10} using:
   (fig. 2, 3, or 4)

   Zone I

   Area 570

   P-index 1.9

   T 0.216

   a. First estimate of Q_{10} = 0.12 in 1000 cfs = 120 cfs.

Hog River No 11

b. Refer to figure 4 or 5

Using Zone I

Area 570

P-index 1.9

T 0.216

Find $\hat{T}$ = 0.10

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{0.10 - 0.216}{0.1}$ % $\frac{0.116}{0.1}$ = 116%

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.216}{0.10}$ = 2.16 c = 2.70 (fig. 6)

(2) C x Q_{10} of 3a = 2.70 x 120 = 325 cfs

4. Final Q_{10} = 325 cfs

Q_{25} = _____ cfs

Q_{50} = 480 cfs

Q_{100} = ~~560~~ 620 cfs

Q_{200} = _____ cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Between envelope curves Yes No

Zone

Hog Brook

H 12
Calc.
1-13-75

Cross Drain No. 1C West St. — Exist. 18"
Sheet 491-5781 — Inv. 199.6 Rdw. 203.0

A_{RZO} - 5% Devel., Grass 95%
Use Coef. 0.3

L = 1100 ft S = 2%
T_c = 31 Min

A_{RZO} - 19.6 Ac × 0.3 = 5.9

Q_{50} = 5.9 × 3.6 = 21.2 cfs

H.W. = 199.6 + (1.5 (5.1) × 3.1) = 204.7 **Not Adequate**

Cross Drain No. 1 - Field Rd — Exist. 18"
Sheet 583 — Inv. 183.7 Rdwy 186.60
Control Elev. 188.00

1A

A_{RZO} - 50% Devel, Grass 50%

A_{RZO} - 0.5 × 0.45 = 0.22
Grass - 0.5 × 0.30 = 0.15
0.37

A_c - 50% Devel, Grass 50%

A_c - 0.5 × 0.60 = 0.30
Grass - 0.5 × 0.30 = 0.15
0.45

A_{RZO} -	3.9 Ac ×	0.37 =	1.4
A_c -	3.4 Ac ×	0.45 =	1.5
	7.3	0.40	2.9

L = 500 ft S = 6%
T_c = 15 Min.

1B

A_{RZO} - 0% Devel, Grass 100%
Use Coef. 0.3

A_{RZO} - 2.5 Ac. × 0.3 = 0.75

L = 300 ft S = 10%
T_c = 14 Min

Hog Brook

H 73
C.D.C.
1-13-75

1C (See Pg 1)
19.6 x 0.3 = 5.9 Tc = 31 Min

1 Aezo - 0% Devel., Grass 100%
Use Coef 0.3

1 - 41.0 Ac x 0.3 = 12.30
1A - 7.3 Ac x 0.4 = 2.90
1B - 2.5 Ac x 0.3 = 0.75
1C - 19.6 Ac x 0.3 = 5.90
70.4 19.85 Tc = 31 + 13 = 44 Min

Q_{50} = 19.85 x 2.9 = 57.5 cfs

H.W = 183.7 + (1.5 x 10) = over 188.0 - Not Adequate

Cross Drain No. 2 Field Rd. Exist 22"

Not Adequate Tc = 44 + 3 = 47 Min

Q_{25} = 24 x 3 = 72 cfs

Cross Drain No. 4A West St. - Exist 30"
Sheet 490 & 583 Inv. 192.3 Rdwy 197.0

Aezo - 15% Devel., Grass 85%

Aezo = 0.15 x 0.95 = 0.07
Grass = 0.85 x 0.30 = 0.25
0.32

L = 1800 ft S = 2.2%

Aezo - 33.4 Ac x 0.32 = 10.7 Tc = 34 Min

Q_{50} = 10.7 x 3.4 = 36.4 cfs

H.W = 192.3 + (2.5 x 1.9) = 195.8 OK
3.5

Hog Brook

C.O.C. 1-13-75

Cross Drain No. 9B Field Rd.

Exist 2-18"
Inv. 189.0 Rdwy 193.00

Sheet 583

9A From Previous Sheet

A_{RZO} - 33.9Ac x 0.32 = 10.7

T_c = 34 Min.

9B A_{RZO} = 100% Devel.
Use Coef. 0.45

9A - 33.9 Ac x 0.32 = 10.7
9B - 6.0 Ac x 0.45 = 2.7
39.9 (0.34) 13.4

T_c 34+1 = 35 Min

Q_{50} = 13.4 x 3.3 = 44 cfs

H.W. = 189.0 + (1.5 x 3.5) = 194.2 (5.2)

Not Adequate

Cross Drain 9D - So. of West St.

Exist. 30"x24"
Inv. 177.0 Rdwy 179.50 ±

Sheet 583

9B (ABOVE) T_c = 34 Min

9C A_{RZO} - 100% Devel.
Use Coef. of 0.45
A_{RZO} = 3.7Ac x 0.3 = 1.1

9D A_{RZO} - 50% Devel, Gross 50%

A_{RZO} - 0.5 x 0.45 = 0.23
Gross - 0.5 x 0.3 = 0.15
0.38

(Cont'd Pg 3)

Hog Brook

H15
CDC
1-13-75
Manor 179.50

4B	-	39.9 Ac	x 0.34 =	13.4
4C	-	3.7 Ac	x 0.30 =	1.1
4D	-	6.2 Ac.	x 0.38 =	2.4
		49.3 Ac.		16.9

$Q_{50} = 16.9 \times 3.2 = 54$ cfs

$H.W. = 177.0 + (2.0 \times \frac{6.2}{3.1}_{\text{Approx.}}) = 183.2$

Not Adequate

Tc = 34+3 = 37 Min

Confluence Point No. 4

Exist 48"
Inv. 153.2 Rdwy 158.0

Sheet 583

3 — A_{R20} - 28% Devel, Grass 72%

A_{R20}	=	0.28 x 0.45	= 0.13
Grass	=	0.72 x 0.3	= 0.22
			0.35

2	-	81.9 Ac	x 0.30 =	27.0
3	-	15.0 Ac.	x 0.35 =	5.2
		96.9 Ac.		32.2

Tc = 47+3 = 50 Min

4D (ABOVE)

Tc = 37 Min

4E — A_{R20} - 100% Devel.

14.2 x 0.45 = 6.4

Tc = 18 Min

4 — A_{R20} - 40% Devel., Grass 60%

A_{R20}	=	0.40 x 0.45	= 0.18
Grass	=	0.60 x 0.30	= 0.18
			0.36

(Cont'd on Pg 5)

Hog Brook

H 16
CDJC
1-13-75

4 - Cont'd

A_{RM} - 20% Devel., Grass 80%

$A_{RM} = 0.20 \times 0.50 = 0.10$
Grass $= 0.80 \times 0.30 = 0.24$
0.34

$A_{RZO} - 25.6 \times 0.36 = 9.2$
$A_{RM} - 2.7 \times 0.34 = 0.9$
28.3 10.1

3 -	96.9	x 0.30	= 32.2
4D -	49.3	x 0.34	= 16.9
4E -	14.2	x 0.45	= 6.4
4 -	28.3	x 0.35	= 10.1
	188.7		65.6

$T_c = 50 + 1 = 51$ Min

$Q_{50} = 65.6 \times 2.6 = 171$ cfs

H.W $= 153.2 + (4 \times 2.2) = 162.0$ Not Adequate

Cross Drain No. 9A Main St. Exist 18"

A_{RZO} - 78% Devel, A_{RM} - 100% Devel

$Q_{50} = 98$ cfs

Previous Calc. Govern - Not Adequate

Storm Sewer stem Design

HOG BROOK WATERSHED - MAIN ST. (FROM BLDG. # 2784) (SHT. # 582/489)

Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Exist. Pipe Size	Length of Pipe	Exist. Slope	Average Velocity	Full Capacity	Headwater	'n'	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
FROM BLDG. NO. 2784															
CB#23 TO CB#24	22	—	22	6.60	6.60	4.0	26.4	24"	330	.020	10	30	4.0	.015	MARGINAL — H.W. TO TOP FRAME
CB#24 TO MH#26	24.5	.6	24.5	12.27	18.87	3.8	71.7	24"	80	.020	22	30	> 20'	.015	
CONTRIBUTION FROM FOREST ST.			12.1		.97										
MH#26 TO CB#27	15	.2	24.7	1.68	21.52	3.7	79.6	18"	180	.017	45	13	> 25'	.015	
CB#27 TO CB#29	15	.4	25.1	2.84	24.36	3.7	90.1	18"	220	.035	51	13	> 30'	.019	
CB#29 TO CB#32	13	.5	25.6	1.10	25.46	3.6	91.7	18"	70	.025	52	15	> 30'	.015	
CONTRIBUTION FROM STEPNEY CIRCLE			18.1		2.65										
CB#31 TO CB#32	16	—	16	1.88	1.88	4.5	8.5	15"?	30	.026	8	9	2.6'	.015	
CB#32 TO CB#36	NIL	.1	25.7	NIL	30.0	3.6	108	18"	380	.051	61	17	> 30'	.019	

Storm Sewer System Design

HOG BROOK WATERSHED - MAIN ST. (SHT # 489)

Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Exist. Pipe Size	Length of Pipe	Exist. Slope	Average Velocity	Full Capacity	Headwater	'n'	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CBH36 TO OUTLET OF SYSTEM															
CBH36 TO HW#37	10.5	.8	26.5	1.50	31.5	3.5	110	18"	120	.038	6.2	18	>30'	.015	
SECONDARY SYSTEM IN MAIN ST. (START @ CARILLON DRIVE)															
CB#33 TO CB#34	11	—	11.0	.39	.39	5.4	2.1	15"	40	.070	8.5	15	0.8'	.015	
CB#34 TO CB#35 (ASSUMING THERE IS AN ADEQUATE STORM DRAIN SYSTEM IN CARILLON DR. DEVELOPMENT)															
ASSUMED CONTRIBUTION FROM CARILLON DR. DEVELOPMENT															
			11.4		1.18										
CB#34 TO CB#35	8	.3	11.7	.11	1.68	5.2	8.7	15"	70	.044	11	13	2.8'	.015	
CBH35 TO OUTLET															
CB#35 TO EW#38	7	.1	11.8	.06	1.74	5.2	9.1	12"	330	.044	11.6	5.4	5.2'	.019	
DRAINAGE SYSTEM FROM BLDG NO. 2599 MAIN ST. TO HOG BROOK															
CB#42 TO EW#40 @ OUTLET	13	—	13	4.06	4.06	5.0	20.3	15"	300	.009	16.5	5.5	11.9'	.015	

Storm Sewer Stem Design

HOG BROOK WATERSHED - FOREST ST. (MAIN ST END) (SHT # 489)

Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Exist. Pipe Size	Length of Pipe	Exist. Slope	Average Velocity	Full Capacity	Headwater	'n'	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
FOREST ST @ MAIN ST.															
CBH1 TO CBH2	12	–	12	.93	.93	4.4	4.1	15"	60	.048	7	10	1.3'	.019	
CBH2 TO MH#2	6.5	.1	12.1	.04	.97	4.4	4.3	15"	100	.008	4.7	5.5	1.3'	.015	

Hydrology Worksheet — Stepney Circle (to Main St) (Calc # 461)

Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Exist. Pipe Size	Length of Pipe	Exist. Slope	Average Velocity	Full Capacity	Headwater	'n'	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
STEPNEY CIRCLE															
CB#5 TO CB#6	15.5	—	15.5	.77	.77	3.9	3.0	15"	50	.0004	2.4	1.3	1.0'	.015	
CB#6 TO CB#7	9	.3	15.8	.18	.95	3.9	3.7	15"	190	.003	3.0	3.3	1.2'	.015	
CB#7 TO CB#3	8.5	1.1	16.9	.27	1.22	3.8	4.6	15"	330	.020	6.5	8.5	1.4'	.015	
CB#4 TO CB#3	13	—	13.0	.78	.78	4.3	3.3	15"	40	.069	9.6	16.0	1.1'	.015	
CB#3 TO CB#2	10	.8	17.7	.23	2.23	3.7	8.3	15"	60	.069	13.0	16.0	2.6'	.015	
CB#2 TO CB#1	7.5	.1	17.8	.08	2.31	3.7	8.5	15"	200	.059	12.0	14.0	2.6'	.015	
CB#1 TO CB#32	MAIN STREET														
CB#1 TO CB#32	10.5	.3	18.1	.34	2.65	3.7	9.8	15"	25	.0004	8.0	1.3	3.1'	.015	

Storm Sewer System Design

ASSUMED CARILLON DR. DEV. DRAIN. SYSTEM CONTRIBUTION

Project _____ Designed by _____

Town _____ Route _____ Checked by _____ Sheet No. _____

Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Pipe Size (Assumed)	Length of Pipe	Slope (Assumed)	Average Velocity	Full Capacity	Headwater	'n'
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A-B	11	-	11	.79	.79	4.5	3.6	15"	180	.056	9	14	1.2'	.015
B-C	10	.3	11.3	.30	1.09	4.5	4.9	15"	50	.040	9	12	1.5'	.015
C-CB#34 @ MAIN ST.	8.5	.1	11.4	.09	1.18	4.5	5.3	15"	170	.074	11	15	1.6'	.015

Storm Sewer System Design

Hog Brook Watershed-West St.

Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Exist. Pipe Size	Length of Pipe	Exist. Slope	Average Velocity	Full Capacity	Headwater	'n'	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
FROM INTERSECT. GILBERT AVE TO MH #							(SHT #564)								
MH# TO MH#	11.5	–	11.5	1.06	1.06	53	5.6	15"	400	.040	9	12	1.7'	.015	
MH# TO HW	15	.7	15	2.74	3.80	4.7	17.9	18"	80	.025	10	15	5.1'	.015	

Storm Sewer stem Design

HOG BROOK WATERSHED - WESTBROOK RD.

Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Exist. Pipe Size	Length of Pipe	Exist. Slope	Average Velocity	Full Capacity	Headwater	'n'	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
GORMAN RD TO GEORGE RD. (SHT #583)															
CB#3 TO CB#6	16	-	16	2.34	2.34	3.9	9.2	18"	680	.007	5.2	8	2.1'	.015	
CONTRIBUTION FROM GEORGE RD.															
			12.6		1.59										
CB#5 TO CB#6	12.5	.4	13.0	0.91	2.50	4.3	10.8	15"	50	.010	8.8	6	2.1'	.015	
CB#6 TO CB#7	7.5	2.2	18.2	0.36	5.20	3.7	19.2	21"	150	.018	8.6	19	3.1'	.015	
CB#7 TO CB#8	6	.3	18.5	0.32	5.52	3.6	19.9	24"	350	.007	6.3	18	2.7'	.015	
INLET @ REAR #32 WESTBROOK RD															
INLET TO CB#9	29	-	29	6.38	6.38	3.4	21.7	30"	175	.010	7.5	38	2.5'	.015	
CB#9 TO CB#10	15	.4	29.4	0.69	12.59	2.8	32.2	36"	30	.03	13	110	2.1'	.015	
CB#10 TO OUTLET	16	NIL	29.4	0.23	12.82	3.4	43.6	36" OR 40" RCP / C.I.	30	.001	6	19	3.6'	.015?	

Storm Sewer stem Design

HOG BROOK WATERSHED - GEORGE RD. (RIDGE RD TO WESTBROOK RD) (SHT # 3 OF 3)

Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Exist. Pipe Size	Length of Pipe	Exist. Slope	Average Velocity	Full Capacity	Headwater	'n'	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CONTRIBUTION FROM RIDGE RD.															
			12.0		.83										
GEORGE RD.															
CB#7 TO CB#8	11.5	.3	12.3	.26	1.09	4.4	4.8	15"	150	.044	9.0	12	1.5'	.015	
GEORGE RD TO CB#5 WESTBROOK RD.															
CB#8 TO CB#5	12	.3	12.6	.50	1.59	4.3	6.8	15"	250	.060	11	15	2.0'	.015	

Storm Sewer System Design

Hog Brook Watershed - Ridge Rd (George Rd End)

Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Exist. Pipe Size	Length of Pipe	Exist. Slope	Average Velocity	Full Capacity	Headwater	'n'	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Ridge Rd.															
CB#4 to CB#5	9	-	9	.26	.26	5.0	1.3	15"	200	.02	4.5	8.5	0.6'	.015	
Ridge Rd to CB#7 George Rd.															
CB#5 to CB#7	12	.7	12	.57	.83	4.4	3.6	15"	60	(.003)	(2.9)	?	1.21	.015	

Storm Sewer System Design

HOG BROOK WATERSHED - PRATT ST. (SHT # 489)

Project _____ Designed by _____

Town _____ Route _____ Checked by _____ Sheet No. _____

Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Exist. Pipe Size	Length of Pipe	Exist. Slope	Average Velocity	Full Capacity	Headwater	'n'
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CB#5 NEAR BLDG. NO. 38 PRATT ST.														
			14.5		2.34									
CB#5 TO MH	11	.6	15.1	.29	2.63	4.0	10.5	18"	300	ASSUMED .083	14	27	2.3'	.015
MH TO MH	13	.4	15.5	1.37	4.00	3.9	15.6	24"	120	ASSUMED .083	16	60	2.3'	.015
MH TO CULV. END	8	.1	15.6	.23	4.23	3.9	16.5	ASSUMED 24"	170	ASSUMED .083	16	60	2.5'	.015

SAW MILL BROOK

1 SE

5.2.74

SAWMILL BROOK - EAST SE

✓ Cross drain No 1 I-91 NB & E of WEST STREET — EXIST 60" RCP ok

Sheet 491

				A=1	
A_{RH}	=	57.5	× 0.62	= 35.6	ΔH 226-191 = 35; L = 30 m; S = 1.17%
A_C	=	11.5	× 0.60	= 6.9	
Hwy	=	5.6	× 0.48	= 2.7	Tc = 26 min
No 1		74.6		45.2	

Q_{50} = 45.2 × 4.1 = 185 cfs — EXIST 60" INV 190.0 L=150' S=0.6%

Q_{25} = 45.2 × 3.6 = 162 cfs

Control EL. 197.0 — Use 198.0

Q50 EXIST 60" INV 190.0; S=0.6% HW = 190.0+5.0+3.90 = 198.90 Outflow at 197.0 (V=9) to 48" RCP; NW & E of West Rd at I-91

✓ Cross drain No 2 - I-91 EXT. of No 1 — EXIST. 66" RCP ok

Sheet 491

Hwy	6.2 × 0.48 =	3.0	
No 1	74.6	45.2	
No 2	80.8	48.2	

Q_{50} = 48.2 × 4.1 = 197.0 cfs — Tc = 26 min

Q_{25} = 48.2 × 3.6 = 173.0 cfs

Control EL 193.0

Q50 EXIST 66" INV 188.70; S = 16/200 = 0.8% HW = 188.70+5.5+1.40 = 195.60 (V=8) Inv Flow 193.0 to 60" CMP

Cross ch. 4C

Cross drain No 3 - West Street — EXIST 72" RCP ok

Sheet 491 & 584

A_{HC}	18.5	= 24.7 × 0.65	16.2	
Hwy	7.5+	= 11.3 × 0.48 =	5.5	
	25.4	36.0	21.7	L = 100 m
No 2		80.8	48.2	Tc = 26+4 = 30 min
No 3		116.8 1062	69.9	

Q_{50} 69.9 × 3.7 = 260 cfs V=9

× 3.3 = 231 cfs INV 176.80 HW 176.80+3.5+2.0 = 182.30

1A
SE

Design of 100 yr. storm sewer

Sawmill Brook EAST

West Street - Cross Culvert No 3 Exist. 72" INV 176.80
No 3. Q_{50} = 26. cfs HW 182.30 OK

Channel

No 4. WEST. RD. Rdw 175.5

2-36" 174.50 / 168.90 Cross Culvert No 4. EXIST 2-36" INV 168.90
H = 5.60 = 150 cfs Q_{50} = 382 cfs add 1-72" INV 167.60
382 / 150 H.W. 174.20 OR use 2-60" INV 167.70
200 cfs - 72" - 1.1×6 = 6.6 6.60
60" - 1.5×5 = 7.50 INV 167.60 + 5.4' = 171.50 174.2 − 2.5
2-36" 1.8×3 = 5.4 = 2+7.5 = 15 cfs
HW 2-60" - 5×1.3 = 6.5 + 167.70 = 174.20 Q = 415 cfs

Channel 3-4 Sta 50.0 - 41.0 = 9.6 Δ INV = 176.60 - 168.60 = 10 S = 0.65%
Q = 380; (Qn 14.0) W = 6.0 H.W. = 4.0 Vel 6.5 ft/sec

176.20 + 4.57 = 180.70 + 173.57 = 177.0 S = 0.7 use W = 5.5/45
177.0 − 5.5
Wo = 5.5 - vel

No 5 Cromwell Ave Exist 3-48" INV 165.48
Q = 470 cfs Rdw 171.50
HW 169.00 due to downstream
3-48 -4.5' 27 cfs 3×90 = 270 cfs
1-72" 1×6 20 cfs HW = 164.0 + 6.0 = 170.0 200 cfs
use add'l 1-60" 1.3×5 = 6.5 163.5 + 6.5 = 170.0

✓ Channel 4-5 Sta 50.0 - 60.0 = 10 Δ INV 166.50 - 160.50 = S = 0.5%

Q 470 (Qn .15) W = 8.0 H.W. = 4.2 V = 6.5 ft/sec
W.G. 166.50 + 5.0 = 171.50 − 169.0 = 2.5 ; S = 0.25% Wo = 5.6
170.25
163.50
6.75
my track W

Cross drain 4A West Bank Rd Exist 30" RCP

Sheet 491 & 584

OK

Rd 205.0

	Aa		A×I			
Ac	26.8 / 3.2 = 30.0	× 0.60 =	16.0 / 2.0 = 18.0	ΔH 250 − 190 = 60	L 1800	S = 60/18 = 3.3%
Q50	= 18.0 × 4.3 =		77.0 cfs	Tc = 23 min		
Q25	= 18.0 × 3.9 =		70.0 cfs			

S = 1% INV 186.60 HW 186.60 + 2.5 + 3.90 = 193.0

To keep HW down provide Burns ditch at EL 189.0 at North side of West Street to I-91 Cross drain 48" RCP

Cross drain 4B I-91 South of West Bank Exist 36" RCP

Sheet 584

OK

Ac	14.30 × 0.60 =	8.50	L = 810	Tc	23 + 1.5 = 24.5 min
4A	30.0	18.0			
4B	44.30	26.50			
Q50	26.50 × 4.2 =	115.0 cfs			
Q25	× 3.7 =	102.0 cfs			

S = 0.7% INV 179.90/178.80 HW 179.90 + 3.0 + 5.0 = 188.0

Cross drain 4C I-91 Ext. of 4B Exist 60" RCP

Sheet 584

OK

Ac	2.5 × 0.60	}	1.5		
AHW	8.5 × 0.48	}	4.0		
	11.0		5.5		
4B	44.3		26.5		
	55.3		32.0	Tc = 25	
Q50	32.0 × 4.2 =		134.0		
Q25	32.0 × 3.7 =		118.0		

Centre EL 187.00

S 1.6/3.4 = 0.45% INV 178.5"/176.90" HW 178.5" + 3.5 + 1.6 = 183.60

Cross drain No 40 Cromwell Ave — Exist 24" RCP

Ac 10.6 x 0.60 = 6.4

Q5Y 6.4 x 5.4 = 34.2 cfs

Q25 6.4 x 4.9 = 31.1 cfs

Rdw 175.50

Ex. INV 170.10

ΔH 235.0 - 174.0 = 61' L = 900' (on)

S = 61/900 = 6.8%

Tc = 14 min

HW 170.10 + 2.0 + 2.4 = 174.50

Cross drain No 4 West Street — Exist 2-36" RCP

	A	A x I
Ac	17.7 x 0.6 =	10.6
4D	10.6	6.4
4C	55.3	32.0
No 3	116.8	69.9
No 4	200.4	118.9

(Sheet 584)

Q50 118.9 x 3.5 = 415 cfs

Q25 x 3.1 = 370 cfs

Exist. Inv. use 3-54" RCP

Prop. Inv 167.0 — 2-60" RCP

Inv 166.0 — 2-60" — Omit 4C

L = 1100 ft 1% V = 5

Tc = 30 + 3 = 33 min

Exist 2-36" & 1-72" Inv 167.8

use 2-60" Inv 167.50

3-54" Inv 169.00

Rdw EL 176.00 Exist Inv 168.90 HW = 174.50

Q50 3-54" 415/3 = 140 = 687 HW 1.25 x 4.5 = 5.60 + 168.90 = 174.50

2-36" 5.6/3 = 1.85 = 150 cfs HW 168.90 + 5.60 = 174.50

Proposed Q50 2-60" Inv 167.00, V = 10 HW 167.5 + 7.0 = 174.50

S = 0.8% L = 800' Inv 160.00 at Cromwell cross drain No 5

or 9'-6" x 6'-5" CMP 5.75 / 7.0 / 5.9

Channel to Cross drain No 5 S = 0.8% Bottom 4 ft, H = 5.0 ft

415

2-36" = 150

265

1-72" x 1.1 x 6 = 6.7 + 167.8 = 174.50

2-60 x 1.4 x 5 = 7.0 + 167.50 = 174.50

8'-2 x 5-9 S 1.6% dc = 4.5 H = 7.0 Bottom 5 ft. H = 4.0 ft

8-10 x 6-1 S = 1.1%

9'-6 x 6'-5 S = 0.8% dc = 4.0 H = 6.0 Inv 168.0 - HW = 174.0

Portion

Q50 = 350 x 0.95 = 330 cfs S = 198 - 168 = 30 / 4100 = 0.75%

use 415 + 350 = 765/2 = 382 cfs

Cross drain No 5A — ELM Street — Exist 15" RCP

Sheet 492 — use 30" RCP

Ac 6.5 x 0.6 = 3.9

A RM. 7.0 x 0.5 = 3.5

13.5 Ac — 7.4

ΔH 194.0 - 186 = 8.0 ft L = 1000 ft S = 0.8%

Tc = 20 min

Q50 = 7.4 x 4.6 = 36 / 34.0 cfs

Q25 = 4.1 = 31.0 cfs

Q25; 30" RCP Rdwy 187.40 INV 183.0 HW 183.0 + 2.5 + 0.7 = 186.20

Cross drain No 5B — ELM / Cromwell — Exist 24" RCP

Sheet 492 — OK

Ac 11.4 x 0.6 = 6.8

ΔH 252 - 200 = 52 ft L = 800 ft S = 6.5%

Tc = 11 min

Q50 = 6.8 x 6.0 = 41.0 cfs

Q25 = 6.8 x 5.4 = 37.0 cfs

Q25; Rdwy 194.0 INV 188.72 HW 188.72 + 2.0 + 2.20 = 192.90

4.8 / 3.6

Cross drain No 5C — Cromwell Ave — Exist 18" RCP

Sheet 492 — use 24" RCP

Ac 10.6 x 0.6 = 6.4

ΔH 247 - 202 = 45 ft L = 12m S = 45/12 = 3.7%

Tc 15 min

Q50 6.4 x 5.2 = 33.2 cfs

Q25 6.4 x 4.7 = 30.0 cfs

Q25; 24" RCP; Hwy 201.60; INV 175.00 HW 195.0 + 2.0 + 2.00 = 199.0

18" RCP INV. 192.0 + 1.5 + 6.3 + 2.00 -

Cross drain No 5D — Cromwell Ave — EXIST 18" RCP

Sheet 492

PROP · INV 195.50 18" RCP
INV 194.50 24" RCP

Ac = 8.00 x .6 = 4.8 — ΔH 256 - 202 = 54 ft — L = 900 ft — S = 5%

Tc 12 min

Q_{50} = 4.8 x 5.8 = 28 cfs
Q_{25} = 4.8 x 5.2 = 25 cfs

Q_{25} — 24" RCP — Hwy ~~204.0~~ 202.0 — INV 194.6 — HW — 197.0 + 2.0 + 1.0 = ~~200.0~~ 200.0
18" — 195.50 — HW — 195.50 + 1.5 + 5.0 = 202.0
6 F
1 F.F

Cross drain No 5E — Cromwell Ave — EXIST 18" RCP

Sheet 492

PROP 36" RCP

Ac 20.5 x 0.6 = 12.3 — ΔH. 246 - 196 = 50 ft — L = 1100 — S = 5%
Ac received due to Lake 5 Ac — Tc + Lake 13 min
Ac 15 x 0.6 = 9.0

Q_{50} = 9.0 x 5.6 = 50 cfs
Q_{25} = 9.0 x 5.0 = 45 cfs

Q_{50} — 36" RCP INV 186.0 — Hwy 192.0 — HW 186.0 + 3.0 + 1.0 = 190.0
30" RCP INV 185.5 — 185.5 + 2.5 + 2.0 = 190.0

Cross drain No 5F — Cromwell Ave — EXIST 18" RCP

Sheet 492

OK

Ac 2.0 x 0.6 = 1.2

Tc 13 + 1 = 14 min

Q_{50} 1.2 x 5.5 = 6.6 cfs
Q_{25} 1.2 x 5.0 = 6.0 cfs
18" INV 186.80 — HW 1920

2.8 1.2

Case 6

Cross drain No 5 — Cromwell Ave — Exist 3-48 RCP

Recd 492,585 — Inv 165.48

AC	35.4+28.3=63.7 ✓	×0.60 =	38.2
AHC	23.5+5.0=28.5 ✓	×0.65 =	18.6
No 5A	13.5 ✓	=	7.4 ✓
B	11.4 ✓	=	6.8 ✓
C	10.6 ✓		6.4 ✓
D	8.0 ✓		4.8 ✓
E	20.5 ✓		12.3 ✓
F	2.0 ✓ 158.2		1.2 ✓ 95.6
No 4	200.4		119.6
No 5	2357.6		214.0

ΔH 184 − 166 = 18 ft L = 300 S = 0.6%

Dist V = 8 f/s Tc = 10 min

Ac = 20/30 min

L = 700

Tc 33 + 2 = 35 min

Q_{50} 214.0 × 3.3 = 708. cfs — 15-90 — V = 7.2

Q_{25} 214.0 × 3.0 = 642. cfs

Exist Hwy = 171.0 Inv 165.42 — HW 165.50 + 4.0 + 2.60 = 172.30

3-66"RCP S = 0.5% Inv 160.0 — HW 160.0 + 5.0 + 2.0 = 167.0

Channel to Cross drain No.6 S = 0.5% Bottom 6-0 ; H = 5.5 ft.

12'-10 × 8'-4" — Ac = 4.80 — H = 7.2 — S_c = 0.1.72

12'-6 × 7'-11 S = 0.75%

11-5 × 7-3 S = 1.15% — Ac = 5.25 — H = 8.0'

Cross drain No 5G Cromwell Ave

Exist 18"

Inv 170.90

Rim 176.0

OK

Ac = 4.5 × .6 = 2.7

Tc = 13.

Q_{25} = 2.7 × 5.0 = 13.5 cfs

2.6

HW = 1.7 × 1.5 + 170.9 = 173.5

Cross drain No 5 Commerce Ave Exist. 3-48 RC

Sheet 492 & 585 Rim 171.0, Inv 165.5/164.9

Ac	= 63.7 x 0.6	= 38.2	
Rac	= 28.5 x 0.65	= 18.6	
	92.2	56.8	
No 5A	13.5	7.4	
5B	11.4	6.8	
5C	10.6	6.4	
5D	8.0	4.8	
5E	20.5	12.3	
5F	2.0	1.2	
	158.2 Ac	95.6	

$S = \frac{184-166}{300} = 0.6\%$

Exist 3-48" & 1-62" Inv 163.20
HW 170.0

Tc 33 min

Contributing to Cross drain 5

Q_{50} 95.6 x 3.5 = 335 cfs
Q_{25} 95.6 x 3.1 = 298 cfs

3-48" HW 165.50 + 4x1.7 = 172.50 present (OR)
7.9

158.2
No 4. 200.4
Σ No 5. 358.6 Ac = 0.56 M² Rational Method N/A

Potter

Q_{50} = 520 x 0.9 = 470 cfs $S = \frac{198-165}{500} = 0.66\%$

NEHL

Q_{10} = 190 cfs
Q_{50} = 350 cfs
Q_{100} = 470 cfs

Q = 520 + 470 + 420
use Q 470 cfs for development

Q = 470

3-48	H 4.5 = 4x1.1 = 3x90 =	270	HW =	170.0
1-72	0.9x6.0 =	5.4		
1-60	1.35x5.0 =	6.8	+ 163.20	= 170.0

EXHIBIT A 6A

No 5

TABULATION SHEET

1. Name of map Saw Mill Crossroads Area

   a. Coordinates of Crossing

      Latitude _____

      Longitude _____

   b. Drainage area, A = 359 acres or 0.359 x 1000 acres
      (640 acres = 1 sq. mi.)

   c. Length of stream L = 60 - 20 = 40 m ; 0.77 miles

      .3L = 120 = 0.24 miles

      .7L = 280 = 0.53 miles

      Elevation (a) at headwater 190.0 ft.

      Elevation (b) at .7L above crossing 184.0 ft.

      Elevation (c) at crossing 165.0 ft.

