PRELIMINARY DRAINAGE REPORT

for

CASA VISTA SUBDIVISION
1825 L ROAD
FRUITA, COLORADO

SUBMITTED TO:

CITY OF FRUITA
PLANNING - ENGINEERING
325 EAST ASPEN STREET
FRUITA, COLORADO 81521

PREPARED FOR:

Quality Built, Inc.
1227 Signal Rock Road
Grand Junction, Colorado 81505

PREPARED BY:

Rhino Engineering, Inc.
1334 Ute Avenue
Grand Junction, Colorado 81501

March 8, 2001

RE Project No. 20062.01

"I hereby certify that this report for the preliminary drainage report for the Casa Vista Subdivision, located at 1825 L Road, Mesa, Colorado (a part of the Section 9, Township 1 North, Range 2 West of the Ute Meridian in Mesa County, Colorado), was prepared by me or under my direct supervision."

_____

John Emil Kornfeld, P.E.
Registered Professional Engineer,
State of Colorado No. 33064

TABLE OF CONTENTS

I. LOCATION AND DESCRIPTION OF PROPERTY

A. Property Location

The project site is located within the incorporated limits of Mesa County, immediately north of the Fruita city limits. The physical address of the property is 1825 L Road. The subject site lies on the south side of L Road, approximately ¼ mile east of 18 Road.

By legal description, the property is located in the NW¼ of Section 9, Township 1 North, Range 2 East of the Ute Meridian in Mesa County, Colorado. The property occupies about 14.0± acres.

L Road borders the site on the north. A mix of single-family residences and agricultural fields bound the site on all sides. The Grand Valley Canal bounds the site on the south. Please refer to Exhibit 1 – Vicinity Map.

The subject property is presently zoned Mesa County AFT. However, the site is proposed to be annexed into the City of Fruita as Community Residential.

B. Description of Property

As stated above, the size of the property is approximately 14 acres. The site is presently undeveloped and is in its natural state, with the exception of a structure located near the northeast corner of the property. The site is characteristic of natural landforms in the area with rolling terrain.

The site slopes to the southwest, with slopes averaging 3 to 6 percent. The lowest elevations occur near the southwest corner of the property. Elevations vary from 4568 to 4593 feet.

According to the Natural Resource Conservation Service (NRCS), the soils in this area consist of the Persayo silty clay loam soil series. Persayo soils are shallow, with medium fine to fine textures. Hydrologic soil group is "D".

Applied Earth Sciences, Inc. completed a Plat of Boundary and topographic survey for the planned development.

Little Salt Wash occurs about ¼ mile to the east side of the site. Big Salt Wash lies about one mile to the west.

C. Purpose of Drainage Report

The 14.0±-acre parcel is planned to be developed into single-family residences. Nine (9) lots are proposed at one acre each in size, and six (6) lots are one-half acre each in size. One "horseshoe" shaped roadway is planned to access the lots.

The purpose to the drainage report is to evaluate the impact (or change) to the existing drainage pattern and peak runoff from developing this 14±-acre parcel.

II. EXISTING DRAINAGE CONDITIONS

A. Major Basin Characteristics

This area of Mesa County consists of mixed residential and agricultural use.

The general area slopes northeast to southwest. The watershed in this area includes the Little Salt Wash. The headwaters of the Little Salt Wash extend northeasterly into the Bookcliffs. Little Salt Wash drains into the Colorado River, which lies about two miles to the southwest.

Soils of the watershed basin are shallow to deep with medium to fine textures. The soils at a given location depend upon its position on the landscape and the geology of the specific location.

According to the Flood Insurance Rate Map (FIRM) per the Federal Emergency Management Agency, the subject site lies in Zone X. Zone X includes those areas outside of the 500-year floodplain. This information is according to FIRM Community Panel 080115 0480C ? , dated July 15, 1992, of Mesa County, Colorado.

B. Site Characteristics

The existing drainage pattern of the property consists of sheet flow, shallow concentrated flow, and channelized flow. The topography of the site is rolling with a ridge near the center of the parcel running north to south. From the ridge, runoff drains easterly and westerly to the property boundaries. The earthen berm along the south property line keeps runoff and sediment from entering the Grand Valley Canal. Refer to Exhibit 2 – Existing Drainage Map.

As stated earlier, the NRCS has identified the soils on the site as Persayo soils. Soil descriptions and interpretative data are included in Appendix I.

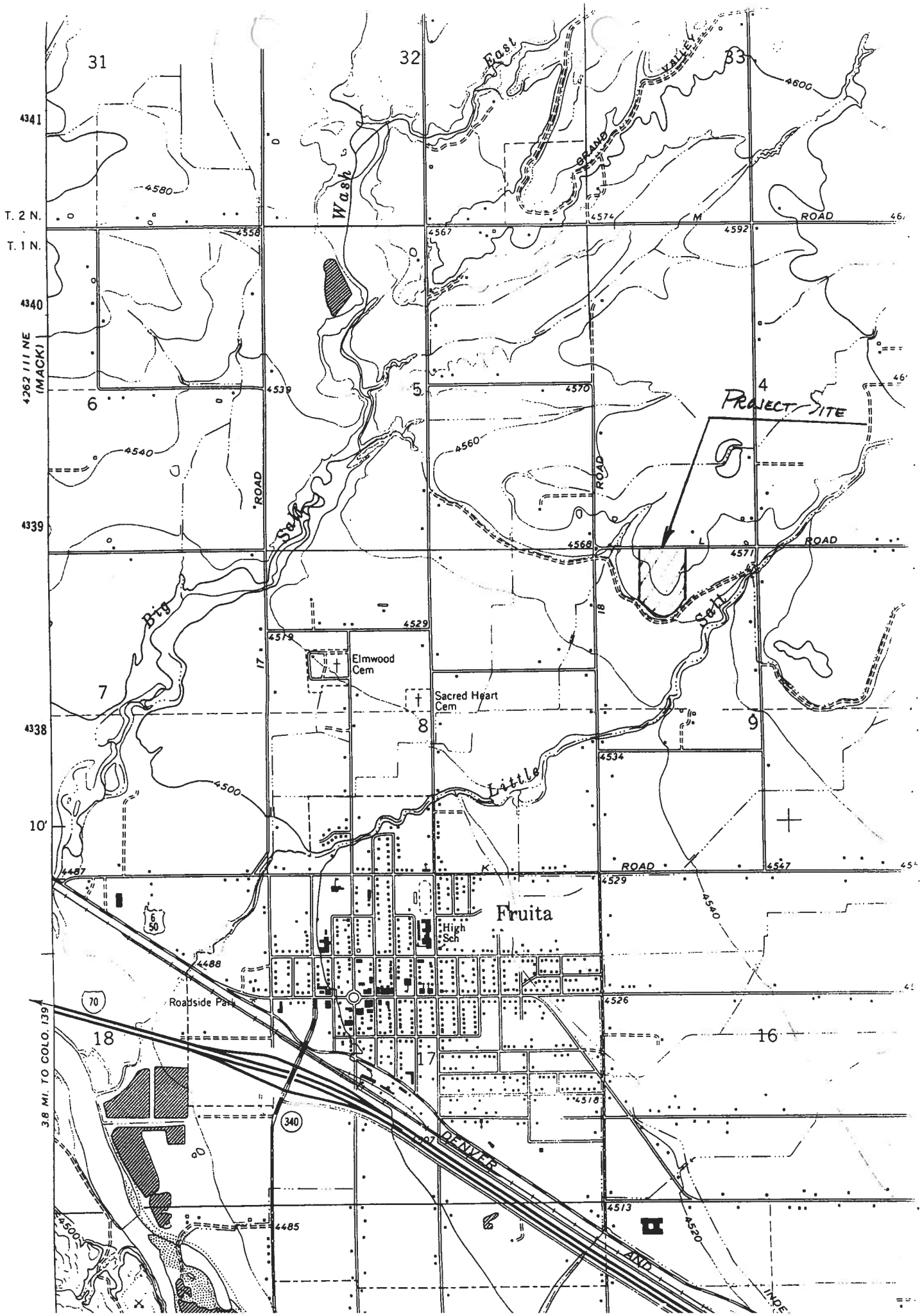
The site is not affected by offsite runoff. The site is situated on a crest of an alluvial ridge. In addition, L Road eliminates runoff from the north from entering the site.

An irrigation canal borders the south property of the site. The canal is the Main Line Grand Valley Canal.

III. PROPOSED DRAINAGE CONDITIONS

A. Changes in Drainage Conditions

The development is a proposed residential development, consisting of 15 single-family residences. The overall drainage concept includes the roofs, driveways, and sidewalks to drain to the street. The street is proposed to be a "modified" urban residential street with curb, gutter, and sidewalk. The modified design includes a sidewalk on one side only. The streets will drain to the southwestern corner of the horseshoe-shaped roadway alignment. At that point, runoff will drain to a detention


PROJECT SITE
Fruita
Elmwood Cem
Sacred Heart Cem
High Sch
Roadside Park
Big Salt Wash
East Salt Wash
Little Salt Wash
GRAND VALLEY
ROAD
DENVER
AND
3.8 MI. TO COLO. 139
T. 2 N.
T. 1 N.
4262 III NE (MACK)

Alan R. Story
1831 L Road
Fruita, CO 81521
Bk 2645 Pg 882
LOT 1
SAMZACK SUBDIVISION

2697-092-30-005
Sunshine of the Redlands Inc.
42.62 acres
Fruita, CO 81521
Plat Bk 16 Pgs 18/20

NATURAL VEGETATION
UNCULTIVATED
ZONED: CR/RR

FND NCSM #1498
W1/16 COR SEC 9,
T1N, R2W, U.M.
POINT OF
COMMENCEMENT

FND NCSM #1498
W1/16 COR SEC 9,
T1N, R2W, U.M.

33.16

ELEC
BOX

2697-043-00-483
Charles E. White
Roger A. Ward
1826 L Road
Fruita, CO 81521
Bk 1918 Pg 867

2697-043-02-001
Randall L. &
Deann Brown
1206 18 Road
Fruita, CO 81521
Bk 2273 Pgs 135-136

BASIS OF BEARING
THE NORTH LINE OF
THE W1/2 Area of
SEC 9, T1N, R2W, U.M.
S89°59'58"E 1338.65'

2697-092-00-702
Richard J. &
Donna M. Gant
1809 L Road
Fruita, CO 81521
Bk 2149 Pgs 133-134

IRRIGATED PASTURE
ZONED: AFT

THE VILLAGE AT
COUNTRY CREEK
SUBDIVISION
ZONED: CR/RR
2697-092-30-005
Sunshine of the Redlands Inc.
42.62 acres
Fruita, CO 81521
Plat Bk 16 Pgs 18/20

2697-092-00-711
Aaron G. &
Nora M. Goetz
1178 18 Road
Fruita, CO 81521
Bk 2645 Pgs 708-709

NORTH

GRAPHIC SCALE
0 25 50 100
1 INCH = 50 FEET

3 DRAINAGE AREA DESIGNATION

DRAINAGE AREA BOUNDARY

REVISION	DATE	DESCRIPTION	BY	CK

EXISTING DRAINAGE
FOR THE
CASA VISTA SUBDIVISION
1825 L ROAD
GRAND JUNCTION, COLORADO

RHINO ENGINEERING, INC.
1334 UTE AVENUE
GRAND JUNCTION, CO 81501
970.241.6027 fax 970.256.7992

APPROVED FOR CONSTRUCTION
CITY OF FRUITA ENGINEERING DATE

FINAL ACCEPTANCE
CITY OF FRUITA ENGINEERING DATE

DATE 03-16-01
SCALE 1" = 100'
PROJECT NO 20080.01
SHEET NO D-1

Aron K. Story
1831 L Road
Fruita, CO 81521
Bk 2645 Pg 882
LOT 1
SAMZACK SUBDIVISION

2697-092-30-005
Sunshine of the Redlands Inc.
42.62 acres
Fruita, CO 81521
Plat Bk 16 Pgs 18/20

NATURAL VEGETATION
UNCULTIVATED
ZONED: CR/RR

FND MCSM #1496
W1/16 COR SEC 9,
T1N, R2W, U.M.
POINT OF
COMMENCEMENT

33.16

7' ELEC

4563

2697-043-00-483
Charles E. White
Roger A. Word
1826 L Road
Fruita, CO 81521
Bk 1918 Pg 867

13

14

12

11

10

FND MCSM #1496
W1/16 COR SEC 9,
T1N, R2W, U.M.

THE VILLAGE AT
COUNTRY CREEK
SUBDIVISION
ZONED: CR/RR
2697-092-30-005
Sunshine of the Redlands Inc.
42.62 acres
Fruita, CO 81521
Plat Bk 16 Pgs 18/20

SILVER STREAMS

IRRIGATED PASTURE
ZONED: AFT

NORTH

GRAPHIC SCALE
0 25 50 100
1 INCH = 50 FEET

2697-043-02-001
Randall L. &
Deann Brown
1206 18 Road
Fruita, CO 81521
Bk 2273 Pgs 135-136

BASIS OF BEARING
THE NORTH LINE OF
THE NW1/4 NW1/4
SEC 9, T1N, R2W, U.M.
S89°55'00"E 1340.52'

2697-092-00-702
Richard J. &
Donna M. Gant
1809 L Road
Fruita, CO 81521
Bk 2149 Pgs 133-134

2697-092-00-711
Aaron C. &
Nora M. Goetz
1176 18 Road
Fruita, CO 81521
Bk 2645 Pgs 708-709

3 DRAINAGE AREA DESIGNATION

DRAINAGE AREA BOUNDARY

REVISION	DATE	DESCRIPTION	BY	CK

PROPOSED DRAINAGE
FOR THE
CASA VISTA SUBDIVISION
1825 L ROAD
GRAND JUNCTION, COLORADO

RHINO ENGINEERING, INC.
1334 UTE AVENUE
GRAND JUNCTION, CO 81501
970.241.6027 fax 970.256.7992

APPROVED FOR CONSTRUCTION

CITY OF FRUITA ENGINEERING DATE

FINAL ACCEPTANCE

CITY OF FRUITA ENGINEERING DATE

DATE
03-16-01

SCALE
1" = 100'

PROJECT NO
20080.01

SHEET NO
D-2

basin. The basin will have a low-level outlet pipe that will drain into the adjacent Grand Valley Canal.

Although the overall drainage concept includes the above description, the natural terrain of the site does not always lend to the overall concept. For example, Lots 1 and 2 of Block 1 will drain to the west property boundary. However, this is the historical drainage pattern, and no increase in stormwater runoff rates are anticipated.

Likewise, Lots 4 and 5 of Block 1 will drain toward the south property boundary. A swale is proposed along the south boundary (near the earthen berm) to convey the runoff to the detention basin.

The rear half of Lots 6, 7, and 8 of Block 1 will drain to the east property boundary. Again, this is the historical drainage pattern and no increase in stormwater runoff rates is anticipated.

All of the streets and the public right-of-way, Lot 9 of Block 1, and Lots 1 – 6 of Block 2 will drain directly to the detention basin.

Refer to Exhibit 3 – Post Development Drainage Plan for the layout of lots and streets and the direction of planned drainage.

To estimate stormwater runoff from this development, the following ground cover conversions are assumed for each lot:

Cover Types & Amounts	*Runoff Curve Number*
1,750 ft^2± of Roof 1,080 ft^2± of Driveway (18' x 60') 280 ft^2± of Sidewalk (4' x 70') 400 ft^2± of Patio (20' X 20') 3,510 ft^2± of Impervious Surface	98
6,000 ft^2± of Turf (60' x 100')	84
Remainder of lot, regardless if ½ acre or 1-acre in size, remains natural.	89

Curve numbers are per TR55 analysis, which is discussed later.

B. Maintenance Issues

Based on the lot sizes and the layout of the access roadway, little maintenance is anticipated.

IV. DESIGN CRITERIA AND APPROACH

A. General Considerations

There are not any drainage constraints imposed on this site with the development.

B. Hydrology

The hydrologic analysis presented in this drainage report uses procedures per the SWMM guidelines.

TR55 is used to calculate the times of concentrations. Analysis for this development includes peak discharges for the 2-year and 100-year intensity precipitation events.

The US Army Corps of Engineers HEC-1 modeling is used to calculate peak discharge rates for both the 2-year and 100-year design storms. HEC-1 software is also used to model the sizing of the detention basin and the water surface elevations with inflow/outflow relationships.

The following curve numbers are used for hydrologic analysis:

Curve Number	*TR55 Description*
84	Fully Developed Urban Lands, Lawns in Fair Condition with "D" soils
89	Pasture, grassland or range in Poor Condition with "D" soils
98	Impervious Areas (roofs, driveways, etc.)

V. RESULTS AND CONCLUSIONS

A. Runoff Rates for the 2-Year and the 100-Year Design Storm

Existing Drainage

The site is composed of five drainage basins.

