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CEP/007/006



PLATEAU MINING COMPANY

A Subsidiary of Cyprus Coal Company
P.O. Drawer PMC Price, Utah 84501
Telephone (801) 637-2875

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MAY 27 1986

DIVISION OF
OIL, GAS & MINING

May 22, 1986

FILE COPY

Mr. D. Wayne Hedberg
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Re: Exploration Permit 86-1, Culvert Design

Dear Mr. Hedberg:

Enclosed, you will find design calculations for the two culverts required for the new road to be constructed for access to drill sites.

Although the regulations only require culverts on a Class III road to be designed to pass a 1-year, 6-hour event, we have designed them to pass a 10-year, 24-hour event.

Seven copies of the calculations are provided for your purposes.

If you have questions, please contact me.

Respectfully,

Ben Grimes
Environmental Coordinator

BG:sd

Enclosures

**VAUGHN
HANSEN
ASSOCIATES**WATERBURY PLAZA - SUITE A
5620 SOUTH 1475 EAST
SALT LAKE CITY, UTAH 84121
(801) 272-5263

May 20, 1986

Mr. Ben Grimes
Plateau Mining Company
P.O. Drawer PMC
Price, Utah 84501RE: Sizing Culverts on Proposed Access Road to Exploration/
Water Monitoring Wells 86-18-1 and 86-18-2.

Dear Ben:

We have completed the hydrologic and hydraulic analysis required to size two culverts on the proposed access road to monitoring wells 86-18-1 and 86-18-2. One 18-inch CMP culvert of adequate length and set at approximately a two percent slope at each location will adequately drain the surface runoff from a 10-year 24-hour storm of 2.30 inches. The approximate locations of the proposed access road, culverts, and drainage areas are shown on the attached map.

In completing the analysis, a curve number of 62 was estimated based on a hydrologic soil group C (soils having slow infiltration rates) and a vegetative ground cover of approximately 55 percent sagebrush and grass. The size of the drainage areas used may be a little conservative as it was assumed that no drainage control cut off ditches would be constructed along the access road and runoff water could run along the west side of the proposed access road to each culvert.

Although a smaller diameter culvert may work depending on the available headwater to diameter ratio, we recommend that 18-inch diameter CMP culverts be installed to maintain a headwater depth/diameter ratio less than one to prevent excessive amounts of water from ponding west of the access road. A second reason for this recommendation is because an 18-inch culvert will not become plugged as easily as smaller culverts.

I. Size two culverts on the proposed access road to exploration/groundwater monitoring wells 86-18-1 and 86-18-2. The drainage areas, hydraulic lengths, and location of culverts are shown on the attached drawing. The SCS curve number methodology was used in the hydrological analysis.

A. Drainage Areas

The area draining to each culvert was determined using a planimeter on a 1" = 200' scaled topographical map showing the location of the proposed access road and culverts.

B. Average Basin Slope

The average slope of each drainage area was determined by measuring the length of each 50 ft contour and using the following formula:

$$\text{AVE. SLOPE} = \frac{\text{Lengths of 50' contours in drainage area} \times 50 \text{ ft}}{\text{Area (ft}^2\text{)}}$$

C. Curve Number

Assuming a 55 percent ground cover of sage-grass with a hydrologic soil group C, a curve number of 61 was estimated for the drainage areas.

D. Design Storm

Using NOAA atlas 2 "Precipitation - Frequency Atlas of the Western United States Volume VI - Utah" by Miller, Friedrichs, and Tracy (see fig. 27) the precipitation for the 10-year, 24 hour storm was determined to be 2.30 inches. The 10-year, 24 hour storm is the design storm in this case.