      $S_1 = \frac{EL(a) - EL(b)}{.3L} = \frac{6}{0.24} = 20$ ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L} = \frac{19}{0.53} = 36$ ft./mi.

      $\sqrt{S_1} = 4.5$ $\sqrt{S_2} = \frac{6}{\sqrt{36}} = \frac{6}{6} = 1$

      $T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{0.24}{4.5} + \frac{0.53}{6.0} = 0.053 + 0.088 = 0.141$

2. From Figure 1

   a. P-index = 1.90 Zone 1

3. Find Q_{10} using:
   (fig. 2, 3, or 4)

   Zone 1

   Area 359

   P-index 1.90

   T 0.141

   a. First estimate of Q_{10} = .095 in 1000 cfs = 95 cfs.

b. Refer to figure 4 or 5

Using Zone I Find $\hat{T}$ = 0.07

Area 359

P-index 1.90

T 0.141

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{0.07}{070}$ % 100%

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.141}{0.07}$ 2.0 c = 2.8 (fig. 6)

(2) C x Q_{10} of 3a = 95 x 2.5 = _____ cfs

4. Final Q_{10} = 240 cfs

Q_{25} = _____ cfs

Q_{50} = 350 cfs

Q_{100} = $\frac{420}{460}$ cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Zone Between envelope curves Yes No

7-1A

75E

Cross Drain No 6 France Street EXIST 2-36"

Sheet 585 INV 156.4/155.9

Hwy 163.00

Ac = 26

No 5 = 359

385 Ac = 0.6 M²

MSE 2-72" INV 155.0 ; HW 162.0

Potter

Q = 540 cfs x 0.95 = 510 cfs

NEHL

Q 10 = 200 cfs

Q 50 = 370 cfs

Q 100 = 500 cfs MSE Q 500 cfs

2-60	1.8x5.0+9.0+153.50 = 162.0	162.0-156.5=5.5
2-72	1.1x6.0+6.6+155.4 = 162.0	
2-36 + 1-72	= 1.5x6.0+9+153.0 = 162.0	500-140=360

Cross Drain No 7 EARTH Rd EXIST 2-24"

Sheet 585 INV 148.0

No 6 385 Ac

18 Ac

403 Ac = 0.63 M²

2-72" INV 148.0

HW 155

Potter Q 550 x 0.95 = 530 cfs

NEHL 520 cfs MSE Q 520 cfs

2-36"	162 / 156.5 / 5.5 / 3 = 1.8	2x75 = 150 ; 520 / 370
2-60"	1.75x5.0 = 8.75 + 147.0 = 156.0	
2-72"	1.15x6.0 = 7.0 + 148.0 = 155.0	

Low Wall Brook EAST

No 6 Frances Street Rdwy 163.0 Exist 2-36" INV 156.50

HW. 161.0 (Build. 162.0)

Q = 500 cfs

2-36" - 4.5 - 120 cfs
1-72 380 cfs INV 151.0
2-60" 577 INV 152.5

Channel No 5-No 6 Str 72-60=12 ΔINV 160.50-152.50=8 S=0.6%

Q 577 cfs Qn = 20 W = ~~6.0~~ 8.0 V = ~~6.5~~ c ; H = 4.3

160.50+5.3=165.8 163.5 7.0
156.5

No 7 Dns Road EXIST 2-24" INV 148.0

Q = 520

2-72 = 7.0 + 147.0 = 154.0 = H.W
2-66 = 7.7

Channel No 6-No 7 Str 79-72=7.0 ΔINV 152.50-146.0=6.5 S=1.25% ~~S=0.6%~~

Q=520 ; Qn 22 W=8.0 V=6.50 ; H 3.8

No 8 Dns Road EXIST 1-24 INV 138

Q = 570

2-66" = 8.3 + 136.0 = 144.30 = HW.

S=1.2%

Channel No 7-No 8 Str 87-79=8.5 Δ 146-136=10 S=0.7%

Qn 22 W=6.0 H=5.2 V=6.0
W=8.0 H=3.8 V=6.5

No 9 Frances Street EXIST. 1-72" INV. 112/111.2

HW 121.0 Q = 745 cfs

2-72" 121.0 - 9.8 = 111.20 INV

Channel No 8-9 Str 102.50-91=16 ΔINV 136-111.25 S=0.7%

Qn 30 W=8.0 H=5.8 V=6.5
W=6.0 H V

16x7=11
14+3.5=17

85E

Cross Drain No 8 — EARTH Rd — EXIST 24"

Sheet 585 — INV 138.20

No 7 — 403 Ac
44
447 Ac = 0.7 Mi.

Potter — 2-72" INV 138.0 H.W 145.0

Q = 600 x 0.95 = 570 cfs

NEHL
Q_{10} = 230
Q_{50} = 420
Q_{100} = 570 cfs — Use Q=570 cfs

2-72 — 1.15 x 6.90 x 138. = 145.0

Cross Drain No 9A — Franco Dist — EXIST 18"

INV 146.7/145.7

A_R 40 — 53.0 x 0.40 = 21.2
A_c = 3.8 x 0.60 = 2.0
56.3 x (0.42) = 23.2

Road 152.0
DH = 230 - 152 = 80
L = 2600
T = 36
S = 80/2600 = 3.0%

Q_{50} = 3.3 x 23.2 = 77 cfs

36" — 36" - INV 143.5

HW = 2.2 x 3 + 143.50 = 150.0 (5.6)

9-9A

9 SE

EAST SAW MILL BROOK

Sheet 586

Cross Drainage No 9 - Finance Sheet .. Exist 72" INV

AR 40	10.4
AR 20	210.8
No 9A	56.3
No 8	447.0
	724.5 Ac

use 2-72" INV 112.40
HW 122.0

Potter

$Q = 820 \times 0.95 = 770$ cfs

NEHL 1.13 Mi

Q_{10}	= 300 cfs
Q_{50}	= 540 cfs
Q_{100}	= 730 cfs

use Q 820 + 730 + 680 = 2230

745 cfs

2-72" 1.6 × 6.0 = 9.6 + 112.40 = 122.0

EXHIBIT A

TABULATION SHEET

1. Name of map Saw Mill - France Street EAST

a. Coordinates of Crossing Cross Drain No 9

Latitude _____

Longitude _____

b. Drainage area, A = 724 acres or .724 x 1000 acres
(640 acres = 1 sq. mi.)

c. Length of stream L = 108-20 - 88+9 = 1.66 miles

.3L = 260 = 0.50 miles

.7L = 620 = 1.16 miles

Elevation (a) at headwater 190 ft.

Elevation (b) at .7L above crossing 170 ft.

Elevation (c) at crossing 118 ft.

$S_1 = \frac{EL(a) - EL(b)}{.3L} = \frac{20}{40}$ ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L} = \frac{52}{45}$ ft./mi.

$\sqrt{S_1}$ = 6.3 $\sqrt{S_2}$ = 6.7

$T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{0.5}{6.3} + \frac{1.16}{6.7} = \frac{0.8}{0.08 + 0.173} = 0.253$

2. From Figure 1

a. P-index = 1.90 Zone I

3. Find Q_{10} using:
(fig. 2, 3, or 4)

Zone I

Area .724

P-index 190

T 0.253

a. First estimate of Q_{10} = 0.15 in 1000 cfs = 150 cfs.

S. M. E. 9

b. Refer to figure 4 or 5

Using Zone I Find $\hat{T}$ = 0.13

Area 724

P-index 1.90

T 0.253

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{3.5 \quad 0.12}{0.13}$ % 94%

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.25}{0.13}$ 1.92 C = 2.50 (fig. 6)

(2) C x Q_{10} of 3a = 150 x 2.50 = 374 cfs

4. Final Q_{10} = 374 cfs

Q_{25} = _____ cfs

Q_{50} = 540 cfs

Q_{100} = 780 cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Zone Between envelope curves Yes No

10-10A

10 SW

WEST NORTH SAW MILL BROOK - SW

Cross Drain No 1 — New Britain Av — Exist 15" / 30" + 18"

Sheet 492

INV 208.0 / 205.0

Rdwy. 214.0 / 210

AR_{20} = 15.1 Ac × 0.45 = 6.8

Q_{50} = 6.8 × 4.4 = 30 cfs

Q_{25} = 6.8 × 4.0 = 27 cfs

Δ H 240 - 208 = 32 L = 1000

T = 22 mm

S = 3.2%

~~24" RCP~~ 24" = Q 27

~~24" RCP~~ - HW = $207.0^{INV} + 4.0^{HW} = 211.0$

30" RCP $208.0 + 1.2^{3.5"} \times 2.5 = 211.0$ use

Cross Drain No 2A — New Britain Av — Exist 18"

Sheet 492

INV 211.7 / 210.9

Rdwy 215.0

24" - INV 210.5

AR_{20} 10.4 Ac × 0.45 = 4.7

Q_{50} = 4.7 × 5.1 = 24 cfs

Q_{25} = 4.7 × 4.5 = 21 cfs

Δ H 234 - 213 = 31

T = 16 mm

L = 650

S = $\frac{31}{650}$ = 4.8%

24" RCP - HW = 3.0 + 210.5 = 213.50

Cross Drain No 2 — Field Rd EARTH — Exist 36" / 24"

Sheet 492

INV 184.5?

Pressure Wetland

Channel 205 - 185 = 20 ft L = 3000

S = 0.7 V = 6

AR_{20}	= 54.4 × 0.45 =	24.6	
No 1	= 15.1	6.8	
No 2A	= 10.4	4.7	
	79.9 Ac	36.1	

Tc 22 + 6 = 28 mm

Ref 1-36" 0.01

2-36" 183 / 184

Q_{50} 36.1 × 3.9 = 141 cfs

Q_{25} 36.1 × 3.5 = 126 cfs

2-36" HW = $184.0^{INV} + 5.1 = 189.1$ See Calc.

1-48

1-54" HW = 183.50 + 5.5 = 189.0 use ?

10A Sw

Sand Hill Branch - WEST

No 2 Earth Rd Q = 141 cfs Exist 36" & 24", Inv 184.0

Exist 36 & 24" HW = 184 + 7.0 = 191.0 Invert rk

90 - 36" - 6.6
45 - 24" - 6.6
135

to use 1-54 HW = 183.5 + 5.5 = 189.0 → to drain

No 3 New Rd Q = 146 cfs Exist 3.5 x 22" Inv 173.6
Rdwy 178.50

54" - HW = 172.0 + 5.5 = 177.50
3.5 x 22" - measure ruby 60 cfs

Channel No 4c To No 3 Q = 90 cfs
EL 179.50 - 169.50
W = 4.0 S = 1.0% V = 5.0 HW 2.30

By passing 4D Channel No 3 to 4D Q = 214 cfs Not
169.50 to 166.0
W = 4.0 S = 1.0% V = 6.0 HW = 3.5

No 4 (6) Tea Road Hwy Q = 345 cfs Inv 109.0
Rdwy 116.0

66" - HW = 104 + 10.0 = 214.0
72" - Inv 9.0 = 213.0
Ex 48" & 60" - 107 + 8.0 = 215.0

48 109.50 + 5.5 = 115.0
60 108 + 1.5 x 5 = 116

345
120 cfs
225 cfs

11 SW

Cross drain No 3 — New Rd — Ex. 35"x22"

Sheet 492

INV 173.6/172.7

Road 177.

A_{R40}	8.0 Ac x 0.4	3.2	
No 2	79.9	36.1	
	87.9 Ac	39.3	

T_c = 28+2 = 30 mn

Q_{50} 39.3 x 3.7 = 146 cfs

Q_{25} 39.3 x 3.3 = 130 cfs

Cross drain No 4A — Trinity Ridge Dr. — Exist 30"x18"

Sheet 492 & 493

INV 208.0/206.8

Road 212.0

A_{R20} 14.6 Ac x 0.45 = 6.6

ΔH = 236 - 208.28; L = 1600; S = 1.7% OK

Q_{50} 6.6 x 4.2 = 28 cfs

Q_{25} 6.6 x 3.7 = 24 cfs

T_c = 25 mn

HW = 208.0 + 2.5 = 210.50

Cross drain No 4B — New Contour Dr. — Exist 18"

INV 204.3/203.3

Road 206.0

A_{R20}	2.2 Ac	x 0.45	= 1.0
No 4A	14.6 Ac		6.6
	16.8		7.6

Q_{50} = 7.6 x 4.1 = 31 cfs

Q_{25} = 7.6 x 3.6 = 27 cfs

T_c = 25+1 = 26 mn

24" INV 201.50

24" HW = 201.50 + 4.0 = 205.5?

Cross Drain No 4C — EARTH Rd — EXIST 12"

Sheet 493 — Inv 179.2

R_{R40} = 41.4 × 0.4 = 16.6
No 4B = 16.8 — 7.6
58.2 Ac — 24.2

AH-216-180.36 — L = 2000 ; S = 1.8%
Tc = 35 min
Mag & Wet Land

48" — Inv 175.0

Q_{50} = 24.2 × 3.6 = 87.0
Q_{25} = 24.2 × 3.2 = 77.0

48" − HW = 178.6 + 5 = 183.6

Cross drain No ~~4D~~ 4 New Rd — 2-24" CMP

Sheet 493

Present
A_{R40} = 16.3 × 0.40 = 4.5
No 4C = 58.2 — 24.2
No 3 = 87.9 — 38.3
157.4 Ac — 67.0

L = 1100 ft
Tc = 35 + 4 = 39

Q_{50} = 67 × 3.2 = 214 cfs

2-48" — 167 + 4 × 1.2 = HW 172.0

Channel 4-5 — S = 4.0/250 = 1.6% — B = 4.0 — H = 3.0

Cross drain No ~~4D~~ 5 New Rd — 2-24" CMP

Sheet 493 — Inv 164.0, 165.4

Present
A_{R40} = 7.1 × 0.40 = 2.8
No 4D = 157.4 — 67.0
164.5 Ac — 69.8

L = 3??

Q_{50} = 69.8 × 3.1 = 222 cfs

2-48" — 163 + 4 × 1.2 = HW 168.0

13 SW

Cross drain No ~~4B~~ New Rd 2-24" CMP

Sheet 493

FUTURE $A_{R\,40}$ 7.1 Ac x 0.4 = 2.8 if By-pass by Channel No 4

FUTURE Q_{50} 2.8 x 4.5 = 12.6 cfs ΔH 210-168 = 42 L = 10m; S = 4.2%

Channel rel. Q_{25} 2.8 x 4.0 = 11.3 cfs T = 21 mm

6A

Cross drain No ~~4E~~ New Rd Exist 18"

Sheet 493. 585 Rdw 165.4 INV 162.3

$A_{R\,40}$ 64.8 Ac x 0.4 = 26.0 42" - INV 157.0

Q_{50} 26.0 x 3.3 = 88 cfs ΔH 254-164 = L = 30m S = 3%

Q_{25} 26.0 x 3.0 = 78 cfs T 35 mm

42" — H/W = 158 + 5.0 = 163.0

Cross drain No 4G JEN Road Highway Farm Rd Hwy Exist 48"

Sheet 585 INV ~~109.0~~ 110.0

$A_{R\,40}$	11.3 Ac	x 0.4 =	4.5
$A_{R\,40}$	48.3 Ac	x 0.4 =	19.3
No 3	87.9		38.3
No 4C	58.2		24.2
No 4D	7.1		2.8
No 4E	64.8		26.0
No 4	277.6 Ac		115.1

Rdw 122.0

By pass ing 118.0

ADD 1-60

L = 200m Tc 40 + 6 = 46 min

Q_{50} 115.1 x 3.0 = 345 cfs

Q_{25} 115.1 x 2.7 = 312 cfs

Potter - 6 380 x 1 = 380 cfs

Hwy 108 + 7.0 = 115.0 (1.4 x 5.)

NEHL 0.45 M_1^{-2}

Q_{10} = 165 cfs

Q_{50} = 380 cfs

Use Q = 345 + 380 + 3 m = 342 cfs

14-14A-14B

14 Sht

Saw Mill East

10A

Cross Drain No 5A France Street Exist 18"

Sht 687

INV 149.7

$AR_{20} = 14.45 \times 0.45 = 6.5$

ΔH 295-150 = 145

L = 13m S = 11%

$Q_{50} = 6.5 \times 5.4 = 35$ cfs

$Q_{25} = 6.5 \times 4.8 = 31$ cfs

Tc = 18

Row 152.0 30" H/W $1.3 \times \overset{3.5}{2.5} + 147 = 150.5$

24" $2.2 \times \overset{4.5}{2} + 146 = 150.5$

10B

Saw Mill East

Cross Drain No 5B France Street Exist 18"

Sht 687

INV 179.60/180.

2.40

182.40

$AR_{20} = 8.0 \times 0.45 = 3.6$

ΔH 300-180=120 L=9m 13%

$Q_{50} = \overset{3.6}{\cancel{6.5}} \times 6.0 = 21.6$ cfs

$Q_{25} = \cancel{6.5} \times 5.4 = 19.5$ cfs

Tc = 15

24" $1.3 \times \overset{2.4}{2} + 178 = 180.6$

Confluence Point No 10 North & South Branch

586

EL 62.0

AR_{40} =	149.2 Ac	× 0.40 =	60.0
No 5A =	14.5		6.5
No 5B	8.0		3.6
	171.7		70.1
No 4	277.6		
	448.3		
No 9	724.5		
	1172.8	Ac =	1.83 M_i^2

L = 1+m 1600
2 3+m
3 6m
400
4 2m
5 2.2m
6200

Pitts

S = 240 - 62 = 178 L = 9200

S = 2%

$Q_{50} = 1120 \times 1.0 = 1120$ cfs

P.R.O.S.W

Q = 1200 cfs

NEHL 1.76 M_i^2

Q_{10} = 420 cfs

Q_{50} = 780 cfs

Q_{100} = 1060 cfs

Use Q = 1120 + 1060 + 1200 = 1120 cfs

EXHIBIT A

TABULATION SHEET

140 Sec 4 W

1. Name of map Saco Mill Brook No 4 & No 9

a. Coordinates of Crossing

Latitude Con Fluence No 10 S No 5

Longitude

b. Drainage area, A = 1172.8 acres or 1.17 x 1000 acres
(640 acres = 1 sq. mi.)

c. Length of stream L = 920 = 1.56 miles

.3L = 2460 0.42 miles

.7L = 5741 1.10 miles

Elevation (a) at headwater 210.0 ft.

Elevation (b) at .7L above crossing 188.0 ft.

Elevation (c) at crossing 62.0 ft.

$S_1 = \frac{EL(a) - EL(b)}{.3L}$ (22) / .42 = 52.5 ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L}$ (126) / 1.1 = 114 ft./mi.

$\sqrt{S_1}$ = 7.25 $\sqrt{S_2}$ = 10.6

$T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{0.42}{7.4} + \frac{1.1}{10.6} = .057 + 0.104 = 0.161$

2. From Figure 1

a. P-index = 1.9 Zone I

3. Find Q_{10} using: (fig. 2, 3, or 4)

Zone I

Area 1172

P-index 1.9

T 0.16

a. First estimate of Q_{10} = 7.00 in 100's cfs = 700 cfs.

b. Refer to figure 4 or 5

Using Zone I Find $\hat{T}$ = 0.175

Area 1172

P-index 1.9

T 0.158

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{0.158 - 0.175}{0.175}$ = 11.4 %

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = 700 cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.158}{0.175}$ = 0.91 c = 0.84 (fig. 6)

(2) C x Q_{10} of 3a = 0.84 x 700 x _____ = 580 cfs

4. Final Q_{10} = 580 cfs

Q_{25} = _____ cfs

Q_{50} = 1050 cfs

Q_{100} = 1200 cfs

Q_{200} = 1400 cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Zone Between envelope curves Yes No

14B 5w

Saw Mill Brook E&W

No 10 Confluence Point

Channel No 10 - No 11 Q = 1120 use S = 0.6%

Qn = 45 W = 10' ; H = 6.8 V = 7.0
W = 12 H = 6.5 V = 7.0

No 11 Frame Street

H.W. 39.50 Q = 1220 cfs Rating fig. 42.0

Box 14' x 10' H

72.5 — 156 — 43 / 113 / 66 × 1.2 = 2.1 — 6 / 10.

9 × 14 = 126 V = 10 100 — 49 / 51 × 1.2

8 × 14 = 112 V = 11 = 120 — 12 / 70 × 1.2

7 × 14 = 98 V = 12.8

164 / 114

1.7

E = 2.3 + 1.36 = 31.0

H.W. = 9 + 1 = 10

H.W. = 8 + 1.5 = 9.3.

7 + 22 = 9.3

15 S-4W

Cross section No 11 France Street EAST 2-30 1-36

688 = 588

INV 31.0

H/W 36.0

AR 40 238.6 Ac

No 5 1172.8 Ac

1411.4 Ac = 2.2 Mi²

Proj.

Q = 1280 cfs

R.R. of S.W

Q = 1250 cfs

NEHL

Q_{10} = 570 cfs

Q_{50} = 900 cfs

Q_{100} = 1300 cfs

Use Q = 1280 + 1300 1290 cfs

H/W 42.0; INV = 31.4; 14 x 10" H/W = 30.+9.8 = 39.8 40.4

CR 0.5%

WATER

10x8 V=15.3 3.8

10x9 13.5 - 3.0

12x8 = 96 ; V=13

12x9 = 108 ; V=11.3

14x8 = 113 V = 10.2 ; 1.20 2.8

14x9 = 126 V = 9.7 ; 1.40 = 10.4

H/W 42.0 Box 14x10; H/W 39.8 (90°) Inv. 30.80

EXHIBIT A

15A S_{EQ}

TABULATION SHEET

1. Name of map Saw Mill Brook E & W

   a. Coordinates of Crossing Rt 11 - Fremont Street

      Latitude _____

      Longitude _____

   b. Drainage area, A = 1411 acres (640 acres = 1 sq. mi.) or 1.411 x 1000 acres

   c. Length of stream L = 8200 + 4500 = 12700 = 2.4 miles

      .3L = 3800 = 0.7 miles

      .7L = 1.7 miles

      Elevation (a) at headwater 210 ft.

      Elevation (b) at .7L above crossing 175 ft.

      Elevation (c) at crossing 32 ft.

      $S_1 = \frac{EL(a) - EL(b)}{.3L}$ = 50 ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L}$ = 84 ft./mi.

      $\sqrt{S_1}$ = 7.1 $\sqrt{S_2}$ = 9.2

      $T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{0.7}{7.1} + \frac{1.7}{9.2} = 0.1 + 0.185 = 0.295$

2. From Figure 1

   a. P-index = 1.9 Zone I

3. Find Q_{10} using: (fig. 2, 3, or 4)

   Zone I

   Area 1411

   P-index 1.9

   T 0.29

   a. First estimate of Q_{10} = 440 in 1000 cfs = 440 cfs.

15A S E & W

b. Refer to figure 4 or (5)

Using Zone 1

Area 1411

P-index 19

T 0.295

Find $\hat{T}$ = 0.215

$$\left[\frac{\hat{T} - T}{\hat{T}}\right] 100 = \frac{0.215 - 0.295}{0.215} \% = 37.2\%$$

0.08

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.295}{0.215}$ = 1.37 c = 1.70 (fig. 7-6)

(2) C x Q_{10} of 3a = 440 x 1.70 = 750 cfs

4. Final Q_{10} = 750 cfs

Q_{25} = _____ cfs

Q_{50} = 1100 cfs

Q_{100} = 1400 cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Zone Between envelope curves Yes No

16 S E & W

Cross channel No. 12 — EARTH Rd — EXIST 40"
Sheet 68 — INV 29.20

AR 20 = 122.70
No 6 = 1411.4
1534.1 Ac = 2.4 M²

Box 14x10 Inv. 28.5
HW = 38.50

Potter
Q = 1350 cfs

NEHL
Q10 = 540 cfs
Q50 = 1110 cfs
Q100 = 1350 cfs

use Q = 1355

Cross channel No 13 — EARTH Rd — EXIST 2-36
Sheet 68 — INV 26.4

AR 20 = 10.7
No 7 = 1534.1
1544.8 Ac = 2.42 M²

Box 14x10 Inv. 26.5
HW = 36.50

Potter
Q = 1360 cfs

use Q 1360

NEHL
Q10 = 540 cfs
Q50 = 1000 cfs
Q100 = 1350 cfs

EXHIBIT A

16A S E & W

TABULATION SHEET

1. Name of map Saw Mill Brook E & W

a. Coordinates of Crossing

Latitude 13 No 7 18

Longitude

b. Drainage area, A = 1534 acres or 1.534 x 1000 acres
(640 acres = 1 sq. mi.)

c. Length of stream L = 12700 + 3mm - 13mm = 2.46 miles

.3L = 0.73 miles

.7L = 1.73 miles

Elevation (a) at headwater 210.0 ft.

Elevation (b) at .7L above crossing 173.0 ft.

Elevation (c) at crossing 29.0 ft.

$S_1 = \frac{EL(a) - EL(b)}{.3L}$ (37) $= \frac{}{0.73}$ = 51.0 ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L}$ (144) $= \frac{}{1.73}$ = 83.2 ft./mi.

$\sqrt{S_1}$ = 7.1 $\sqrt{S_2}$ = 9.1

$T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{0.73}{7.1}$ (0.103) $+ \frac{1.73}{9.1}$ (0.19) = 0.293

2. From Figure 1

a. P-index = 1.9 Zone 1

3. Find Q_{10} using:
(fig. 2, 3, or 4)

Zone 1

Area 1.534

P-index 1.9

T 0.293

a. First estimate of Q_{10} = 500 in 1000 cfs = 500 cfs.

No 7

b. Refer to figure 4 or 5 Find $\hat{T}$ = 0.23

Using Zone I

Area 1.534

P-index 1.9

T 0.295

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{0.23 - 0.295}{0.23}$ % = 0.065

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10} c = 1.60 (fig. 6)

(1) $\frac{T}{\hat{T}}$ = $\frac{0.295}{0.23}$ 1.28

(2) C x Q_{10} of 3a = 500 x 1.60 = 800 cfs

4. Final Q_{10} = 800 cfs

Q_{25} = _____ cfs

Q_{50} = 1200 cfs

Q_{100} = 1350 cfs

Q_{200} = 1575 cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Zone Between envelope curves Yes No

Prescott

Low Mill East — JDR 1-10-75

Cross drain No 4 West Street — 2-36" CCP

491 — Rated 176.00

No 4 200 Ac un develp. $\bar{I}$ = .30 = 60.0

T_c = 42

Q_{50} = 60 × 3.0 = 180 cfs

H_w = 3 × 2.3 + 168.90 = 175.80 ok

Saw Mill Brook East

CDC
1-10-75

Cross Drain No. 5A Elm St.

Exist 15" RCP
INV. 183.00 Rdy 187.90

A_c - 0% Devel., 100% Grass
USE COEF. 0.3

A_{RM} - 0% Devel., 100% Grass
Use COEF 0.3

$A_c = 6.5\ Ac. \times 0.3 = 1.9$
$A_{RM} = \frac{7.0\ Ac}{13.5} \times \frac{0.3}{(0.3)} = \frac{2.1}{4.0}$

$L = 1000$ ft $S = 0.8\%$
$T_c = 37$ Min

$Q_{50} = 4.0 \times 3.2 = 12.8$ cfs

$H.W. = 183.00 + (1.25 \times 3.1) = 186.9$ (3.9)

Not Adequate diff. 0.5 ft.

Cross Drain No. 5C Cromwell Ave

Exist 18" RCP
INV. 196.80 Rdy 201.60

A_c - 0% Devel., Grass 100%
Use 0.3 COEF.

$A_c = 10.6\ Ac \times 0.3 = 3.2$

$L = 1200$ ft $S = 3.7\%$
$T_c = 30$ Min

$Q_{50} = 3.2 \times 3.7 = 11.8$ cfs

$H.W = 196.8 + (1.5 \times 1.6) = 199.20$ (2.4)

OK

Saw Mill Brook East

1-10-75

Cross Drain No. 5D Cromwell Ave.

Exist 18" RCP
Inv. 198.50 Rdwy 202.00

A_c - 10% Devel., Grass 90%

$A_c = 0.10 \times 0.6 = 0.06$
$GRASS = 0.90 \times 0.3 = 0.27$
0.33

$A_c = 8.0 \times 0.33 = 2.6$

$L = 900$ ft $S = 5\%$
$T_c = 22$ Min

$Q_{50} = 2.6 \times 4.4 = 11.5$ cfs

$H.W. = 198.50 + (1.5 \times \frac{2.3}{1.5}) = 200.8$ O/C

Cross Drain No. 5E Cromwell Ave

Exist 18" RCP
Inv. 189.60 Rdwy 192.0

A_c - 25% Devel, Grass 75%

$A_c = 0.25 \times 0.6 = 0.15$
$Grass = 0.75 \times 0.3 = 0.23$
0.38

$A_c = 15 \times 0.38 = 5.7$
↑ Reduced Area Due To Pond

$L = 1000$ ft $S = 5\%$
$T_c = 21$ Min

$Q_{50} = 5.7 \times 4.5 = 25.6$ cfs

$H.W = 189.60 + (1.5 \times \frac{7.25}{4.9}) = 196.95$

Not Adequate

Saw Mill Brook East

COE
1-10-75

Cross Drain No. 9A France St.

Exist 18" RCP
Inv 146.70 Rdwy 152.0

A_c - 0% Devel Grass - 100%
USE COEF. 0.3

A_{R40} - 13% Devel, Grass - 87%

A_{R40} = 0.13 × 0.40 = 0.05
Grass = 0.87 × 0.30 = 0.26
0.31

A_c = 4.7 A_c × 0.3 = 1.4
A_{R40} = 55.3 A_c × 0.31 = 15.9
60.0 (0.3) 17.3

L = 2600 ft S = 30%
T_c = 44 Min.

Q_{50} = 17.3 × 2.9 = 50.2 cfs

H.W. = 146.7 + (1.5 × 6+) = 155+
Not Adequate

Cross Drain No. 10A France St.

Exist. 18" RCP
Inv. 149.7 Rdwy 152.0

A_{R20} - 0% Devel, Grass 100%
USE COEF. 0.3

L = 1300 ft S = 11%
T_c = 25 Min

A_{R20} = 14.95 A_c × 0.3 = 4.35

Q_{50} = 4.35 × 4.2 = 18.3 cfs

H.W. = 149.7 + (1.5 × 2.7) = 154.2 (4.05)
Not Adequate

Saw Mill Brook East

CDC
1-10-25

Cross Drain No. 10 B France St. Exist 18" RCP
Inv. 179.60 Rdwy 182.± Present

A_{R20} - 0% Devel., Grass 100%
Use Coef. 0.3

A_{R20} - 8.0 Ac. × 0.3 = 2.4

L = 900 ft S = 13%
T_c = 21 Min

Q_{50} = 2.4 × 4.5 = 10.8 cfs

H.W. = 179.6 + (1.5 × 1.4) = 181.7 OK - Earth Rd.
2.1

Saw Mill Brook - West

COC
1-10-75

Cross Drain No. 1 New Britain Ave

Exist 30" x 18" 15"
Inv. 208.4 / 205.0
Rdw. 214 / 210

A_{R20} = 15% Devel, Grass - 85%

A_{R20} = 0.15 x 0.45 = 0.07
Grass = 0.85 x 0.30 = 0.25
0.32

L = 1000 ft S = 3.2%
T_c = 27 Min

A_{R20} = 15.1 Ac. x 0.32 = 4.8

Q_{50} = 4.8 x 4.0 = 19.2 cfs

H.W. = 210.2 + (1.25 x 6.2) = 217.95 Not Adequate
7.75

Cross Drain No. 2A New Britain Ave.

Exist 18"
Inv. 211.7 Rdw 215.0

A_{R20} = 45% Devel, Grass 55%

A_{R20} = 0.45 x 0.45 = 0.20
Grass = 0.55 x 0.30 = 0.17
0.37

A_{R20} = 10.4 Ac x 0.37 = 3.86

L = 650' ft S = 4.8%
T_c = 19 Min

Q_{50} = 3.86 x 4.7 = 18.1 cfs

H.W. = 211.7 + (1.5 x 2.6) = 215.6 Not Adequate
2.9

No 3

Saw Mill Brook - West

C&C
1-10-75

Cross Drain No. 2 Field Road

Exist 36" + 24"
Inv. 184.00 Rdwy 188.00

2 A_{R20} - 15% Devel., Grass - 85%

$A_{R20} = 0.15 \times 0.45 = 0.07$
Grass $= 0.85 \times 0.30 = 0.25$
0.32 Coef.