According to TR55 procedures, the curve number that best matches the existing hydrologic condition is 89. A curve number of 89 represents "other agricultural lands, pasture, grassland, or range, in poor condition, with "D" hydrologic soils".

The times of concentrations for the basins vary from 0.03 hours (1.8 minutes) to 0.24 hours (14.4 minutes) for the 2-year design storm and 0.02 hours (1.2 minutes) to 0.17 hours (10.2 minutes) for the 100-year storm. The time of concentration includes sheet flow, shallow concentrated flow, and channelized flow. The time does not include a "wetting" time, and therefore, a minimum time of concentration is assumed for the smallest drainage basin.

According to hydrologic analysis, the historic (existing) peak runoff rates for this site include:

Site	Area (acres)	2-Year Peak Runoff Rate (cfs)	100-Year Peak Runoff Rate (cfs)
CP1	6.26	0.71	8.1
CP2	3.77	0.45	4.9
CP3	2.23	0.27	2.9
CP4	1.11	0.13	1.4
Combined	13.37	1.56	17.5
CP5	0.67	0.08	0.7
Combined	14.04	1.60	18.2

The peak runoff rates are based on the HEC-1 model. The TR55 data summary and the HEC-1 output summaries for the existing drainage are included in Appendix II.

Developed Drainage

A minimum time of concentration of 10 minutes is again used for analysis proposes. This is a conservative estimate as the time is takes for sheet flow across turf will take considerably longer than sheet flow across a natural desert cover type.

Peak runoff rates are based on the assumptions provided earlier for the changes in the ground cover conversion. According to hydrologic/hydraulic analysis, the developed peak runoff rates include:

Site	Area (acres)	2-Year Peak Runoff Rate (cfs)	100-Year Peak Runoff Rate (cfs)
CP11	1.00	0.12	1.3
CP12	3.79	0.73	5.5
CP13	3.87	0.90	6.0
CP14	2.72	0.33	3.0
Combined	11.38	2.10	16.5
Detention		0.80	12.8
CP10	2.00	0.24	2.6
Combined	13.38	0.88	13.9
CP5	0.67	0.08	0.7
Combined	14.05	0.90	15.8

The peak runoff rates are based on the HEC-1 model. The TR55 data summary and the HEC-1 output summaries for the developed drainage are included in Appendix III.

With the development of the parcel, the existing drainage areas do not coincide with the developed drainage basins.

B. Detention

Per City of Fruita development requirements, detention is required for the development of this site. According to SWMM guidelines, no increase in the existing peak runoff rates leaving the site are allowed. The Casa Vista Subdivision development is proposing a "wet" pond, i.e., a combination of an irrigation pond and stormwater detention basin. The basin will be a total of 5 feet in depth.

The lower 3 feet of elevation will be reserved for irrigation purposes. The irrigation water level will be maintained by a pump/water level system to regulate the 3-foot depth. An outlet system will regulate the 3-foot maximum level. Stormwater volume, therefore, will always be available above the 3-foot level. Maximum stormwater ponding will be 2 feet. An emergency spillway will be constructed at a depth of 1.5 feet above the outlet structure. Minimum spillway length will be 3 feet. Stormwater will be released into the Grand Valley Canal.

A minimum of 10,020 cubic feet of detention stormwater volume below the spillway elevation will be available in the basin.

The outlet works will consist of a concrete structure, with an 18-inch diameter opening. The flowline of the opening will be at the permanent irrigation water surface. The outlet structure will empty into an 18-inch smooth lined pipe.

With the outlet works, the developed 2-year peak flows will be reduced from 1.56 cfs (existing) to 0.80 cfs. Likewise, the developed 100-year peak flow will be reduced from 17.5 cfs (existing) to 12.8 cfs.

B. Storm Drain

A storm drain is proposed from the catch basin inlet structures on the roadway to the detention basin. A 15-inch smooth-lined pipe is proposed from the inlet structures to basin. The 2-year peak runoff is 1.63 cfs, and the 100-year peak runoff rate is 11.5 cfs. The capacity of the 15-inch storm drain line is 10± cfs, with the ponding depth at about the grate flowline elevation.

Appendix IV contains pipe flow analysis for the 15-inch pipe.

C. Swales

A swale is proposed along the berm near the southern boundary to convey runoff from Lots 4, 5, and 6 to the detention basin. Minimum swale dimensions include:

Type:	"Vee"
Depth:	1.5 Foot
Slopes:	4:1
Longitudinal Slope:	1%
Velocity:	3.05 cfs
Discharge:	12.2 cfs

The swale will daylight into the detention basin. Riprap erosion protection is proposed from the top of the basin to the 3-depth level.

D. Street Flow

Runoff on L Road will not be changed as a result of developing this property.

E. Finish Floor Elevations of Structures

Finished floor elevations for the permanent structures are a minimum of 1.0 feet above the highest adjacent grade to the structure.

F. Overall Compliance

The drainage plan for the proposed development will not alter the flow quantities leaving the property. Adherence to this drainage report will not impact this site or to adjacent properties.

G. Construction Phasing

This is a several phase construction project.

VI. REFERENCES

The following manuals and computer programs were used for this drainage report:

- Stormwater Management Manual, City of Grand Junction and Mesa County, May 1996.
- The NRCS method Technical Release 55 entitled "Urban Hydrology for Small Watersheds" was used to calculate runoff rates and stormwater volumes.
- US Army Corps of Engineers HEC-1 modeling software.

APPENDIX I

NRCS SOIL DESCRIPTIONS AND SOIL INTERPRETATIONS

MESA SOIL CONSERVATION DISTRICT
2754 COMPASS DRIVE, SUITE 170
GRAND JUNCTION, CO 81506
PHONE 242-4511
FAX 242-8469

Name: JOHN KORNFELD - RHINO ENGINEERING INC

Mailing Address: 1334 UTE AVE GRAND JCT, CO 81501

Daytime Phone: 970-245-6027

Property Address for Soils Information Needed: NEAR L & 18 ROADS

Legal Description: NW¼ SEC 9 T1N R2W U.M.

Other Location Description, if needed:

(Please check boxes that apply)

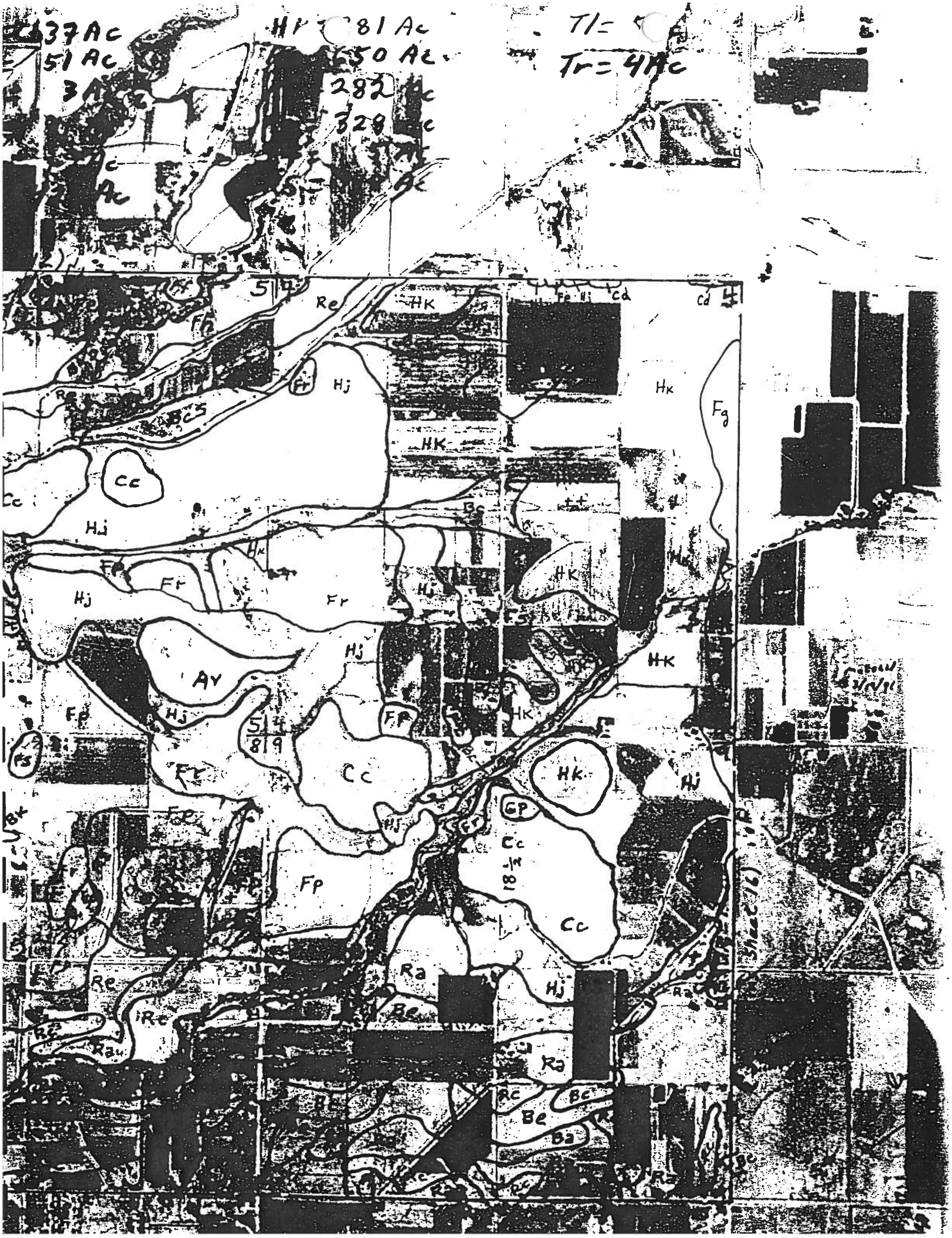
___Please send soils information to above address.
(My check is enclosed)

X Please call - I will pickup the information.

___I would like an appointment with a soils/resource professional.

Please mail or fax this request to the above address or fax number. Allow 3-5 days for processing. **The charge for soils information and subdivision review is $35.00.** This cost will cover administrative time in preparing the report, copy expense and the review of drainage, irrigation systems and soil related issues. Please make checks payable to Mesa SCD.

Signed John E Kornfeld


37 Ac
51 Ac
81 Ac
50 Ac
282 Ac
328 Ac
Tr = 4Ac
Re
HK
Hj
Fr
Fg
Cc
Av
Fp
Cd
GP
Ra
Be
Rc
Ba
Sheet 16

MESA SOIL CONSERVATION DISTRICT
2754 COMPASS DRIVE, SUITE 170
GRAND JUNCTION, CO 81506 (970) 242-4511

10/16/00

ENGINEERING INDEX PROPERTIES
kornfld

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
c:												
Persayo---------	0-4	Silty clay loam	ML	A-6, A-7	0	0	100	100	95-100	85-95	35-45	10-15
	4-15	Silty clay loam	ML	A-6, A-7	0	0	100	100	95-100	85-95	35-45	10-15
	15-19	Weathered bedrock			0	0	0	0	0	0	---	NP
p:												
Fruitland-------	0-16	Fine sandy loam	SC-SM, SC	A-4	0	0	100	100	70-85	40-50	25-30	5-10
	16-40	Fine sandy loam	SC-SM, SC	A-4	0	0	100	100	70-85	40-50	25-30	5-10
	40-60	Very fine sandy loam	CL, CL-ML	A-4	0	0	100	100	85-95	50-65	25-30	5-10
Fr:												
Fruitland-------	0-16	Fine sandy loam	SC-SM, SC	A-4	0	0	100	100	70-85	40-50	25-30	5-10
	16-40	Fine sandy loam	SC-SM, SC	A-4	0	0	100	100	70-85	40-50	25-30	5-10
	40-60	Very fine sandy loam	CL, CL-ML	A-4	0	0	100	100	85-95	50-65	25-30	5-10
Hj:												
Killpack--------	0-12	Silty clay loam	ML	A-6, A-7	0	0	95-100	90-100	80-100	80-95	35-45	10-15
	12-26	Silty clay loam	ML	A-6, A-7	0	0	95-100	90-100	80-100	80-95	35-45	10-15
	26-30	Weathered bedrock			0	0	0	0	0	0	---	NP

ENGINEERING INDEX PROPERTIES

ndnote -- ENGINEERING INDEX PROPERTIES

his report gives estimates of the engineering classification and of the range of index properties for the ajor layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper or 6 feet.

EPTH to the upper and lower boundaries of each layer is indicated. The range in depth and information on other roperties of each layer are given in the published Soil Survey for each soil series under "Soil Series and Their orphology."

EXTURE is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined ccording to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in iameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 ercent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is dded, for example, "gravelly." Textural terms are defined in the Soil Survey Glossary.

lassification of the soils is determined according to the Unified soil classification system and the system dopted by the American Association of State Highway and Transportation Officials.

he UNIFIED system classifies soils according to properties that affect their use as construction material. Soils are lassified according to grain-size distribution of the fraction less than 3 inches in diameter and according to lasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, W, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils xhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

he AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. n this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven roups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in roup A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 re fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection. If laboratory ata are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group ndex number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

ock FRAGMENTS larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight asis. The percentages are estimates determined mainly by converting volume percentage in the field to weight ercentage.

ercentage of soil particles passing designated sieves (PERCENTAGE PASSING SIEVE NUMBER--)is the percentage of the oil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA tandard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on aboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

IQUID LIMIT and PLASTICITY INDEX (Atterberg limits) indicate the plasticity characteristics of a soil. The stimates are based on test data from the survey area or from nearby areas and on field examination. The estimates f grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, f the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across lassification boundaries, the classification in the marginal zone is omitted in this report.

SANITARY FACILITIES
kornfld

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Pc:					
Persayo	Severe: depth to rock	Severe: depth to rock, slope	Severe: depth to rock	Moderate: slope	Poor: depth to rock
Rp:					
Fruitland	Slight	Severe: seepage	Slight	Slight	Good
Fr:					
Fruitland	Slight	Severe: seepage	Slight	Slight	Good
Hj:					
Killpack	Severe: depth to rock, percs slowly	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock

SANITARY FACILITIES

ndnote -- SANITARY FACILITIES

his report shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, nd sanitary landfills. The limitations are considered "Slight" if soil properties and site features generally are avorable for the indicated use and limitations are minor and easily overcome; "Moderate" if soil properties or site eatures are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or inimize the limitations; and "Severe" if soil properties or site features are so unfavorable or so difficult to overcome nat special design, significant increases in construction costs, and possibly increased maintenance are required. his report also shows the suitability of the soils for use as daily cover for landfills. A rating of "Good" indicates nat soil properties and site features are favorable for the use and good performance and low maintenance can be xpected; "Fair" indicates that soil properties and site features are moderately favorable for the use and one or ore soil properties or site features make the soil less desirable than the soils rated "Good"; and "Poor" indicates nat one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable roperties requires special design, extra maintenance, or costly alteration.

EPTIC TANK ABSORPTION FIELDS are areas in which effluent from a septic tank is distributed into the soil through ubsurface tiles or perforated pipe. Only that part of the soil between depths of 24 to 72 inches is evaluated. The atings are base on soil properties, site features, and observed performance of the soils. Permeability, a high ater table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones nd bedrock or a cemented pan interfere with installation. Unsatisfactory performance of septic tank absorption fields, ncluding excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. roundwater can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the ase of the absorption field, if slope is excessive, or if the water table is near the surface. There must be nsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances equire that this material be of a certain thickness.

EWAGE LAGOONS are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid astes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons enerally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon loor and sides is required to minimize seepage and contamination of ground water. This report gives ratings for he natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material elow the surface layer are excavated to provide material for the embankments. The ratings are based on soil roperties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a igh water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter. xcessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage n the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater vertops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it nhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can inder compaction of the lagoon floor.

ANITARY LANDFILLS are areas where solid waste is disposed of by burying it in soil. There are two types of landfill, rench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily ith a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the urface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil form a source away rom the site. Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of roundwater pollution. Ease of excavation and revegetation need to be considered. The ratings in this report are based

SANITARY FACILITIES

Endnote -- SANITARY FACILITIES--Continued

on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rate "Slight" or "Moderate" may not be valid. Onsite investigation is needed.