E. Peak Flowrate

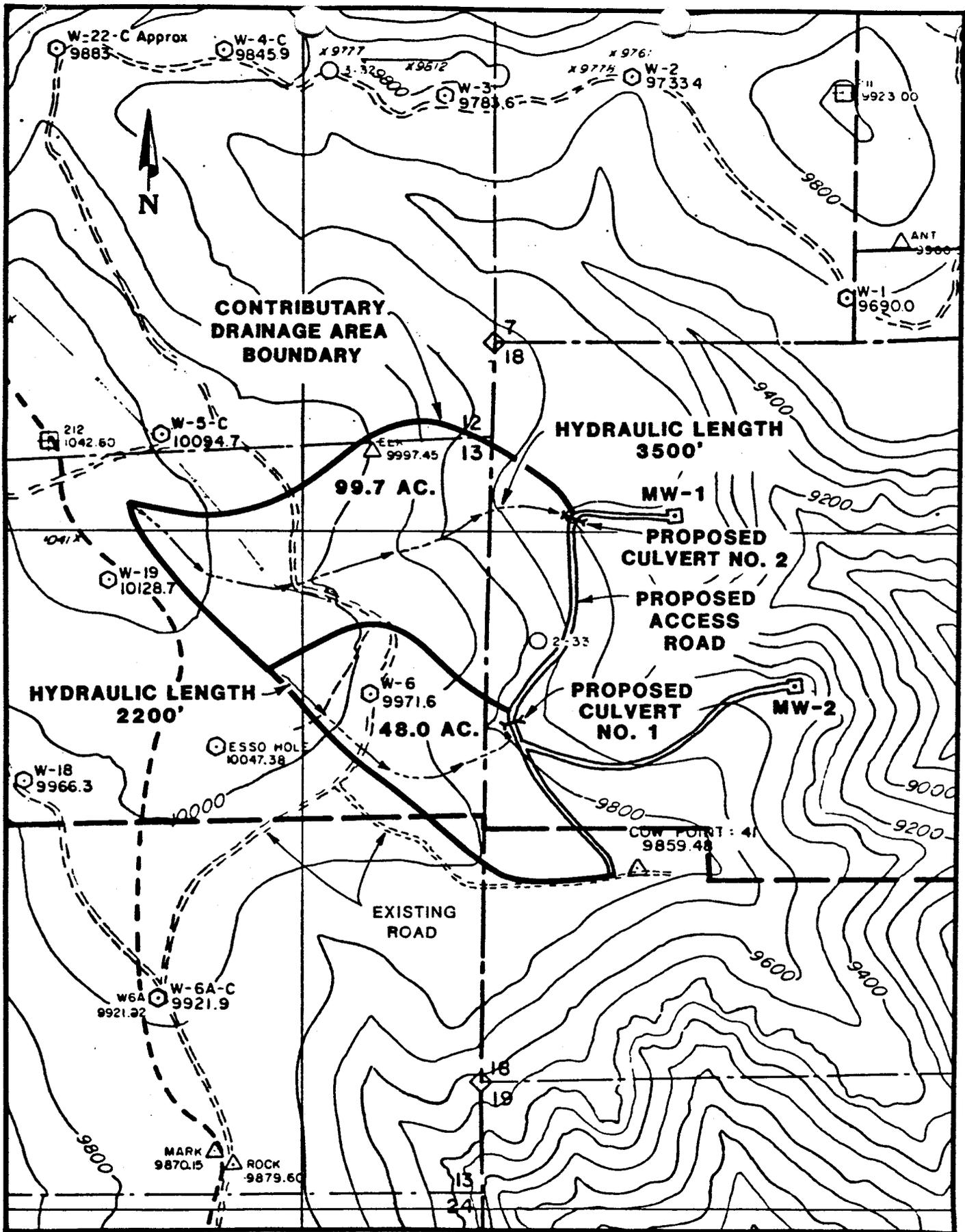
The peak flowrate was determined using the Soil Conservation Service curve number methodology. The results are summarized on the attached computer printouts. (Culvert #1: 163 cfs)
(Culvert #2: 328 cfs)

F. Size Culverts

Using Chart 5 from "Hydraulic Charts for the Selection of Highway Culverts" Hydraulic Engineering Circular No. 5, December 1965, prepared by the Hydraulics Branch, Bridge Division, Office of Engineering, Federal Highway Administration, it was determined that a 18-inch CMP culvert would adequately carry the flows and maintain a Headwater Depth / Diameter ratio of less than one in both cases.