2A From Sheet 1
A_{R20} - 10.4Ac × 0.37 = 3.86
T_c = 19 Min

1 From Sheet 1
A_{R20} - 15.1 Ac × 0.32 = 4.8
T_c = 27 Min

2	= 54.4 Ac × 0.32	= 17.40	
2A	= 10.4 Ac. × 0.37	= 3.86	
1	= 15.1 Ac × 0.32	= 4.80	L = 3,000 ft
	79.9	26.0	

T_c = 27 + 13 = 40 min

Q_{50} = 2.6 × 31 = 81.0

SDB
OK

Cross Drain No 3 New Rd

Exist. 35" + 22"
Rdwy 178.50
Inv 173.60
JDR

Q_{50} 90.0 — No Good

Cross Drain No 6

Ten Road 1-48"
Inv 110.0
Rdwy top pave 118.0

Q_{50} = 16 cfs JDR
OK

H_W = 110 + 1.6 × 4 = 116.4

LITTLE BROOK

Little Brook

Cross Drain No 1 — Falcon Ridge Road — East 24"

Sh 407

INV 187.10 187.5

Rein 198.50

A_{R20} = 23.9 × 0.45 = 10.8

Q_{25} = 4.1 × 10.8 = 44.5 cfs

Q_{50} = 4.6 × 10.8 = 50.0 cfs

use 36"

ΔH 225 − 190 = 35

L = 1100 S = 3.5/110 = 3.2 Tc = 20

use 36"

HW 187.0 × 3.6/3 × 1.2 = 190.6

Long. Drain 2A — Falcon Ridge Rd — East 24"

Sh 408

INV 218.0

Rein 223.0

A_{R20} = 23.2 × 0.45 = 10.5

Q_{25} = 10.5 × 4.5 = 47.5

Q_{50} = 10.5 × 5.0 = 52.5

ΔH 330 − 220 = 110

L = 1500 S = 110/150 = 7.4% Tc = 21

use 36"

36" HW 218.0 + 1.2 × 3.6/3.0 = 221.6.0

Cross drain No 2 — Trinity Ridge — East 36"

Sh 493

INV 176.8

Rein 183.50

use Add 54"

A_{R24} = 74.3 × 0.45 = 33.4

No 1 = 23.9 = 10.8

No 2A = 23.2 = 10.6

121.4 54.8

Q_{50} = 54.8 × 4.1 = 224 cfs

Tc = 20 + 6 = 26

60" HW 176.8 + 5 × 7.5/1.5 = 184.3

add 1-54" HW 176.2 + 6.3 = 182.51

1-36 HW 176.8 + 5.7 = 182.50

224
160
65

Little Brook

Cross Drain No 3 Fuchs Rd — Exist 48"

Sheet 493

INV 132.40
Rdwy 135.6

A = 296.7
No 2 = 121.4
418.1 = 0.65 Mi²

Rational: Q50 = 530
NEHL: Q50 = 360, Q100 = 480

use Q = ½(530+360) = 480 cfs

1-84" HW = 132.0 + 1.4 × 7.0 (9.8) = 140.0

Cross Drain No 4A NW Bottom Rd — Exist 18"

Sheet 586

INV 167.0
Rdwy 171.0

A R20 = 3.8 × .45 = 1.7
D R40 = 17.5 × .40 = 7.0
21.3 8.7

ΔH 216 − 170 = 46
L = 2700' S = 46/2700 = 2.6 Tc = 25

Q25 = 8.7 × 3.7 = 32.0

30" HW 167 + 1.2 × 2.5 = 170.0

Cross Drain No 4 Beach Rd — 2.36'

Sheet 587

INV 102.8
Rdwy 108.0

A = 78.7
No 3 = 418.1
No 4A = 21.3
518.1 = 0.81 Mi²

Rational: Q50 = 660
NEHL: Q50 = 450, Q100 = 600

use Q = 600 cfs (193.2 / 7.8)

2-72" HW = 6 × 1.30 + 99.3 = 107.1

114x78

L-3

Cross Drain No 5 Colby Rd Exist 108"x78"

INV 74.1
Road 82.5

A = 120.2
No 4 = 518.1
638 = 1.0 M.

Patten Q = 730
NEHL Q50 = 510
Q100 = 690

use Q = 690 cfs

A = 44 sft V = 16 $\frac{16}{2g}$ = 4 x 1.25 = 5.0

HW = 74.1 + 7.5 = 81.6 1.8 x 44 = 354 cfs

1.4 x 6 = 8.4

ADD 1-72 INV 73.0 HW = 73.0 + 8.5 = 81.5 81.6

69.0
336

Cross Drain No 6A ~~WEATHERSFIELD~~ New Bristol Minor

Road 130

13 x 0.4 = 5.2

~~Q_{25} 22.4 x 0.4 = 10~~

5.2 x 3.5 = 18 cfs

~~Q_{50} 10 x 3.4 = 34~~
25

~~Δ H 20 - 12.0 = 8.0~~
~~L 270' S $\frac{8.0}{270'}$ = 3.2~~ Tc 28 min

~~24" HW 10.1 + 2.2 x 2 = 10.5~~

24" HW 12.5.6 + 1.2 x 2.0 = 12.9.0

Cross Drain No 6B Weathersfield Exist 24"

INV 101.0
Road 110.0

A_{R4} = 9 x 0.4 = 3.6
Q_{25} = 3.6 x 3.7 = 13.5 cfs

24" HW. 101.0 + 2.0 = 103.0

T = 25 min

Little Brook

acc. 1-13-75

Cross Drain No. 1 Falcon Ridge Rd.

Exist 24" Inv. 187.5 Rdwy. 191.50

A_{R20} - 65% Devel., Grass - 35%

A_{R20} - $0.65 \times 0.45 = 0.29$
Grass - $0.35 \times 0.30 = 0.11$
0.40

$A_{R20} = 23.9\ Ac \times 0.40 = 9.6$

L = 1100 ft S = 3.2%
T_c = 24 Min

$Q_{50} = 9.6 \times 4.3 = 41.3$

$H.W. = 187.5 + (2 \times 3.2) = 193.9$ (6.4)

Not Adequate

Cross Drain No. 2A Falcon Ridge Rd.

Exist 24" Inv. 218.0 Rdwy 223.0

Previous Calc. Govern - Not Adequate

$A_{R20} = 23.2 \times 0.45 = 10.5$

T_c = 21 Min

Cross Drain No. 2 Trinity Ridge Rd.

Exist 36" INV. 176.8 Rdwy - 183.50

A_{R20} - 0% Devel., Grass 100%
Use Coef. 0.3

1 - $23.9 \times 0.40 = 9.6$
2A - $23.2 \times 0.45 = 10.5$
2 - $24.3 \times 0.30 = 25.3$
121.4 45.4

L = 1700 S = $\frac{10}{1710} = 0.6\%$
$\Delta H = 190 - 180 = 10$

T_c = 46 Min

$Q_{50} = 45.4 \times 2.8 = 127$ cfs

$H.W. = 176.8 + (3 \times 4.1) = 189.1$ (12.3)

Not Adequate

Little Brook

L-5
doc
1-13-75

Cross Drain No. 3 Field Rd.

Exist 48"
Inv. 132.4
Rdwy 135.6

Previous Calc. Govern. - Not Adequate

Cross Drain No. 4A New Britain Ave.

Exist 18"
Inv. 167.0
Rdwy 171.0

A_{R20} - 80% Devel., Grass 20%

$A_{R20} = 0.8 \times 0.45 = 0.36$
Grass $= 0.2 \times 0.30 = \underline{0.06}$
0.42

A_{R40} - 22% Devel., Grass 78%

$A_{R40} = 0.22 \times 0.40 = 0.09$
Grass $= 0.78 \times 0.30 = \underline{0.23}$
0.32

A_{R20}	3.8×0.42	1.6
A_{R40}	17.5×0.32	5.6
	21.3×0.34	7.2

$L = 2000$ ft $S = 2.6\%$
$T_c = 34$ Min

$Q_{50} = 7.2 \times 3.4 = 24.5$ cfs

$H.W. = 167.0 + (1.5 \times 4.9) = 174.4$ (7.4) Not Adequate

VALLEY BROOK

West

Valley Brook - West

✓ Cross Drain 1A (Gilbert Ave) EXIST 24" RCP OK

Sht 491 A×1

$A_{RH} = 3.1 \times .62 = 1.9$

$A_C = \frac{5.1}{8.2} \times 6.0 = \frac{3.1}{5.0}$ (.V)

ΔH 244 - 226 = 18 ft L = 1000 ft S = $\frac{18}{1m}$ = 1.8% Tc = 16 min

$Q_{25} = 5.0 \times 4.5 = 22.5$

$Q_{10} = 5.0 \times 3.9 = 19.5$

Q_{25} Rdwy. 218.0 INV 212.81 HW 212.81 + 2.0 + 1.20 = 216.0

Cross Drain 1B (Gilbert Ave) Ex. 18" RCP OK

Sheet 491

A×1

$A_{RH} = 3.7 \times .62 = 2.3$

ΔH = 234 - 212 = 22 ft L = 650 ft S = $\frac{22}{650}$ = 3.4% ; Tc = 12 min

$Q_{25} = 2.3 \times 5.2 = 12.0$

$Q_{10} = 2.3 \times 4.4 = 10.0$

Q_{25} Rdwy 216.0 INV 208.80 HW 208.8 + 1.5 + 1.0 = 211.3

Cross Drain 1C (Gilbert Ave) Ex. 18" RCP OK

Sheet 491

A×I

$A_{RH} = 4.0 \times .62 = 2.5$

ΔH = 230 - 210 = 20 ft L = 500 ft S = $\frac{20}{5m}$ = 4.0% Tc = 10 min

$Q_{25} = 2.5 \times 5.6 = 14.0$

$Q_{10} = 2.5 \times 4.7 = 11.8$

Q_{25} Rdwy 212.0 INV 207.90 HW 207.80 + 1.5 + 1.20 = 204.60

V2w

Cross Drain 1 (Elm St.) Ex. 36" RCP

Area 491 405

	A	A x I
1A =	8.2	5.0
1B =	3.7	2.3
1C =	4.0	2.5
I =	58.0	26.0
	73.9	35.8

INV 167.66

A x I

A_{R-20} = 58.0 x .45 = 26.0

ΔH = 240 - 170 = 70 ft. L = 2510 S = 70/2500 = 2.8%

Tc = 28 min

Q_{50} = 35.8 x 3.9 = 140 cfs

Q_{25} = 35.8 x 3.5 = 125 cfs

Use 48"

Q_{50} Road EL 177.0 INV 167.70 36" RCP HW = 167.7 + 3.0 + 7.9 = 178.6

Q_{25} HW = 167.7 + 3.0 + 6.3 = 177.0

Q_{50} { use 42" RCP HW = 166 + 3.5 + 4.0 = 173.5

48" RCP HW = 166. + 4.0 + 2.40 = 172.4

Cross Drain 2 (Ridge Drive) Ex. 42" RCP

Area 491

	A	A x I
A_{RH} =	6.8 x .62	4.2
A_{R20} =	10.7 x .45	4.8
	17.5	9.0
A_1	73.9	35.8
A_2	91.4	44.8

INV 156.68

L = 200 Tc = 28 + 1 = 29 min

Q_{50} 44.8 x 3.8 = 170 cfs

Q_{25} 44.8 x 3.4 = 153 cfs

Control Ground Elev. 162.0 (ELM RIDGE DRIVE)

Q_{50} 42" RCP INV 156.70 / Cntr. 148.0 HW = 156.70 + 3.5 + 5.6 = 165.80

Q_{25} 4.4 = 164.60

Q_{50} use 54" RCP L = 700 S = 1.0% HW = 155.0 + 4.50 + 2.20 = 161.70

Prop. INV 148.0 + 7.0 = 155.0 based on 54" RCP

V3 W

Cross Section 3 (Wright Rd) Exist 36" RCP

Sheet 406 INV 139.3

		A x I
A_{R20}	= 31.7 x 0.45 =	14.5
A_2	= 91.4	44.8
A_3	= 123.1	58.3

L 4m Tc 29+1 = 30 min

Q_{50} = 58.3 x 3.7 = 216.0 cfs

Q_{25} = 58.3 x 3.3 = 192.0 cfs

Rdwy El. 145.0 Ex INV 139.30 36" RCP

Proposed Use: Q_{50} / Q_{25} Rdwy El 145.0 5.1% INV 136.50 60" RCP HW 136.5+5.0+2.40 = 144.0

Cross Section 4 (Battleship Rd) Exist. 36" RCP

Sheet 406 INV 128.8 ~~Rdwy 154.0~~

2.

		A	A x I
A_{R20}	= 10.5	x 0.45 =	4.7
A_3	= 123.1		58.3
A_4	= 133.6		63.0

L 4m Tc 30+1 = 31 min

Q_{50} = 63.0 x 3.6 = 226.0 cfs

Q_{25} = 63.0 x 3.2 = 202.0 cfs

Rdwy El 135.0 Ex. INV 128.75 / 126.70 36" RCP

Proposed Q_{50} / Q_{25} 5.1% 60" RCP INV 125.50 HW = 125.5+5+2.5 = 133.0

V 4 W

Cross Drain 5 (Orchard Street) Exist 48" RCP

Sheet 406 / 490-491 INV 111.07

	A	A×I	
$A_{R\text{-}20}$ = 21.0 + 51.0 = 72.0 × 0.45 =		32.4	ADD 54"
A_4	133.6	63.0	
A_5	205.6	95.4	T_C = 31+1 = 32 min.

Q_{50} = 95.4 × 3.5 = 334 cfs

Q_{25} = 95.4 × 3.2 = 305 cfs

Recm. EL 119.60 Ex INV. 111.10/98.80 48" RCP 2.

Proposed Q_{50} S=1.7% 60" RCP 1090/98.80 L=60m HW 109.0 + 5.0 + 4.4 = 118.4

Q_{25} 117.1

	1	48"	HW	111.0 + 7.0 = 118.0	140
	ADD	54"	HW	110.3 4.5×1.7 (7.7) = 118.0	195

Cross Drain 6A ℄ (Elm Street) Exist 36" RCP ℄ (℄ 42")

Sheet 490 / 405 INV 125.03

Recm 131.4

$A_{R\text{-}20}$ = 7.15 × 0.45 = 32.0

ΔH = 255 − 130 = 125 L 22m S = 125/22 = 5.7%, T_C = 24 min

Q_{50} = 32.0 × 4.3 = 136.0 cfs

Q_{25} = 32.0 × 3.8 = 122.0 cfs misc 48" HW 124 + 1.6 (6.4) + 4.0 = 130.4

2. Recm EL 132.0 Exist INV. 125.0 Ex 36"/42" 124 1.6×4=6.4 130.4

Proposed Q_{50} 42" RCP S=1.7% INV 124.0 HW 124.0 + 3.5 + 2.8 = 130.30

Q_{50} Ex Pipe Cnvt 140m × 1.9 = 26.50 + 99.8 = 126.30 HW 126.3 + 3.5 + 2.8 = 132.60 (2.)

Q_{25} 140m × HW 2.0 = 131.80

48" RCP S=0.8% HW 124.0 + 4.0 + 1.6 = 129.60

Recom. Change 36" to 42" at Elm Street

MH2 Inv. El. 124.0

V S W

Cross drain No 6B Below Terry Lane Exist 48" RCP

Sheet 405 INV 99.90

A_{R-20} = 31.6 × 0.45 = 14.2 Rdwy 109.0

No 6A = 7.5 39.0

A = 103.1 46.2 T_c = 24 + 3 = 27 min.

Q_{50} = 46.2 × 4.0 = 184 cfs

Q_{25} = 46.2 × 3.5 = 162 cfs

54" HW = 99.8 + 4.5 (7.4) 2165 = 107.2

99.8 + 4 × 2.1 (8.4) = 108.2

Cross drain 6 Valley Brook Rd 2 - 42 RCP

Sheet 405 INV 91.90

		Ac	A x I
from Cross drain	5	205.6	95.4
Cross drain	6B	103.1	46.2
A_{R-20}		10.0 × 0.45	4.5
	No 6	318.7	146.1

L = 90' T_c = 32 + 2 = 34 min.

Q_{50} = 146.1 × 3.4 = 495 cfs

Q_{25} = 146.1 × 3.1 = 450 cfs

Rdwy 97.50 INV 91.80 2-42" RCP

Proposed Q_{50} 2-60" HW 88.50 + 5.0 + 3.0 = 96.5

Rittin - 3334 318.7 Ac

Q = 490 cfs

2-66 HW = 90 + 9 = 99.0

NEHL 0.5 Mc use 2-72" HW = 90 + 6 = 96.0

Q_{10} = 175

Q_{50} = 320 use Q = 1/3 (495 + 490 + 440) = 475 cfs

Q_{100} = 440

9.80 / 14.40

V6

W

Cross Channel 7 & 8 (Test Road & Ave) ENT. 2-36 RCP
2-50"x31" CMP
51"x32" Rdw 93.5?

Sheet 405

$A_{R-20} = 23.4 \times 0.45 = .106$

$A_7 = 318.7$ 146.1

$A_8 = 342.1$ 156.7 L = 4m Tc = 34+1 = 35 min

$Q_{50} = 156.7 \times 3.3 = 518$ cfs

$Q_{25} = 156.7 \times 3.0 = 472$ cfs

2-36" RCP
2-50x31" CMP

Rdw EL. 93.00 Inv 87.52

Control EL. 91.50

Proposed Q50 S=1.3 Inv 82.70/Out. 81.70 2-60" HW. = 82.70+5.0+3.3 = 91.0

S=0.8 Inv 83.44/Out 82.60 2-66" HW. = 83.44+5.5+2.4 = 91.0

use 9'-6"x6'-5" $S_f = 1.15\%$ $d_c = 4.60$ HW. = 83.10+7.20 = 90.30

Ditch to School Lane 0.3% a 200 ft. Inv. EL 82.00 HW. 90.00

280 ft a 0.7% Out. EL 80.50

Position - 333 ac 342 ac

Q = 500 cfs use 2-72" HW 86.50+6.0 = 92.50

MEHL 0.53 Ac

$Q_{10} = 180$ cfs use Q = 455 cfs

$Q_{50} = 340$

$Q_{100} = 450$ cfs

518
177
450
342
1809
450

No 8

$A_{N.7}$ 342.1
7.6
349.7 Ac

Q = 450 cfs

Cross drain No 9 below Tarbrook at school — Exist 36" — V7 w

sheet 405

A R20 = 15.2
No 8 349.7
364.9 Ac

Poor to fair cond

Q = 510

MEHL 0.56 Mi — Hse 2-72" INT 82.0 HW 88.0

Q = 190
Q = 350
Q tot = 480

Hse Q = 470 cfs

Cross drain No 10 A — Orchard Street — EXIST 18" RCP

INT 85.75
Road 92.0

A R20 = 12.7 x 0.45 = 5.7

Q 50 = 5.7 x 4.5 = 25.6 cfs
Q 25 = 5.7 x 4.0 = 23.0 cfs

ΔH 124 − 88 = 36
L = 13m = S = 36/13 = 2.8%
Tc = 21 min

18"
24"

HW 85.75 + 6.00 = 91.75
HW 85.75 + 1.7 x 2.0 = 89.15

IV

V 8

Cross drain No 10 — Passage Street

Sheet 328

AR20 = 66.7
No 10R = 12.7
No 9 = 357.3
436.7 Ac = 0.68 Mi

East 60" RCP
INV 64.50
Road 73.0

use 2-72" HW 64.5 + 6.0 = 70.5

P. Tc

Q = 590 cfs

590
530
360
1480

NEH

Q10 = 280
Q50 = 440
Q100 = 530

use Q = 510

Cross drain No 11 — Abandoned RR Water Course Ext — East 48"

Sheet 328

Ac = 26.60
AR20 = 18.20
No 10

44.8
436.7
481.5 Ac = 0.75 Mi

P. Tc

Q = 650 cfs

640
580
370
1590

NEH

Q10 = 235 cfs
Q50 = 430 cfs
Q100 = 580 cfs

use Q = 540

use 2-72" INV 47.0 HW 53.2

VALLEY BROOK - EAST

Cross drain No 12A (was 12) Grimes Rd — EXIST 24" RCP

Sheet 490 — Rim 145.0; INV 139.6

AR 20: 12.5 × 0.45 = 5.6

Q25 = 5.6 × 4.1 = 23.0 cfs
Q50 = 5.6 × 4.6 = 25.7 cfs

ΔH 166 − 144 = 22
L = 100'
S = 2.2%
Tc = 20 / 2
OK

24" HW 139.6 + 1.5×2.0 = 142.6

Cross drain No 12' Elm Sheet — EXIST 36" RCP

Sheet 405 — INV 132.3; Rim 139.0

AR 20: 59.7 × 0.45 = 26.8
No 12D: 12.5 = 5.6
72.2 — 32.4

ΔH 220 − 134 = 86
L 18m
S = 8.6/18 = 4.8%
Tc = 23

Q25 = 32.4 × 3.9 = 126 cfs
Q50 = 32.4 × 4.3 = 139 cfs

4.5×1.25

use 54" HW 132 + 5.5 = 137.5

Cross drain No 13 (was 2) Monitor View — EXIST 33"×60"

Sheet 405 — Rim 132.6 INV 128.10

AR 20: 26.8 × 0.45 = 12.0
No. 12: 72.2
99.0 — 32.4 — 44.4

Tc = 23 + 2 = 25

Q25 = 44.4 × 3.7 = 164.0 cfs
Q50 = 44.4 × 4.2 = 186.0 cfs

6.6

54" HW = 125.0 + 4.5×1.5 = 131.5
use 60" HW = 126.0 + 5×1.1 (5.5) = 131.5

V 10
E

Long Drain No 3 West of Mountain View Exist 36" RCP

Sheet 405 Ac I Sheet 40.5 INV 110.1 Exist. 120.0

AR 20 No 13: 47.1 × 0.45 = 21.2; 99.0; 44.4; 146.1; 65.6

Tc = 25 + 2 = 27

Q_{10} = 65.6 × 4.0 = 262 cfs

450 1-60" HW 109 + 1.8 × 5 = 118.0

Long. Drainage ~~Cross Drain~~ No 4A ~~15~~ below Mountain View Exist 24" RCP

Sheet 405 INV 109.0

AR 20 73.4 × 0.45 = 6.2

Q_{25} 6.2 × 4.3 = 26.6

Tc 17

HW 109 + 3.0 = 112.0

Long. ~~Cross~~ Drain No 4 ~~15~~ Chapin Ave Exist 36" RCP

Sheet 405

AR 20 No 14A: 9.6 × 0.45 = 4.3; 159.5; 71.8; 169.1; 76.1

Tc = 27 + 1 = 28

Q_{50} = 76.1 × 3.9 = 298 cfs

Bolt 1-60" owned 98.0 HW 104.0

1.6 × 5.5 + 98 = 107

Y 11
E

Cross Drain No 16 5 Sitas Drive Hwy. Exist 30"

Sheet 405

INV. 90.50
Road 97.0

A_{R20}	8.6		+ 0.45 =	3.9
A_C	8.4	17.0	× 0.60 =	5.2
No 15		169.1		76.1
		186.1		85.0

Q_{IN} = 85.0 × 3.8 = 322 cfs

Tc 28 + 1 = 29

2-60" HW 90.00 + 1.1 × 5.0 = 95.50

Cross Drain No 17A 6A Sitas Drive Hwy Exist 18"

Sheet 405

INV 95.1 Road 102.0

A_C =	7.4	× 0.6 =	4.4	4.44
A_{RH} =	8.2	× 0.6 =	4.9	4.92
	15.6		9.3	9.36

$Q_{.50}$ = 9.3 × 4.9 = 45.5

Q_{25} = 4.3 = 40.0

A_H 168 - 102
L = 110
T = 18

$S = \frac{66}{11} = 6.0$

30" HW 95.1 + 2.5 × 1.5 = 99.0

Cross Drain No 17B 6B Canal Ch. Exist 24"

Sheet 404

A = 210 - 110 = 100 INV 96.2
L = 800 S = $\frac{17}{800}$ = 1.3%
Tc = 12 Road 102.0
OK

A_{R20}	8.6	× 0.45 =	3.9	
A_{RH}	1.6	× 0.6 =	1.0	
	10.2		4.9	

Q_{50} = 4.9 × 5.8 = 28.4

Q_{25} = 5.2 = 25.6

24" HW 96.2 + 2 × 1.7 = 99.6

V12
E

6C

Cross Drain No 17 Bel Air Circle Exist 36"

Sheet 405

Inv 88.3
Rim 94.0

AR20	14.6	× 0.45 =	6.6	
ARM	17.2	× 0.50 =	8.6	
Ac	8.01	× 0.6 =	4.8	
	39.80		20.0	Tc = 18 + 3 = 21
No 17A	15.60		9.3	
17B	10.20		4.9	
	65.6		34.2	

Q_{10} 34.2 × 4.5 = 154 cfs

54" HW = 1.4 × 4.5 + 85.7 = 92.0 (6.3)
60" HW = 1.1 × 5.0 + 87.5 = 93.0 (5.5)
6

Cross Drain No 18 St Luis Drive Easy Exist 48"

Sheet 405

Inv 85.5
Rim 95.0

Ac	7.3	× 0.6 =	4.4	
AR20	4.1	× 1.45 =	1.9	
	11.4		6.3	
No 16	186.1		85.0	
No 17	65.6		34.3	
	263.1		125.6	Tc = 29 + 2 = 31

Q_{50} = 125.6 × 3.6 = 451 cfs

Pipe

2-66" HW 1.1 × 5.5 + 86.0 = 92.0 (6.0)
use 2-60" HW 1.35 × 5.0 + 85.00 = 91.8 (6.75)

Q = 430 cfs

NEHL 263 Ac = 0.41 $M_c^{1.2}$

Q_{10} = 150 cfs
Q_{50} = 270 cfs
Q_{100} = 365 cfs

Use Q = 451 + 430 + 365 = 1245 = 400 cfs

V13 E

Cross drain No 19 PARSONAGE St. EXIST 48"

Exist 328 INV 84.7+
Rdwy 95.0

AR 20 = 4.6 × 0.45 = 2.1
Ac = 39 / 8.5 × 0.6 = 2.4

No 18 263.1 / 271.6 — 125.6 / 130.1 — Tc = 31 + 1 = 32

Q = 143 × 3.5 = 500 cfs

No 7D AR 20 23.1 × 0.45 = 11 —
Ac 39 × 0.6 = 2.3
28. / 300 Ac — 143

Potter

Q = 470 cfs

NEHL 0.42 Mi

Q 10 = 170
Q 50 = 310
Q 100 = 420

use Q = 500 + 470 + 420 + 330 = 440 cfs

use 2-60" HW 1.35 × 5 + 84.0 = 90.8

Cross drain No 20A Silas Deans Hwy Exist 15"

Exist 328 Rdwy 93.5

ARM 6.5 × 0.5 = 3.2 — A 16 — INV 84.4+
L .6mi — S = 2.7%
Tc 14

Q 25 = 3.2 × 4.9 = 15.6 cfs — etc

HW 84.4 + 5/4 × 1.25 = 89.4

V14 E

Personage St Las Dams - 7A
Sheet 328

Exist 24 36
INV 88.6
Rdwy 95.2

A R2a	23.1	× 0.45	10.4
Ac	3.9	× 0.6	2.3
	27 Ac		12.7

T = 17

Q_{25} = 12.7 × 5.0 = 64 cfs

Exist
~~Use~~ 36" HW = 3×1.7 + 89.0 = 94.0 OK

S Long Silas Deane No 8

Exist 72+
INV 82.7
~~Rdwy~~/Hwm = 93.0

No 7	3 ac
No 8 A	6.5
	39
	310.4 Ac

Use Q 455 cfs

Pitkin	485 cfs
Nodl	440 cfs

72" HW 82.7 + 7.3 = 90.0 290
ADD 54" HW 83.0 + 4.5×1.5 = 91.0 165

Cross drain No ~~21B~~ 12B
Sheet 328

A Bounded R.C
~~Water Av Ext~~

Exist 30"
INV 59.0
OK

A R2a	2.0	× 0.45	0.9
A c	9.0	× 0.60 =	5.4
	11.0		6.3

Δ 112 - 60 = 52
L = 11m
S = 4.7
Tc 16

Q_{25} 6.3 × 5.2 = 33 cfs
Q_{50} 6.3 × 5.8 = 37 cfs

30" HW 1.4×2.5 + 59.0 = 62.5
3.5

Cross drain No ~~21A~~ 12A

A Bounded RC
~~Water Av Ext~~

Exist. 36"
OK

Sheet 328

A R2a	9.5	× 0.45 =	4.3
A c	11.9	× 0.60 =	7.2
	21.4		11.5

Δ = 128 - 78 = 50
L = 150 ft
S = 3.3%
T = 20

Q_{25} = 11.5 × 4.1 = 47 cfs
Q_{50} = 11.5 × 4.6 = 53 cfs

36" HW 1.35×3 + 75 = 79.0

Confluence No 12/21 East & West Valley Brook
Sheet 328

No	11	East	481.5
No	20	West	305.2
No	21	A	21.4
	21	B	11.0
Ac			65.0
			884.1

Potter

Q = 940 cfs

NE+L 1.39 Mi²

Q 10 = 360 cfs
Q 50 = 660 cfs
Q 100 = 880 cfs

Use Q 940 + 880 + 710 = 2530
= 850 cfs

Confluence Tumble & Valley Brook #
Cross Section No 22/13 Silas Deane Hwy Exist 10% Brch Inc 21.0
Sheet 328

No 12/21	884.1
TUMBLE BROOK No C	622.5
	1506.6

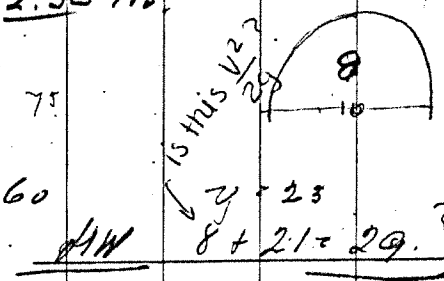
= 2.35 Sq. Mi.

Potter

Q = 1350

NE+L

Q 10 = 540
Q 50 = 1080
Q 100 = 1350



HW 8 + 21 = 29.?