DAILY COVER FOR LANDFILL is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils may be sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing. After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter than the rest of the profile, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

PRIME FARMLAND
kornfld

Map Symbol	Soil name
[illegible]o	Fruitland fine sandy loam, 0 to 2 percent slopes (where irrigated)
[illegible]r	Fruitland fine sandy loam, 2 to 5 percent slopes (where irrigated)

BUILDING SITE DEVELOPMENT
kornfld

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Pc:						
Persayo	Severe: depth to rock	Moderate: shrink-swell, slope, depth to rock	Severe: depth to rock	Severe: slope	Severe: low strength	Severe: depth to rock
Fp:						
Fruitland	Slight	Slight	Slight	Slight	Slight	Slight
Fr:						
Fruitland	Slight	Slight	Slight	Slight	Slight	Slight
Hj:						
Killpack	Moderate: depth to rock	Moderate: shrink-swell	Moderate: depth to rock, shrink-swell	Moderate: shrink-swell	Severe: low strength	Moderate: depth to rock

BUILDING SITE DEVELOPMENT

Endnote -- BUILDING SITE DEVELOPMENT

This report shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are "Slight", "Moderate", or "Severe". The limitations are considered "Slight" if soil properties and site features are generally favorable for the indicated use and limitaions are minor and easily overcome; "Moderate" if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and "Severe" if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

SHALLOW EXCAVATIONS are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or bands to sloughing or caving is affected by soil texture and the depth to the water table.

DWELLINGS AND SMALL COMMERCIAL BUILDINGS are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

LOCAL ROADS AND STREETS have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

LAWNS AND LANDSCAPING require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

CONSTRUCTION MATERIALS
kornfld

The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
c:				
Persayo	Poor: depth to rock, low strength	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
p:				
Fruitland	Good	Improbable: excess fines	Improbable: excess fines	Good
r:				
Fruitland	Good	Improbable: excess fines	Improbable: excess fines	Good
j:				
Killpack	Poor: depth to rock, low strength	Improbable: excess fines	Improbable: excess fines	Fair: depth to rock, too clayey, small stones

CONSTRUCTION MATERIALS

dnote -- CONSTRUCTION MATERIALS

his report gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated Good", "Fair", or "Poor" as a source of roadfill and topsoil. They are rated as a "Probable" or "Improbable" urce of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the oil and its use as construction material. Normal compaction, minor processing, and other standard construction ractices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

adfill is soil material that is excavated in one place and used in road embankments in another place. In this report, he soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less acting in design than higher embankments. The ratings are for the soil material below the surface layer to a pth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have ayers of contrasting suitability within their profile. The report entitled Engineering Index Properties is also available nd it provides detailed information about each soil layer. This information can help determine the suitability of each yer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in e ratings.

e ratings are based on soil properties, site features, and observed performance of the soils. The thickness of itable material is a major consideration. The ease of excavation is affected by large stones, a high water table, nd slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as ferred from the engineering classification of the soil) and shrink-swell potential.

oils rated "Good" contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable aterial, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the ter table is more than 3 feet

oils rated "Fair" have more than 35 percent silt- and clay-sized particles and have a plasticity of less than 10. ey have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 3 feet.

ils rated "Poor" have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of re than 25 percent. They are wet, and the depth to the water table is less than 1 foot. These soils may have ayers of suitable material, but the material is less than 3 feet thick.

nd and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and avel are used in many kinds of construction. Specifications for each use vary widely. In this report only he probability of finding material in suitable quantity is evaluated. The suitability of the material for specific rposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate e soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification f the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and tratification are given in the soil series descriptions. Gradation of grain sizes is given in the Engineering Index operties report.

soil rated as a "Probable" source has a layer of clean sand and gravel or a layer of sand or gravel that contains to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large ones. All other soils are rated as an "Improbable" source. Coarse fragments of soft bedrock, such as shale and iltstone, are not considered to be sand and gravel.

CONSTRUCTION MATERIALS

hdnote -- CONSTRUCTION MATERIALS--Continued

opsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil s evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. Plant growth is ffected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease f excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness f suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, nd toxic material.

oils rate "Good" have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, ave little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are aturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

oils rated "Fair" are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 o 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or oils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

oils rate "Poor" are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of ravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the urface. The surface layer of most soils is generally preferred for topsoil because of it organic matter content. rganic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

NONTECHNICAL SOILS DESCRIPTION REPORT
kornfld

Map Symbol	Soil name and description
	Persayo silty clay loam, 5 to 12 percent slopes
	This unit is unsuited for row crops due to slope. This unit is best suited to a permanent cover crop such as irrigated pastureland. Because of the slope, sprinkler or drip irrigation is most suitable for the less sloping areas. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion.
	This unit consists of shallow, well drained soils on hill sides. These soils formed in residuum derived dominantly from Mancos shale. The surface layer is silty clay 4 inches thick. The upper 7 inches of the underlying material are silty clay, and the lower part to a depth of 19 inches is silty clay. Permeability of this soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.
	Capability Subclass 7C; nonirrigated
	Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; without consideration of possible unlikely major reclamation projects.
	Class VII - Not suited for cultivation. Very severe limitations. Suited for range, woodland or wildlife uses if carefully managed. Usually cannot apply physical practices such as pitting, furrowing, seeding, etc.
	C - Climate is the major hazard. Growing season may be very short; there is a shortage of rainfall or both.
	Fruitland fine sandy loam, 0 to 2 percent slopes

Map symbol	Soil name and description
	This unit is suited for irrigated crops. It has few limitations. Furrow and sprinkler irrigation is suited to this soil. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Use of pipe or ditch lining reduces water loss and deep percolation. Tilth and fertility can be improved by returning crop residue to the soil and using a suitable rotation. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry. Because of the undulating topography, onsite investigations may be needed before leveling. This unit consists of very deep, well drained soils on fan terraces. These soils formed in alluvium and have a loess cap. The surface layer is fine sandy loam 16 inches thick. The upper part of the underlying material is fine sandy loam about 24 inches thick, while the lower part to a depth of 60 inches or more is very fine sandy loam. Permeability of this soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This unit is considered prime farmland. Capability Subclass 2E; irrigated; 7C; nonirrigated Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; without consideration of possible unlikely major reclamation projects. Class II - Some limitations that reduce the choice of crops or require moderate conservation measures.

Map Symbol	Soil name and description
	Class VII - Not suited for cultivation. Very severe limitations. Suited for range, woodland or wildlife uses if carefully managed. Usually cannot apply physical practices such as pitting, furrowing, seeding, etc. E - Erosion by wind of water is the major problem. C - Climate is the major hazard. Growing season may be very short; there is a shortage of rainfall or both.
r	Fruitland fine sandy loam, 2 to 5 percent slopes This unit is suited for irrigated hay and pasture. Furrow, drip, and sprinkler irrigation is suited to this soil. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Use of pipe reduces water loss and deep percolation. Tilth and fertility can be improved by returning crop residue to the soil and using a suitable rotation. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry. Because of the undulating topography and slope, onsite investigations are needed before leveling. Care should be taken in leveling designs to avoid cuts into unsuitable soil material. This unit consists of very deep, well drained soils on fan terraces. These soils formed in alluvium and have a loess cap. The surface layer is fine sandy loam 16 inches thick. The upper part of the underlying material is fine sandy loam about 24 inches thick, while the lower part to a depth of 60 inches or more is very fine sandy loam. Permeability of this soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate. This unit is considered prime farmland. Capability Subclass 3E; irrigated; 7C; nonirrigated

ap mbol	Soil name and description
	Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; without consideration of possible unlikely major reclamation projects.
	Class III - Severe limitations that reduce choice of crops or require special conservation practices or both.
	Class VII - Not suited for cultivation. Very severe limitations. Suited for range, woodland or wildlife uses if carefully managed. Usually cannot apply physical practices such as pitting, furrowing, seeding, etc.
	E - Erosion by wind of water is the major problem.
	C - Climate is the major hazard. Growing season may be very short; there is a shortage of rainfall or both.
	Killpack silty clay loam, 2 to 5 percent slopes
	If this unit is used for irrigated crops, the main limitations are depth to shale and low water holding capacity. Furrow and sprinkler irrigation is suited to this soil. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Use of pipe or lining reduces water loss and deep percolation. Tilth and fertility can be improved by returning crop residue to the soil and using a suitable rotation which includes alfalfa. Because of shallow depths to shale, onsite investigations may be needed before leveling. Care should be taken in planning and designing land leveling to avoid deep cuts into shale.

Map Symbol	Soil name and description
	This unit consists of moderately deep, well drained soils on narrow, upper ends of swales. These soils formed in residuum derived dominantly from Mancos shale. The surface layer is silty clay loam about 10 inches thick. The upper 9 inches of the underlying material are silty clay loam, and the lower part to a depth of 22 inches is silty clay. Weathered Mancos shale is at a depth of 22 inches. Depth to shale ranges from 20 to 40 inches. Permeability of this soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. Capability Subclass 3E; irrigated; 7C; nonirrigated Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; without consideration of possible unlikely major reclamation projects. Class III - Severe limitations that reduce choice of crops or require special conservation practices or both. Class VII - Not suited for cultivation. Very severe limitations. Suited for range, woodland or wildlife uses if carefully managed. Usually cannot apply physical practices such as pitting, furrowing, seeding, etc. E - Erosion by wind of water is the major problem. C - Climate is the major hazard. Growing season may be very short; there is a shortage of rainfall or both.

10/16/00

PRIME FARMLAND
kornfld

Map ymbol	Soil name
p	Fruitland fine sandy loam, 0 to 2 percent slopes (where irrigated)
r	Fruitland fine sandy loam, 2 to 5 percent slopes (where irrigated)

WATER MANAGEMENT
kornfld

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Cc:							
Persayo	Severe: depth to rock, slope	Severe: thin layer	Severe: no water	Deep to water	Slope, depth to rock, erodes easily	Slope, depth to rock, erodes easily	Too arid, slope, erodes easily
Fp:							
Fruitland	Severe: seepage	Moderate: thin layer	Severe: no water	Deep to water	Soil blowing	Soil blowing	Too arid
Fr:							
Fruitland	Severe: seepage	Moderate: thin layer	Severe: no water	Deep to water	Slope, soil blowing	Soil blowing	Too arid
Hj:							
Killpack	Moderate: depth to rock, slope	Severe: thin layer	Severe: no water	Deep to water	Slope, depth to rock	Depth to rock, erodes easily	Too arid, erodes easily, depth to rock

WATER MANAGEMENT

Endnote -- WATER MANAGEMENT

This report gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes and levees; and aquifer-fed excavated ponds. The limitations are considered "Slight" if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; "Moderate" if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and "Severe" of soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. This report also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways

POND RESERVOIR AREAS hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

EMBANKMENTS, DIKES, AND LEVEES are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this report, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction. The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties. Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

AQUIFER-FED excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

DRAINAGE is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium , or sulfur. Availability of drainage outlets is not considered in the ratings.

WATER MANAGEMENT

dnote -- WATER MANAGEMENT--Continued

RRIGATION is the controlled application of water to supplement rainfall and support plant growth. The design
d management of an irrigation system are affected by depth to the water table, the need for drainage, flooding,
ailable water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected
y large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the
oot zone, the amount of salts or sodium, and soil reaction.

RRACES AND DIVERSIONS are embankments or a combination of channels and ridges constructed across a slope to control
rosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a
mented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of
nd or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

RASSED WATERWAYS are natural or constructed channels, generally broad and shallow, that conduct surface water to
tlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the
nstruction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting
epth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and
intenance of the grass after construction.

WATER FEATURES
kornfld

Map symbol and soil name	Hydrologic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
c:									
Persayo---------	D	None	---	---	>6.0	---	---	---	---
fp:									
Fruitland-------	B	None	---	---	>6.0	---	---	---	---
Fr:									
Fruitland-------	B	None	---	---	>6.0	---	---	---	---
Hj:									
Killpack--------	C	None	---	---	>6.0	---	---	---	---

WATER FEATURES

dnote -- WATER FEATURES

his report gives estimates of various soil water features. The estimates are used in land use planning that involves ngineering considerations.

ydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are ssigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly t and receive precipitation from long-duration storms. The four hydrologic soil groups are:

Group " A". Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group "B". Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group "C". Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group "D". Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

a soil is assigned to two hydrologic groups in this report, the first letter is for drained areas and the second for undrained areas. Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from jacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered ooding, nor is water in swamps and marshes. This report gives the frequency and duration of flooding and e time of year when flooding is most likely. Frequency, duration, and probable dates of occurrence are estimated.

equency is expressed as "None", "Rare", "Occasional", and "Frequent". "None" means that flooding is not probable; are" that it is unlikely but possible under unusual weather conditions; "Occasional" that it occurs, on the erage, once or less in 2 years; and "Frequent" that it occurs, on the average, more than once in 2 years.

ation is expressed as "Very brief" if less than 2 days, "Brief" if 2 to 7 days, "Long" if 7 to 30 days, and "Very ng" if more than 30 days. The information is based on evidence in the soil profile, namely thin strata of gravel, nd, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; absence of distinctive horizons that form in soils that are not subject to flooding. Also considered are local formation about the extent and levels of flooding and the relation of each soil on the landscape to historic floods.

WATER FEATURES

Endnote -- WATER FEATURES--Continued

Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in this report are the depth to the seasonal high water table; the kind of water table, that is, "Apparent", "Artesian", or "Perched"; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in this report.

An "Apparent" water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

An "Artesian" water table exists under a hydrostatic beneath an impermeable layer. When the impermeable layer has been penetrated by a cased borehole, the water rises. The final level of the water in the cased borehole is characterized as an artesian water table.

A "Perched" water table is water standing above an unsaturated zone. In places an upper, or "Perched", water table is separated from a lower one by a dry zone. Only saturated zones within a depth of about 6 feet are indicated.

Ponding is standing water in a closed depression. The water is removed only by deep percolation, transpiration, evaporation, or a combination of these processes.

This report gives the depth and duration of ponding and the time of year when ponding is most likely. Depth, duration, and probable dates of occurrence are estimated.

Depth is expressed as the depth of ponded water in feet above the soil surface. Duration is expressed as "Very brief" if less than 2 days, "Brief" if 2 to 7 days, "Long" if 7 to 30 days, and "Very long" if more than 30 days. The information is based on the relation of each soil on the landscape to historic ponding and on local information about the extent and levels of ponding.

APPENDIX II

TIME OF CONCENTRATIONS AND PEAK RUNOFF CALCULATIONS FOR EXISTING CONDITIONS

EX2

TABULAR HYDROGRAPH METHOD Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: EXISTING HYDROLOGIC CONDITIONS

Total watershed area: 0.022 sq mi Rainfall type: II Frequency: 2 years

	Subareas				
	CP1	CP2	CP3	CP4	CP5
Area(sq mi)	0.01*	0.01*	0.00*	0.00*	0.00*
Rainfall(in)	0.7	0.7	0.7	0.7	0.7
Curve number	89*	89*	89*	89*	89*
Runoff(in)	0.12	0.12	0.12	0.12	0.12
Tc (hrs)	0.24*	0.17*	0.17*	0.13*	0.03*
(Used)	0.20	0.20	0.20	0.10	0.10
TimeToOutlet	0.00	0.00	0.00	0.00	0.00
Ia/P	0.35	0.35	0.35	0.35	0.35

Time (hr)	Total Flow	Subarea Contribution to Total Flow (cfs)				
		CP1	CP2	CP3	CP4	CP5
11.0	0	0	0P	0P	0P	0P
11.3	0	0	0	0	0	0
11.6	0	0	0	0	0	0
11.9	0	0	0	0	0	0
12.0	0	0	0	0	0	0
12.1	1P	1P	0	0	0	0
12.2	1	1	0	0	0	0
12.3	1	1	0	0	0	0
12.4	0	0	0	0	0	0
12.5	0	0	0	0	0	0
12.6	0	0	0	0	0	0
12.7	0	0	0	0	0	0
12.8	0	0	0	0	0	0
13.0	0	0	0	0	0	0
13.2	0	0	0	0	0	0
13.4	0	0	0	0	0	0
13.6	0	0	0	0	0	0
13.8	0	0	0	0	0	0
14.0	0	0	0	0	0	0
14.3	0	0	0	0	0	0
14.6	0	0	0	0	0	0
15.0	0	0	0	0	0	0
15.5	0	0	0	0	0	0
16.0	0	0	0	0	0	0
16.5	0	0	0	0	0	0
17.0	0	0	0	0	0	0
17.5	0	0	0	0	0	0
18.0	0	0	0	0	0	0
19.0	0	0	0	0	0	0
20.0	0	0	0	0	0	0
22.0	0	0	0	0	0	0
26.0	0	0	0	0	0	0

P - Peak Flow * - value(s) provided from TR-55 system routines

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: _____ Date: _____
Subtitle: EXISTING HYDROLOGIC CONDITIONS

Subarea #1 - CP1

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	0.70	50	.030	J					0.152
Shallow Concent'd		250	.030	U					0.025
Open Channel		540						2.5	0.060
								Time of Concentration =	0.24*
									=====

Subarea #2 - CP2

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	0.70	50	.04	J					0.136
Shallow Concent'd		250	.04	U					0.022
Open Channel		150						2.5	0.017
								Time of Concentration =	0.17*
									=====

Subarea #3 - CP3

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	0.70	50	.04	J					0.136
Shallow Concent'd		100	.04	U					0.009
Open Channel		200						2.5	0.022
								Time of Concentration =	0.17*
									=====