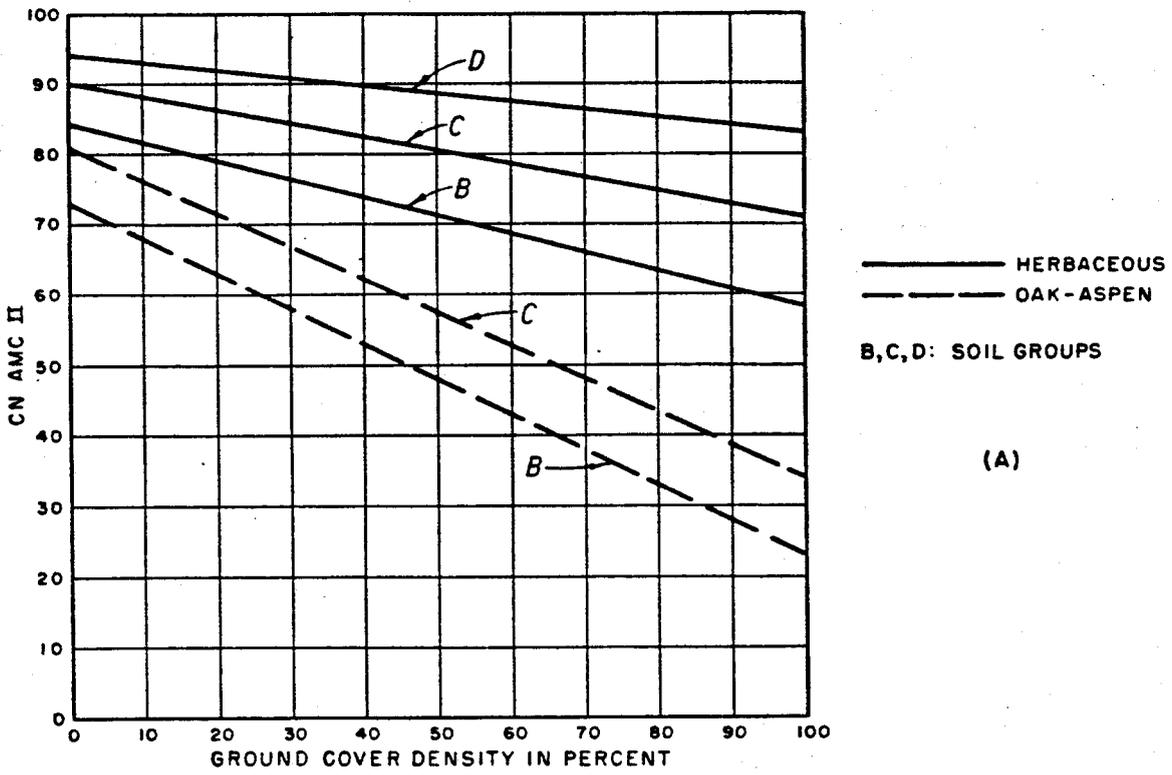
G. RECOMMENDATION

It is recommended that an 18-inch CMP culvert of adequate length be installed under the proposed access road at the locations shown on the attached drawing. The slope of the culverts shall be approximately 2 percent.