Use Q = 1380 cfs

V 16

Valley

Cross drain No 14A / Marshall Rd — 54" INV 30.6, RH 40.0 — Ex. 30" & 36", INV. 33.4, Rdl 43.0, OK

328

A RH	= 21.1	× 0.6	= 12.6	
RH	= 6.8	× 0.6	= 4.1	
RQ20	= 23.9	× 0.45	= 10.8	
Ac	= 17.3	× 0.6	= 10.3	
	69.1		37.8	

ΔH 206 − 54 = 152 — L = 2400 — S = 22% — Tc = 24

Q50 = 37.8 × 4.3 = 162 cfs

30" & 36" HW — 2.3 × 3.0 + 3.0 (6.9) = 40.4

54" HW — 30.6 + 1.4 (6.4) × 4.5 = 37.0 OK

Cross drain No 14B Town Line Rd — Ext 36" INV 22.46, Rdwy 30.0, OK

260

A R20 42.6 × 0.45 = 19.3

Q = 19.3 × 4.8 = 93.0 cfs

ΔH 100 − 26 = 74 — L 1600 — S $\frac{74}{1600}$ = 4.6 — Tc = 23

36" HW — 22.4 + 2.2 (6.6) × 3.0 = 29.0

Cross drain No 14C I-91 Ramps — Ex. 60" INV. 20.0, Rdwy. 32.1, OK

Ac	= 20.90	× 0.60	= 12.6	
AR20	= 11.9	× 0.45	= 5.4	
A 91	= 1.5	× 0.57	= 0.75	
	34.30		18.8	
14B	42.6		19.3	
	76.9		38.1	

ΔH = 122.0 − 20 — L = 1600 — S = $\frac{102}{1600}$ = 6.3 — Tc = 24

Q50 32.1 × 4.6 = 176 cfs

60" HW 1.2 × 5.0 + 2.0 = 26 OK

V 17

Gas station 140 I-91

Ac	= 4.0	x 0.6	= 2.4	
Ag.	= 7.1	x 0.5	= 3.5	
AF	= 11.16	x 0.2	= 2.3	
	22.3		8.2	
14C	76.9		38.1	
	99.2		46.3	

Ea. 96"
INV 16.0
Rock 40.0
OK

Tc = 25

$Q_{50} = 46.3 \times 4.5 = 208$ cfs

96" HW 16. + .7 x 8 = 21.6

Valley Brook at Confluence with Golf Brook

A	68.3	
14A	69.1	
14D	99.2	
13	1506.6	
	1743.2	Ac = 2.72 Mi²

Pipes 1500 cfs

Nekl 10 - 584
50 - 1104
100 - 1480

USC 1500 cfs

Storm Sewer Stem Design

VALLEY BROOK WATERSHED - GILBERT AVE. (FROM RDG. NO. 157 GILBERT AVE) SHT #491

Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Exist. Pipe Size	Length of Pipe	Exist. Slope	Average Velocity	Full Capacity	Headwater	'n'	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
HW#29 TO CB#28	12.5	–	12.5	3.47	3.47	5.0	17.4	18"	40	.023	10	14		.015	
CB#28 TO CB#26	N/L	.1	12.6	.03	3.50	4.3	15.1	18"	470	ASSUMED .027	9	15		.015	
HW#25 TO CB#26	10.5	–	10.5	1.27	1.27	5.5	7.0	18"	75	.014	6	11		.015	
CB#26 TO CULV. END #27	8	.9	13.5	.41	5.18	4.9	25.4	24"	20	.018	9	27		.015	
CB#22 TO HW#23	12	–	12	2.32	2.32	5.2	12.1	18"	50	.023	8.6	14		.015	
HW#21 TO HW#20	11.5	–	11.5	2.48	2.48	5.3	13.1	18"	40	.018		13		.015	

VALLEY BROOK WATERSHED - ELM ST. (FROM CHURCH @ 797 ELM ST.) (SHT #49)

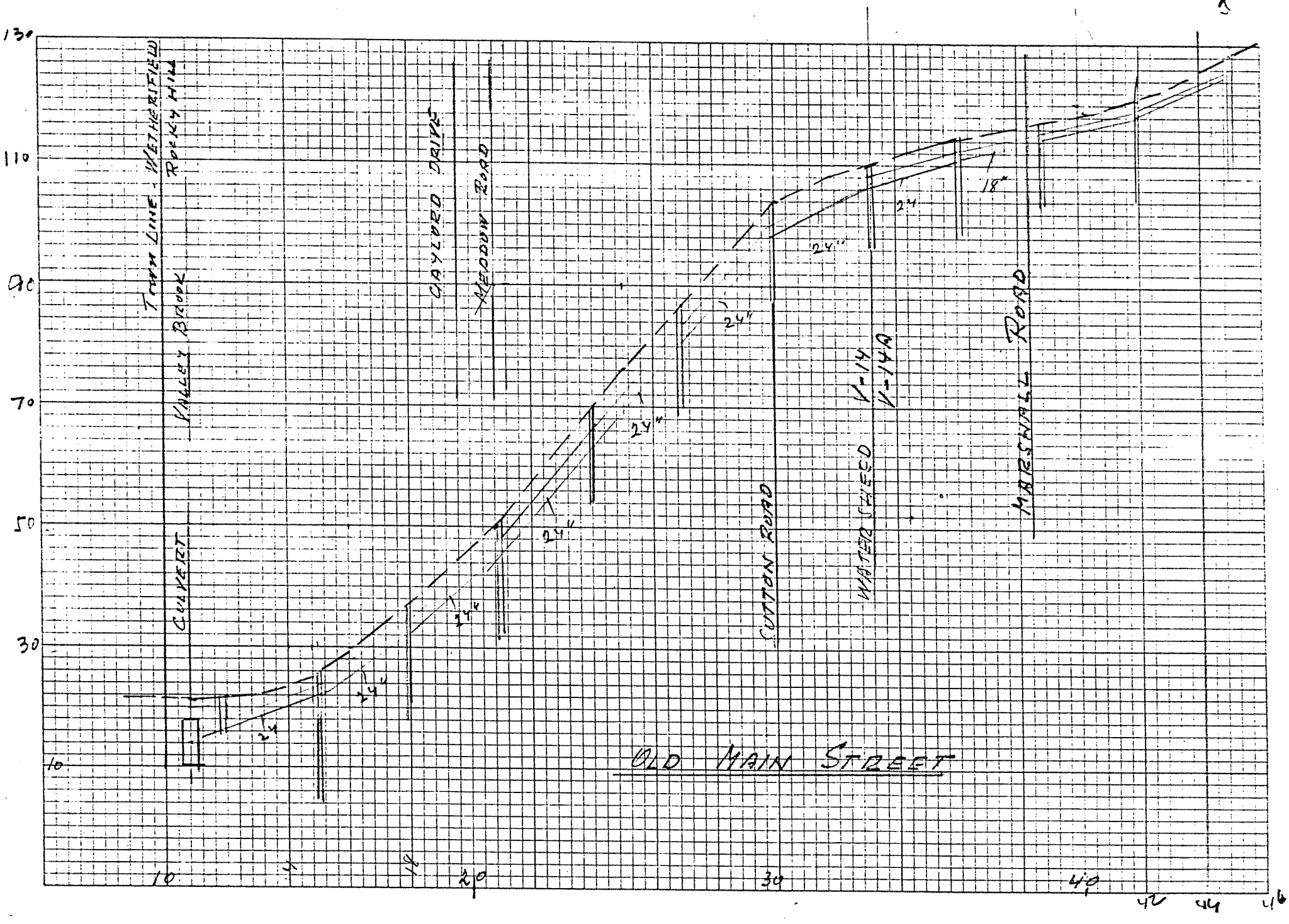
Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Exist. Pipe Size	Length of Pipe	Exist. Slope	Average Velocity	Full Capacity	Headwater	'n'	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CB#39 TO CB#38	10	-	10	.59	.59	6.4	3.8	15"	150	.051	7	11		.019	
CB#38 TO CB#37	6	.4	10.4	.17	.76	6.4	4.9	15"	50	.030	8	11		.015	
CB#37 TO CB#35	12	.1	12	2.58	3.34	5.2	17.3	15"	80	.084	15	17		.015	
CB#35 TO CB#33	NIL	.1	12.1	.11	3.45	5.2	17.9	15"	100	.054	15	14		.015	
CB#33 TO CB#17	GILBERT AVE.														
CB#33 TO CB#17	17	.1	17	1.81	5.26	4.4	23.1	18"	20	.056	13	22		.015	
CB#17 TO CB#18	9	NIL	17	1.20	6.46	4.4	28.4	18"	50	.007	16	8		.015	
CB#18 TO CB#32	NIL	NIL	17	.04	6.50	4.4	28.6	18"	220	.075	16	25		.015	
CB#32 TO CB#31	5	.2	17.2	.29	6.79	4.4	29.9	18"	120	.042	17	19		.015	
CB#31 TO MH#30	6.5	.1	17.3	.11	6.90	4.4	30.4	18"	60	.041	17	19		.015	
MH#30 TO CB#28	-	NIL	17.3	NIL	6.90	4.4	30.4	18"	200	.009	17	9		.015	

Storm Sewer System Design

VALLEY BROOK WATERSHED - ELM ST. (SHT # 491)

Line Segment	Time to Inlet	Time in Pipe	Accumulated Time	AI Entering Catch Basin	Sum of AI in System	Rainfall Intensity	Q in System	Exist Pipe Size	Length of Pipe	Exist Slope	Average Velocity	Full Capacity	Headwater	'n'	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CB #2 TO EW #2	11	.2	17.5	1.42	8.32	4.3	35.8	18"	30'	.186	19	40		.019	

K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



(EXISTING)

Y, W

EAST
1 of 1

Valley Brook West

CROSS DRAIN 1 — Exist. 36" RCP - INV. = 167.66

sht. 491

CROSS DRAIN 1A

A_{RH} = .62 x .10 (10%) = .06
g_{RASS} = .30 x .90 (90%) = .27
Σ = .33 x 3.1 AC. = 1.02

A_C = .60 x .10 (10%) = .06
g_{RASS} = .30 x .90 (90%) = .27
Σ = .33 x 5.1 AC = 1.68
(AI) = 2.7

CROSS DRAIN 1B

A_{RH} = .62 x .30 (30%) = .186
grass = .30 x .70 (70%) = .21
Σ = .40 x 3.7 AC = 1.5
(AI) = 1.5

CROSS DRAIN 1C

A_{RH} = .62 x .40 (40%) = .248
grass = .30 x .60 (60%) = .18
.43 x 4.0 AC = 1.7
(AI) = 1.7

CROSS DRAIN 1

A_{R-20} = .45 x .5 (50%) = .225
grass = .30 x .5 (50%) = .15
.38 x 58 AC = 22.2
(AI) = 22.2

CROSS DRAIN 1A = 2.7
" " 1B = 1.5
1C = 1.7
1 = 22.2
(Σ AI) = 28.1

L = 2500
S = 2.8
I = (28.1 / 73.9) = .38 (C)
T_c = 34 min

Q_{10} = (AI) 28.1 x (F) 2.5 = 70.3 cfs
Q_{50} = 28.1 x 3.4 = 96.0 cfs

5.1
HW = 167.66 + (1.7 x 3) = 172.8 ok
6 6 2 2 x3

Valley Brook West

Cross Drain 2 (Elm Ridge Drive) sht. 491 Exist. 42" RCP ; INV = 156.68
Rdwy 162.00

From Cross Drain 1 – (AI) 28.1 (A) (73.9) Q = 70.3 cfs

Cross Drain 2

A_{RH} = .62 x .75 (75%) = .465
grass = .30 x .25 (25%) = .075
Σ = .54 x 6.8 Ac. = 3.67

A_{R-20} = .45 x .90 (90%) = .405
grass = .30 x .10 (10%) = .03
Σ = .44 x 10.7 = 4.72
(AI) = 8.4

Cross Drain 1 = 28.1 L = 200
" " 2 8.4
ΣAI = 36.5 T_c = 34 + 1 = 35 min

73.9
17.5
91.4

Q_{10} = 36.5 (AI) x 2.5 (R) = 91.3 cfs
Q_{50} = 36.5 x 3.4 = ~~124.0~~ 124.4 cfs
H_W = 156.68 + (3.5 x 1.55) = 162.10 (2.2 = 7.7) 164.49
H_W = 162.1 RDWY = 162.0 Not Adequate

Cross Drain 3 (Wright Rd. sh 406) Exist 36" RCP; INV = 139.3

From Cross Drain 2 – (AI) 36.5 (A) 91.4 Not Adequate

Cross Drain 3

A_{R-20} = 0.45 x .92 (92%) = .415
grass = 0.30 x .08 (8%) = .024
Σ = .44 x 31.7 Ac = 14.0
(AI) = 14.0

Cross Drain 2 = 36.5 L = 400
Cross Drain 3 = 14.0 T_c = 35 + 1 = 36 min.
ΣAI = 50.5

Q_{10} = 50.5 (AI) x 2.5 (R) = 126.2 cfs
H_W = 139.3 + (3.0 x 3.9) = 151.0, Roadway = 145.0
Q_{50} = 50.5 x 3.3 = 167 cfs. H_W = 5.8 x 3 = 17.4

Valley Brook West

Cross Drain 4 (Berkshire Rd. - sh. 406) Exist 36" Rcp, INV = 128.8

From Cross Drain 3 - $\Sigma AI = 50.5$ $\Sigma A = 123.1$ Ac

Cross Drain 4

$A_{R-20} = .45 \times 1.00\ (100\%) = .45$

grass $= .30 \times 0 = 0$

$\Sigma = .45 \times 10.5_{Ac} = 4.7$

	(AI)	
Cross Drain 3 =	50.5	L = 400
4 =	4.7	$T_c = 36 + 1 = 37$ min
ΣAI =	55.2	

$Q_{10} = 55.2 \times 2.4 = 132$ cfs

$HW = 128.8 + (3 \times 4.0) = 140.8$

Roadway = $135^{\pm}$

Not Adequate

Cross Drain 5 (Oechard St - sh 406/405) Ex. 48" Rcp INV = 111.1

RDW = 119.6

INV = 111.1

8.5

max HW = 8.5

$HW/D = 2.12$ $Q \leq 170$ cfs to be O.K.

From Cross Drain 4 - $\Sigma AI = 55.2$ $\Sigma A = 133.6$

Cross Drain 5

$A_{R-20} = .45 \times 100\% = .45$

grass $= .30 \times 0 = .0$

$\Sigma = .45 \times 72_{Ac} = 32.4$

Cross Drain 4 =	55.2	
5 =	32.4	L = 700
ΣAI =	87.6	$T_c = 37 + 1 = 38$ min

$Q_{10} = 87.6 \times 2.4 = 210.5$ cfs

$Q_{50} = 87.6 \times 3.2 = 280.0$ cfs

$HW = 111.1 + (4 \times \frac{11.4}{2.85}) = 122.5$

Road = 119.6

$HW = 111.1 + 4 \times 4 = 127.1$

Not Adequate

Valley Brook West

Cross Drain 6A (Elm Street - sh 405) Ex. 36" INV = 125.03

A_{R20} = .45 x .20 (20%) = .09
grass = .30 x .80 (80%) = .24
Σ = .33 x 71.5 Ac = 23.6

(AI) (R)
Q_{10} = 23.6 x 2.5 = 59.0 cfs
Q_{50} = 23.6 x 3.5 = 82.7
HWS = 125.0 + (3 x 1.5) = 129.5
HW_{50} = 125.0 + 2.1 x 3 = 131.3 HW = 129.5
Rdwy = 132.0 OK

L = 2200
S = 5.7
T_c = 33 MIN

Cross Drain 6B (Terry Lane sh-405) Ex 48" RCP INV = 99.9
between No. #44-54

A_{R-20} = .45 x 100% = .45
grass = .30 x 0% = .0
Σ = .45 x 31.6 Ac = 14.2

from Cross Drain 6A, (AI) = 23.6 (A) = 71.5
Cross Drain 6B, (AI) = 14.2 (A) = 31.6
ΣAI = 37.8 ΣA = 103.1

900' 127.0 elv.
T_c = 33 + 3 = 36 min.
Q_{10} = 37.8 x 2.5 = 94.5 cfs
HW_{10} = 99.9 + (4 x 1.15) = 104.5
(4.6)

Roadway = 109.0 O.K

Cross Drain 6 (Valley Brook Rd - sh. 405) Ex. 2-42" INV = 91.90
Rdwy = 97.5

A_{R-20} = .45 x 100% = .45
grass = .30 x 0% = .0
Σ = .45 x 10 Ac = 4.5 (AI)

from Cross Drain 6B - (AI) = 37.8 (A) = 103.1 Ac
from Cross Drain 5 - (AI) = 87.6 (A) = 205.6
Cross Drain 6 - (AI) = 4.5 (A) = 10
129.9 (ΣA) = 318.7 Ac

T_c = 38 + 2
T_c = 40
Q_{10} = 299

Potter Izzard Formula
A = 318.7 ; Q_{10} = 320 cfs x factor of 1.0 = 320 cfs

- Continued -

CROSS DRAIN 6 (cont.)

NEHL $A = .5$, $P = 1.9$, $Q_{10} = 175$ (graph $K \leq 4.5$)

Q_{10} = Use 1/3 $(299 + 320 + 175) = 264.7$ cfs

$(Q = 265)$ $H_W = 91.7 + (3.5 \times 2.3) = 100.0$ (8.1?) NOT ADEQUATE

ROADWAY = 97.5

CROSS DRAIN 7 & 8 (Textbook Sh. 405 Ave.) exist. 2-30" RCP INV 87.5 & 2-5'1"x32" CMP. Arch

CROSS DRAIN 7

$A_{R-20} = .45 \times 100\% = .45$

$= .30 \times 0\% = .0$

$\Sigma = .45 \times 23.4 \text{ Ac} = 10.6$

from CROSS DRAIN 6	(AI) = 129.9	(A) = 318.7 ac
CROSS DRAIN 7	(AI) = 10.6	(A) = 23.4
	ΣAI 140.5	(ΣA) = 342.1

$T_C = 40 + 1 = 41$ min

(RATIONAL) $Q_{10} = 140.5 \times 2.3 = 323.5$ cfs

POWER IZZARD $Q_{10} = 330$ cfs x factor of 1.0 = 330 cfs.

NEHL $Q_{10} = 185$ cfs

$A = .535 \text{ mi}^2$ $K \leq 4.5\%$ $P = 1.9$

$Q_{10} = 1/3 (324 + 330 + 185) = 280$ cfs

$Q_{10} = 280$ cfs; $H_W = 87.5$ (2.5 x (cannot read to high on chart))

NOT ADEQUATE

Control elev. = 91.0

CROSS DRAIN 8 -

$A_{R-20} = .45 \times 100\% = .45$

grass = $.30 \times 0\% = .0$

$\Sigma = .45 \times 7.6 \text{ AC} = 3.4$ (AI)

ΣAI = 143.9

ΣA = 349.7 ac.

CROSS DRAIN No 9 (North of Textbook DR - sht 405) exist 36" RCP
INV = 83 ±
Control El. = 88 ±

MAX Allowable Hw = 4'

$Hw/D = \frac{4}{3} = 1.33$

with exist. 36" MAX Q = 55 cfs.

(@9) (A_{R-20}) = 15.2 AC
From Cross Drain 8 = 349.7 AC
ΣA = 364.9 AC.

Not Adequate

CROSS DRAIN No 10A (ORCHARD St. - Sheet 405) Exist 18" RCP INV = 85.8

A_{R-20} = 0.45 × 70% = .315
grass = 0.30 × 30% = .09
Σ = .41 × 12.7 Ac = 5.2 (AI)

L = 1300
S = 2.8 %
T_c = 39

× 3.3 = 17 cfs
Q_{10} = 5.2 × 2.3 = 12 cfs
Hw = 85.8 + (1.5 × 1.6 / 2.3) = 88.1

ROADWAY El = 92 OK

CROSS DRAIN No 10 - (PARSONAGE Street - sh. 328) exist. 60" RCP INV = 64.5
Rdwy = 73.0

Rdwy = 73.0
INV = 64.5
8.5 - MAX Hw = 7.5
Hw/D = 1.5 MAX Q = 225

? from Cross Drain 9 - (A) = 364.9
from 10A (A) = 12.7
to 10 (A) = 66.7
444.3 = .695 mi² (7.6)?

Q_{10} - Potter Izzard = 400 cfs
Q_{10} - NEHL = 220 cfs

Q_{10} = 310 cfs
Hw = 64.5 (5 × 2.1) = 75.0
10.5
Not Adequate.

CROSS DRAIN No 11 (ABANDONED RAILROAD - SR 328) - EXIST 48" INV. = 47.0
ROAD. ELEV. = 57.0±

From Cross Drain 10 - (A) = 444.3 ac
to Cross Drain 11 - (A) = 44.8 ac
489.1 Acres

PEAK FLOW
Q_{10} = 425 cfs

NEHL A = 0.76 mi² K = 4.5 P = 1.9
Q_{10} = 230 cfs

∴ $Q_{10} = \frac{1}{2}(425 + 230) = 328^{\pm}$ cfs

$H_W = 47 + (4 \times 5.8) = 70.3$
(23.3)

NOT ADEQUATE

Valley Brook East

Sheet 1
C DC
1.9.75

Cross Drain No. 1 Elm St.

Exist 36" RCP
INV. 132.3 Rdw. 139.0

Sheet 405

1A A_{RZO} 100% Devel.

Computed P_2 V_E 9

$12.5 Ac \times 0.45 = 5.6$

1 A_{RZO} - 25% Devel Grass - 75%

$A_{RZO} = 0.25 \times 0.45 = 0.11$
Grass $= 0.75 \times 0.30 = 0.23$
0.34

1A - $12.5 Ac \times 0.45 = 5.6$
1 - $59.7 Ac \times 0.34 = 20.4$
$72.2 Ac$ (0.36) 26.0

$L = 1800$ ft $S = 4.8\%$
$T_c = 28$ MIN

$Q_{10} = 26 \times 2.9 = 75.5$ cfs
$Q_{25} = 26 \times 3.9 = 117$ cfs
$H.W._{10} = 132 + (3.0 \times 1.85) = 137.5$ OK
$H.W._{25} = 132 + (3.0 \times 3.9) = 142.2$ No good

Cross Drain No. 2 - Mountain View Dr.

Exist 33" x 60"
INV. 128.10 Rdw. 132.60

2 A_{RZO} - 45% Devel., Grass - 55%

$A_{RZO} = 0.45 \times 0.45 = 0.20$
Grass $= 0.55 \times 0.30 = 0.17$
0.37

2 - $26.8 Ac \times 0.37 = 9.9$
1 - $72.2 Ac. \times 0.36 = 26.0$
99.0 (0.36) 35.9

$T_c = 28 + 3 = 31$ Min

Cont'd Next Page No.

Valley Brook East

Sheet 2

(Cross Drain 2 Cont'd)

Q_{10} = 35.9 x 2.6 = 94 cfs
Q_{50} = 35.9 x 3.6 = 129 cfs
H.W. 128.10 + 3.5 x 7.7/2.2 = 135.8 no good

Cross Drain No. 3 West of Mountain View Dr. Exist 36" RCP
Inv. 110.1 Rdw. 120.0

2 99 Ac x (0.36) = 35.9

3 A_{E20} - 100% Devel,

3 - 47.1 Ac x 0.95 = 21.2
2 - 99.0 Ac x 0.36 = 35.8
146.1 Ac (0.39) 57.0

T_c = 31 Min + 4 = 35 Min

Q_{10} = 57.0 x 2.5 = 143 cfs
Q_{50} = 57.0 x 14.7/3.0 = 129.7 N.G.
H.W. = 110.1 + (3.0 x 4.9) = 124.7 N.G.

Valley Brook East

Sheet 3

Cross Drain No. 4 Chapin Ave

Ex's 36" RCP
Inv. = 96.0 Rdwy 105.0

4A A_{RZO} = 100% Devel

$A_{RZO} = 13.4\ Ac \times 0.45 = 6.2$ (From Pg $V_E 10$) $T_c = 17$ Min

4 A_{RZO} - 40% Devel., Gross - 60%

$A_{RZO} = 0.40 \times 0.45 = 0.18$
Gross $= 0.60 \times 0.30 = 0.18$
0.36

3 See Sheet 2
146.1 Ac. × 0.39 = 57.0 $T_c = 35$ Min

4 - 9.6 Ac.	× 0.36 =	3.5
4A - 13.4 Ac	× 0.45 =	6.2
3 - 146.1 Ac	× 0.39 =	57.0
169.1 Ac.		66.7

$T_c = 35 + 1 = 36$ Min.

$Q_{10} = 66.7 \times 2.5 = 167$ cfs
Q_{50}

H.W. = 98.0 + (3.0 (E.C.) × 6.2) = 116.6

Not Adequate

Valley Brook East

Sheet 4

C.O.C.
1-10-74

Cross Drain No. 6A Silas Deane Hwy — Exist 18"
Inv. 95.1 Rdwy 102.0

100% Developed See Pg VE 11

Not Adequate

Cross Drain No. 6C Bel Air Circle — Exist 36"
INV. 88.3
Rdwy 94.0

6A 100% Developed
6B 100% Developed
6C 100% Developed

Not Adequate
See Pg VE 12

Cross Drain 7A Silas Deane Hwy — Exist 24"
Inv. 88.6 Rdwy 95.2

100% Developed - Not Adequate
See Pg VE 14

BELDEN BROOK

Belden Brook

Cross drain No 1 Main Street — Exist 43"x27" ± 42"x27"

Sheet 404 & 405, 490, 489

INV 101.10
Rdwy 106.0

AR=20	15.7+3.6+27.7 = 43.4 x 0.45 =	19.6	
Ac	14.9 + 9.8 = 24.7 x 0.60 =	14.8	
No 1	68.1	34.4	

ΔH 1.46 - 106 = 40 ft L = 2000' S = 2%
Tc = 25 min

Q50 34.4 x 4.2 = 143.0
Q25 34.4 x 3.7 = 126.0

Ex. 43x27 - 42" (No 2) Rdwy 106.50 INV 98.36

Q50
Q25

42" HW 98.36 + 3.5 (10.5) x 3.0 = 108.90

48" 98.2 = 1.7 (6.8) x 4 = 105.0 S=0.7

See Cross drain No 2 fig 1A

Cross drain No 3 Belden Lane — Exist 48" RCP

Sheet 404, 489

added 36" RCP
INV 58.3 ±

Ac	4.2 x 0.6 =	2.5	
ARM	19.5 x 0.5 =	9.8	
	23.7	12.3	
No 1-2	82.0	42.8	L = 1570 V=5
No 2	105.7	55.1	Tc = 25 + 5 = 30 min

Q50 55.1 x 3.7 = 205.0 cfs
Q25 55.1 x 3.3 = 182.2 cfs

Exist 48" RCMP Rdwy 70.0 INV 58.4 ? HW 58.4 + 4.2 (10.6) x 2.6 = 69.0 / 170cfs
added 30" RCP INV 60.4 HW 63.0 + 2.5 (5.25) x 2.1 = 68.3 / 56cfs
/226cfs

Add 48" CMP HW = 58.3 + 7.6 (1.9 x 4) = 65.9 — 120 cfs
36" 58.3 + 2.2 x 3 = 65.0 — 90 cfs

B1A.

Belolen Brook

Cross Section 1+2 BEGIN 72+44 END 72+44

Ac. Shed 40x INV 76.3

Ac = 14.0 x 0.6 = 8.4 6x OK

Ac	8.4	
No1	68.0	34
	82.0	42.8

Q_{25} 42.8 x 3.5 = 150.0

Q_{50} 42.8 x 4.1 = 175.0

T = 25+1 = 26

10 x 1.25

H/W 76.3 + 3.6 + 2.0 = 81.9

OK

Bellevue Brook

Cross drain No 3 (4A) — Silas Deane Hwy — Exist 24" RCP use 30" RCP

Sheet 405, 404

	Ac.	I	Ac x I
Ac	8.20	0.60	4.90
AR-20	5.80	0.45	2.60
No 3	14.0	0.55	7.50

ΔH 150 − 110 = 40; L = 1000 S = 4%

Tc = 14 min

Q50 = 7.50 x 5.4 = 40.5 cfs

Q25 = 7.50 x 4.9 = 37.0 cfs

Exist 24" Road EL 110.0 INV 105.18 HW 105.2 + 3 x 2.0 = 111.2

Q 50 30" RCP 105.2 + 1.5 x 2.5 = 109.0

Proj. Q 25; 30" RCP INV 104.50; S = 1.2% (3 →); HW 104.50 + 1.4^3.50 x 2.50 = 108.0 L = 1300 ft

Cross drain No 4 B — Old Main Street — Exist 24" RCP

Sheet 404

INV 90.2

Road 105.1

AR-20	22.5	x 0.45	= 10.0
Ac	9.3	x 0.60	= 5.6
No 3 (4A)	14.0	x	= 7.5
No 4	45.8		= 23.1

Tc 14 + 4 = 18 min L = 1300

Q50 = 23.1 x 4.9 = 113.2 cfs

Q25 = 23.1 x 4.3 = 99.3 cfs

Exist 24" RCP S = 0.8% (4 →) Road 105.0 INV 90.20 HW

Proj. Q25; 48" RCP S = 0.7% INV 90.20 HW 90.20 + 4.0^5.2 x 1.3 = 95.40 L = 1200 ft

Long- 4C
Cross drain No 5 Glastonbury Exe North Exist ~~30"RCP~~ 24"
Sheet 404 use 48" CC-

INV 85.9
Grnd 95.0

Ac 3.5 x 0.6 = 2.1
DRM 8.0 x 0.5 = 4.0
No 4B 45.8 23.1
No 5 57.3 29.2

Tc = 18+4 = 22 min ; L = 1200

Q50 29.2 x 4.4 = 128 cfs
Q25 29.2 x 4.0 = 116 cfs

EXIST 30"RCP M.H 88.50 INV 83.80

Prop Q50 48"RCP S = 1.0% INV 81.0 HW MH = 85.9 + 4.0 x 1.6 (6.4) = 92.90

4D
Cross drain No ~~6A~~ Glastonbury & Washington Street
Sheet 404 Exist 18"RCP
OK

DRM = 5.4 x 0.5 = 2.7

DH 1m - 80 = 20 ft L = 80m @ S = 25%
Tc = 16 min

Q50 2.7 x 5.1 = 13.8 cfs
Q25 2.7 x 4.5 = 12.2

EXIST 18"RCP Robin 77.00 INV 67.9 HW 67.9 + 1.5 x 2.0 (3.0) = 70.90

Long Drain 4C Robin Old Main St. Exist 24"
Grnd 94.0
INV 86.6

Ac 3.5 x 0.6 2.1
DRM 8.0 x 0.5 = 4.0
No 4B 45.8 23.1
57.3 29.2

48" HW = 86.6 + 6.4 (1.6 x 4) = 93.0

Q50 = 29.2 x 4.7 = 137 cfs

4E

Cross drain No 6B Glaston Energy Ave Exist 24" CP
Sheet 404 use 30" RCP
50.3

AR-20	18.3	x 0.45 =	8.3
No 6A 4D	5.4		2.7
No 6B 4E	23.7		11.0

Tc = 16 min

Q50	11.0 x 5.1 =	56.0	cfs
Q25	11.0 x 4.7 =	52.0	cfs

Rdw 57.0

EXIST INLET #5 Rdw 72.0 INV 64.4

Prop. INLET Q25 = 50 cfs 30" RCP .5 = 2%
No 6B

HW = 50.3 + 3.5 x 1.9 = 55.1 ok
3 + 4.8

EXIST. Cross drain 24" Rdw 57.0 S = 2.5% INV. 49.3 + 2.0 x 4.3 = 58.0
8.6

Q25 { 30" S = 2% HW 49.3 + 2.5 x 2.7 = 56.1
36" RCP S = 1.1% HW 49.3 + 3.0 x 1.4 = 53.6

P. 30.

Cross drain No 64 Pratt Street / Rail Road / EXIST 48"
Sheet 404 INV 23.0
Rdw 38.0

AR 20	13.1 x 0.45 =	5.9
No 6B	23.7	11.0
No 5	57.3	29.2
No 2	105.7	55.1
	199.8	101.2

Tc = 30 + 2 = 32 min
permit 300 cfs

Q50 =	101.2 x 3.5 =	352	cfs
Q25 =	101.2 x 3.1 =	312	cfs

72"

6 x 1.5
HW 23.0 + 9.0 = 32.0

48" HW 23 + 5 x 4 = 43.

No. 4

Cross Drain ~~No 6~~ R. Road Exist 48" RCP
Sheet 404 Asphalt

A R-20	= 13.1 × 0.45 =	5.9	L 900; T = 3
No 2	= 117.5	61.2	Tc 30 + 3 = 33 min
No 5	= 57.3	29.2	Tc 22
No 6B	= 23.7	11.0	Tc 16
No 6	211.6	107.3	Tc = 33 min

Q 50 107.3 × 3.5 = 375.0 cfs
Q 25 107.3 × 3.1 = 332.6 cfs

Q 50 Ex. 8.48" RCP Cont. EL 40.0 INV 23.0 HW 23.0 + 4.0 + 6.0 => 43.0 max
Q 25 42.0

Exist 48" RCP Q 50
Add 36" RCP
48"

HW 23.0 + 4.0 × 4.0 = 39.0 (260 cfs)
HW 28.8 + 3.0 × 3.4 = 39.0 (115 cfs)
375 cfs

Belden Brook

CDC
1-13-75

Cross Drain No. 1 Main St. — Exist 93"x27"

Sht. 905 & 905

A_{R20} - 86% Devel, A_c - 100% Devel

Previous Calc. Govern. Not Adequate

Cross Drain No. 3 Belden Ca. — Exist. 98"

Sht. 904 & 989

Nearly 100% Devel.

11'8" — 58.3 + 2.5x4 = 68.3

Previous Calc. Govern - ~~Not Adequate~~

Cross Drain No. 4A Silas Deane Hwy — Exist 24"

Sht. 904+905

INV. 105.1
Rdwy 110.0

A_{R20} - 100% Devel.
Use Coef. 0.3

A_c = 80% Devel, Grass 20%

$A_c = 0.8 \times 0.6 = 0.48$
$Grass = 0.2 \times 0.3 = 0.06$
0.54

$A_{R20} = 5.8 \times 0.45 = 2.6$
$A_c = \frac{8.2}{14.0} \times \frac{0.54}{(0.50)} = \frac{4.5}{7.1}$

$L = 1000$ $S = 4.0\%$
$T_c = 16$ Min

$Q_{50} = 7.1 \times 5.1 = 36.2$ cfs
$Q_{25} = 7.1 \times 4.5 = 32.0$ cfs

Q_{50} - H.W. = 105.1 + (2x2.5) = 110.1
Q_{25} - H.W. = 105.1 + (2x2.2) = 109.5

~~Not Adequate~~

Belden Brook

B 7
CDC
1-13-75

Cross Drain 4B O. Main St. Exist 24"
Sht. 40 4

A_{R20} - 100% Devel, A_c - 100% Devel.

Previous Calc. Govern - Not Adequate

Cross Drain 4C No. of Glastonbury Ave Exist 24"
Sht. 40 4

A_c - 100% Devel, A_{EM} - 100% Devel.

Previous Calc. Govern - Not Adequate

Cross Drain 4E Glastonbury Ave Exist 24"

A_{R20} - 100% Devel.