Subarea #4 - CP4

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	0.70	50	.067	J					0.110
Shallow Concent'd		130	.067	U					0.009
Open Channel		80						2.5	0.009
								Time of Concentration =	0.13*
									=====

* - Generated for use by TABULAR method

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: _____ Date: _____
Subtitle: EXISTING HYDROLOGIC CONDITIONS

Subarea #5 - CP5

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	0.70	20	.35	J					0.027
Shallow Concent'd		20	.06	U					0.001
								Time of Concentration =	0.03*

--- Sheet Flow Surface Codes ---

A Smooth Surface
B Fallow (No Res.)
C Cultivated < 20 % Res.
D Cultivated > 20 % Res.
E Grass-Range, Short
F Grass, Dense
G Grass, Burmuda
H Woods, Light
I Woods, Dense
J Range, Natural

--- Shallow Concentrated --- Surface Codes ---

P Paved
U Unpaved

* - Generated for use by TABULAR method

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: EXISTING HYDROLOGIC CONDITIONS
Subarea : CP1

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
		Acres (CN)			
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range	poor	-	-	-	6.26(89)
Total Area (by Hydrologic Soil Group)					6.26

SUBAREA: CP1 TOTAL DRAINAGE AREA: 6.26 Acres WEIGHTED CURVE NUMBER: 89

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: EXISTING HYDROLOGIC CONDITIONS
Subarea : CP2

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
		Acres (CN)			
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range	poor	-	-	-	3.77(89)
Total Area (by Hydrologic Soil Group)					3.77

SUBAREA: CP2 TOTAL DRAINAGE AREA: 3.77 Acres WEIGHTED CURVE NUMBER: 89

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: EXISTING HYDROLOGIC CONDITIONS
Subarea : CP3

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
		Acres (CN)			
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range	poor	-	-	-	2.23(89)
Total Area (by Hydrologic Soil Group)					2.23

SUBAREA: CP3 TOTAL DRAINAGE AREA: 2.23 Acres WEIGHTED CURVE NUMBER: 89

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: EXISTING HYDROLOGIC CONDITIONS
Subarea : CP4

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
		Acres (CN)			
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range	poor	-	-	-	1.11(89)
Total Area (by Hydrologic Soil Group)					1.11

SUBAREA: CP4 TOTAL DRAINAGE AREA: 1.11 Acres WEIGHTED CURVE NUMBER: 89

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: EXISTING HYDROLOGIC CONDITIONS
Subarea : CP5

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
		Acres (CN)			
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range	poor	-	-	-	0.67(89)
Total Area (by Hydrologic Soil Group)					.67

SUBAREA: CP5 TOTAL DRAINAGE AREA: .67 Acres WEIGHTED CURVE NUMBER: 89

CA100

TABULAR HYDROGRAPH METHOD Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: _____ Date: _____
Subtitle: EXISTING HYDROLOGIC CONDITIONS

Total watershed area: 0.022 sq mi Rainfall type: II Frequency: 100 years

	Subareas				
	CP1	CP2	CP3	CP4	CP5
Area(sq mi)	0.01*	0.01*	0.00*	0.00*	0.00*
Rainfall(in)	2.0	2.0	2.0	2.0	2.0
Curve number	89*	89*	89*	89*	89*
Runoff(in)	1.04	1.04	1.04	1.04	1.04
Tc (hrs)	0.17*	0.12*	0.11*	0.08*	0.02*
(Used)	0.20	0.10	0.10	0.10	0.10
TimeToOutlet	0.00	0.00	0.00	0.00	0.00
Ia/P	0.12	0.12	0.12	0.12	0.12

Time (hr)	Total Flow	Subarea Contribution to Total Flow (cfs)				
		CP1	CP2	CP3	CP4	CP5
11.0	0	0	0	0	0	0
11.3	0	0	0	0	0	0
11.6	0	0	0	0	0	0
11.9	6	2	2	1	1	0
12.0	12	4	4	2	1	1P
12.1	20P	7	6P	4P	2P	1
12.2	16	8P	4	2	1	1
12.3	7	5	1	1	0	0
12.4	5	3	1	1	0	0
12.5	3	2	1	0	0	0
12.6	2	1	1	0	0	0
12.7	2	1	1	0	0	0
12.8	1	1	0	0	0	0
13.0	1	1	0	0	0	0
13.2	1	1	0	0	0	0
13.4	1	1	0	0	0	0
13.6	1	1	0	0	0	0
13.8	0	0	0	0	0	0
14.0	0	0	0	0	0	0
14.3	0	0	0	0	0	0
14.6	0	0	0	0	0	0
15.0	0	0	0	0	0	0
15.5	0	0	0	0	0	0
16.0	0	0	0	0	0	0
16.5	0	0	0	0	0	0
17.0	0	0	0	0	0	0
17.5	0	0	0	0	0	0
18.0	0	0	0	0	0	0
19.0	0	0	0	0	0	0
20.0	0	0	0	0	0	0
22.0	0	0	0	0	0	0
26.0	0	0	0	0	0	0

P - Peak Flow * - value(s) provided from TR-55 system routines

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: EXISTING HYDROLOGIC CONDITIONS

Subarea #1 - CP1

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.01	50	.030	J					0.090
Shallow Concent'd		250	.030	U					0.025
Open Channel		540						2.5	0.060
								Time of Concentration =	0.17*
									=====

Subarea #2 - CP2

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.01	50	.04	J					0.080
Shallow Concent'd		250	.04	U					0.022
Open Channel		150						2.5	0.017
								Time of Concentration =	0.12*
									=====

Subarea #3 - CP3

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.01	50	.04	J					0.080
Shallow Concent'd		100	.04	U					0.009
Open Channel		200						2.5	0.022
								Time of Concentration =	0.11*
									=====

Subarea #4 - CP4

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.01	50	.067	J					0.065
Shallow Concent'd		130	.067	U					0.009
Open Channel		80						2.5	0.009
								Time of Concentration =	0.08*
									=====

* - Generated for use by TABULAR method

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: EXISTING HYDROLOGIC CONDITIONS

Subarea #5 - CP5

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.01	20	.35	J					0.016
Shallow Concent'd		20	.06	U					0.001
								Time of Concentration =	0.02*
									=====

--- Sheet Flow Surface Codes ---

A Smooth Surface
B Fallow (No Res.)
C Cultivated < 20 % Res.
D Cultivated > 20 % Res.
E Grass-Range, Short
F Grass, Dense
G Grass, Burmuda
H Woods, Light
I Woods, Dense
J Range, Natural

--- Shallow Concentrated --- Surface Codes ---

P Paved
U Unpaved

* - Generated for use by TABULAR method

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             SEPTEMBER 1990           *
*              VERSION 4.0             *
*                                      *
*  RUN DATE  02/18/2001  TIME  18:32:45 *
*                                      *
****************************************
```


```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```


```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   1          ID        CASA VISTA SUBDIVISION
   2          ID        EXISTING HYDROLOGIC MODEL
   3          ID        2-YEAR 24 DURATION DESIGN STORM
   4          ID
              *DIAGRAM
   5          IT       5 16FEB01    1200     300
   6          IN      15
   7          IO       5

   8          KK     CP1
   9          BA   .0098
  10          PB   0.70
  11          PC   .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
  12          PC   .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
  13          PC   .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
  14          PC   .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
  15          PC   .181    .191    .203    .218    .236    .253    .283    .387    .663    .707
```

```
16          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
17          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
18          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
19          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
20          PC    .983    .986    .989    .992    .995    .998   1.000
21          LS              89
22          UD    .144

23          KK     CP2
24          BA   .0059
25          LS              89
26          UD    .102

27          KK     CP3
28          BA   .0035
29          LS              89
30          UD    .102

31          KK     CP4
32          BA   .0017
33          LS              89
34          UD     .10

35          KK    COMB
36          HC       4

37          KK     CP5
38          BA   .0010
39          LS              89
40          UD     .10

41          KK    COMB
42          HC       2
43          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK

 INPUT
  LINE      (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR         (<---) RETURN OF DIVERTED OR PUMPED FLOW

     8        CP1
                .
                .
    23          .         CP2
                .           .
                .           .
    27          .           .         CP3
                .           .           .
                .           .           .
    31          .           .           .         CP4
                .           .           .           .
                .           .           .           .
    35        COMB.....................................
                .
```

```
                .
                .
   37           .          CP5
                .           .
                .           .
   41        COMB............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             SEPTEMBER 1990            *
*              VERSION 4.0              *
*                                       *
*  RUN DATE  02/18/2001  TIME  18:32:45 *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

CASA VISTA SUBDIVISION
EXISTING HYDROLOGIC MODEL
2-YEAR 24 DURATION DESIGN STORM

```
   7 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT           HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE     16FEB 1  STARTING DATE
                      ITIME        1200  STARTING TIME
                         NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     17FEB 1  ENDING DATE
                     NDTIME        1255  ENDING TIME
                     ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL      .08 HOURS
                        TOTAL TIME BASE    24.92 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT
1
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT	CP1	1.	12.08	0.	0.	0.	.01		
+	HYDROGRAPH AT	CP2	0.	12.00	0.	0.	0.	.01		
+	HYDROGRAPH AT	CP3	0.	12.00	0.	0.	0.	.00		
+	HYDROGRAPH AT	CP4	0.	12.00	0.	0.	0.	.00		
+	4 COMBINED AT	COMB	2.	12.08	0.	0.	0.	.02		
+	HYDROGRAPH AT	CP5	0.	12.00	0.	0.	0.	.00		
+	2 COMBINED AT	COMB	2.	12.08	0.	0.	0.	.02		

*** NORMAL END OF HEC-1 ***

```
1*****************************************
 *                                       *
 *    FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *              SEPTEMBER 1990           *
 *               VERSION 4.0             *
 *                                       *
 *  RUN DATE  02/18/2001  TIME  18:30:28 *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX           XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   1          ID        CASA VISTA SUBDIVISION
   2          ID        EXISTING HYDROLOGIC MODEL
   3          ID        100 YEAR - 24 HOUR DURATION DESIGN STORM
   4          ID
              *DIAGRAM
   5          IT       5 16FEB01    1200     300
   6          IN      15
   7          IO       5

   8          KK     CP1
   9          BA   .0098
  10          PB    2.01
  11          PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
  12          PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
  13          PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
  14          PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
  15          PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
```

```
16          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
17          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
18          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
19          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
20          PC    .983    .986    .989    .992    .995    .998   1.000
21          LS              89
22          UD    .102

23          KK     CP2
24          BA   .0059
25          LS              89
26          UD     .10

27          KK     CP3
28          BA   .0035
29          LS              89
30          UD     .10

31          KK     CP4
32          BA   .0017
33          LS              89
34          UD     .10

35          KK    COMB
36          HC       4

37          KK     CP5
38          BA   .0010
39          LS              89
40          UD     .10

41          KK    COMB
42          HC       2
43          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     8        CP1
                .
                .
    23          .         CP2
                .           .
                .           .
    27          .           .         CP3
                .           .           .
                .           .           .
    31          .           .           .         CP4
                .           .           .           .
                .           .           .           .
    35        COMB.....................................
                .
```

```
                .
   37           .          CP5
                .           .
                .           .
   41        COMB............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             SEPTEMBER 1990            *
*              VERSION 4.0              *
*                                       *
*  RUN DATE  02/18/2001  TIME  18:30:28 *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

CASA VISTA SUBDIVISION
EXISTING HYDROLOGIC MODEL
100 YEAR - 24 HOUR DURATION DESIGN STORM