Previous Calc. Govern - Not Adequate

C

TUMBLE BROOK

T. 1712

Tumble Book

Cross drain No 1A — Elm Street — Elliptical 2-12"

Sheet 491

AHc = 15.8 × 0.65 = 10.3

Q25 = 10.3 × 4.4 = 45.4
Q50 = × 5.0 = 54.5

2-18" HW
2-24"

182 + 6×1.5 = 192
182 + 1.5×2.0 = 185.0

224 - 40 INV 183.0
ΔH 204 - 184 = 20 Rdwy 186.0
L 140.0 S = 14.3%
T = 17 min

Cross drain No 1B — Cromwell Ave — Ellip 24"

Sheet 492

INV 190.4
Rdwy 199.0

A R 20 16.3 × 0.45 = 7.35
Ac 15.4 × 0.6 = 9.30
NR3 6.5 × 0.6 = 3.9
38.2 20.60

ΔH 233 - 200 = 33
L 1200 S = 2.7%
T = 16 min

Q25 = 20.6 × 4.5 = 93
Q50 = 20.6 × 5.1 = 105

36" HW 3×3 + 188.5 = 197.5

Cross drain No 1C — Maple Street — Ellip 15"acc

INV 189.50
Rdwy 197.0

A R 20 11.1 × 0.45 = 5.0

ΔH 210 - 196 = 14
L = 1000 S = 1.4%
T = 22 min

Q25 = 5.0 × 4.0 = 20.0
Q50 = 5.0 × 4.4 = 22.0

15" HW 189.50 + 5 × 1.25 = 197
18" 189.50 + 4 × 1.5 = 195.50

T2

Long. No 1D Fernwood Drive — Exist 36"

Sheet 491

AR 20 — 30.8 x 0.45 = 14.0

Q25 = 3.7 x 14.0 = 52.0
Q50 = 4.2 x 14.0 = 59.0

36" HW 1.3 x 3.9 + 176.8 = 180.7

INV 176.8
Δ 204 - 180 = 24 Rim 180
L = 140' S = 1.7%
T = 25 mm

Cross drain No 1 Pvg. 291 — Exist 84"

Sheet 406

AR 2D	11.8	x 0.45	= 5.3
ARM	36.6	x 0.60	= 22.0
ARH	29.6	x 0.60	= 17.7
	78.0		45.0
No 1A	15.8		10.3
1B	38.2		20.6
1C	11.1		5.0
1D	30.8		14.0
No 1	173.9 Ac		94.9

Q25 = 94.9 x 3.5 = 332 cfs
Q50 = 94.9 x 3.9 = 370 cfs

84" HW 162 + 8.0 = 170.0 (INV 161.0 / 169.0, 2)

INV 162.0 | 161.0 OK
Rim 178.0

T = 25 + 3 = 28 mm

Cross drain No 2A - Pvg 291 — Exist 24"

Sheet 491

A.C = 8.9 x 0.60 = 5.3

Q25 = 5.3 x 4.2 = 22.2
Q50 = 5.3 x 4.7 = 25.0

24" HW 169 + 1.6 x 3.7 = 172.2

INV 169.0
ΔH 220 - 170 = 50 Rim 175.0
L = 21m S = 2.4% OK
T = 19 mm

Cross drain No 2B — Exist 24"

A91 = 10.6 x 0.50 = 5.3

Q25 = 5.3 x 3.5 = 18.5
Q50 = 5.3 x 3.9 = 20.6

ΔH 200 - 170 = 30 INV 169.0
L 23m S = 1.3% OK
T = 2.9 mm

HW 169 + 1.5 x 2 = 172

T3

Cross Drain No 2C Prop. 291 — EXIST 30"

Sheet 406 — INV 164.0 — Rdwy 184.0 — OK

Reg	3.0	× 0.50	= 1.5
No 2A	8.9		5.3
No 2B	10.6		5.3
	22.5		12.1

T = 29 min

Q_{25} = 12.1 × 3.5 = 42.3

Q_{50} = 12.1 × 3.9 = 47.0

30" HW 164 + 1.6 × 2.5 = 168

Cross Drain No 2 I-91 — EXIST 2-60"

Sheet 406 — INV L43.0 141.4 — Rdwy 152.1 — OK

A_{R2A} =	35.6	× 0.45	= 16.0
A_{91} =	8.0	× 0.50	= 4.0
	43.6		20.0
No 2C	22.5		12.1
No 1	173.9		94.9
	240.0 ac		127.0

Tc = 28 + 3 = 31 min

Q_{50} = 127.0 × 3.6 = 460 cfs

Potter

Q = 400

Use Q = 460 + 400 + 370 = 1230 = 410

NEHL 0.38 Mi

Q_{10} = 150

Q_{25} = 275

Q_{100} = 370

141.4 148.4

2-60" HW 143.0 + 1.4 × 5 = 150.0

Cross Drain No 3A I-91

Exist 54"
INV 140.41
ROW 155.0

Sheet 406

A_{R4}	= 4.7	× 0.60	= 2.80
A_{R20}	= 30.4	× 0.45	= 13.70
A_{91}	= 9.0	× 0.50	= 4.50
	144.1		21.00

ΔH 232 − 150 = 82
L 2700 S = 3.0%

Tc = 28 min

$\frac{Q_{25}}{Q_{50}}$ 21 × 3.5 = 74 cfs
90

54" HW 140.4 + .9 × 4.5 = 144.4

Cross Drain No 3B I-91

Exist 24" / 36"
INV 139.75

A_{R20} = 6.3 × 0.45 = 2.8

ΔH 170 − 160 = 10 ok
L = 700 S = 1.4%
Tc = 19 min

Q_{50} 16 cfs
Q_{25} 0.8 × 4.7 = 13 cfs

24" HW 139.7 + 1.2 × 2 = 142.1

Cross Drain No 4A I-91

Exist 36"
Exist 48" RCP
INV 103.90
ROW 110.0

A_{R20}	= 2.3	× 0.45	= 1.4
A_{91}	= 12.4	× 0.50	= 6.2
	14.7		7.6

ΔH = 150 − 115 = 35 ok
L = 1600 S = 2.2%
Tc = 23 min

$\frac{Q_{25}}{Q_{50}}$ 7.6 × 4.3 = 33 cfs
38 cfs

36" HW 103.9 + 3 = 106.9
48" 103.9 + 1.7 × 4 = 106.7

Timber No 3

b. Refer to figure 4 or 5 Find $\hat{T}$ = 0.06

Using Zone I

Area 310

P-index 1.90

T 0.111

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = 0.051 / .06 = 86%

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = 0.111 / 0.06 = 1.85 C = 2.3 (fig. 6)

(2) C x Q_{10} of 3a = 95 x 2.3 = 219 cfs

4. Final Q_{10} = 219 cfs

Q_{25} = _____ cfs

Q_{50} = 310 cfs

Q_{100} = 360/400 cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Yes No

Zone Between envelope curves

EXHIBIT 1.

TABULATION SHEET

1. Name of map TIMBER BROOK No 3

   a. Coordinates of Crossing

      Latitude _____

      Longitude _____

   b. Drainage area, A = 310 acres or 0.310 x 1000 acres
      (640 acres = 1 sq. mi.)

   c. Length of stream L = 4500 = 0.85 miles

      .3L = 1300 = 0.24 miles

      .7L = 3200 = 0.61 miles

      Elevation (a) at headwater 180 ft.

      Elevation (b) at .7L above crossing 166 ft.

      Elevation (c) at crossing 130 ft.

      $S_1 = \frac{EL(a) - EL(b)}{.3L} = \frac{14}{0.24} = 58$ ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L} = \frac{36}{.61} = 59$ ft./mi.

      $\sqrt{S_1} = 7.6$ $\sqrt{S_2} = 7.7$

      $T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{0.24}{7.6} + \frac{0.61}{7.7} = \frac{0.032}{} + \frac{0.080}{} = 0.111$

2. From Figure 1

   a. P-index = 1.90 Zone I

3. Find Q_{10} using:
   (fig. 2, 3, or 4)

   Zone I

   Area 310

   P-index 1.90

   T 0.111

   a. First estimate of Q_{10} = .095 in 1000 cfs = 95 cfs.

T5

Cross drain No 3 I-91 Exist 2-72"

Sheet 406

Inv 123.76

Rim 136.0

OK

Aq1 =	120.5	x 0.50 =	10.25	
No 3A =	44.1		21.0	
No 2 =	240.0		127.0	
No 3B =	6.3		2.8	
No 3	310.5 Ac		161.0	Tc 31+1=32

Q50 161 x 3.5 = 562 cfs

Potter

Q = 470 cfs

NEHL 0.49 Mi

Q10 = 180 cfs

Q50 = 330 cfs

Q100 = 460 cfs

Q = 562 + 470 + 460 + 361 = 1850

use 462

2-72" HW 123.7 + 1.1 x 6 = 130.3

Cross Drain No 4B — Sheet 406 — Gutter Area: — EXIST None

Rdwy 150.0 HR

$A_{R20} = 14.9 A_2 \times 0.45 = 6.7$ — Tc 16 min

$Q_{50} = 5.1 \times 6.7 = 34$ cfs

30" HW $1.2 \times 2.5 + 145.0 = 148.0$ (3.)

$1.5 \times 2.5 = 3.75$

Cross Drain No 4C — Pipe I-291 — EXIST 48" RCP

Sheet 406 — INV 126.08

Rdwy 132.1 OK

A_{R20}	19.6	× 0.45 =	8.8
No 4B =	14.9		6.7
	34.5		15.5

Q_{50} 15.5 × 4.9 = 76 cfs — Tc 18 min

48" HW $126 + 0.9 \times 4.0 = 129.6$

Cross Drain No 4D — I-91 — EXIST 54" RCP

Sheet 406 — INV 99.7

Rdwy 106.0 ok

A_{91} =	10.8	× 0.50 =	5.4
No 4C =	34.5		15.5
	45.3		20.9

Tc 19 min

Q_{50} 20.9 × 4.7 = 98 cfs

54" HW $99.7 + 0.95 \times 4.5$ (4.3) $= 104.0$

Cross drain No. 4E Raymond Rd Exist 48" RCP

INV 85.50

A_{R20} = 43.3 × 0.45 = 19.5 ΔH 176 − 90 = 86 L = 1600 S $\frac{86}{16}$ = 5.3 Tc 19.0

Q_{25} 19.5 × 4.7 = 93 cfs

48" HW 85.50 + 1.1 × 4.0 = 90.9 cfs OK

Cross drain No 4F I-91 Exist 54" RCP

INV 69.43

Row 79.50

OK

A_{91} = 8.7 × 0.50 = 4.4

No 4E = 43.3 19.5

52.0 23.9

Q_{50} 23.9 × 4.6 = 110 cfs

54" HW 69.4 + 1.1 × 4.5 = 74.4

EXHIBIT A

TABULATION SHEET

No 4

1. Name of map Timber Brook

   a. Coordinates of Crossing

      Latitude _____

      Longitude _____

   b. Drainage area, A = 498 acres or .498 x 1000 acres
      (640 acres = 1 sq. mi.)

   c. Length of stream L = 780 - 1.48 miles

      .3L = 2300 - .44 miles

      .7L = 5500 - 1.04 miles

      Elevation (a) at headwater 180 ft.

      Elevation (b) at .7L above crossing 162 ft.

      Elevation (c) at crossing 90 ft.

      $S_1 = \frac{EL(a) - EL(b)}{.3L} = \frac{18}{.44} = 41$ ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L} = \frac{72}{1.04} = 69$ ft./mi.

      $\sqrt{S_1} = 6.4$ $\sqrt{S_2} = 8.3$

      $T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{.44}{6.4} + \frac{1.04}{8.3} = \frac{0.069}{} + \frac{0.126}{} = 0.195$

2. From Figure 1

   a. P-index = 1.90 Zone 5

3. Find Q_{10} using:
   (fig. 2, 3, or 4)

   Zone 5

   Area 498

   P-index 1.90

   T 0.195

   a. First estimate of Q_{10} = 0.95 in 1000 cfs = 95 cfs.

Trenton NO.4.

b. Refer to figure 4 or 5

Using Zone I Find $\hat{T}$ = 0.09

Area .498

P-index 1.90

T 0.195

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{0.105}{0.09}$ % 117%

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.195}{0.09}$ 2.16 C = 2.80 (fig. 6)

(2) C x Q_{10} of 3a = .95 x 2.80 = 266 cfs

4. Final Q_{10} = 266 cfs

Q_{25} = _____ cfs

Q_{50} = 400 cfs

Q_{100} = 460

Q_{200} = 500 cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Zone Between envelope curves Yes No

T 8

Cross Drain No 4 Orchard St Box 12'x6'

Sheet 329

HW 61.8
Road 90.0
OK

Az-20	75.3 Ac	x 0.45 =	34.0
No 3	310.5		161.0
No 4A	14.7		7.6
No 4D	45.3		20.9
No 4F	52.0		23.9
	497.8 Ac		247.4

Porter

Q = 650

Neill .78 Mi

Q_{10} = 240
Q_{50} = 450
Q_{100} = 610

S.W. = 460 5x12 = 60

use Q 650+610+460 ÷ 570 cfs

Box 12'x6' HW 61.80 + 1.2 $\frac{120}{64}$ = 63.80 + 5 = 68.80

Cross Drain No 5A Orchard St. I-91 Exist 30"RCP

Sheet 329

HW 75.60
Road ~

Az-20 = 12.00 x 0.45 = 5.4

Q_{25} 5.4 x 4.5 = 24.2 cfs

Δ H = 110 - 76 = 34
L = 1200 S = 3.0
T = 21

30" HW 75.6 + 2.5 = 78.1 OK

To

Cross Drain No 5B Orchard Street EAST 2-24ϕ

Sheet 329

AR 20 = 81.30 × 0.45 = 36.4

Q_{25} = 36.4 × 4.0 = 145

Q 50 = 36.4 × 4.4 = 160

INV 74.00

Road 77.0

ΔH 176 − 70 = 106

L = 1900 S = 5.6

Tc 22

2-24 HW 74.0 + 12 = = 86.0

2-48" HW 71.0 + 4.0 = 75.0

2-42" HW 71.0 +

Lower Inv.

48" = 67 + 2×4 = 75

54" = 1.4 × 6.4 × 5 + 68.6 = 77

Cross Drain No 5C I-91 EXIST 60"

Sheet 328

2 INV. 62.0 ϕ

A R 20 = 5.70 × 0.45 = 25.6

No 5A = 12.00 5.4

5B = 81.30 36.4

98.00 67.4

T = 23

Q_{25} = 67.4 ×

Q 50 = 67.4 × 4.3 = 290 cfs

HW 62 + 2.0 × 5 = 72.0

2 + 1.8 × 5 = 11.0 OK

Cross Drain No 5 Waters Ave. EXIST 10' RCP Culv.

Sheet 328 Abandoned R.R. R.O.W.

INV 48.00 49.0

Road 62.0 OK

A R 20 = 17.20 × 0.45 = 32.2

No 5C = 98.00 67.4

No 4 = 497.80

603.00

2 40 ϕ 10' x 6'

730

657

520

190

Potter

Q = 730 cfs

NEHL 0.94 Mi

Q 10 = 270.0 260

Q 50 = 500 450

Q 100 = 675 650

Max. Q = 630

10 ϕ used HW 49 + 1.25 16/64 = 53 + 5 = 59.0

EXHIBIT I.
No 5

TABULATION SHEET

1. Name of map Timber Brook

   a. Coordinates of Crossing

      Latitude _____

      Longitude _____

   b. Drainage area, A = 603 acres or 0.603 x 1000 acres
      (640 acres = 1 sq. mi.)

   c. Length of stream L = 8801 = 1.68 miles

      .3L = 2650 = 0.51 miles

      .7L = 6150 = 1.17 miles

      Elevation (a) at headwater 1801 ft.

      Elevation (b) at .7L above crossing 158 ft.

      Elevation (c) at crossing 50 ft.

      $S_1 = \frac{EL(a) - EL(b)}{.3L} = \frac{180-158}{0.51} = \frac{22}{0.51} = 43$ ft./mi. $S_2 = \frac{EL(b) - EL(c)}{.7L} = \frac{158-50}{1.17} = \frac{108}{1.17} = 92$ ft./mi.

      $\sqrt{S_1} = 6.6$ $\sqrt{S_2} = 9.6$

      $T = \frac{.3L}{\sqrt{S_1}} + \frac{.7L}{\sqrt{S_2}} = \frac{0.51}{6.6} + \frac{1.17}{9.6} = \frac{0.077}{} + \frac{0.122}{} = 0.199$

2. From Figure 1

   a. P-index = 1.90 Zone I

3. Find Q_{10} using:
   (fig. 2, 3, or 4)

   Zone I

   Area 603

   P-index 1.90

   T 0.199

   a. First estimate of Q_{10} = 0.135 in 1000 cfs = 135 cfs.

b. Refer to figure 4 or 5

Using Zone I Find $\hat{T}$ = 0.11

Area 603

P-index 190

T 0.199

$\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 = $\frac{0.199 - 0.089}{0.11}$ % 82.9%

c. If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 is less than ± 30% Q = _____ cfs (See 3a)

If $\left[\frac{\hat{T} - T}{\hat{T}}\right]$ 100 if greater than ± 30% go to 3d.

d. Adjusting Q_{10}

(1) $\frac{T}{\hat{T}}$ = $\frac{0.199}{0.11}$ = 1.81 C = 2.30 (fig. 6)

(2) C x Q_{10} of 3a = 135 x 2.30 = 310 cfs

4. Final Q_{10} = 310 cfs

Q_{25} = _____ cfs

Q_{50} = 450 (520) cfs

Q_{100} = 570 cfs

5. Applicability of procedure (see appendix)

Final Q = _____ cfs Drainage Area _____ acres

Zone Between envelope curves Yes No

T 10

Cross drain 6A — I-91-Ramps — Exist 60" RCP

Sheet 328 — Inv 39.00

$A_{R2.0}$ =	2.8	× 0.45	1.4	
A_C =	10.7	× 0.60	= 6.4	
A_{91} =	2.3	× 0.50	= 1.2	
	15.8		9.0	T_C = 15

over land from 5C

Q_{50} = 9.0 × 5.2 = 46 cfs

60" HW 39.0 + 1.2 × 5 = 45

Cross drain 6B — I-91 — Exist 60" RCP

Sheet 328 — Inv 35.00

A_{91} =	2.0 Ac	× 0.5	= 1.0
No. 6A =	15.8		9.0
	17.8		10.0

Q_{50} 10 × 5.1 = 51 cfs + ovrflow from 5C

60" HW 35.0 + 6 = 41.

Cross drain No 6 — at I-91 — Exist 2-60" RCP

Sheet 328 — Sheet 329 — Inv 26.00 dw — Rdwy 33.0

$A_{R2.0}$ =	7.4 Ac	× 0.45	
A_C	12.1	× 0.60	
No 5 =	603.0		
	622.5 Ac		

Potter

Q = 750 cfs (with Confluence Valley Brook)

NE HL — 0.97 Mi

Q_{10} =	270	
Q_{50} =	500	
Q_{100} =	675 cfs	

use Q = 750 + 675 + 545 = 645

28 / 36

2-6.0" HW 26.0 + 2.0 × 5.0 = 36.0

2-60" HW 26.00 + 1.2 × 5 = 32.0 } HW 31.5

add 1-72 — 24.0 + 7.0 = 31.0 }

T 12
2
CDC
1-13-75

Tumble Brook

Cross Drain No. 6 - AT I-91

Exist 2-60"
INV. 26.00
Rdwy 33.0

COLD SPRING BROOK

T 11

1 of 2

Tumble Brook

CPC
1-13-75

Cross Drain No. 1A Elm St.

Exist 2-18"
Inv. 183.0 Rdwy 186.0

A_{HC} - 0% Devel, Grass 100%
Use Coef. 0.3

A_{HC} - 15.8Ac × 0.3 = 4.7

L = ~~1460 ft~~ 1220 ft S = ~~1.4%~~ 3.0%
T_c = ~~38~~ 30 Min.

Q_{50} = 4.7 × 3.2 = ~~15~~ 18 cfs

H.W. = 183 + (1.5 × ~~1.1~~ 1.7) = 184.65 O.K

Cross Drain No. 1B Cromwell Ave

Exist 24"
Inv. 190.9 Rdwy 199.0

A_{NB} - 100% Devel, A_c - 80% Devel, A_{R20} - 100% Devel.

It is safe to assume that previous calculations will govern and the pipe that exists isn't adequate.

R = 92

Cross Drain No. 1C Maple St.

Exist 15"
Inv. 189.5 Rdwy 197.0

A_{R20} - 100% Devel.

Previous Calc. Govern - Not Adequate

Cross Drain No. 5B Orchard St.

Exist 2-24"
Inv. 74.0 Rdwy 77.0

A_{R20} - 90% Devel.

Previous Calc. Govern - Not Adequate

Cold Spring Brook

Cross drain 1A Cold Spring Rd

Sheet 686

East 24" | 18"
INV 184.60 | 187.0
Rdwy 195.0

A_{R20} = 11.9 × 0.45 = 5.4

ΔH = 237 − 188 = 50

Q_{50} = 5.4 × 5.0 = 27 cfs L = 900 S = 50/900 = 5.5% Tc = 17

Q_{25} = 5.4 × 4.4 = 24 cfs

24" for 24" HW: 2 × 3 + 184.6 = 189.2

18" Misc 200 ft for 18" HW: 4.5 + 1.5 + 18.7 = 193.8 HW OK

relative elev to c.b. 2 × 1.5 = 3.0

Cross drain 1B Cold Spring Rd

Sheet 686

East 24" INV 206.50
Rdwy 214.0
OK

A_{R20} = 12.2 × 0.45 = 5.5

ΔH = 243 − 208 = 35

Q_{50} 5.5 × 5.1 = 28 cfs L = 750 S = 35/750 = 4.7% Tc = 16

Q_{25} 5.5 × 4.5 = 25 cfs

24" HW: 2.2 × 2 + 206.50 = 210.9

!! Cross drain 1C Cold Spring Rd

Sheet 686

East 30"
INV 196.0
Rdwy 210.0
OK

A_{R20} = 17.5 + 12.4 (1B) = 29.7

29.7 × 0.45 = 13.4

ΔH 242 − 210 = 32

L = 1800 S = 32/1800 = 1.8% Tc = 27

Q_{50} = 13.4 × 4.0 = 53.8

Q_{25} = 13.4 × 3.5 = 47.0

30" HW: 4.3 × 2.5 + 196.0 = 206.3 OK

2.0

201.0

10.10.74 JJR

Cross drain No 1 Development Rd Exist 2-36"

Sheet 686

INV 175.80

OK

A_{R20} = 1.0 × .45 =	.45	
A_{RH} = 15.2 × .60 =	9.1	
	16.2	9.5
1A	11.9	5.4
1C	23.0	10.4
	51.1	25.4

T_c 27+1-28

Q_{50} 25.4 × 3.9 = 100 cfs

Q_{25} 25.4 × 3.4 = 86 cfs

2-36" HW 175.8 + 1.3 × 3 = 179.7

Cross drain No 2 Development Rd Exist 60"

Sheet 686

INV 159.0

OK

A_{R20} = 11.9 × 0.45 =	5.4	
A_{RH} = 3.4 × 0.6 =	2.0	
	14.3	7.4
No 1	51.1	25.4
	65.4	32.8

T_c 29

Q_{50} = 32.8 × 3.8 = 125.0

Q_{25} 32.8 × 3.3 = 107.0

1-60" HW = 159 + 4.5 = 163.5 OK

Cross drain No 3A Centuary Rd Exist 18"

Sheet 686

INV 183.8

Road 194.0 OK

A_{R20}	1.2 × 0.45 =	0.5
A_{RH}	2.9 × 0.6 =	1.8
	4.1	2.3

A H 222 - 185 = 37

L 680 S = $\frac{37}{680}$ = 5.4 %

T_c = 13

Q_{50} 2.3 × 5.0 = 13 cfs

Q_{25} 2.3 × 5.0 = 11 cfs

18" HW 183.8 + 1.8 × 1.5 = 186.5 OK

Cross drain No 3 Development Rd 1-60"

Sheet 686

INV 154.0
OK

A_{RH}	= 5.8 x 0.6 =	3.5
No 2	= 65.4	32.8
No 3A	4.1	2.3
	75.3	38.6

Q_{50} 38.6 x 3.7 = 144 cfs Tc 29 + 1 = 30

1-60" HW = 154.0 + 5 x 1.1 = 159.5'

Cross drain No 4 Development Rd 1-60"

Sheet 686

INV 146.0
OK

A_{RH}	= 0.6	
A_{RH}	= 10.4 x 0.6 =	6.6
No 3	= 75.3	38.6
	86.3	45.2

Q_{50} = 45.2 x 3.6 = 163 cfs Tc = 31

1-60" HW = 146.0 + 1.15 x 5.0 = 151.50

Cross drain 5A Centre Rd 24"

686 & 795

INV 168.3
Rd 183.0
OK

A_{RH} = 7.5 x 0.6 = 4.5 Tc = 14

Q_{50} = 4.5 x 5.4 = 24.4 cfs

24" HW = 168.3 + 2.$\overset{3.1}{\times}$ 1.8 = 171.9

CS5

Cross drain 6B ~~Field Rd~~ IN Way of Rd EAST 24"

Shut 686 INV 137.6

A_M = 18.7 × 0.7 = 13.1
No 6A = 39.4 27.5
58.1 40.6

T = 20 + 4 = 24

Q_{50} = 40.6 × 4.3 = 176 cfs

60" HW 137.0 + 1.2 × 5.0 = 143.0
2-48" 137.0 + ~~4.0~~ 4.6 = ~~141.0~~ 141.6

Cross drain 6D Cemetery Rd. 24"

Shut 686 INV 133.3
Rdwy 139.0

A_M = 51.9 × 0.7 = 36.2

Q 4.6 × 36.2 = 166

ΔH 146 - 134 = 12
L 157' S $\frac{12}{157}$ = 0.8 Tc 20

54" HW 137.0 + 1.4 × 4.5 = 137.3

manually Q ext. 50 cfs 2.8
24" HW 133.3 + 4.4 × 2 = 142.1 no good.

Cross drain 6C J-91 2-42

Shut INV 115.8
Rdwy 132

A_M = 71. × 0.7 = 50
A_{91} = 12.3 × 0.4 = 5
83. 55

ΔH 146 - 118 = 28 OK
L 2600 S $\frac{28}{2600}$ = 1 Tc 27

Q_{50} = 4.0 × 51 = 204

2-42 HW 1.6 × 4.5 + 115.8 = 123 14

WESTERLY TERRACE BROOK

WESTERLY Terrace Basin

Cross drain No 1. Westerly Terrace — Exist 48"

407

A_{R20} = 80 x 0.45 = 36

Q_{50} = 3.6 x 36 = 130 cfs

Q_{25} = 3.2 x 36 = 115 cfs

INV 174.8
Road 183.40
OK

ΔH = 235 - 184 = 51 ft
L = 3 rods S = 5'/3rds = 1.7% Tc = 3x

48" HW = 174.8 + 1.5 x 4.0 (6.0) = 180.8 rd ok

Cross drain No 2 proposed by State Hwy. Dept 48 & 60" ok

Cont' onto of Terrace
Cross drain No 2A see pg 2
Sheet 406

H D L

Hang Dog Lane Basin

407

Cross drain 1A Hayes Rd — East 15"

407

A_{R20} = 13.1 x 0.45 = 5.9

Q_{25} = 5.9 x 4.7 = 27.8 cfs

INV 196.50
Road 201.0

ΔH 235 - 200 = 35
L = 1100 S = 35/110 = 3% Tc = 19

24" HW 1.0 x 2 + 196.1 = 199.6

Cross drain 1B Hayes Rd — East 2-18"

407

A_{R20} 3.3 x 0.45 = 1.5

Q_{25} = 1.5 x 5.6 = 8.1 cfs

195.0 / 192.3
Road 197.5 / 196
ΔH 205 - 194 = 11
L = 450 S = 11/450 = 2.5 Tc = 14 min
OK

HW 195 + 1.5 = 196.5
HW 192.3 + 1.5 = 193.8

AREA BETWEEN
DIVIDEND AND HOG BROOK

Be –

Areas between Diversion & Hog Back (BE)

Cross drain No 1A Diversion Road — Exist 18"

489

INV. 103.9
Rdw 107.9

$A_{R20} = 8.3 \times 0.45 = 3.7$

$Q_{25} = 5.0 \times 3.7 = 18.4$ cfs

ΔH 156 − 106 = 50
L 900 S $\frac{50}{900}$ = 5.5 Tc = 17

18" HW 2.8 × 1.5 + 1039 = 108.1
24" HW 1.2 × 2.0 + 103.9 = 106.3

Cross drain No 1 a BRR — None

489

INV ?
RR. 500

$A_C = 7.3 \times 0.60 = 4.4$
$A_{R_{20}} = \frac{32.7}{40.0} \times 0.45 = \frac{14.7}{19.1}$
1A $\frac{8.3}{48.3}$ $\frac{3.7}{22.8}$

ΔH
Tc = 3 + 17 = 20

Q_{50} 5.2 × 22.8 = 118 cfs

48" HW = 24 + 1.4 × 4.0 = 29.6

Cross drain No 2A Diversion Rd — Exist 18"

489

92.1 Inv ~~92.1~~
100.0 Rdw ~~100.0~~
OK

$A_{R20} = 7.5 \times 0.45 = 3.4$

ΔH 158 − 110 = 48
L = 1000 ; S $\frac{48}{1000}$ = 4.8 Tc = 18

$Q_{25} = 3.4 \times 48 = 16.3$ cfs

18" HW 92.1 + 2 × 1.5 = 95.1
~~98.1~~ ~~101.1~~

Areas between Divisional & Hog Back - (BE)

Cross drain No 2B Divisional & Evans

INV 48.0 15"
Road. 53.0

A_{220}	13.8	x 0.45	6.2
A_M	17.4	x 0.70	12.2
	31.2		18.4
3A	7.5		3.4
	38.7		21.8

Q_{50} 21.8 x 4.7 = 102
Q_{25} 21.8 x 4.2 = 92

ΔH 160 - 55 = 105
L 1600 S $\frac{105}{1600}$ = 6.6 Tc 18+1=19

48" HW 46.6 + 1.3 x 4.0 (5.2) = 51.8

$Q = 102 \times \frac{0.45}{0.70} = 66$ cfs

Cross drain No 2 Rail Rd

East 42
Road 35.0 INV. 25.70

A_M = 41.9 x 0.70 = 29.4
2B = 38.7 = 21.8
80.6 51.2

Q_{50} 4.3 x 51.2 = 220
~~5.0 x 29.9 = 147~~
Q_{25} ~~4.4 x 29.4 = 129~~

$Q = 220 \times \frac{0.45}{0.7} = 140$ cfs

ΔH 92 - 40 = 52 OR
L 1900 S $\frac{52}{1900}$ = 2.7
Tc ~~19~~ 14+3=22

42 HW 2.1 x 3.5 + 25.7 (7.4) = 33.1
60" HW 1.5 x 5.0 + 26.5 = 34.0
54" HW 2.0 x 4.5 + 25.0 (5) = 34.0
48" HW 3. x 4.0 + 22.0 = 34.0

Cross drain No 3C (3A) Divisional Rd

East 15"
Road. 49.5 INV 46.3

A_M = 34.7 x 0.7 = 24.2

Q_{25} = 24.2 x 4.9 = 116
Q_{50} = 24.2 x 5.4 = 131

ΔH 170 - 40 = 130
L 1800 S $\frac{130}{1800}$ = .72 Tc = 14

Q = 75

2-30" HW 44.0 + 1.5 x 3.1 (4.5) = 48.50

Areas between Dividend & Big Bear (BE)

Cross Section No 38 - Belanoso Ave — UNKNOWN — None

Direct To Dividend Brook — Rain 38.6

$A_M = 4.8 \times 0.70 = 3.3$

$Q_{25} = 3.3 \times 5.2 = 17.1$ cfs

$\Delta H = 53 - 36 = 17$

$L = 750$; $S = \frac{17}{750} = 2.3$ $T_c = 12$

18" HW $2.3 \times 1.5 + 3.1 = 3.4 = 34.4$

$A_M = 31.4 \times 0.7 = 22.0$

$T_c = 19$

3B	38.7	21.8
3A 3C	34.7	24.2
	104.8	68.0
	66.1	46.2

$Q_{50} = 46.2 \times 4.7 = 218$ cfs

$Q = 125$ cfs

72" HW = $30.0 + 1.3 \times 6 = 37.8$ (Fwy. 7.8)

2-54" HW = $30.0 + 1.4 \times 4.5 = 36.3$ (6.8)

1-60" HW = $30.0 + 1.5 \times 5.0 = 37.5$

Cross Section No 3 — Rail Road — UNKNOWN — None

Direct by Channel to Dividend Brook — RR - 37.0 — I.P = 29.0

$A_M = 31.4 \times 0.70 = 22.0$

3B	38.7	21.8
3C	34.7	24.2
3D	4.8	3.3
	109.6	49.3

$T_c = 19 + 2 = 21$

Q_{25} $4.0 \times 49.3 = 197.0$

Q_{50} $4.5 \times$ $= 222.0$

$A_M = 4.8 \times 0.7 = 3.3$

3B 3D	66.1	46.2
	104.8	68.0
	109.6	71.3
	70.9 x	49.5

$Q_{50} = 71.3 \times 4.5 = 228$ cfs

60" HW $28 + 1.5 \times 5.5 = 35.5$ (7.5)

72" HW $28 + 6 = 34.0$

2-48 HW $28 + 1.2 \times 4 = 32.8$

Channel 4 Ft S = 0.5% (2:1 2:1)

BE-4

Areas Between Divided & Lag Basin (BE) "N Known - Now?

480 East of Wrentham Road -

Present Low Point El. 33.0

BE-No 4

A_{R2}	10.4	× 0.45	=	4.7
A_{R4}	4.1	× 0.50	=	2.0
	14.5			6.7

AH 114 − 34 = 80

L 1100 $S \frac{80}{1100} = 8\%$ $T_c = 15$ min

$Q_{25} = 4.7 \times 6.7 = 31.5$ cfs

$Q_{50} = 5.1 \times 6.7 = 34.2$ cfs

24"

INV 2.2×2

HW = 31 + 4.4 = 35.4

Areas Between Dividend Brook & Hog Brook

Be 5 of 5
CDOC
1-14-75

Cross Drain No. 1A Dividend Rd.