```
   7 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT           HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE     16FEB 1  STARTING DATE
                      ITIME        1200  STARTING TIME
                         NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     17FEB 1  ENDING DATE
                     NDTIME        1255  ENDING TIME
                     ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL      .08 HOURS
                       TOTAL TIME BASE   24.92 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT
```

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT	CP1	8.	12.00	1.	0.	0.	.01		
+	HYDROGRAPH AT	CP2	5.	12.00	1.	0.	0.	.01		
+	HYDROGRAPH AT	CP3	3.	12.00	0.	0.	0.	.00		
+	HYDROGRAPH AT	CP4	1.	12.00	0.	0.	0.	.00		
+	4 COMBINED AT	COMB	17.	12.00	2.	1.	1.	.02		
+	HYDROGRAPH AT	CP5	1.	12.00	0.	0.	0.	.00		
+	2 COMBINED AT	COMB	18.	12.00	2.	1.	1.	.02		

*** NORMAL END OF HEC-1 ***

APPENDIX III

TIME OF CONCENTRATIONS AND PEAK RUNOFF CALCULATIONS FOR DEVELOPED CONDITIONS

DEV 2

TABULAR HYDROGRAPH METHOD Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: DEVELOPED HYDROLOGIC CONDITIONS

Total watershed area: 0.022 sq mi Rainfall type: II Frequency: 2 years

	Subareas					
	CP10	CP11	CP12	CP13	CP14	CP5
Area(sq mi)	0.00*	0.00*	0.01*	0.01*	0.00*	0.00*
Rainfall(in)	0.7	0.7	0.7	0.7	0.7	0.7
Curve number	89*	89*	91*	92*	89*	89*
Runoff(in)	0.12	0.12	0.17	0.20	0.12	0.12
Tc (hrs)	0.30*	0.26*	0.33*	0.35*	0.35*	0.03*
(Used)	0.30	0.30	0.30	0.30	0.30	0.10
TimeToOutlet	0.00	0.00	0.00	0.00	0.00	0.00
Ia/P	0.35	0.35	0.28	0.25	0.35	0.35

Time (hr)	Total Flow	Subarea Contribution to Total Flow (cfs)					
		CP10	CP11	CP12	CP13	CP14	CP5
11.0	0	0P	0P	0	0	0P	0P
11.3	0	0	0	0	0	0	0
11.6	0	0	0	0	0	0	0
11.9	0	0	0	0	0	0	0
12.0	0	0	0	0	0	0	0
12.1	0	0	0	0	0	0	0
12.2	2P	0	0	1P	1P	0	0
12.3	2	0	0	1	1	0	0
12.4	1	0	0	0	1	0	0
12.5	0	0	0	0	0	0	0
12.6	0	0	0	0	0	0	0
12.7	0	0	0	0	0	0	0
12.8	0	0	0	0	0	0	0
13.0	0	0	0	0	0	0	0
13.2	0	0	0	0	0	0	0
13.4	0	0	0	0	0	0	0
13.6	0	0	0	0	0	0	0
13.8	0	0	0	0	0	0	0
14.0	0	0	0	0	0	0	0
14.3	0	0	0	0	0	0	0
14.6	0	0	0	0	0	0	0
15.0	0	0	0	0	0	0	0
15.5	0	0	0	0	0	0	0
16.0	0	0	0	0	0	0	0
16.5	0	0	0	0	0	0	0
17.0	0	0	0	0	0	0	0
17.5	0	0	0	0	0	0	0
18.0	0	0	0	0	0	0	0
19.0	0	0	0	0	0	0	0
20.0	0	0	0	0	0	0	0
22.0	0	0	0	0	0	0	0
26.0	0	0	0	0	0	0	0

P - Peak Flow * - value(s) provided from TR-55 system routines

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: DEVELOPED HYDROLOGIC CONDITIONS

Subarea #1 - CP10

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	0.70	50	.03	F					0.248
Shallow Concent'd		120	.03	U					0.012
Open Channel		400						2.5	0.044
								Time of Concentration =	0.30*
									=====

Subarea #2 - CP11

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	0.70	50	.03	F					0.248
Shallow Concent'd		150	.03	U					0.015
								Time of Concentration =	0.26*
									=====

Subarea #3 - CP12

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	0.70	50	.03	F					0.248
Shallow Concent'd		150	.03	U					0.015
Open Channel		630						2.5	0.070
								Time of Concentration =	0.33*
									=====

Subarea #4 - CP13

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	0.70	50	.03	F					0.248
Shallow Concent'd		130	.03	U					0.013
Open Channel		760						2.5	0.084
								Time of Concentration =	0.35*
									=====

* - Generated for use by TABULAR method

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: DEVELOPED HYDROLOGIC CONDITIONS

Subarea #5 - CP14

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	0.70	50	.03	F					0.248
Shallow Concent'd		230	.03	U					0.023
Open Channel		680						2.5	0.076
								Time of Concentration =	0.35*
									=====

Subarea #6 - CP5

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	0.70	20	.35	J					0.027
Shallow Concent'd		20	.06	U					0.001
								Time of Concentration =	0.03*
									=====

--- Sheet Flow Surface Codes ---

A Smooth Surface
B Fallow (No Res.)
C Cultivated < 20 % Res.
D Cultivated > 20 % Res.
E Grass-Range, Short
F Grass, Dense
G Grass, Burmuda
H Woods, Light
I Woods, Dense
J Range, Natural

--- Shallow Concentrated --- --- Surface Codes ---

P Paved
U Unpaved

* - Generated for use by TABULAR method

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: DEVELOPED HYDROLOGIC CONDITIONS
Subarea : CP10

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
		Acres (CN)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Open space (Lawns,parks etc.)					
Fair condition; grass cover 50% to 75%		-	-	-	.28(84)
Impervious Areas					
Paved parking lots, roofs, driveways		-	350 ft²/43,560 = .08 x 2	-	= .16(98)
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range	poor	-	-	-	1.56(89)
Total Area (by Hydrologic Soil Group)					2 ====

SUBAREA: CP10 TOTAL DRAINAGE AREA: 2 Acres WEIGHTED CURVE NUMBER: 89

what about streets?

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: DEVELOPED HYDROLOGIC CONDITIONS
Subarea : CP11

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D	Acres (CN)
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Open space (Lawns,parks etc.)					
Fair condition; grass cover 50% to 75%	-	-	-		0.14(84)
Impervious Areas					
Paved parking lots, roofs, driveways	-	-	-		0.08(98)
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range poor	-	-	-		0.78(89)
Total Area (by Hydrologic Soil Group)					.999 ====

SUBAREA: CP11 TOTAL DRAINAGE AREA: 1 Acres WEIGHTED CURVE NUMBER: 89

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: DEVELOPED HYDROLOGIC CONDITIONS
Subarea : CP12

COVER DESCRIPTION	Hydrologic Soil Group A	B	C	D
	Acres (CN)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)				
Open space (Lawns,parks etc.)				
Fair condition; grass cover 50% to 75%	-	-	-	0.83(84)
Impervious Areas				
Paved parking lots, roofs, driveways	-	-	-	0.48(98)
Streets and roads				
Paved; curbs and storm sewers	-	-	-	0.72(98)
OTHER AGRICULTURAL LANDS				
Pasture, grassland or range poor	-	-	-	1.76(89)
Total Area (by Hydrologic Soil Group)				3.79 ====

SUBAREA: CP12 TOTAL DRAINAGE AREA: 3.79 Acres WEIGHTED CURVE NUMBER: 91

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: DEVELOPED HYDROLOGIC CONDITIONS
Subarea : CP13

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
		Acres (CN)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Open space (Lawns,parks etc.)					
Poor condition; grass cover < 50%		-	-	-	0.41(89)
Impervious Areas					
Paved parking lots, roofs, driveways		-	-	-	0.24(98)
Streets and roads					
Paved; curbs and storm sewers		-	-	-	0.87(98)
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range	poor	-	-	-	2.35(89)
Total Area (by Hydrologic Soil Group)					3.87 ====

SUBAREA: CP13 TOTAL DRAINAGE AREA: 3.87 Acres WEIGHTED CURVE NUMBER: 92

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: DEVELOPED HYDROLOGIC CONDITIONS
Subarea : CP14

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
		Acres		(CN)	
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Open space (Lawns,parks etc.)					
Fair condition; grass cover 50% to 75%		-	-	-	0.41(84)
Impervious Areas					
Paved parking lots, roofs, driveways		-	-	-	0.24(98)
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range	poor	-	-	-	2.07(89)
Total Area (by Hydrologic Soil Group)					2.72 ====

SUBAREA: CP14 TOTAL DRAINAGE AREA: 2.72 Acres WEIGHTED CURVE NUMBER: 89

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: DEVELOPED HYDROLOGIC CONDITIONS
Subarea : CP5

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
		Acres (CN)			
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range	poor	-	-	-	0.67(89)
Total Area (by Hydrologic Soil Group)					.67

SUBAREA: CP5 TOTAL DRAINAGE AREA: .67 Acres WEIGHTED CURVE NUMBER: 89

QEV100

TABULAR HYDROGRAPH METHOD Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: DEVELOPED HYDROLOGIC CONDITIONS

Total watershed area: 0.022 sq mi Rainfall type: II Frequency: 100 years

	Subareas					
	CP10	CP11	CP12	CP13	CP14	CP5
Area(sq mi)	0.00*	0.00*	0.01*	0.01*	0.00*	0.00*
Rainfall(in)	2.0	2.0	2.0	2.0	2.0	2.0
Curve number	89*	89*	91*	92*	89*	89*
Runoff(in)	1.04	1.04	1.17	1.25	1.04	1.04
Tc (hrs)	0.20*	0.16*	0.23*	0.24*	0.24*	0.02*
(Used)	0.20	0.20	0.20	0.20	0.20	0.10
TimeToOutlet	0.00	0.00	0.00	0.00	0.00	0.00
Ia/P	0.12	0.12	0.10	0.09	0.12	0.12
(Used)	0.12	0.12	0.10	0.10	0.12	0.12

Time (hr)	Total Flow	Subarea Contribution to Total Flow (cfs)					
		CP10	CP11	CP12	CP13	CP14	CP5
11.0	0	0	0	0	0	0	0
11.3	0	0	0	0	0	0	0
11.6	0	0	0	0	0	0	0
11.9	5	1	0	1	2	1	0
12.0	11	1	1P	3	3	2	1P
12.1	18	2	1	5	6P	3P	1
12.2	20P	3P	1	6P	6	3	1
12.3	12	2	1	3	4	2	0
12.4	6	1	0	2	2	1	0
12.5	4	1	0	1	1	1	0
12.6	3	0	0	1	1	1	0
12.7	2	0	0	1	1	0	0
12.8	2	0	0	1	1	0	0
13.0	1	0	0	0	1	0	0
13.2	0	0	0	0	0	0	0
13.4	0	0	0	0	0	0	0
13.6	0	0	0	0	0	0	0
13.8	0	0	0	0	0	0	0
14.0	0	0	0	0	0	0	0
14.3	0	0	0	0	0	0	0
14.6	0	0	0	0	0	0	0
15.0	0	0	0	0	0	0	0
15.5	0	0	0	0	0	0	0
16.0	0	0	0	0	0	0	0
16.5	0	0	0	0	0	0	0
17.0	0	0	0	0	0	0	0
17.5	0	0	0	0	0	0	0
18.0	0	0	0	0	0	0	0
19.0	0	0	0	0	0	0	0
20.0	0	0	0	0	0	0	0
22.0	0	0	0	0	0	0	0
26.0	0	0	0	0	0	0	0

P - Peak Flow * - value(s) provided from TR-55 system routines

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: DEVELOPED HYDROLOGIC CONDITIONS

Subarea #1 - CP10

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.01	50	.03	F					0.147
Shallow Concent'd		120	.03	U					0.012
Open Channel		400						2.5	0.044
								Time of Concentration =	0.20*
									=====

Subarea #2 - CP11

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.01	50	.03	F					0.147
Shallow Concent'd		150	.03	U					0.015
								Time of Concentration =	0.16*
									=====

Subarea #3 - CP12

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.01	50	.03	F					0.147
Shallow Concent'd		150	.03	U					0.015
Open Channel		630						2.5	0.070
								Time of Concentration =	0.23*
									=====

Subarea #4 - CP13

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.01	50	.03	F					0.147
Shallow Concent'd		130	.03	U					0.013
Open Channel		760						2.5	0.084
								Time of Concentration =	0.24*
									=====

* - Generated for use by TABULAR method

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : CASA VISTA SUBDIVISION User: JEK Date:
County : MESA State: CO Checked: ____ Date: _____
Subtitle: DEVELOPED HYDROLOGIC CONDITIONS

Subarea #5 - CP14

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.01	50	.03	F					0.147
Shallow Concent'd		230	.03	U					0.023
Open Channel		680						2.5	0.076
								Time of Concentration =	0.24*

Subarea #6 - CP5

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.01	20	.35	J					0.016
Shallow Concent'd		20	.06	U					0.001
								Time of Concentration =	0.02*

--- Sheet Flow Surface Codes ---

A Smooth Surface
B Fallow (No Res.)
C Cultivated < 20 % Res.
D Cultivated > 20 % Res.
E Grass-Range, Short
F Grass, Dense
G Grass, Burmuda
H Woods, Light
I Woods, Dense
J Range, Natural

--- Shallow Concentrated --- --- Surface Codes ---

P Paved
U Unpaved

* - Generated for use by TABULAR method

```
1****************************************
*                                      *
*    FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*          SEPTEMBER 1990              *
*           VERSION 4.0                *
*                                      *
*  RUN DATE  03/09/2001  TIME  16:14:31 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*         609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  1           ID        CASA VISTA SUBDIVISION
  2           ID        DEVELOPED HYDROLOGIC MODEL
  3           ID        2-YEAR 24 DURATION DESIGN STORM
  4           ID
              *DIAGRAM
  5           IT       5 16FEB01    1200     300
  6           IN      15
  7           IO       5

  8           KK    CP10
  9           BA   .0031
 10           PB    0.70
 11           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 12           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 13           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 14           PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
 15           PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
```

```
                16          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
                17          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
                18          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
                19          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
                20          PC    .983    .986    .989    .992    .995    .998   1.000
                21          LS              89
                22          UD    .102

                23          KK    CP11
                24          BA   .0016
                25          LS              89
                26          UD     .10

                27          KK    CP12
                28          BA   .0059
                29          LS              91
                30          UD     .10

                31          KK    CP13
                32          BA   .0060
                33          LS              92
                34          UD     .10

                35          KK    CP14
                36          BA   .0043
                37          LS              89
                38          UD     .10

                39          KK    COMB
                40          HC       4

                41          KK  DETENTION/IRRIGATION BASIN
                42          KO                2
                43          RS        1     ELEV
                44          SA    .0551   .0887   .1289     .15
                45          SE     4572    4573    4574  4574.5
                46          SL   4572.7    1.77     0.6      .5
                47          SS   4573.5       3    3.09     1.5
1                                                  HEC-1 INPUT                                                PAGE  2

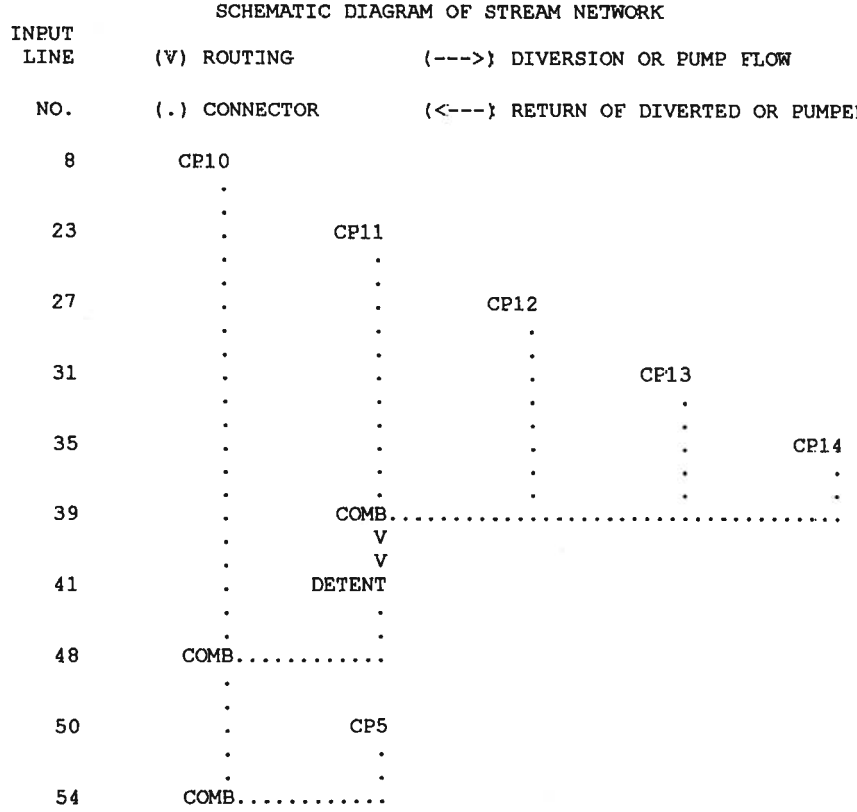
            LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


                48          KK    COMB
                49          HC       2

                50          KK     CP5
                51          BA   .0010
                52          LS              89
                53          UD     .10

                54          KK    COMB
                55          HC       2
                56          ZZ
1
```

SCHEMATIC DIAGRAM OF STREAM NETWORK



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             SEPTEMBER 1990            *
*              VERSION 4.0              *
*                                       *
*  RUN DATE  03/09/2001  TIME  16:14:31 *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

CASA VISTA SUBDIVISION
DEVELOPED HYDROLOGIC MODEL
2-YEAR 24 DURATION DESIGN STORM

```
  7 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE     16FEB 1  STARTING DATE
                      ITIME        1200  STARTING TIME
                         NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     17FEB 1  ENDING DATE
                     NDTIME        1255  ENDING TIME
                      ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL      .08 HOURS
                       TOTAL TIME BASE    24.92 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


               **************
               *            *
  41 KK        *    DETENT  *     ION/IRRIGATION BASIN
               *            *
               **************

  42 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           2  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
1                                                    STATION    DETENT