Exist 18"
Inv. 103.9
Rdwy 107.9

A_{RCD} - 80% Devel, Grass 20%

A_{R20} - 0.8 x 0.45 = 0.36
Grass - 0.2 x 0.3 = 0.06
0.42

L = 900 ft S = 5.5%
Tc = 18 Min

A_{R20} - 8.3 Ac x 0.42 = 3.5

$Q_{10} = 3.5 \times 3.7 = 13.0$ cfs
$Q_{50} = 3.5 \times 4.9 = 17.2$ cfs

Q_{10} - H.W - $103.9 + (1.5^{2.7} \times 1.8) = 106.6$
Q_{50} - H.W. - $103.9 + (1.5^{3.6} \times 2.4) = 107.5$

30

Cross Drain No. 3C Dividend Rd.

Exist 15"
Inv. 96.3
Rdwy 99.5

A_M - 0% Devel, Grass 100%
Use Coef. 0.3

L = 1800 ft S = 7.2%
Tc = 32 Min

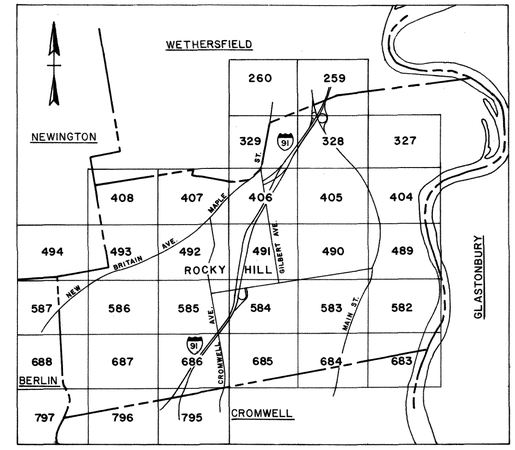
A_M = 34.7 Ac x 0.3 = 10.4

$Q_{10} = 10.4 \times 2.6 = 27$ cfs
$Q_{50} = 10.4 \times 3.6 = 37.4$ cfs

Q_{10} - H.W = 96.3 + (1.25 x 10+) = 58+
Q_{50} - H.W = 96.3 + (1.25 x 10+) = 58+

Not Adequate

DRAINAGE STUDY



INDEX PLAN

LEGEND

MAJOR WATERSHED	
MINOR WATERSHED	
WATERSHED SUB-AREA NUMBER	
NUMBER OF CROSSDRAIN AND LOCATION	
EXISTING SYSTEM	15"R
PROPOSED SYSTEM	30"
TYPE OF PIPE	
ASPHALT COATED CORREGATED METAL	A
CORREGATED METAL	C
CAST IRON	C.I.
REINFORCED CONCRETE	R
TILE	T

ROCKY HILL
Incorporated 1843
CONNECTICUT

ROCKY HILL, CONNECTICUT

CE MAGUIRE, INC.

ENGINEERS

NEW BRITAIN - WALTHAM - PROVIDENCE

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY

Scale 1 inch = 200 ft. or $\frac{1}{2400}$

0 50 100 200 300 400 500 1000

Contour interval 1 and 2 ft.

Datum is Metropolitan District Datum

Zero of Coordinates 150,000 ft. South and West of Lat. 41° 45' 42".641 and Long. 72° 44' 35".476

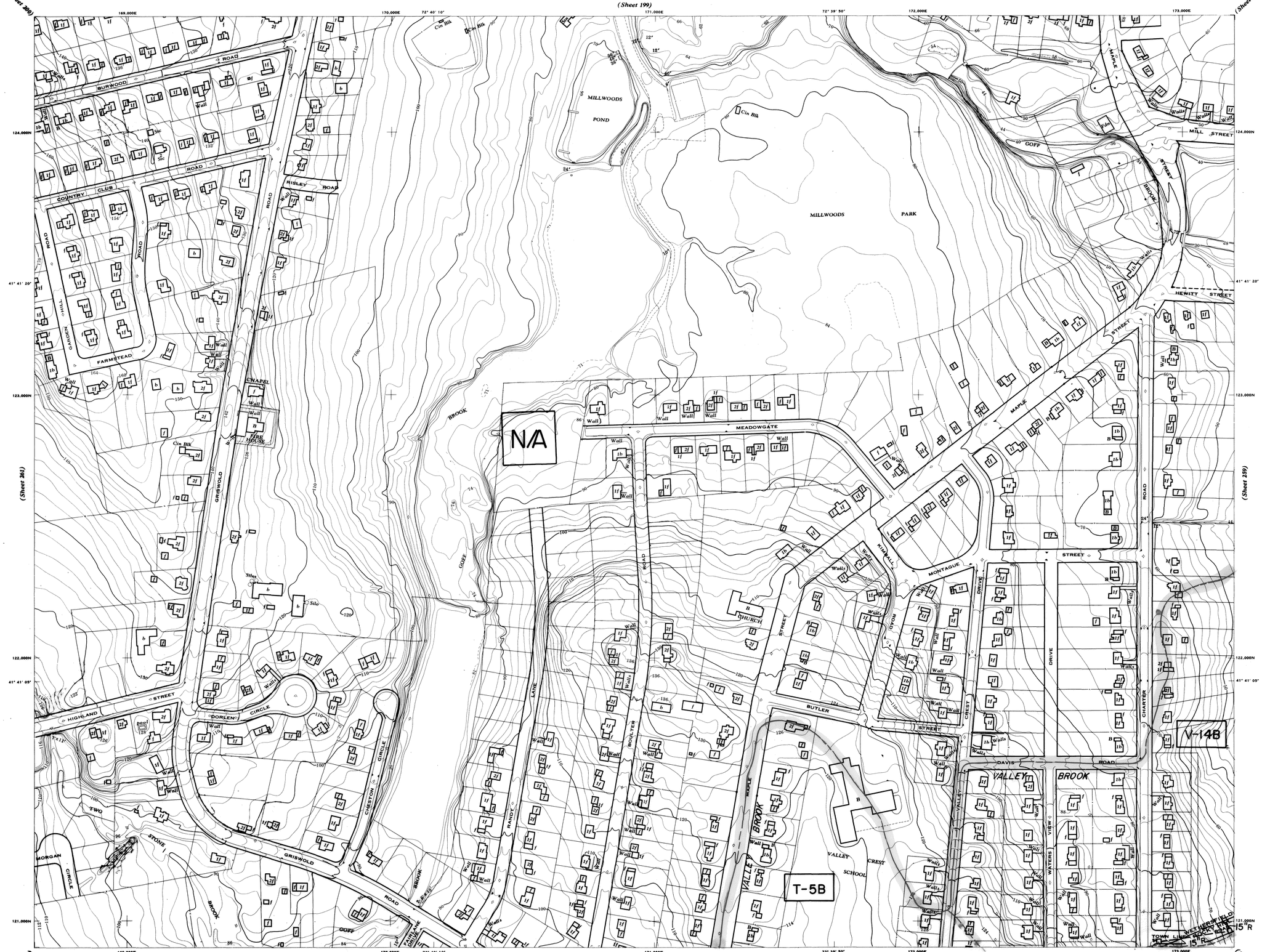
For 1947 adjusted values of Geographic Positions for Sheet Corners substract 0".037 seconds from latitudes and add 0".254 seconds to longitudes to perimeter shown.

TOPOGRAPHY BY
ABRAMS AERIAL SURVEY CORPORATION
DECEMBER
1962

PRIMARY CONTROL AND REPRODUCTION
BY THE
DEPARTMENT OF SURVEYS
OF THE
COMMISSION ON REGIONAL PLANNING
THE METROPOLITAN DISTRICT
HARTFORD COUNTY CONNECTICUT

SHEET 259
WETHERSFIELD
ROCKY HILL

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



Scale 1 inch = 200 ft. or $\frac{1}{2400}$

0 50 100 200 300 400 500 1000

Contour interval 1 and 2 ft.
Datum is Metropolitan District Datum
Zero of Coordinates 150,000 ft. South and West of Lat. 41° 45' 42".641 and Long. 72° 44' 35".476
For 1947 adjusted values of Geographic Positions for Sheet Corners subtract 0".037 seconds from latitudes and add 0".254 seconds to longitudes to perimeter shown.

TOPOGRAPHY BY
ABRAMS AERIAL SURVEY CORPORATION
DECEMBER
1962

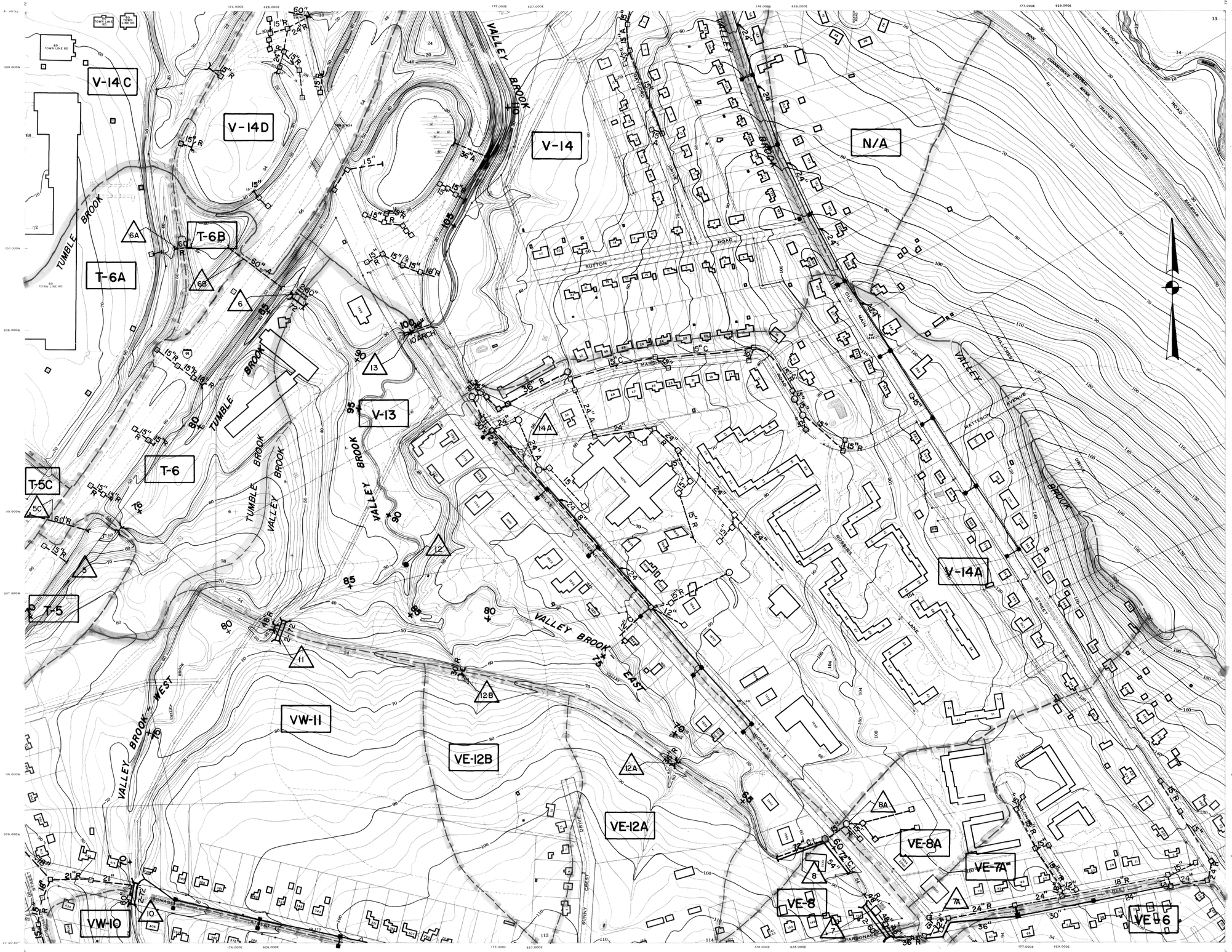
PRIMARY CONTROL AND REPRODUCTION
BY THE
DEPARTMENT OF SURVEYS
OF THE
COMMISSION ON REGIONAL PLANNING
THE METROPOLITAN DISTRICT
HARTFORD COUNTY CONNECTICUT

SHEET 260
WETHERSFIELD
ROCKY HILL

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY

VE-7A
VE-7C
VALLEY BROOK
MEADOW BROOK
NORTH MEADOW BROOK
MEADOW BROOK
MEADOW BROOK

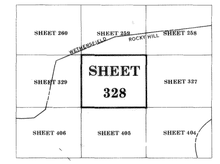
THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- 666 HOUSE NUMBER

TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973



THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL PLANNING
HARTFORD COUNTY, CONNECTICUT

SHEET 328

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

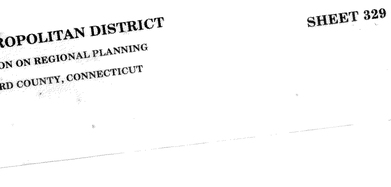
CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
1973

-LEGEND-

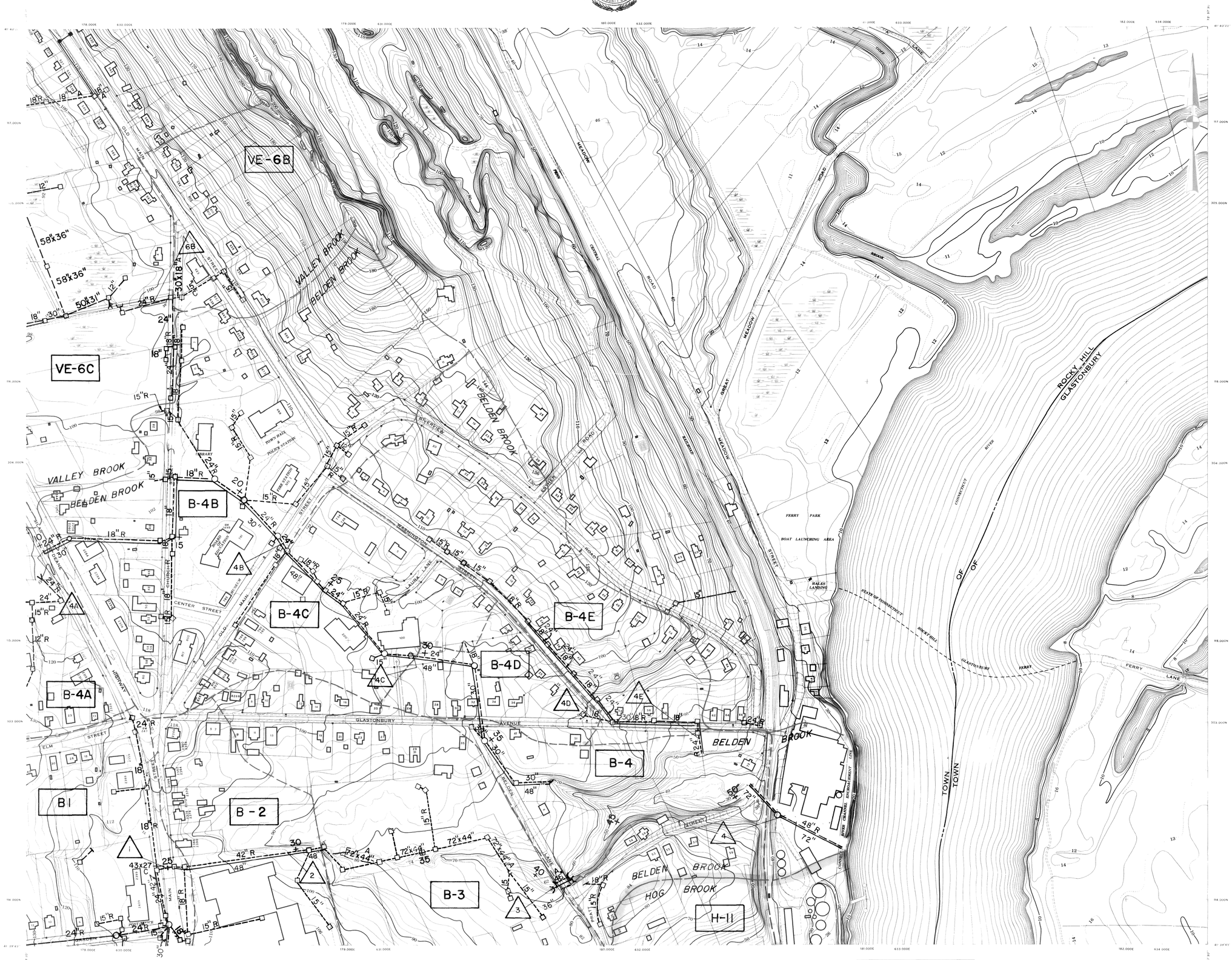
- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER



THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL PLANNING
HARTFORD COUNTY, CONNECTICUT

SHEET 329

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

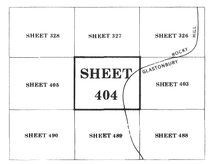
-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- 636 HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

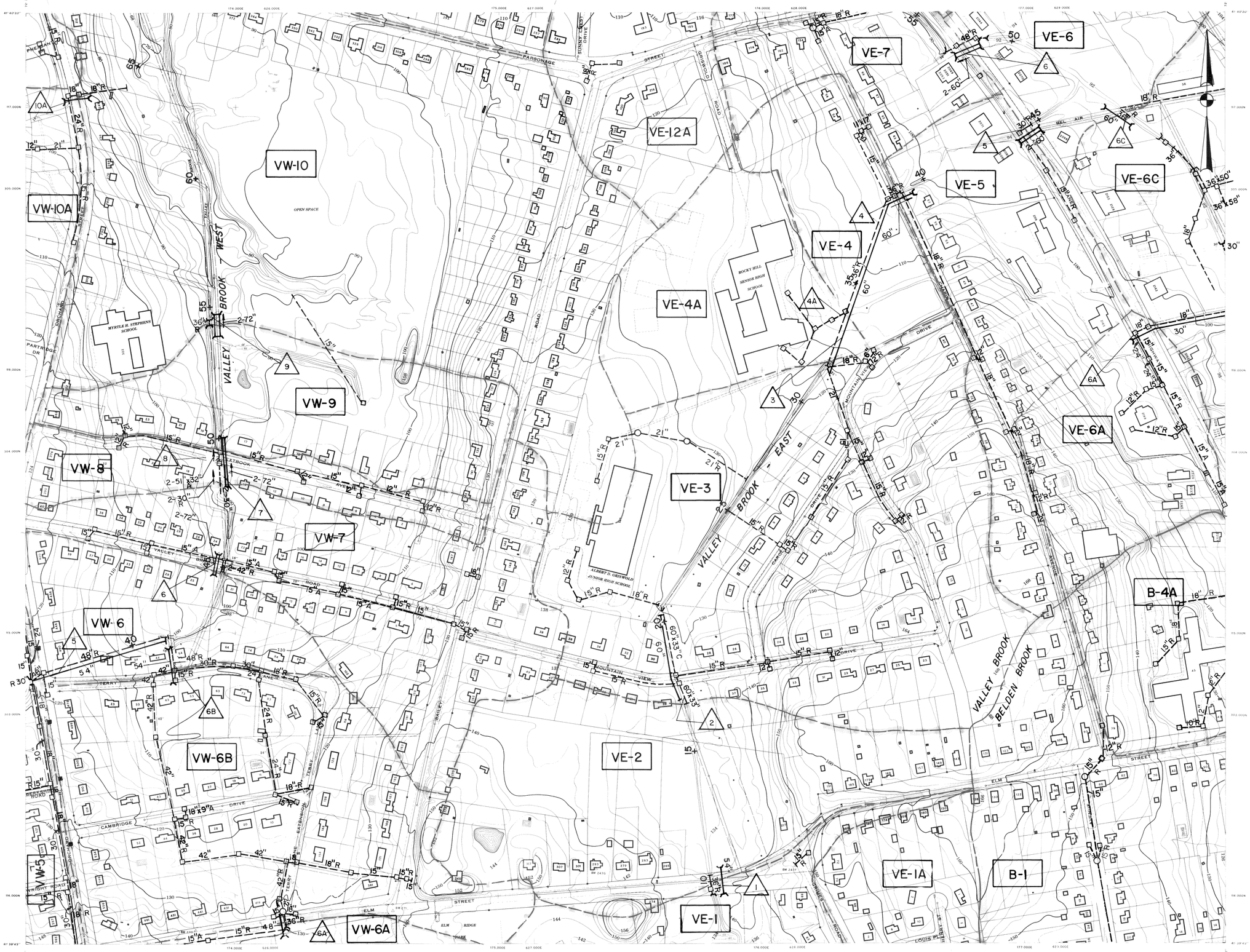
CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM WEST OF CONNECTICUT RIVER
USC&GS DATUM EAST OF CONNECTICUT RIVER
1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS



THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL PLANNING
HARTFORD COUNTY, CONNECTICUT

SHEET 404

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET

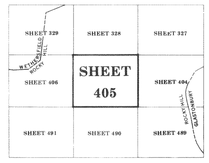
METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE

METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM

CONNECTICUT COORDINATE GRID SHOWN IN BROWN

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS

FROM AERIAL PHOTOGRAPHS TAKEN

MARCH, 1973

THE METROPOLITAN DISTRICT

COMMISSION ON REGIONAL PLANNING

HARTFORD COUNTY, CONNECTICUT

SHEET 405

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY

TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER

SCALE 1:2400

CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

SHEET 406

THE METROPOLITAN DISTRICT
COMMISSION ON

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY

TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

THE METROPOLITAN DISTRICT
COMMISSION

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY

TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- 846 HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

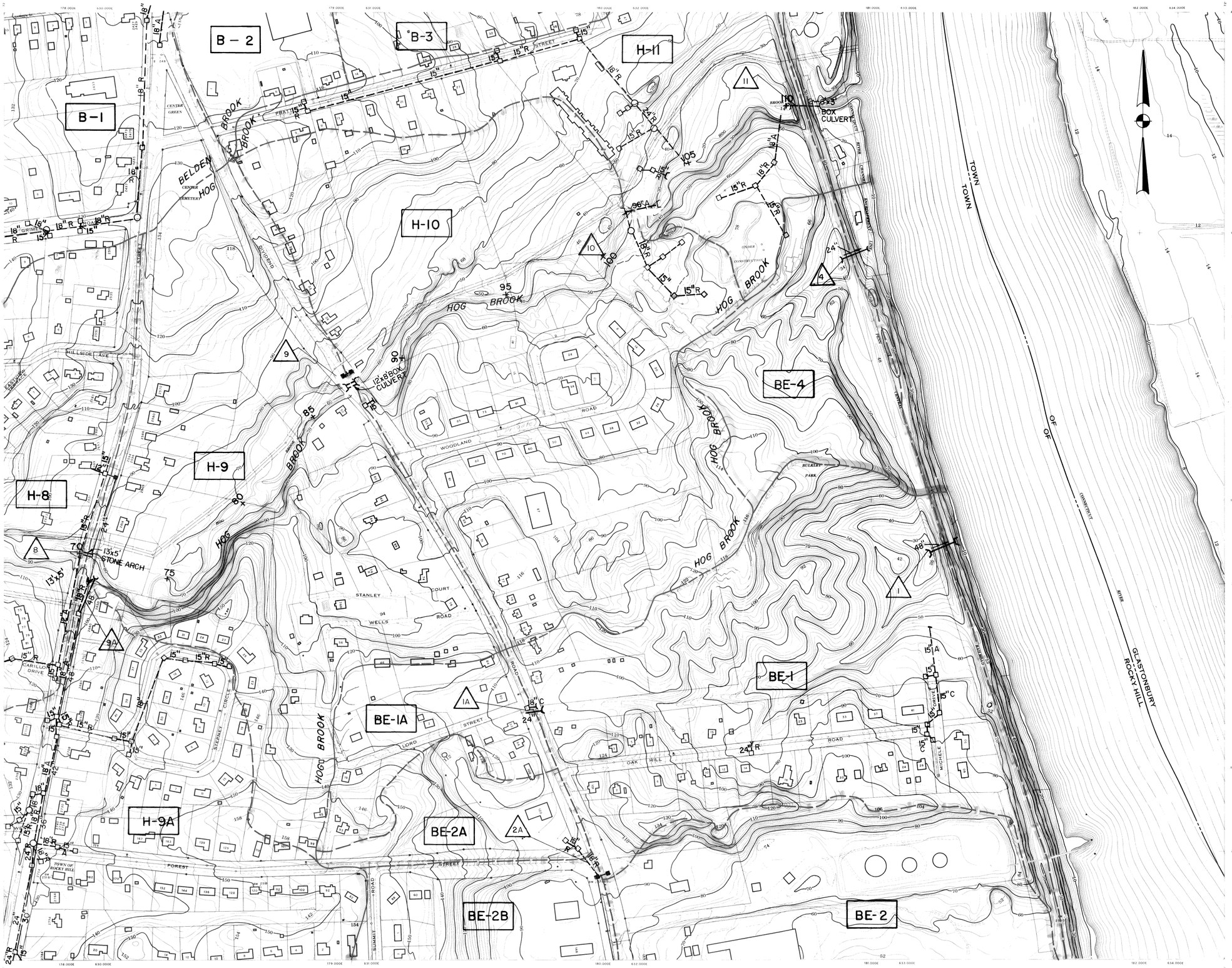
1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

SHEET 408

SHEET 332 | SHEET 331 | SHEET 330
SHEET 409 | SHEET 407
SHEET 484 | SHEET 483

THE METROPOLITAN DISTRICT
COMMISSION ON

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS

FROM AERIAL PHOTOGRAPHS TAKEN

MARCH, 1973

-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- 170 HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET

METROPOLITAN DISTRICT DATUM WEST OF CONNECTICUT RIVER

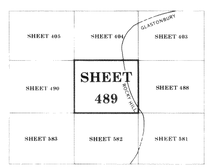
USC&GS DATUM EAST OF CONNECTICUT RIVER

1000-FOOT GRID BASED ON THE

METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM

CONNECTICUT COORDINATE GRID SHOWN IN BROWN

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS



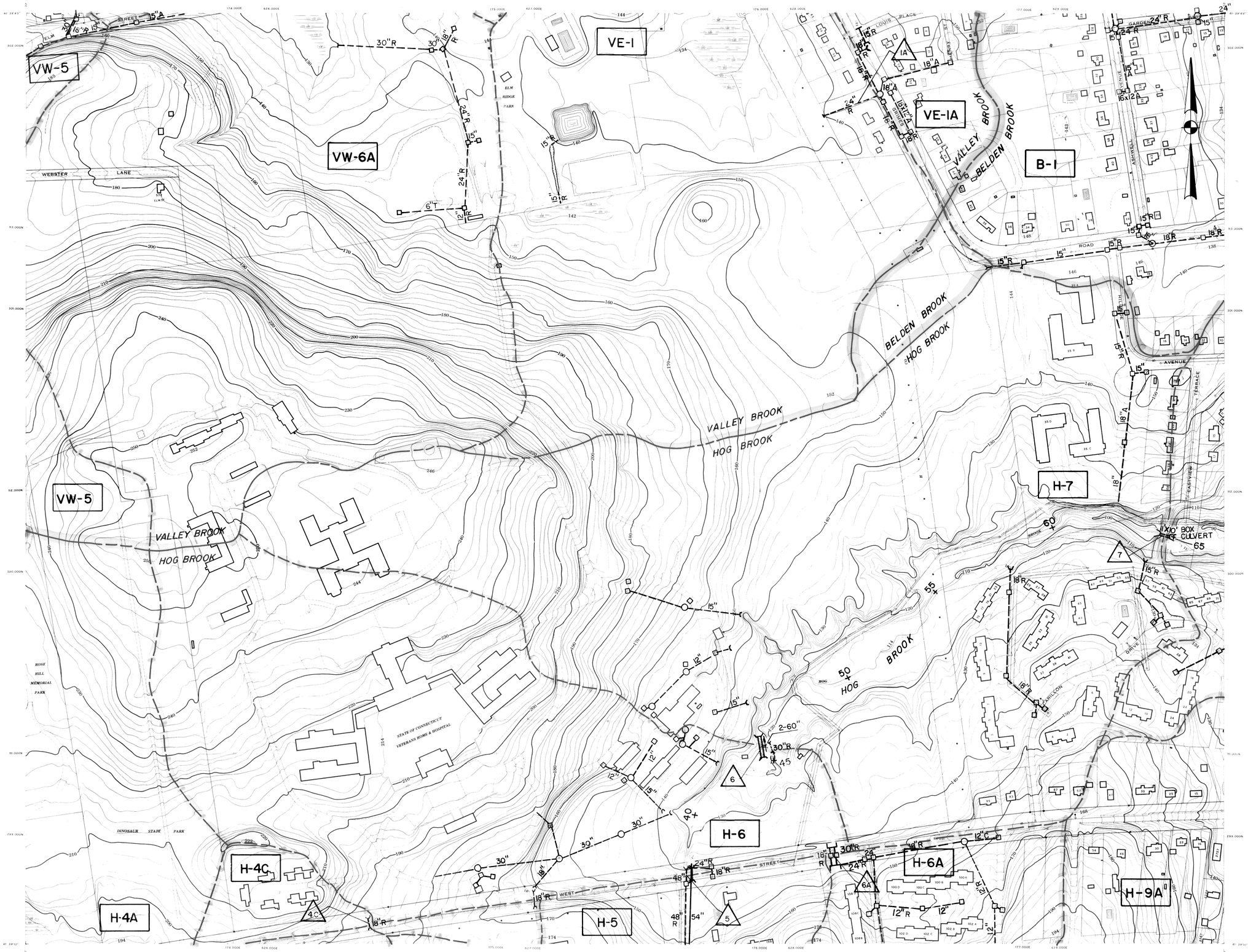
THE METROPOLITAN DISTRICT

COMMISSION ON REGIONAL PLANNING

HARTFORD COUNTY, CONNECTICUT

SHEET 489

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS

FROM AERIAL PHOTOGRAPHS TAKEN

-LEGEND-

SANITARY SEWER
STORM SEWER
CATCH BASIN
WATER MAIN
HYDRANT
VERTICAL CONTROL POINT
HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET

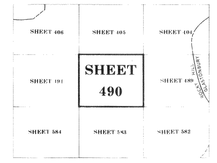
METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE

METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM

CONNECTICUT COORDINATE GRID SHOWN IN BROWN

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS



SHEET 490

THE METROPOLITAN DISTRICT

COMMISSION ON REGIONAL PLANNING

HARTFORD COUNTY, CONNECTICUT

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY

T-1 T-1A T-2A T-2B T-2C T-3 T-3A
VW-1 VW-1A VW-1B VW-1C VW-2 VW-3 VW-5
SME-1 SME-2 SME-3
H-1C H-4A

TUMBLE BROOK
SAW MILL BROOK
VALLEY BROOK
HOG BROOK
SAW MILL BROOK EAST

TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-
SANITARY SEWER
STORM SEWER
CATCH BASIN
WATER MAIN
HYDRANT
VERTICAL CONTROL POINT
HOUSE NUMBER

SCALE 1:2400

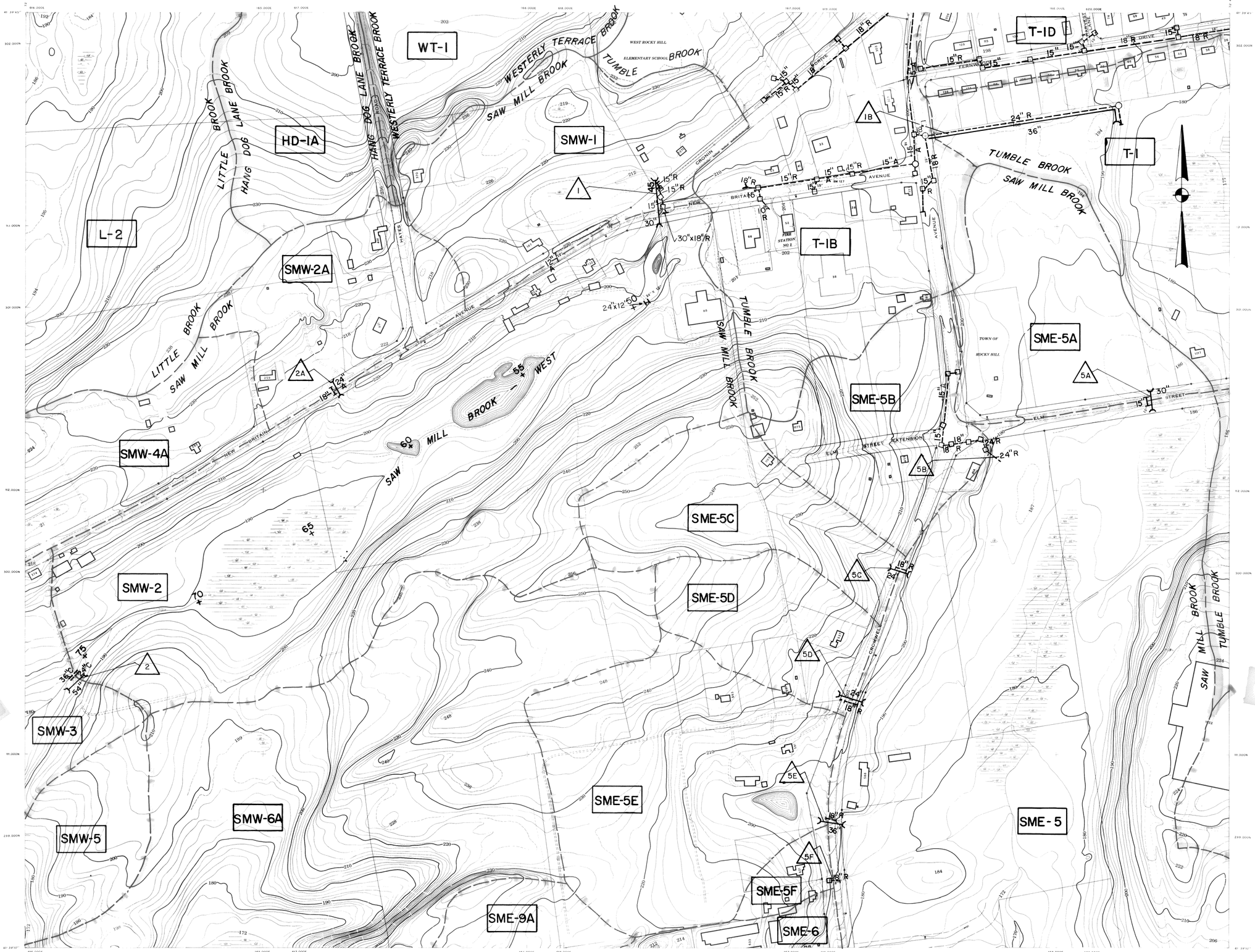
CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

SHEET 491
SHEET 407 SHEET 406 SHEET 405
SHEET 192 SHEET 196
SHEET 385

THE METROPOLITAN DISTRICT
COMMISSION ON

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- 295 HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

NEWINGTON	WETHERSFIELD / ROCKY HILL	
SHEET 408	SHEET 407	SHEET 406
SHEET 493	**SHEET 492**	SHEET 491
SHEET 566	SHEET 565	SHEET 564

THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL PLANNING
HARTFORD COUNTY, CONNECTICUT

SHEET 492

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY

TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

SHEET 493

THE METROPOLITAN DISTRICT
COMMISSION

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY

(Sheet 409)

(Sheet 410)

(Sheet 408)

(Sheet 496)

(Sheet 588)

(Sheet 587)

(Sheet 586)

RICHARD STREET

DEMING STREET

TURNPIKE

HARTFORD NEW HAVEN

CULVER STREET

CAMBRIDGE DRIVE

COLONIAL DRIVE

SALEM DRIVE

GARDENWOOD DRIVE

FRANKLIN DRIVE

LANDFALL LANE

COSTELLO ROAD

LITTLE BROOK

TOWN OF NEWINGTON

TOWN OF ROCKY HILL

CLAIRVIEW AVENUE

LAKEVIEW AVENUE

Conc Blk

Plastic

B

L-4

L-5

Scale: 1 inch = 200 ft. or 1/2400

0 50 100 200 300 400 500 1000 FEET

Contour interval 1 and 2 ft.