                        (I) INFLOW,   (O) OUTFLOW
         .0        .4        .8       1.2       1.6       2.0       2.4        .0        .0        .0        .0        .0        .0
                                                                                                (S) STORAGE
        .00       .00       .00       .00       .00       .00       .00       .02       .04       .06       .00       .00       .00
 DAHRMN PER
 161200   1I---------.---------.---------.---------.---------.---------S---------.---------.---------.---------.---------.---------.
 161205   2I         .         .         .         .         .         S         .         .         .         .         .         .
 161210   3I         .         .         .         .         .         S         .         .         .         .         .         .
 161215   4I         .         .         .         .         .         S         .         .         .         .         .         .
 161220   5I         .         .         .         .         .         S         .         .         .         .         .         .
 161225   6I         .         .         .         .         .         S         .         .         .         .         .         .
 161230   7I         .         .         .         .         .         S         .         .         .         .         .         .
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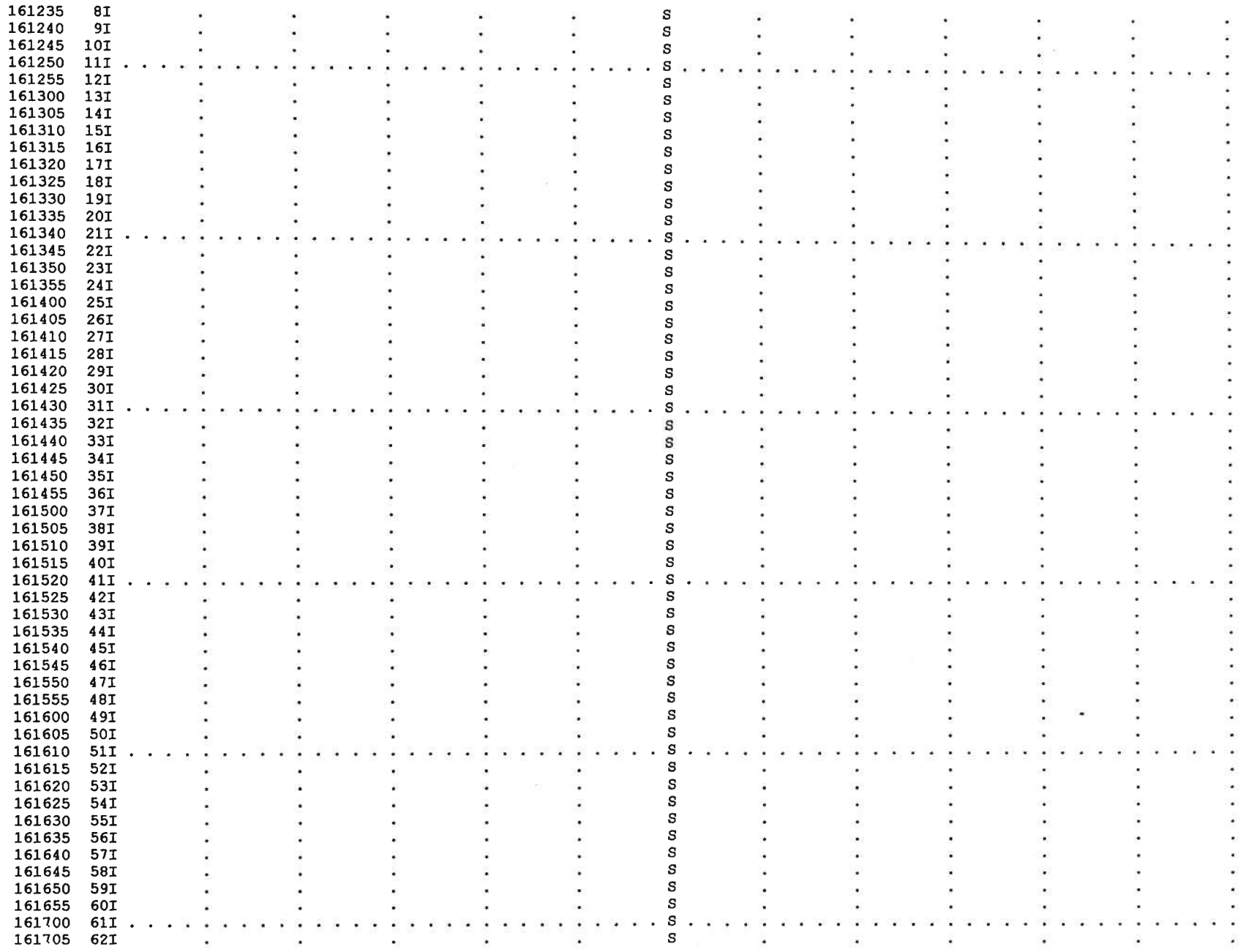
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161245 10I
161250 11I
161255 12I
161300 13I
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161310 15I
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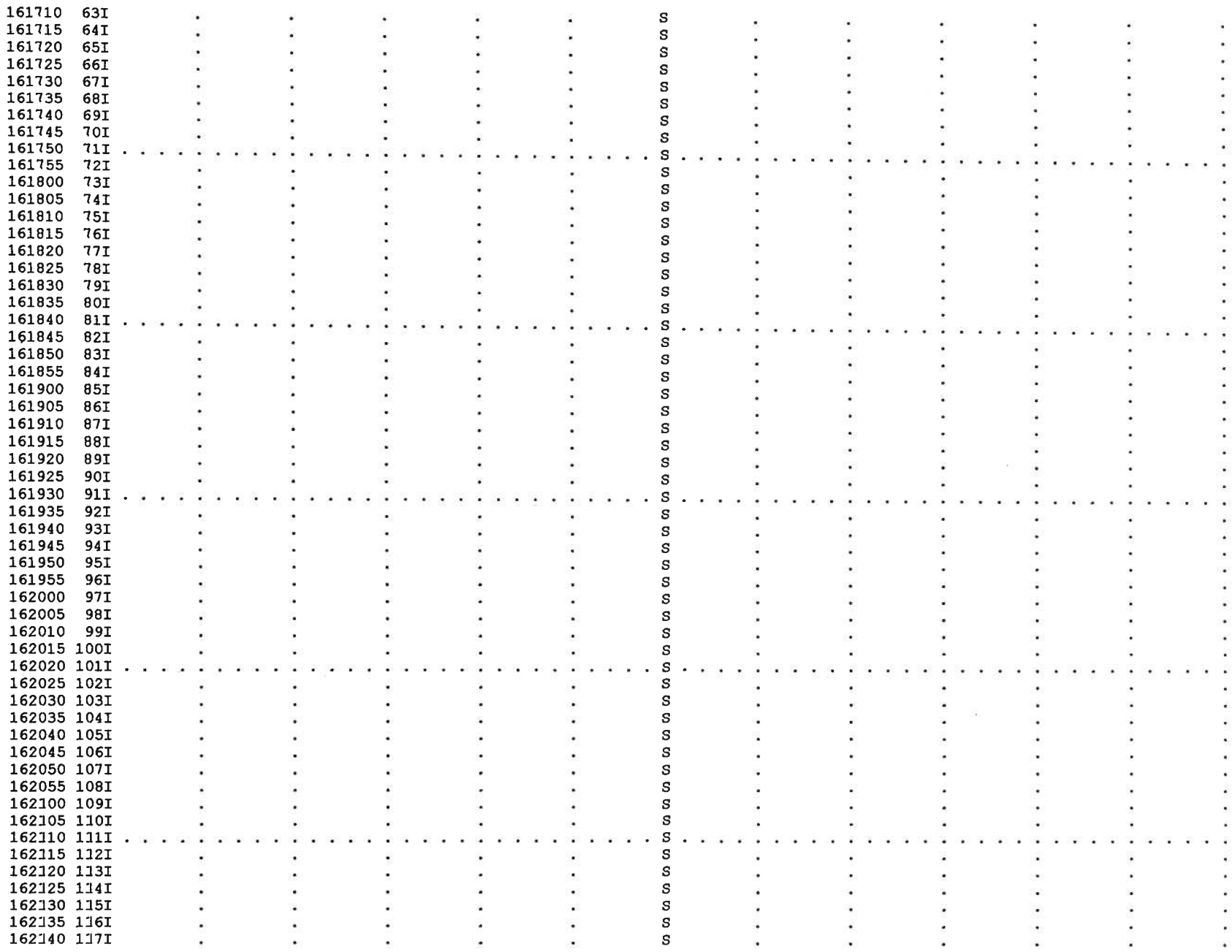
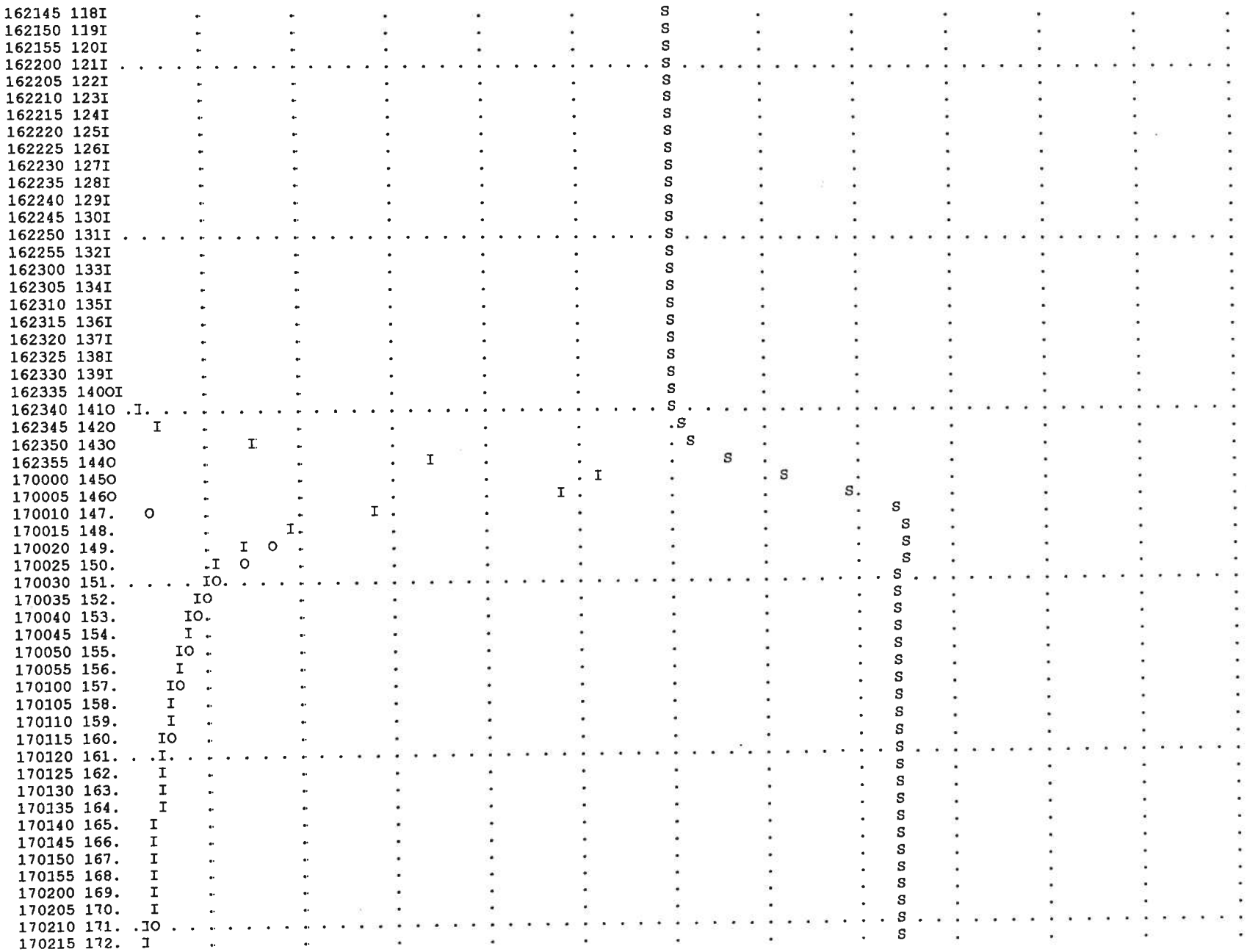
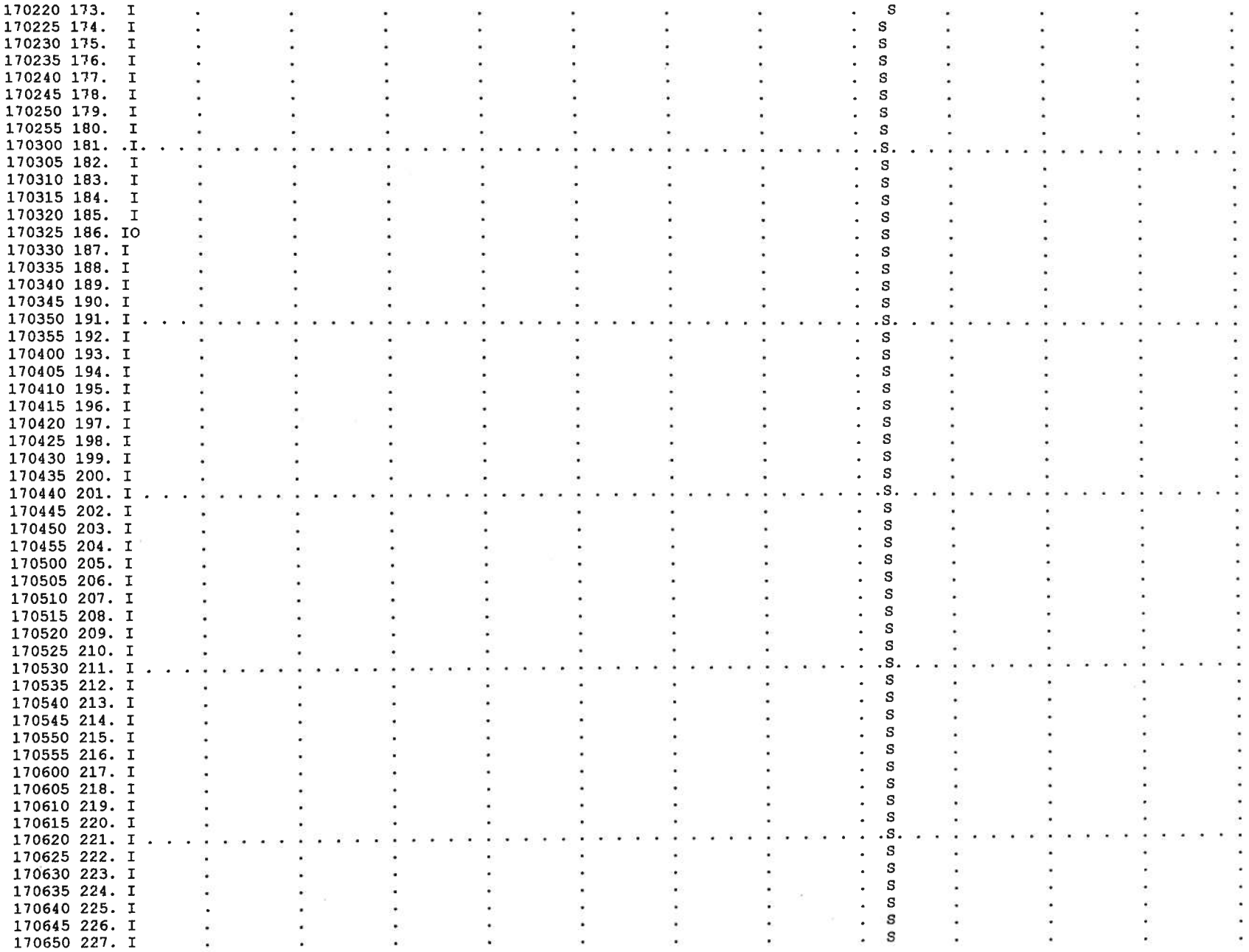
161320 17I
161325 18I
161330 19I
161335 20I
161340 21I
161345 22I
161350 23I
161355 24I
161400 25I
161405 26I
161410 27I
161415 28I
161420 29I
161425 30I
161430 31I
161435 32I
161440 33I
161445 34I
161450 35I
161455 36I
161500 37I
161505 38I
161510 39I
161515 40I
161520 41I
161525 42I
161530 43I
161535 44I
161540 45I
161545 46I
161550 47I
161555 48I
161600 49I
161605 50I
161610 51I
161615 52I
161620 53I
161625 54I
161630 55I
161635 56I
161640 57I
161645 58I
161650 59I
161655 60I
161700 61I
161705 62I


161710 63I
161715 64I
161720 65I
161725 66I
161730 67I
161735 68I
161740 69I
161745 70I
161750 71I
161755 72I
161800 73I
161805 74I
161810 75I
161815 76I
161820 77I
161825 78I
161830 79I
161835 80I
161840 81I
161845 82I
161850 83I
161855 84I
161900 85I
161905 86I
161910 87I
161915 88I
161920 89I
161925 90I
161930 91I
161935 92I
161940 93I
161945 94I
161950 95I
161955 96I
162000 97I
162005 98I
162010 99I
162015 100I
162020 101I
162025 102I
162030 103I
162035 104I
162040 105I
162045 106I
162050 107I
162055 108I
162100 109I
162105 110I
162110 111I
162115 112I
162120 113I
162125 114I
162130 115I
162135 116I
162140 117I


162145 118I
162150 119I
162155 120I
162200 121I
162205 122I
162210 123I
162215 124I
162220 125I
162225 126I
162230 127I
162235 128I
162240 129I
162245 130I
162250 131I
162255 132I
162300 133I
162305 134I
162310 135I
162315 136I
162320 137I
162325 138I
162330 139I
162335 140OI
162340 1410
162345 1420
162350 1430
162355 1440
170000 1450
170005 1460
170010 147.
170015 148.
170020 149.
170025 150.
170030 151.
170035 152.
170040 153.
170045 154.
170050 155.
170055 156.
170100 157.
170105 158.
170110 159.
170115 160.
170120 161.
170125 162.
170130 163.
170135 164.
170140 165.
170145 166.
170150 167.
170155 168.
170200 169.
170205 170.
170210 171.
170215 172.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170300 181. I
170305 182. I
170310 183. I
170315 184. I
170320 185. I
170325 186. IO
170330 187. I
170335 188. I
170340 189. I
170345 190. I
170350 191. I
170355 192. I
170400 193. I
170405 194. I
170410 195. I
170415 196. I
170420 197. I
170425 198. I
170430 199. I
170435 200. I
170440 201. I
170445 202. I
170450 203. I
170455 204. I
170500 205. I
170505 206. I
170510 207. I
170515 208. I
170520 209. I
170525 210. I
170530 211. I
170535 212. I
170540 213. I
170545 214. I
170550 215. I
170555 216. I
170600 217. I
170605 218. I
170610 219. I
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170625 222. I
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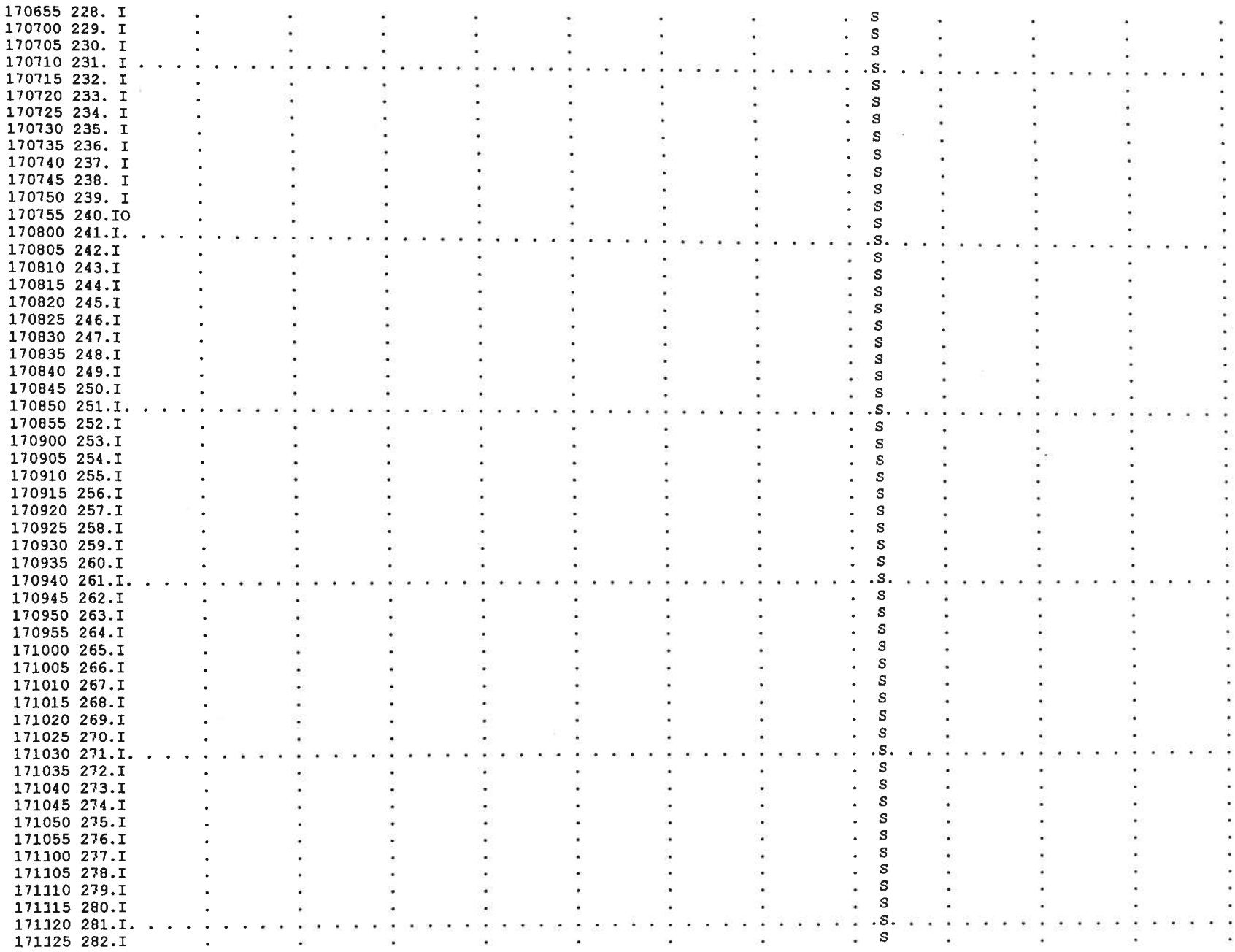
170640 225. I
170645 226. I
170650 227. I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170735 236. I
170740 237. I
170745 238. I
170750 239. I
170755 240.IO
170800 241.I.
170805 242.I
170810 243.I
170815 244.I
170820 245.I
170825 246.I
170830 247.I
170835 248.I
170840 249.I
170845 250.I
170850 251.I.
170855 252.I
170900 253.I
170905 254.I
170910 255.I
170915 256.I
170920 257.I
170925 258.I
170930 259.I
170935 260.I
170940 261.I.
170945 262.I
170950 263.I
170955 264.I
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171005 266.I
171010 267.I
171015 268.I
171020 269.I
171025 270.I
171030 271.I.
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171040 273.I
171045 274.I
171050 275.I
171055 276.I
171100 277.I
171105 278.I
171110 279.I
171115 280.I
171120 281.I.
171125 282.I

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171140 285.I        .         .         .         .         .         .         .         S         .         .         .         .
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171150 287.I        .         .         .         .         .         .         .         S         .         .         .         .
171155 288.I        .         .         .         .         .         .         .         S         .         .         .         .
171200 289.I        .         .         .         .         .         .         .         S         .         .         .         .
171205 290.I        .         .         .         .         .         .         .         S         .         .         .         .
171210 291IO. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
171215 292I         .         .         .         .         .         .         .         S         .         .         .         .
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171230 295I         .         .         .         .         .         .         .         S         .         .         .         .
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171240 297I         .         .         .         .         .         .         .         S         .         .         .         .
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171250 299I         .         .         .         .         .         .         .         S         .         .         .         .
171255 300I---------.---------.---------.---------.---------.---------.---------.---------.--S------.---------.---------.---------.
1
1
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT	CP10	0.	12.00	0.	0.	0.	.00		
+	HYDROGRAPH AT	CP11	0.	12.00	0.	0.	0.	.00		
+	HYDROGRAPH AT	CP12	1.	12.00	0.	0.	0.	.01		
+	HYDROGRAPH AT	CP13	1.	12.00	0.	0.	0.	.01		
+	HYDROGRAPH AT	CP14	0.	12.00	0.	0.	0.	.00		
+	4 COMBINED AT	COMB	2.	12.00	0.	0.	0.	.02		
+	ROUTED TO	DETENT	1.	12.25	0.	0.	0.	.02	4572.75	12.25
+										
+	2 COMBINED AT	COMB	1.	12.25	0.	0.	0.	.02		
+	HYDROGRAPH AT	CP5	0.	12.00	0.	0.	0.	.00		

2 COMBINED AT

+	COMB	1.	12.25	0.	0.	0.	.02

*** NORMAL END OF HEC-1 ***

CASA100D

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             SEPTEMBER 1990            *
 *              VERSION 4.0              *
 *                                       *
 *  RUN DATE  03/09/2001  TIME  15:12:19 *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  1           ID        CASA VISTA SUBDIVISION
  2           ID        DEVELOPED HYDROLOGIC MODEL
  3           ID        100 YEAR - 24 HOUR DURATION DESIGN STORM
  4           ID
              *DIAGRAM
  5           IT       5 16FEB01    1200     300
  6           IN      15
  7           IO       5

  8           KK    CP10
  9           BA   .0031
 10           PB    2.01
 11           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 12           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
```

```
14          PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
15          PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
16          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
17          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
18          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
19          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
20          PC    .983    .986    .989    .992    .995    .998   1.000
21          LS              89
22          UD    .102

23          KK    CP11
24          BA   .0016
25          LS              89
26          UD     .10

27          KK    CP12
28          BA   .0059
29          LS              91
30          UD     .10

31          KK    CP13
32          BA   .0060
33          LS              92
34          UD     .10

35          KK    CP14
36          BA   .0043
37          LS              89
38          UD     .10

39          KK    COMB
40          HC       4

41          KK  DETENTION/IRRIGATION BASIN
42          KO                2
43          RS      1     ELEV
44          SA   .0551    .0887    .1289      .15
45          SE    4572     4573     4574    4574.5
46          SL  4572.7     1.77       .6       .5
47          SS  4573.5        3     3.09      1.5
```



```
LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

48          KK    COMB
49          HC       2

50          KK     CP5
51          BA   .0010
52          LS              89
53          UD     .10

54          KK    COMB
55          HC       2
```

```
            56          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     8        CP10
              .  .
              .  .
    23        .  .        CP11
              .  .          .
              .  .          .
    27        .  .          .        CP12
              .  .          .          .
              .  .          .          .
    31        .  .          .          .        CP13
              .  .          .          .          .
              .  .          .          .          .
    35        .  .          .          .          .        CP14
              .  .          .          .          .          .
              .  .          .          .          .          .
    39        .  .        COMB.....................................
              .  .          V
              .  .          V
    41        .  .       DETENT
              .  .          .
              .  .          .
    48        COMB.....     .
              .  .          .
              .  .          .
    50        .  .          CP5
              .  .          .
              .  .          .
    54        COMB.....     .

  (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             SEPTEMBER 1990            *
 *              VERSION 4.0              *
 *                                       *
 *  RUN DATE  03/09/2001  TIME  15:12:19 *
 *                                       *
 *****************************************