Datum is Metropolitan District Datum

Zero of Plane Coordinates is 150,000 ft. South and West of Lat. 41° 45′ 42″ .641 and Long. 72° 44′ 35″ .476

Photogrammetry by Abrams Aerial Survey Corporation

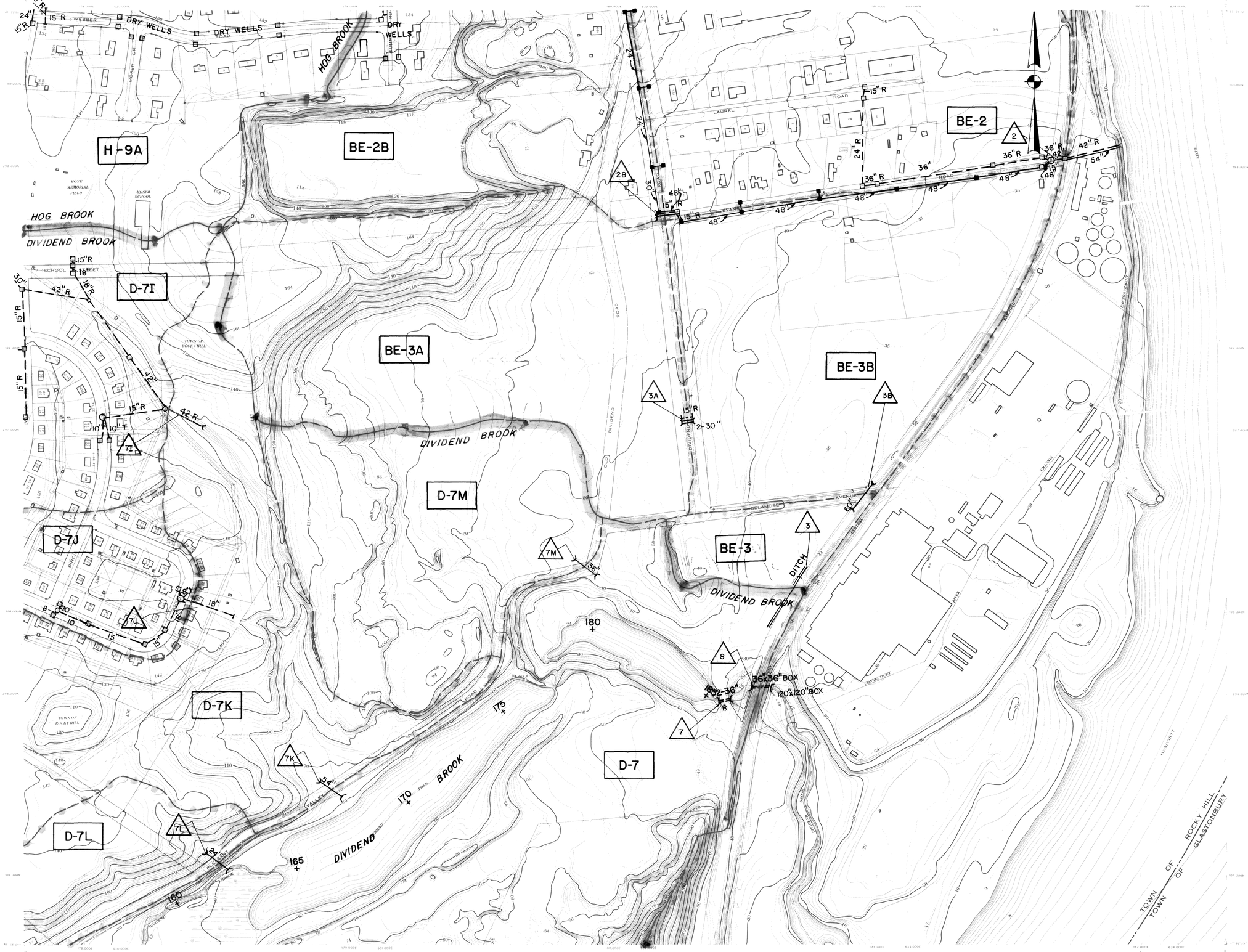
December 1967

- LEGEND -

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- MDC HYDRANT
- VERTICAL CONTROL POINT

CONTROL AND REPRODUCTION
BY THE
SURVEY AND MAPPING DIVISION
GENERAL SER...

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



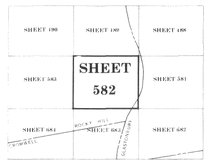
TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-
- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER

SCALE 1:2400
0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

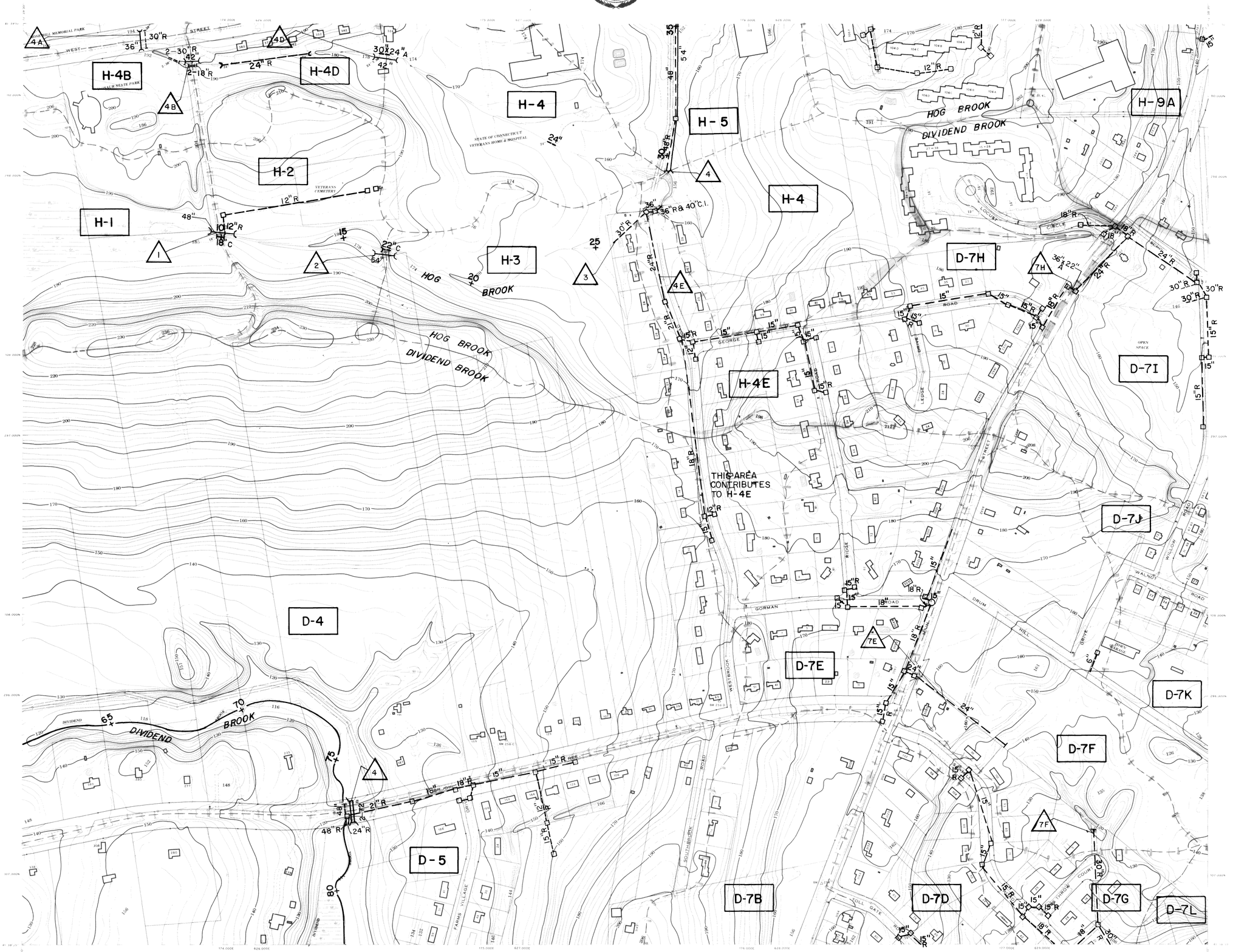
1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS



THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL PLANNING
HARTFORD COUNTY, CONNECTICUT

SHEET 582

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET

METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE

METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM

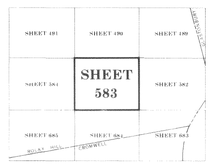
CONNECTICUT COORDINATE GRID SHOWN IN BROWN

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS

FROM AERIAL PHOTOGRAPHS TAKEN

MARCH, 1973



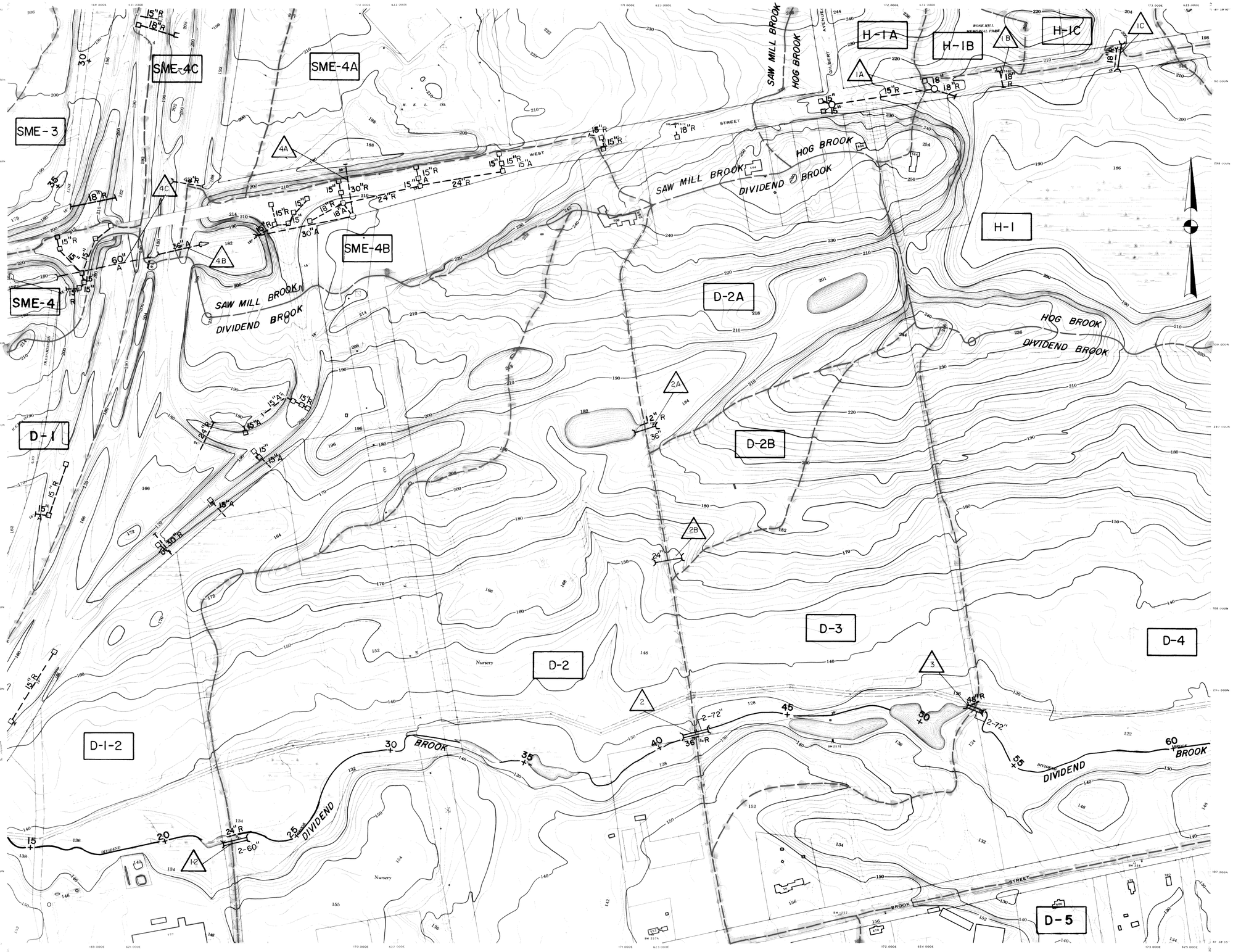
THE METROPOLITAN DISTRICT

COMMISSION ON REGIONAL PLANNING

HARTFORD COUNTY, CONNECTICUT

SHEET 583

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

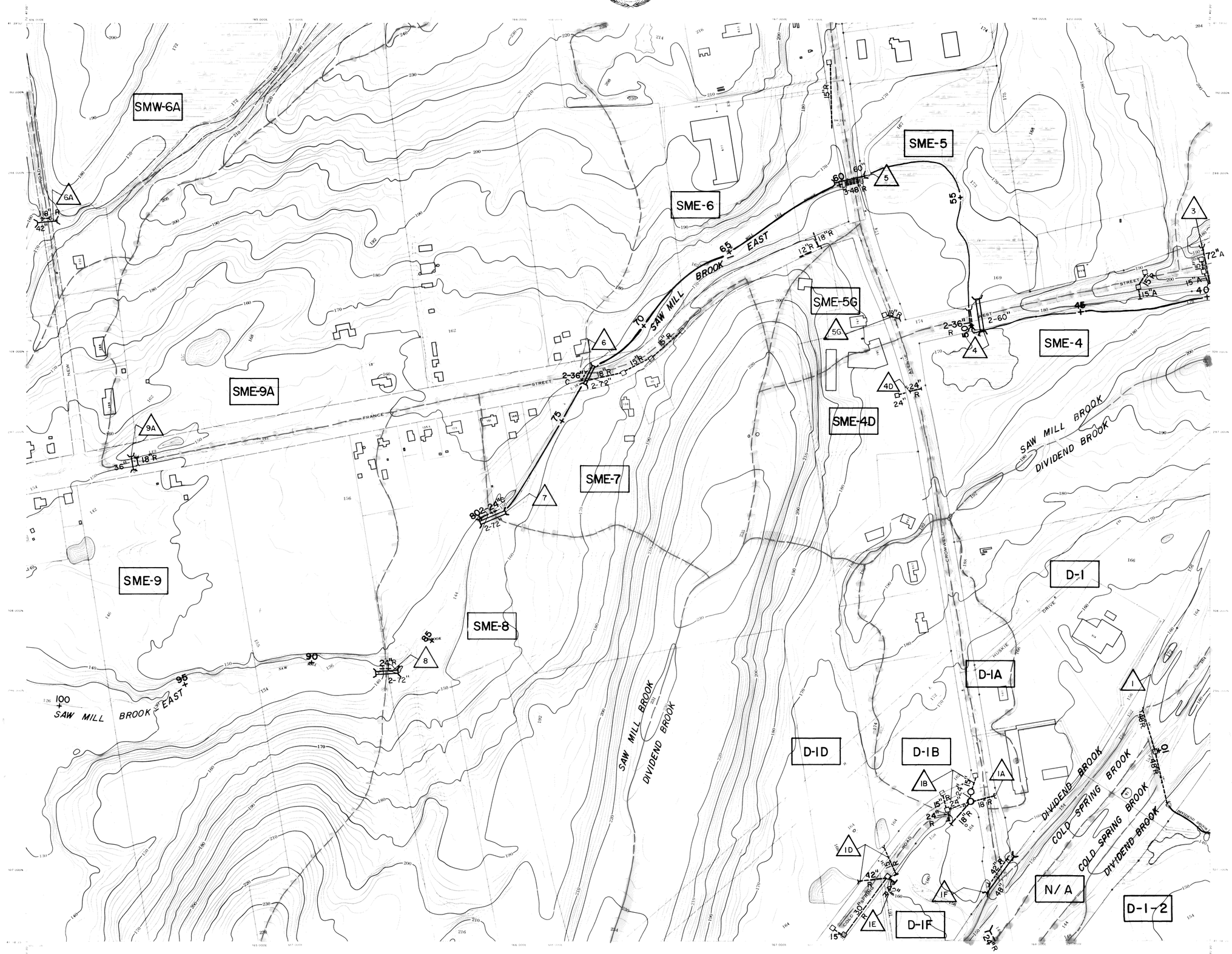
1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

SHEET 192	SHEET 191	SHEET 190
SHEET 585	**SHEET 584**	SHEET 583
SHEET 586	SHEET 585	SHEET 581

THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL PLANNING
HARTFORD COUNTY, CONNECTICUT

SHEET 584

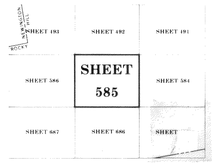
THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-

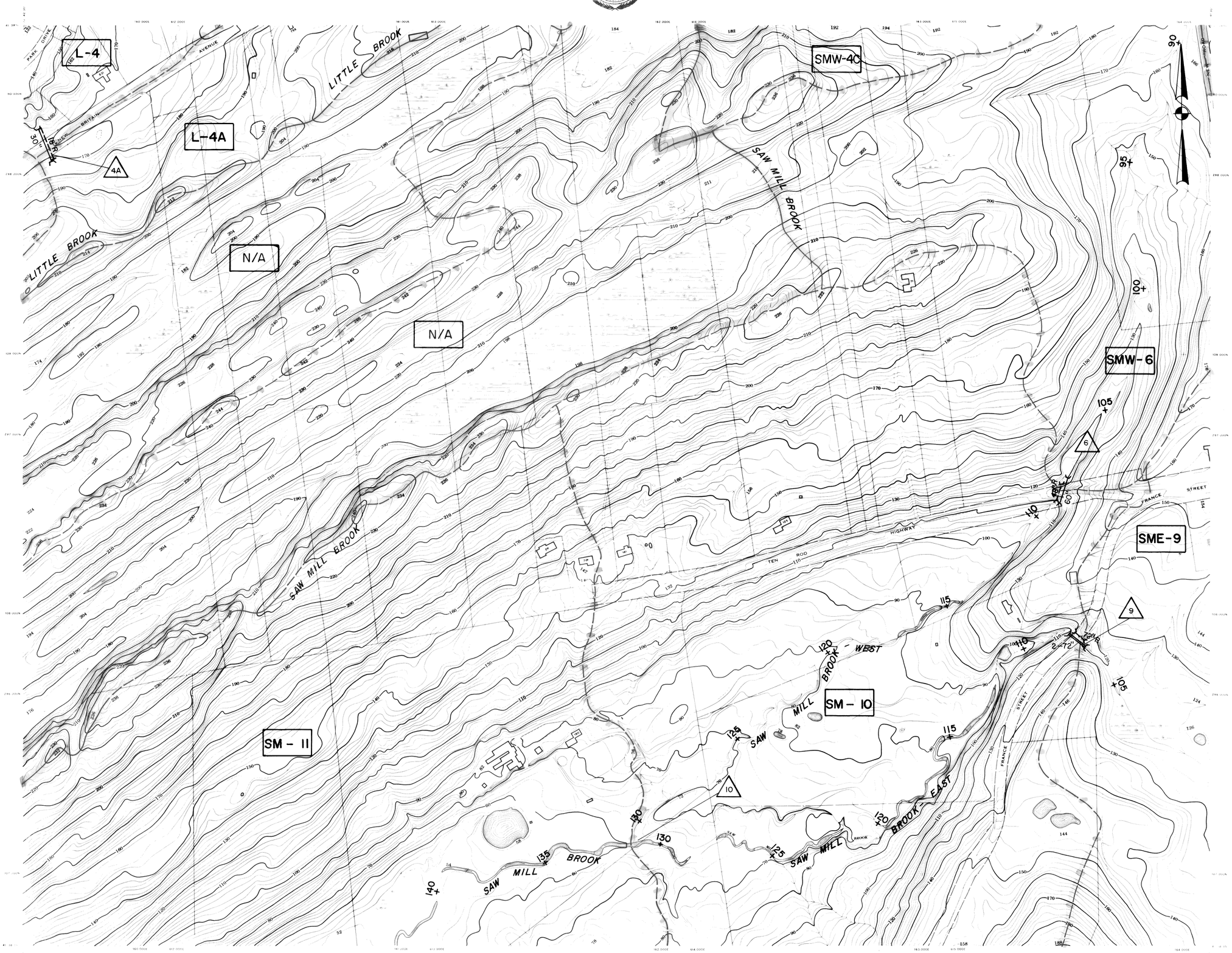
- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- 828 HOUSE NUMBER



THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL PLANNING
HARTFORD COUNTY, CONNECTICUT

SHEET 585

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-

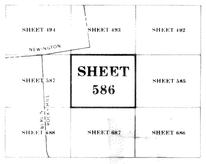
- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER

SCALE 1:2400

0 10 100 200 300 500 1000 FEET

CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

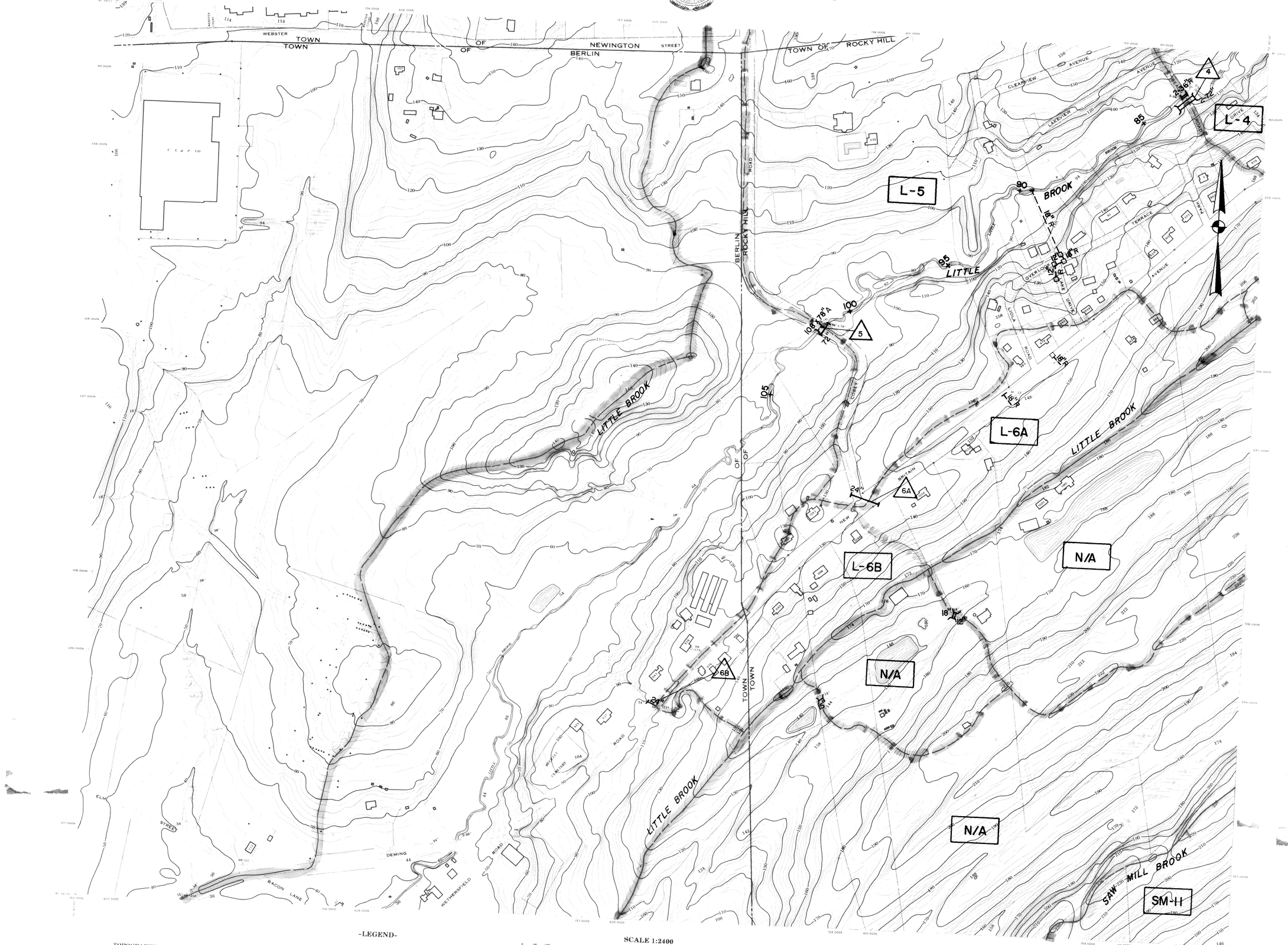
1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS



THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL PLANNING
HARTFORD COUNTY, CONNECTICUT

SHEET 586

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL PLANNING
HARTFORD COUNTY, CONNECTICUT

SHEET 587

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY

TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

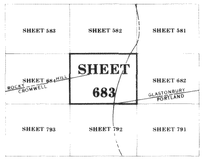
-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

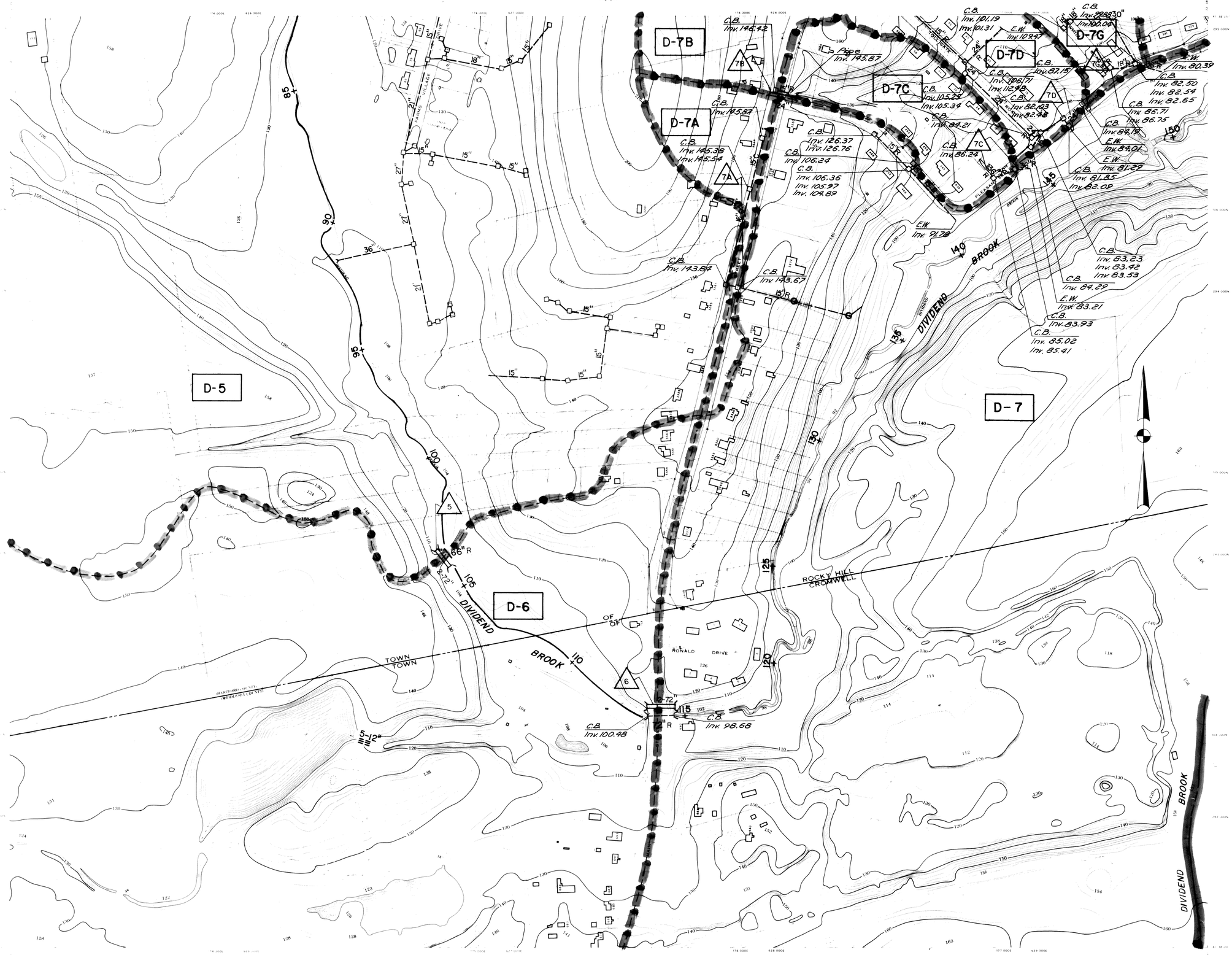
CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM WEST OF CONNECTICUT RIVER
USC&GS DATUM EAST OF CONNECTICUT RIVER
1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS



THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL PLANNING
HARTFORD COUNTY, CONNECTICUT

SHEET 683

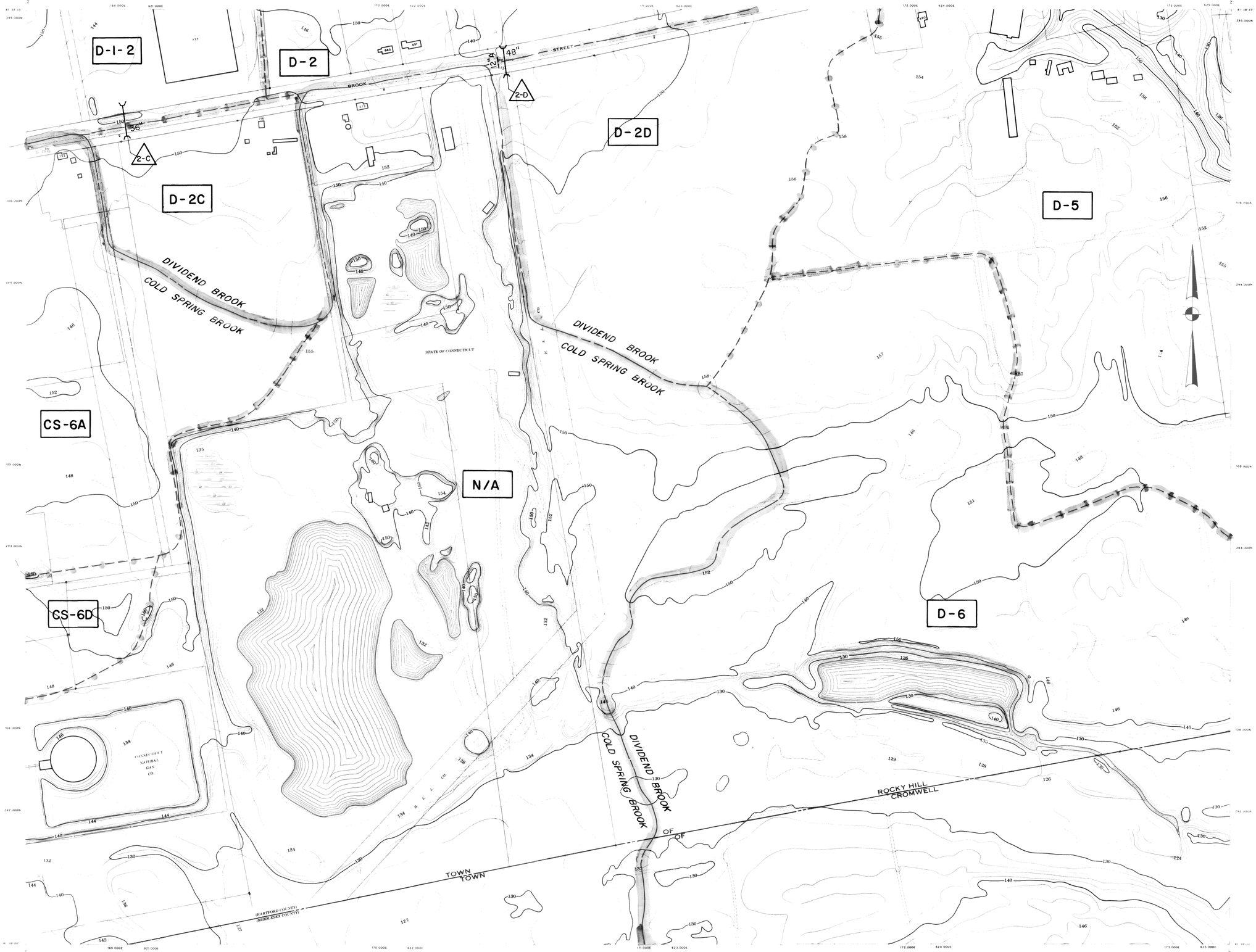
THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



SCALE 1:2400

0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000 3200 3400 3600 3800 4000 4200 4400 4600 4800 5000 5200 5400 5600 5800 6000 6200 6400 6600 6800 7000 7200 7400 7600 7800

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-

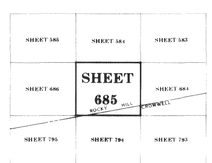
- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- 893 HOUSE NUMBER

SCALE 1:2400

0 40 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS



THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL PLANNING
HARTFORD COUNTY, CONNECTICUT

SHEET 685

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY

SME 8
SME 9
SAW MILL BROOK
COLD SPRING BROOK
DIVIDEND BROOK
D ID
D-IF
D IC
CS IB
CS IA
CS IC
CS I
CS 2
CS 3
CS 3A
CS 4
CS 5
CS 5A
N/A
D-1-2
CS 6B
CS 6A
CS6C
CS 6D
INWOOD ROAD
DIVIDEND BROOK STREET
CONNECTICUT NATURAL GAS CO.
STATE OF CONN

TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-
SANITARY SEWER
STORM SEWER
CATCH BASIN
WATER MAIN
HYDRANT
VERTICAL CONTROL POINT
HOUSE NUMBER

SCALE 1:2400
0 50 100 200 300 400 500 1000 FEET

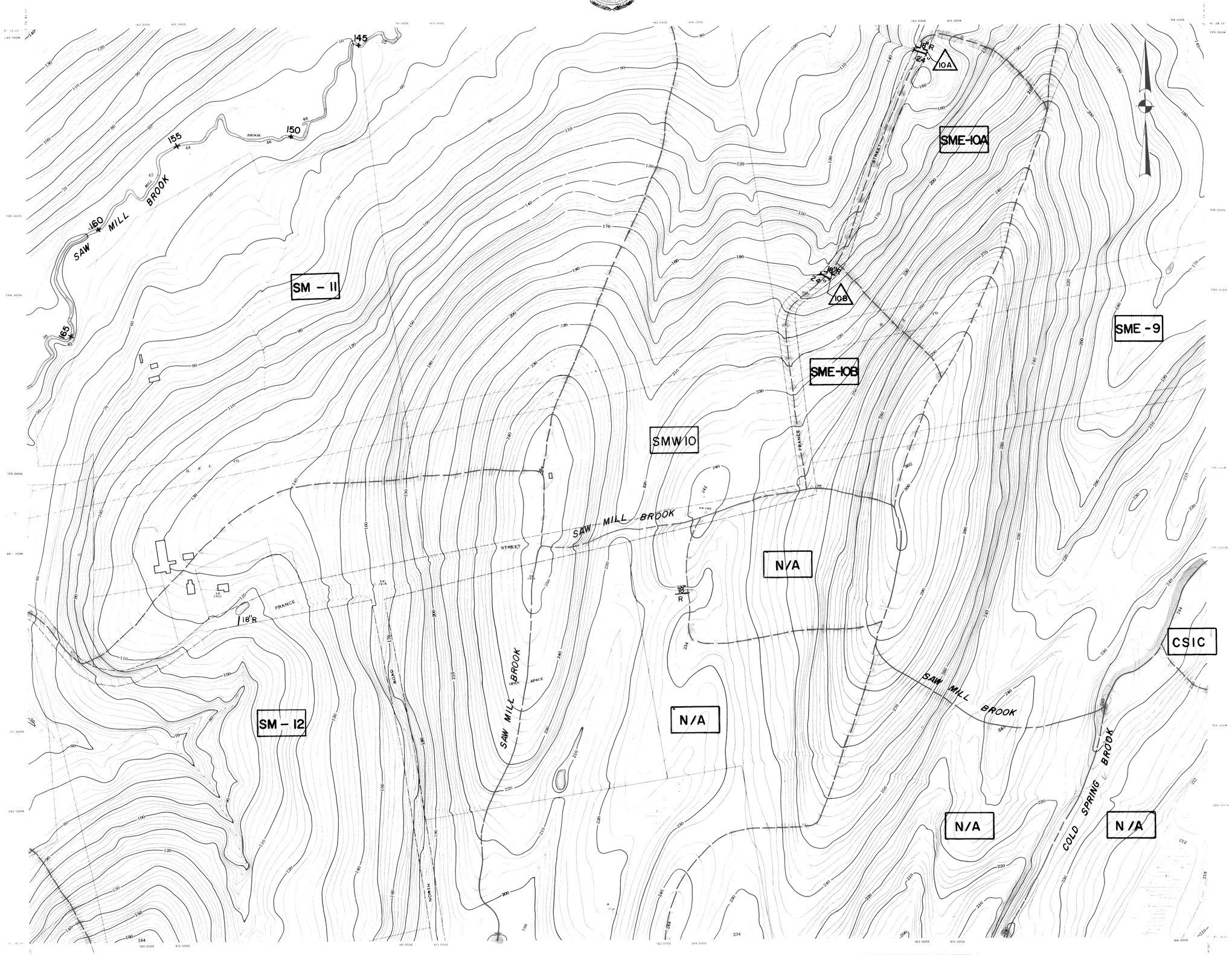
CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

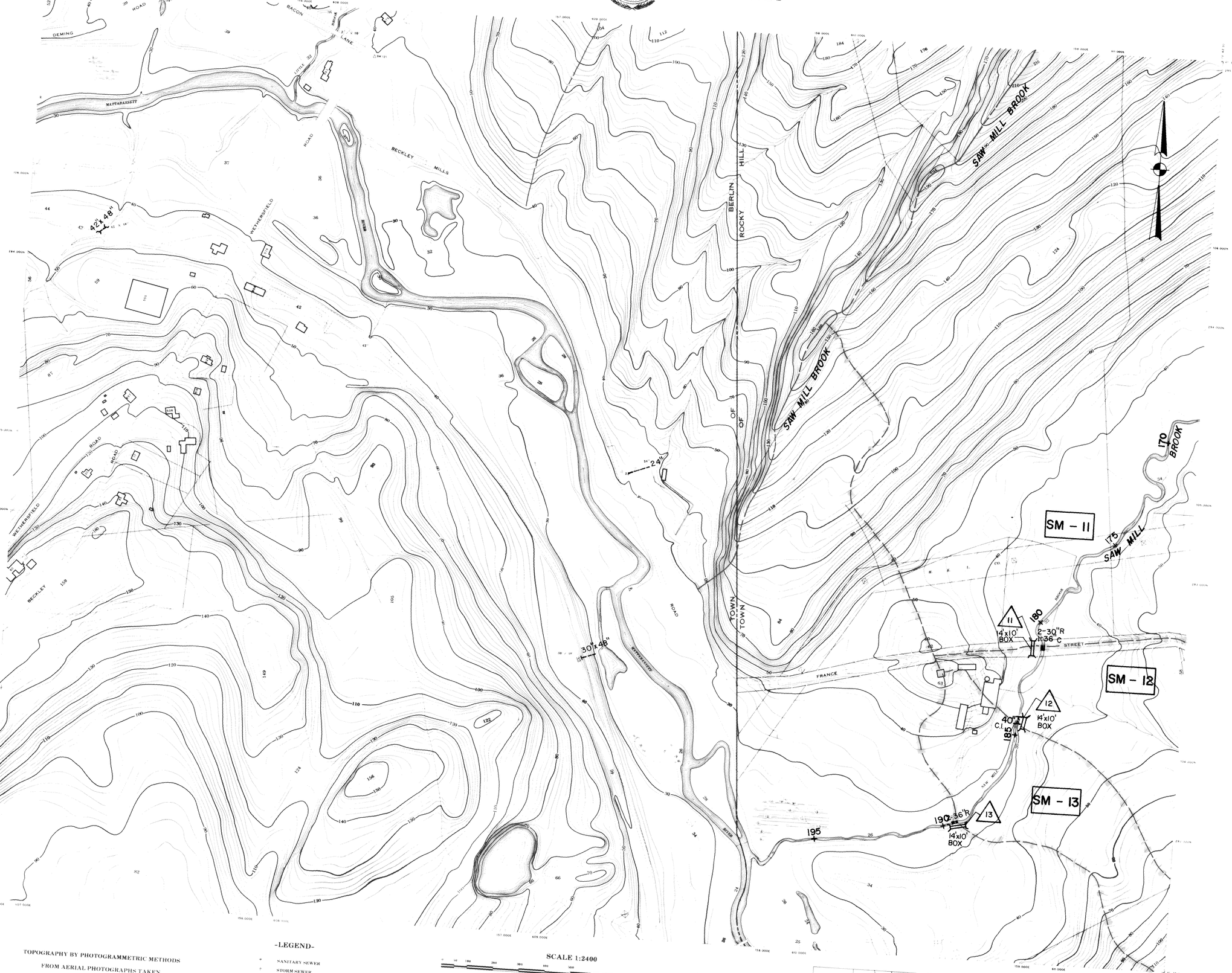
SHEET 686
SHEET 586 | SHEET 585 | SHEET 584
SHEET 687 | SHEET 686 | SHEET 685
SHEET 788 | SHEET 787 | SHEET 786

THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS
FROM AERIAL PHOTOGRAPHS TAKEN
MARCH, 1973

-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER

SCALE 1:2400

0 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET
METROPOLITAN DISTRICT DATUM

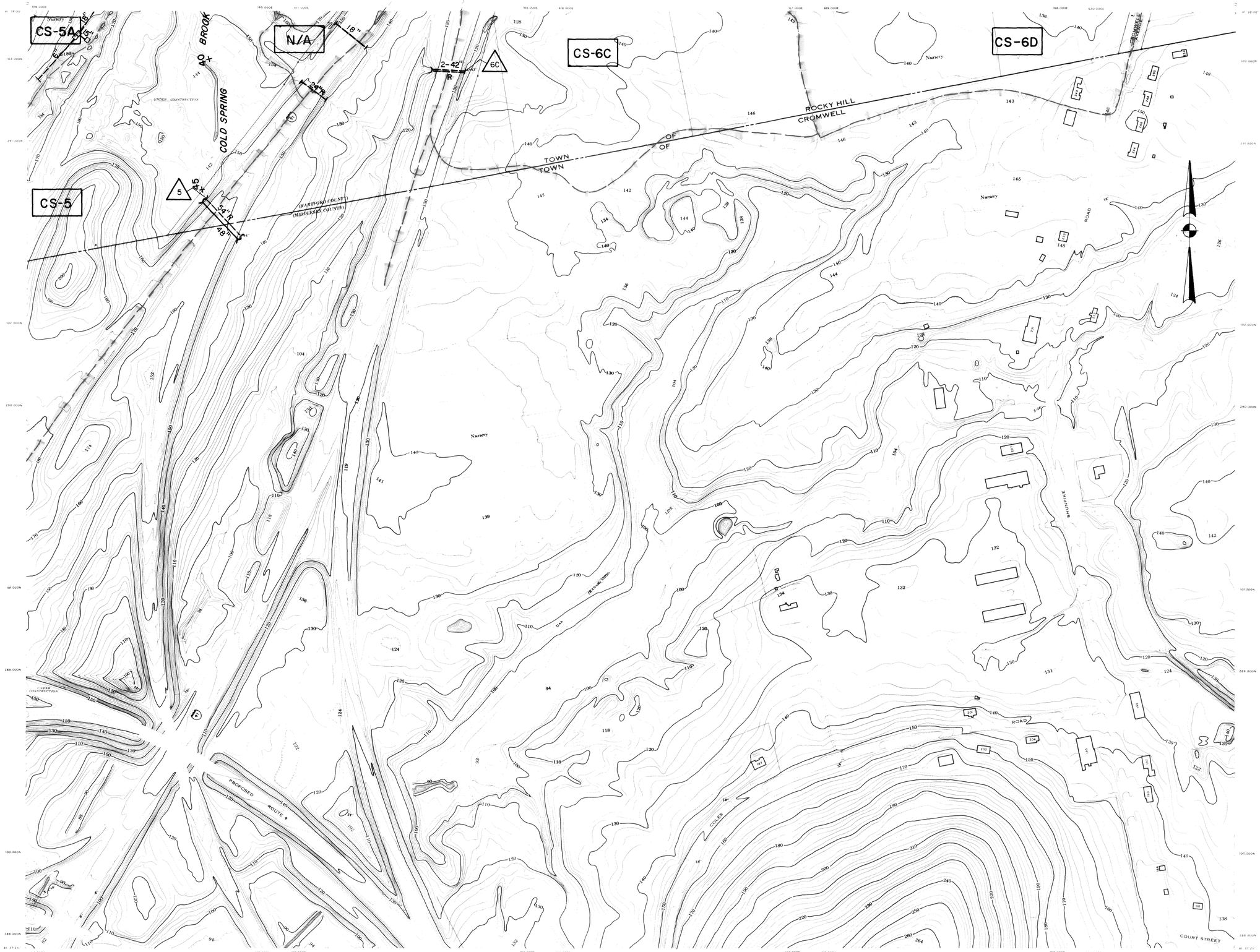
1000-FOOT GRID BASED ON THE
METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM
CONNECTICUT COORDINATE GRID SHOWN IN BROWN

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

THE METROPOLITAN DISTRICT
COMMISSION ON REGIONAL PLANNING
HARTFORD COUNTY, CONNECTICUT

SHEET 688

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET

METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE

METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM

CONNECTICUT COORDINATE GRID SHOWN IN BROWN

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

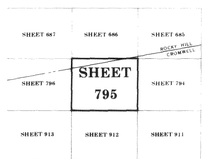
TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS

FROM AERIAL PHOTOGRAPHS TAKEN

MARCH, 1973

-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- HOUSE NUMBER



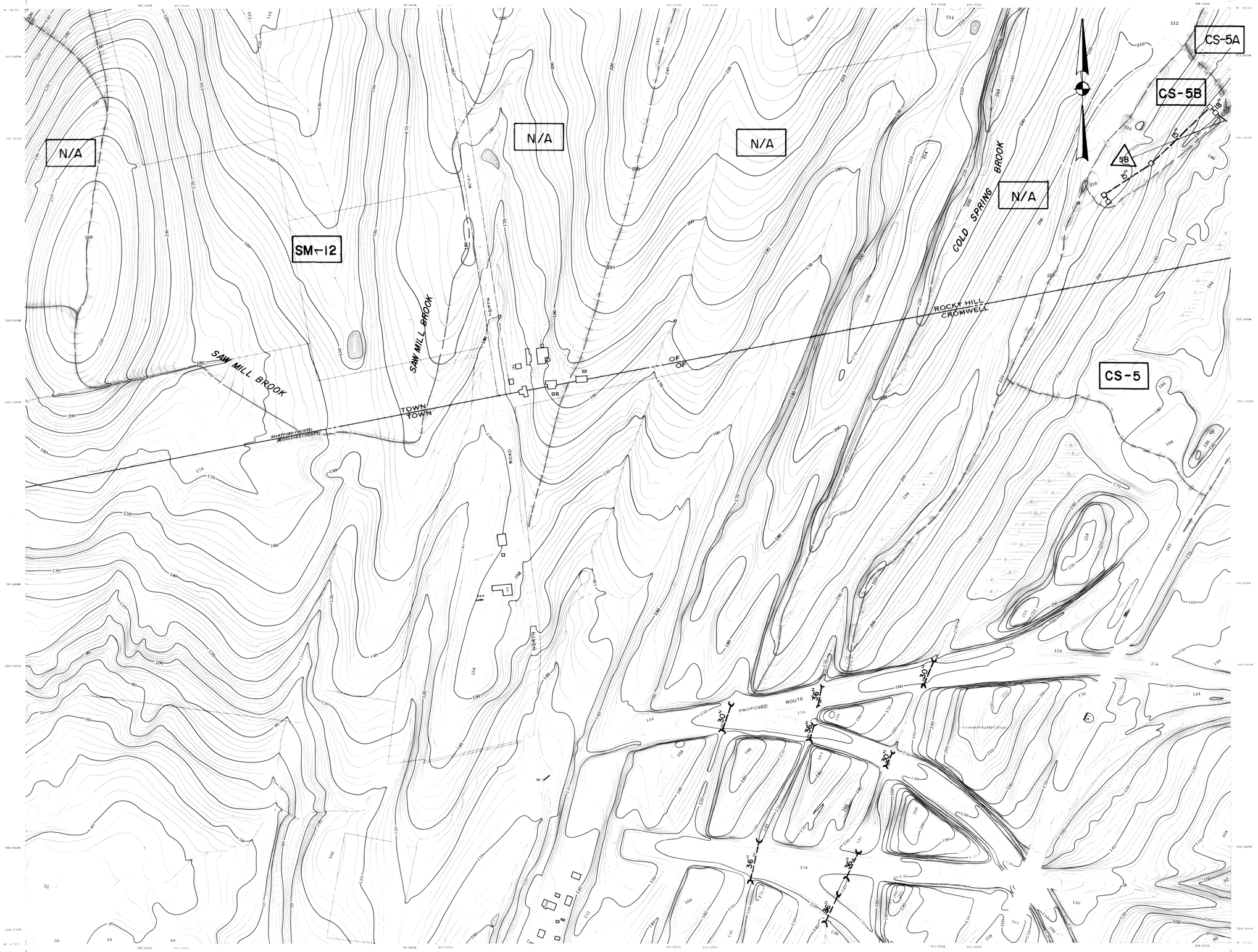
THE METROPOLITAN DISTRICT

COMMISSION ON REGIONAL PLANNING

HARTFORD COUNTY, CONNECTICUT

SHEET 795

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS

FROM AERIAL PHOTOGRAPHS TAKEN

MARCH, 1973

-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- 710 HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET

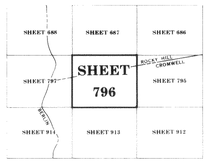
METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE

METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM

CONNECTICUT COORDINATE GRID SHOWN IN BROWN

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS



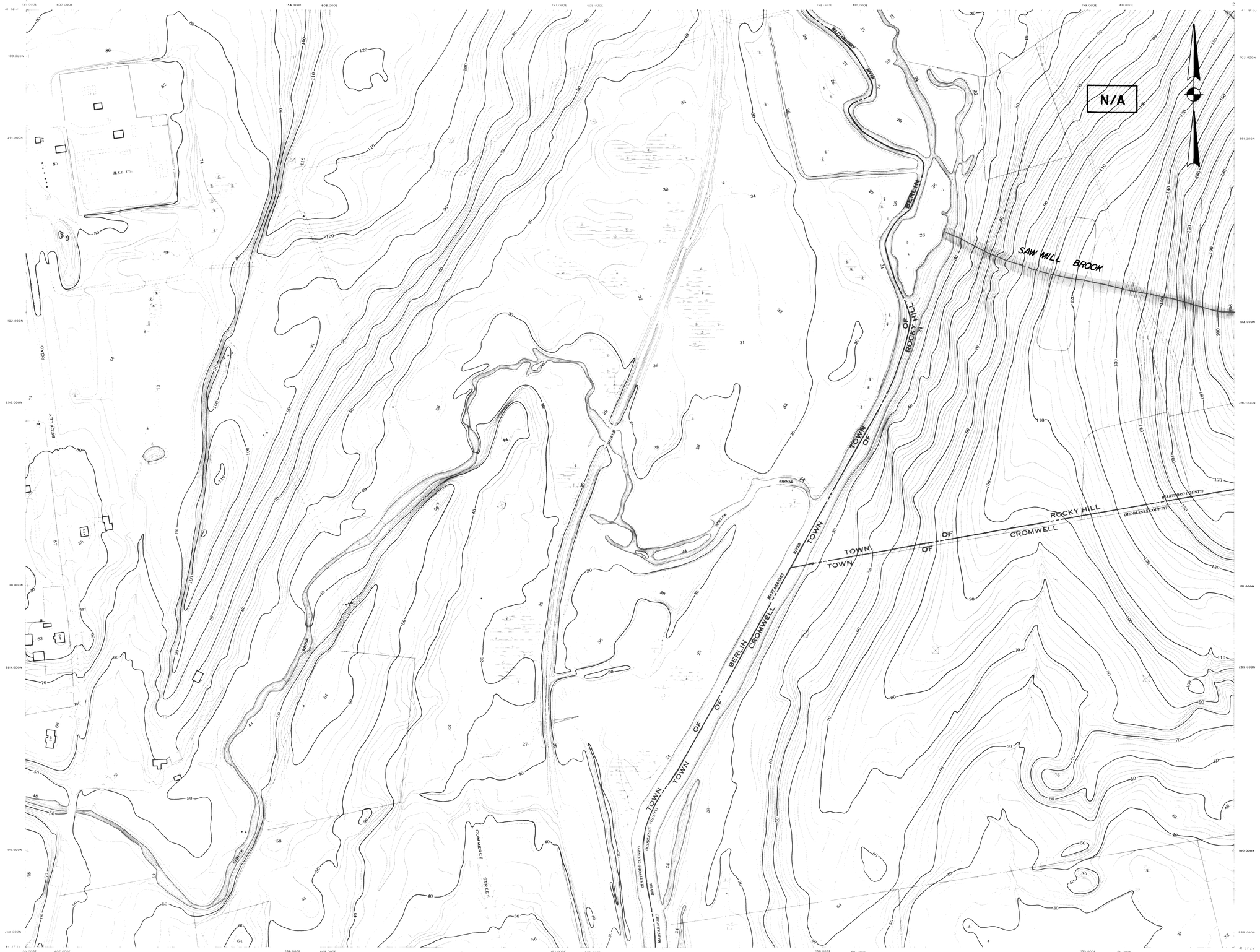
THE METROPOLITAN DISTRICT

COMMISSION ON REGIONAL PLANNING

HARTFORD COUNTY, CONNECTICUT

SHEET 796

THE METROPOLITAN DISTRICT
GEODETIC AND TOPOGRAPHICAL SURVEY



TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS

FROM AERIAL PHOTOGRAPHS TAKEN

MARCH, 1973

-LEGEND-

- SANITARY SEWER
- STORM SEWER
- CATCH BASIN
- WATER MAIN
- HYDRANT
- VERTICAL CONTROL POINT
- 709 HOUSE NUMBER

SCALE 1:2400

0 50 100 200 300 400 500 1000 FEET

CONTOUR INTERVAL 2 FEET

METROPOLITAN DISTRICT DATUM

1000-FOOT GRID BASED ON THE

METROPOLITAN DISTRICT PLANE RECTANGULAR COORDINATE SYSTEM

CONNECTICUT COORDINATE GRID SHOWN IN BROWN

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

SHEET 689 | SHEET 688 | SHEET 687

SHEET 799 | SHEET 797 | SHEET 796

SHEET 913 | SHEET 914 | SHEET 915

THE METROPOLITAN DISTRICT

COMMISSION ON REGIONAL PLANNING

HARTFORD COUNTY, CONNECTICUT

SHEET 797

ROCKY HILL STREET INDEX

2ND LANE 4
ANNE'S COURT 6
ASHWELL AVE. 5
B LANE 2
BAILEY RD. 5
BARNYARD RD. 10
BARRY PL. 3
BAYBERRY LA. 4
BEACH RD. 7
BEECHER LA. 9
BEL AIR CIR. 3
BELAMOSE AVE. 7
BELDEN LA. 5
BERKSHIRE RD. 5
BIRCH RD. 8
BOARDMAN PL. 10
BROOK ST. 8
BROOKWOOD DR. 5
C LANE 7
CALIBER LA. 7
CAMBRIDGE DR. 5
CANDLE LITE DR. 4
CARILLON DR. 2
CAROL DR. 4
CEDAR HOLLOW DR. 5
CENTER ST. 4
CENTURY HILLS DR. 10
CHAPIN AVE. 3
CHARTER RD. 2
CHRISTIANNA DR. 5
CHURCH ST. 4
CLEARVIEW AVE. 7
CLEMENS CT. 9
COREY RD. 7
COLD SPRING RD. 9
COLONIAL DR. 3
COURTNEY DR. 5
CRESTRIDGE RD. 2
CROMWELL AVE. 6
CROWN DR. 5
DEXTER RD. 1
DIVIDEND RD. 5
DRUM HILL DR. 8
DRUMMOND DR. 10
EASTVIEW TERR. 6
ELDERLA. 5
ELMS COMMON DR. 6
ELM ST. 5
ELM ST. EXT. 5
ESTHER RD. 4
EVANS RD. 7
FALCON RIDGE RD. 5
FARMS VILLAGE DR. 9
FARVIEW DR. 5
FERN ST. 4
FERNWOOD DR. 5
FOOTEHILL RD. 3
FOREST ST. 6
FRANCE ST. 8
GARDEN ST. 5
GARFIELD RD. 4
GAYLORD DR. 2
GEORGE RD. 7
GILBERT AVE. 6
GLASTONBURY AVE. 4
GORMAN RD. 8
GREAT MEADOW RD. 1
GRIMES RD. 5
GRISWOLD RD. 3
HANG DOG LA. 4
HARVEST LA. 5
HAYES RD. 4
HENRY ST. 8
HIGHMEADOW 3
HIGHVIEW DR. 8
HILLCREST DR. 2
HILLSIDE AVE. 5
HOLLISTER DR. 4
HUSKIE DR. 8
INWOOD RD. 9
JUNE CIR. 4
KINGSLEY CT. 10
KNOLLWOOD RD. 5
LAKE DR. 6
LAKEVIEW AVE. 7
LATHROP LA. 10
LAURA LA. 4
LAUREL RD. 7
LEDGE DR. 7
LIOLA RD. 7
LITCHFIELD PL. 5
LOCUST CIR. 7
LORD ST. 6
LOUIS PL. 5
MAIN ST. 5
MAPLE ST. 5
MARK LA. 4
MARSHALL RD. 2
MARTIN DR. 9
MATTESON AVE. 2
MEADOW RD. 1
MEADOW ST. 4
MICHELE DR. 6
MOSER DR. 7
MOUNTAIN VIEW DR. 4
NEW BRITAIN AVE. 2
NEW RD. 6
NORTH CONDOR DR. 4
NORTH MEADOW LA. 2
NORTH RD. 8
NUTMEG LA. 5
OAK HILL RD. 6
OLD DIVIDEND RD. 7
OLD MAIN ST. 2
ORCHARD ST. 2
OVERLOOK TERR. 7
PALMER DR. 1
PARISH RD. 5
PARK DR. 7
PARSONAGE ST. 3
PARTRIDGE DR. 4
PELICAN CT. 4
PENN PL. 10
PHEASANT DR. 4
PINE MEADOW RD. 5
PLEASANT VALLEY RD. 9
PRATT ST. 5
QUAIL DR. 4
RAYMOND RD. 3
RICHARD RD. 3
RIDGE RD. 2
RIDGEWOOD RD. 5
RIVERVIEW RD. 4
ROBBINS LA. 2
ROBINSON RD. 10
SAGE RD. 5
SAWMILL RD. 8
SCHOOL ST. 7
SHIPMAN RD. 10
SILAS DEANE HWY. 2
SOUTHBROOK RD. 8
SOUTH CONDOR DR. 4
SOUTH MEADOW LA. 5
STANLEY CT. 6
STARR DR. 2
STEPNEY CIR. 6
STEVENS PL. 9
STONES THROW CT. 8
SUMMIT RD. 1
SUNNY CREST DR. 3
SUTTON RD. 2
TEN ROD RD. 8
TERRY LA. 4
TERRY LA. EXT. 5
TEXTBOOK AVE. 4
TOLL GATE RD. 8
TOWN LINE RD. 1
TRINITY RIDGE 6
TUMBLEBROOK RD. 4
TWENTY ROD RD. 8
VALLEY BROOK RD. 4
VALLEY CREST DR. 2
VALLEY VIEW DR. 3
WALNUT RD. 4
WASHINGTON ST. 4
WATERS AVE. 2
WEBSTER RD. 7
WEBSTER LA. 5
WELLS RD. 6
WESTBROOK RD. 7
WESTERLY TERR. 4
WESTMEADOW RD. 5
WEST ST. 7
WILLOW RD. 8
WOODLAND RD. 6
WOODHAVEN CIR. 5
WRIGHT RD. 5

SCHOOLS, LIBRARIES, AND EDUCATIONAL FACILITIES

J 4 ALBERT D. GRISWOLD JUNIOR HIGH SCHOOL
K 4 BOARD OF EDUCATION OFFICES
K 7 DR. ORAN A. MOSER SCHOOL
I 4 MYRTLE M. STEVENS SCHOOL
I 4 ROCKY HILL HIGH SCHOOL
E 5 WEST HILL SCHOOL

K 4 CORA J. BELDEN LIBRARY

RECREATIONAL, CULTURAL, AND HISTORICAL PLACES

L 4 BOAT LAUNCHING AREA
L 6 BULKLEY PARK
K 5 CENTER GREEN
I 7 DINOSAUR STATE PARK
I 5 ELM RIDGE PARK
I 4 FERRY PARK
I 4 FLANAGAN FIELD
K 7 HOYE MEMORIAL FIELD
L 4 SHIPYARD PARK
I 4 SUNNY CREST PARK

K 4 ROCKY HILL HISTORICAL SOCIETY MUSEUM
K 4 THEATRE GUILD BUILDING

GOVERNMENTAL OFFICES AND FACILITIES

K 7 ELDERLY HOUSING
K 4 FIRE STATION #1
E 5 FIRE STATION #2
K 4 POLICE DEPARTMENT
F 6 RECYCLE CENTER
F 8 TOWN GARAGE
K 4 TOWN HALL

F 9 STATE HIGHWAY GARAGE
J 7 STATE RECORDS CENTER
J 6 STATE VETERANS HOME AND HOSPITAL

K 4 POST OFFICE

J 7 MDC ROCKY HILL STANDPIPE
B 4 MDC VEXATION HILL WATER STORAGE TANKS
J 1 MDC WATER POLLUTION CONTROL PLANT

MISCELLANEOUS

K 5 CENTER CEMETERY
I 7 COL. RAYMOND F. GATES MEMORIAL CEMETERY
H 6 ROSE HILL MEMORIAL PARK

L 4 HALE'S LANDING
L 8 INDUSTRIAL PARK SITE
M 4 ROCKY HILL-GLASTONBURY FERRY
K 6 VOLUNTEER AMBULANCE ASSOCIATION

INDEX MAP

TOWN OF
ROCKY HILL
CONNECTICUT
1977
SCALE 1:12000

LEGEND
- 683 M.D.C. Mapping 1" = 200'*
- 403a Mapping from adjoining town**
- * Metropolitan District Datum
- ** National Geodetic Vertical Datum

PREPARED BY
THE METROPOLITAN DISTRICT
P. O. BOX 800
HARTFORD CONNECTICUT 06101