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 *                                     *
 *    U.S. ARMY CORPS OF ENGINEERS     *
 *    HYDROLOGIC ENGINEERING CENTER    *
 *          609 SECOND STREET          *
 *       DAVIS, CALIFORNIA 95616       *
 *           (916) 756-1104            *
 *                                     *
 ***************************************
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CASA VISTA SUBDIVISION
DEVELOPED HYDROLOGIC MODEL
100 YEAR - 24 HOUR DURATION DESIGN STORM

```
  7 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE     16FEB 1  STARTING DATE
                      ITIME        1200  STARTING TIME
                         NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     17FEB 1  ENDING DATE
                     NDTIME        1255  ENDING TIME
                      ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL      .08 HOURS
                       TOTAL TIME BASE    24.92 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


               **************
               *            *
  41 KK        *    DETENT  *      ION/IRRIGATION BASIN
               *            *
               **************

  42 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           2  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
1                                                 STATION   DETENT

                        (I) INFLOW,   (O) OUTFLOW
         0.        2.        4.        6.        8.       10.       12.       14.       16.       18.        0.        0.        0.
                                                                                  (S) STORAGE
        .00       .00       .00       .00       .00       .00       .00       .05       .10       .15       .20       .00       .00
 DAHRMN PER
 161200   1I---------.---------.---------.---------.---------.---------S---------.---------.---------.---------.---------.---------.
 161205   2I         .         .         .         .         .         S         .         .         .         .         .         .
 161210   3I         .         .         .         .         .         S         .         .         .         .         .         .
 161215   4I         .         .         .         .         .         S         .         .         .         .         .         .
 161220   5I         .         .         .         .         .         S         .         .         .         .         .         .
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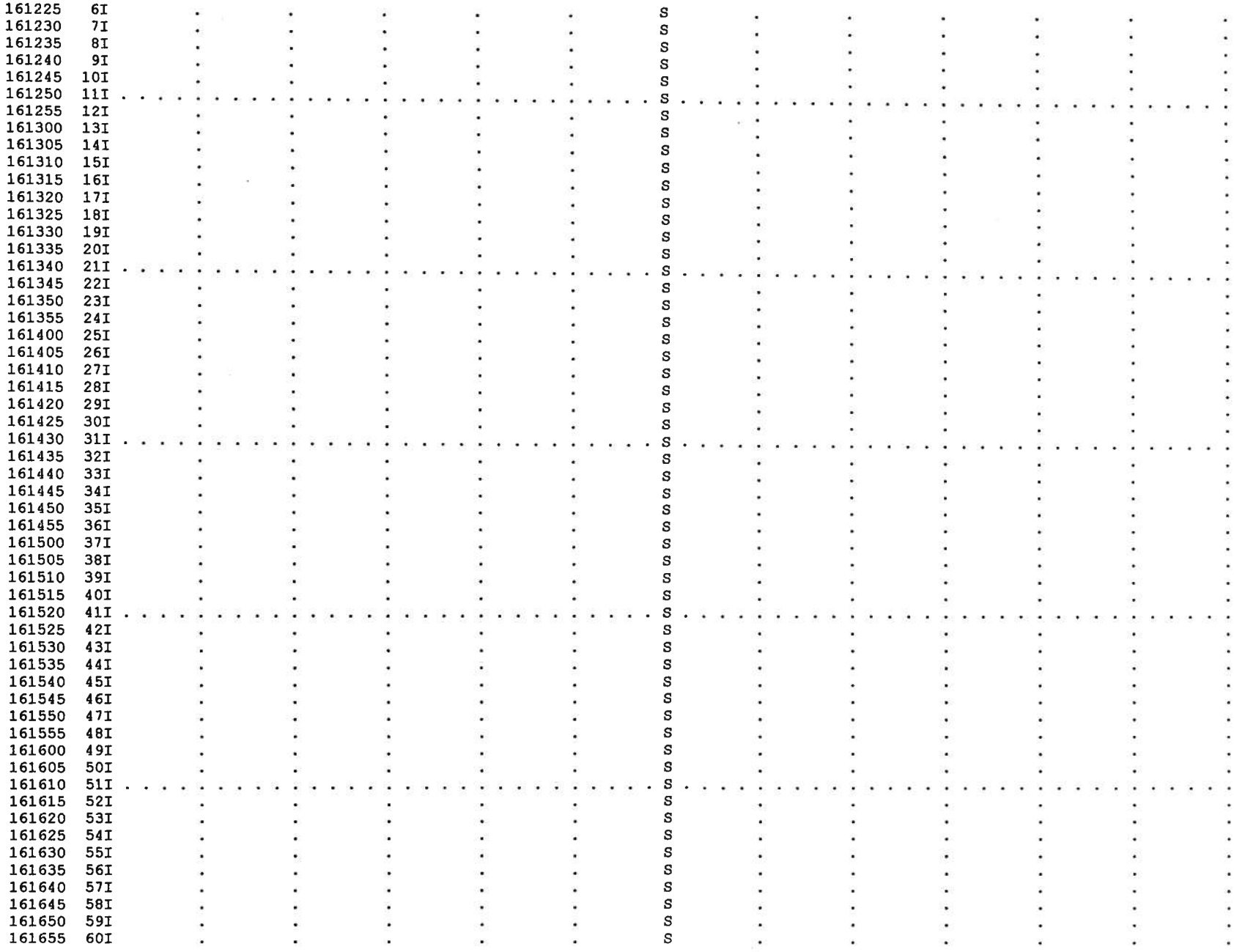
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161310 15I
161315 16I
161320 17I
161325 18I
161330 19I
161335 20I
161340 21I
161345 22I
161350 23I
161355 24I
161400 25I
161405 26I
161410 27I
161415 28I
161420 29I
161425 30I
161430 31I
161435 32I
161440 33I
161445 34I
161450 35I
161455 36I
161500 37I
161505 38I
161510 39I
161515 40I
161520 41I
161525 42I
161530 43I
161535 44I
161540 45I
161545 46I
161550 47I
161555 48I
161600 49I
161605 50I
161610 51I
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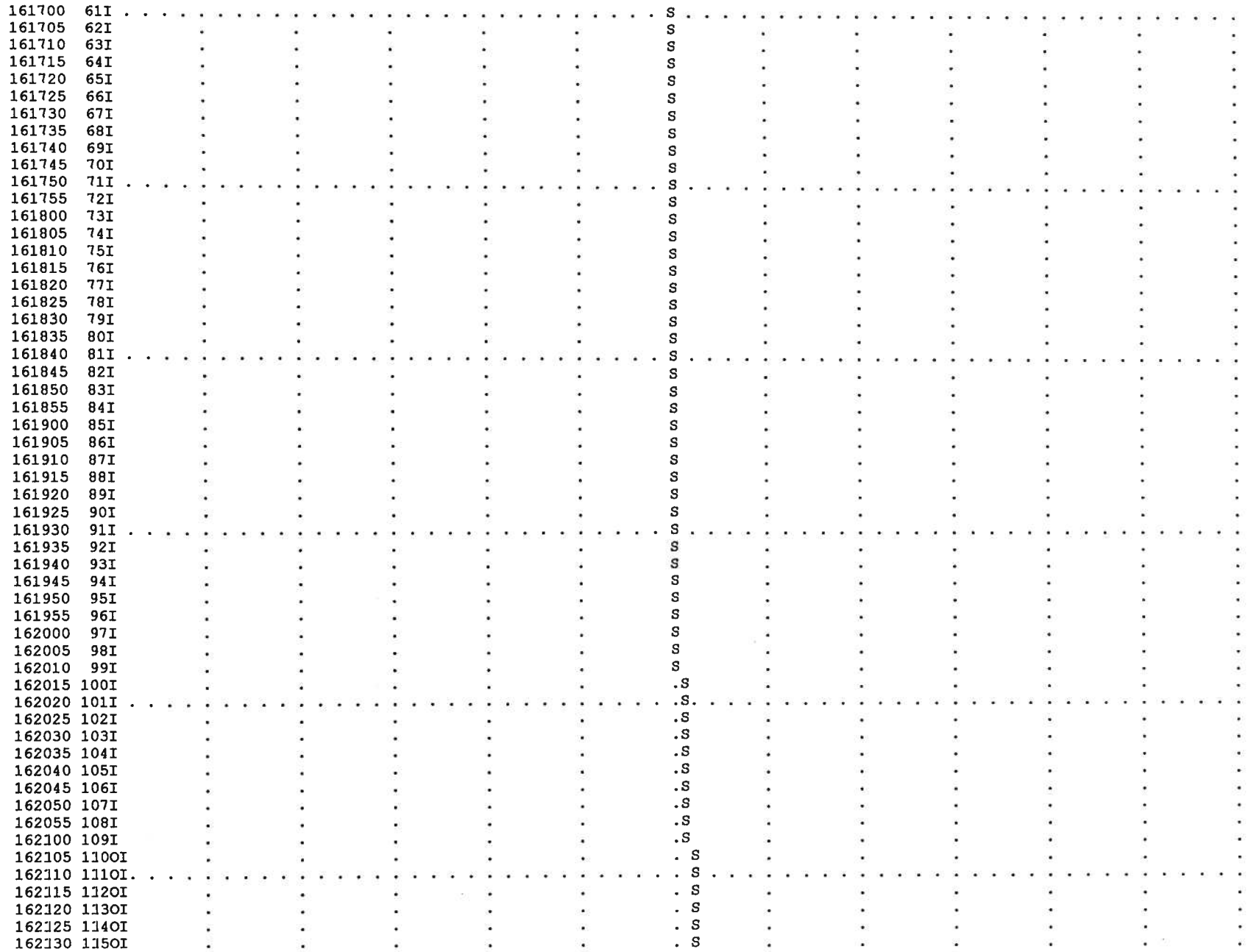
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161745 70I
161750 71I
161755 72I
161800 73I
161805 74I
161810 75I
161815 76I
161820 77I
161825 78I
161830 79I
161835 80I
161840 81I
161845 82I
161850 83I
161855 84I
161900 85I
161905 86I
161910 87I
161915 88I
161920 89I
161925 90I
161930 91I
161935 92I
161940 93I
161945 94I
161950 95I
161955 96I
162000 97I
162005 98I
162010 99I
162015 100I
162020 101I
162025 102I
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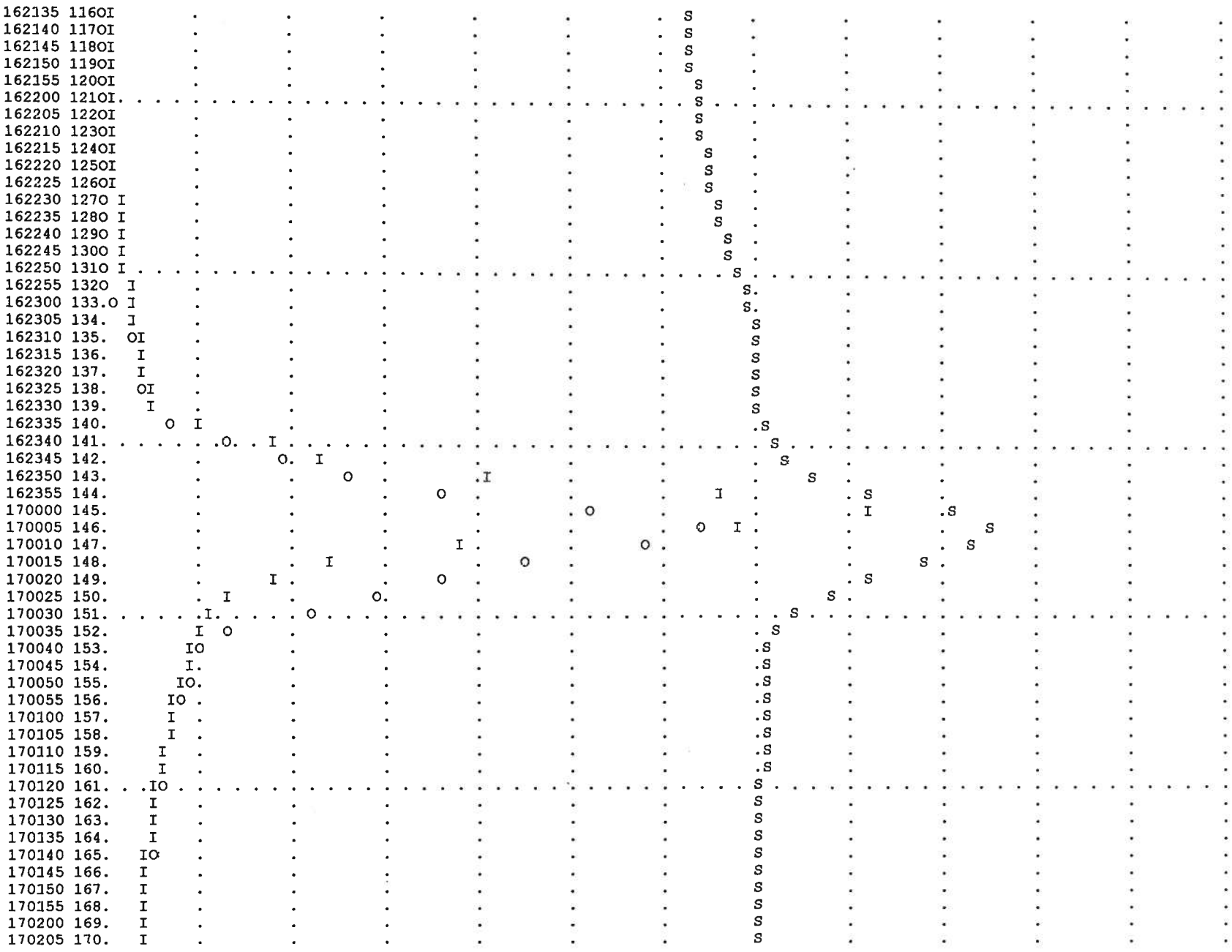
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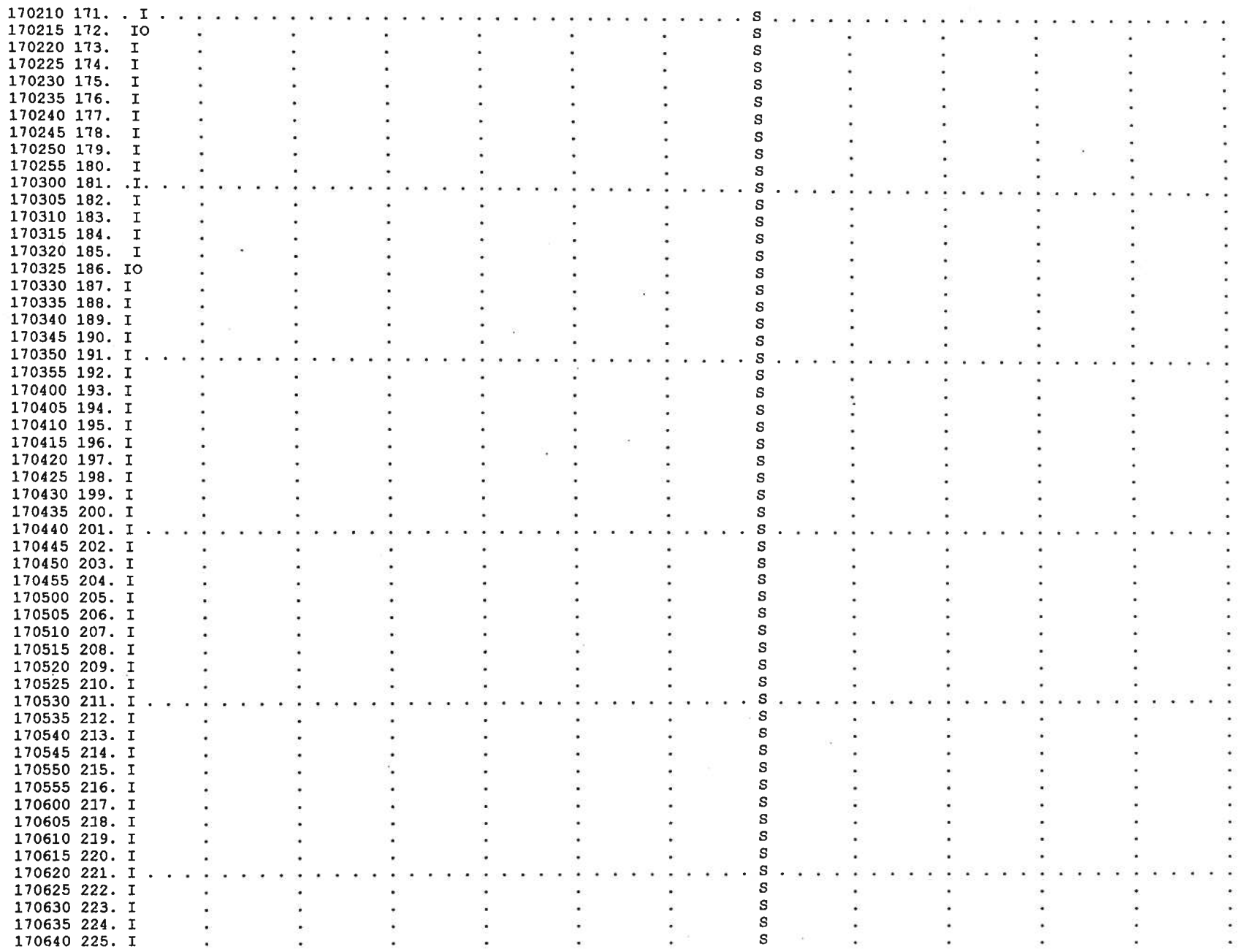
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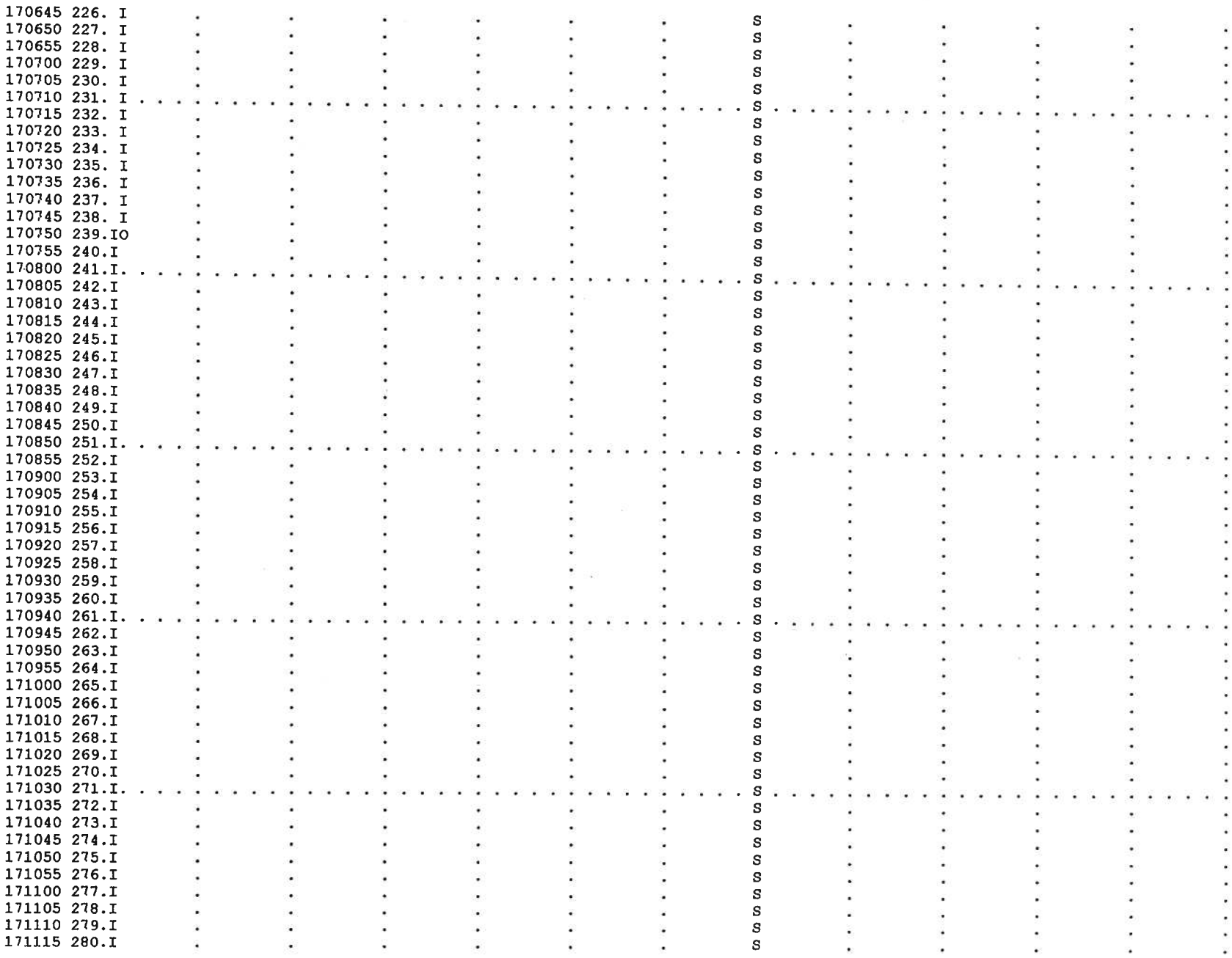
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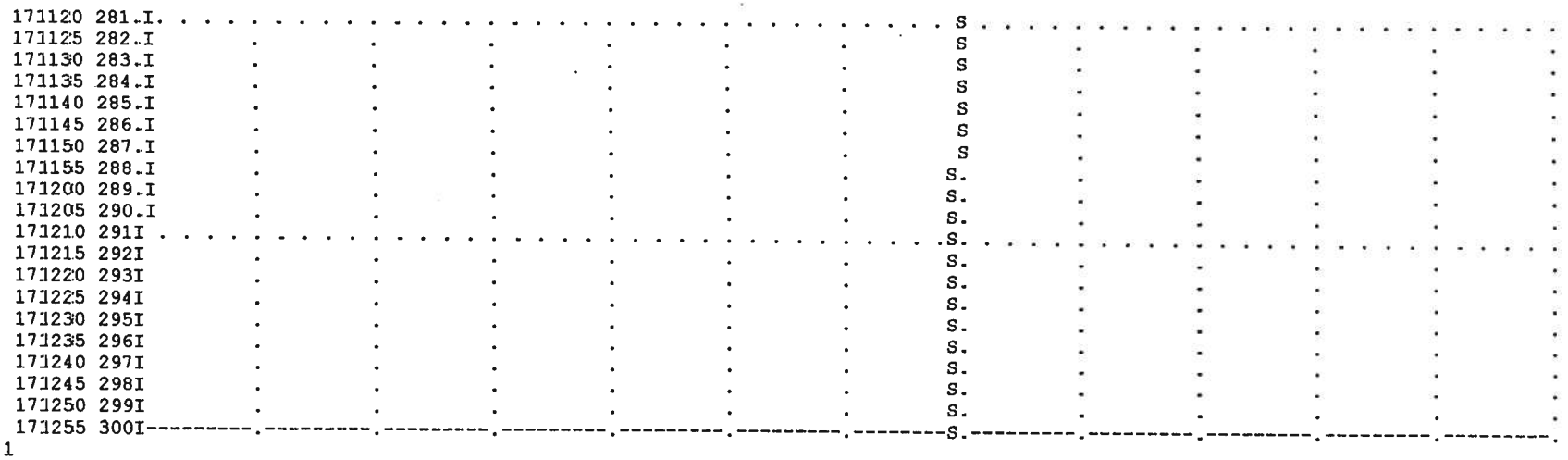

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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	CP10	3.	12.00	0.	0.	0.	.00		
+	HYDROGRAPH AT	CP11	1.	12.00	0.	0.	0.	.00		
+	HYDROGRAPH AT	CP12	6.	12.00	1.	0.	0.	.01		
+	HYDROGRAPH AT	CP13	6.	12.00	1.	0.	0.	.01		
+	HYDROGRAPH AT	CP14	4.	12.00	0.	0.	0.	.00		
+	4 COMBINED AT	COMB	16.	12.00	2.	1.	1.	.02		
+	ROUTED TO	DETENT	13.	12.08	2.	1.	1.	.02		
+									4573.98	12.08
+	2 COMBINED AT	COMB	15.	12.08	2.	1.	1.	.02		

	HYDROGRAPH AT						
+		CP5	1.	12.00	0.	0.	0.	.00
	2 COMBINED AT						
+		COMB	16.	12.08	2.	1.	1.	.02

*** NORMAL END OF HEC-1 ***

APPENDIX IV

STORM DRAIN ANALYSIS

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 20, 2001

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	1.25
FHWA Chart Number	1
FHWA Scale Number (Type of Culvert Entrance)	3
Manning's Roughness Coefficient (n-value)	0.012
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	150.0
Invert Elevation at Downstream end of Culvert (ft)	4,574.0
Invert Elevation at Upstream end of Culvert (ft)	4,576.0
Culvert Slope (ft/ft)	0.0133
Starting Flow Rate (cfs)	1.0
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	21.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
1.0	0.0	0.53	0.0	0.3	0.39	0.3	4.48
2.0	0.0	0.78	0.0	0.42	0.56	0.42	5.45
3.0	0.0	1.0	0.0	0.53	0.7	0.53	6.1
4.0	0.0	1.2	0.0	0.62	0.81	0.62	6.57
5.0	0.0	1.42	0.0	0.71	0.91	0.71	6.93
6.0	0.0	1.61	0.0	0.8	0.99	0.8	7.21
7.0	0.0	1.89	0.0	0.9	1.06	0.9	7.42
8.0	0.0	2.2	0.0	1.01	1.11	1.01	7.5
9.0	0.0	2.56	2.08	1.25	1.16	1.25	7.33
10.0	0.0	2.96	2.8	1.25	1.18	1.25	8.15
11.0	0.0	3.4	3.57	1.25	1.2	1.2	9.07
12.0	0.0	3.89	4.39	1.25	1.22	1.22	9.85
13.0	0.0	4.41	5.29	1.25	1.23	1.23	10.64
14.0	0.0	4.98	6.26	1.25	1.23	1.23	11.44
15.0	0.0	5.59	7.3	1.25	1.24	1.24	12.25
16.0	0.0	6.24	8.41	1.25	1.24	1.24	13.06
17.0	0.0	6.94	9.59	1.25	1.24	1.24	13.87
18.0	0.0	7.67	10.85	1.25	1.24	1.24	14.68
19.0	0.0	8.45	12.17	1.25	1.24	1.24	15.49
20.0	0.0	9.27	13.57	1.25	1.25	1.25	16.3
21.0	0.0	10.14	15.03	1.25	1.25	1.25	17.12