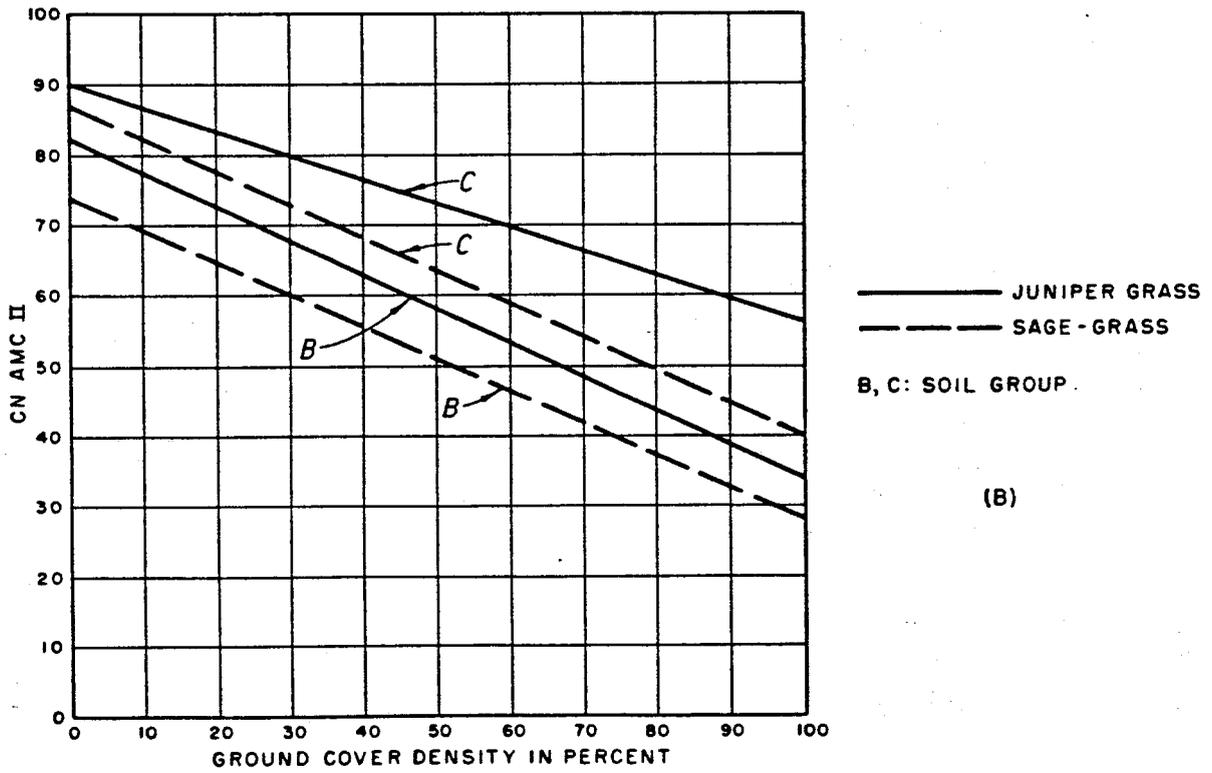


**PROPOSED CULVERT LOCATIONS AND
CONTRIBUTORY DRAINAGE AREA ALONG
SECTION 18 EXPLORATION HOLE ACCESS ROAD.**

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(A)



(B)

Figure A-3. Determining CN for forest-range in the western United States. 288-D-2824.

PROJECT : PLATEAU MINING CULVERT #1 DESIGN

AREA= 48.0 ACRES
 AVERAGE BASIN SLOPE= 14.5 PERCENT
 CURVE NUMBER= 61.
 DESIGN STORM= 2.30 INCHES
 STORM DURATION= 24.0 HOURS
 HYDRAULIC LENGTH= 2200. FEET
 MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .2938 HOURS QPCFS= 123.57 CFS QPIN= 2.5530 INCHES
 C3= 12.5835 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.81	1.1917	.0000	.0000	.0	.00
11.87	1.2944	.0000	.0000	6.2	.00
11.93	1.3971	.0022	.0021	38.4	.01
11.99	1.4998	.0074	.0052	82.0	.12
12.04	1.5396	.0102	.0028	113.4	.40
12.10	1.5591	.0118	.0015	123.6	.79
12.16	1.5785	.0134	.0017	115.8	1.16
12.22	1.5980	.0152	.0018	97.7	1.42
12.28	1.6174	.0170	.0019	76.4	1.56
12.34	1.6369	.0190	.0020	56.4	1.61
12.40	1.6564	.0211	.0021	39.7	1.62
12.46	1.6758	.0232	.0022	27.0	1.62
12.51	1.6930	.0252	.0020	17.8	1.63
12.57	1.7030	.0264	.0012	11.4	1.63
12.63	1.7130	.0276	.0012	7.2	1.61
12.69	1.7230	.0289	.0012	4.4	1.55
12.75	1.7330	.0301	.0013	2.7	1.46
12.81	1.7430	.0314	.0013	1.6	1.37
12.87	1.7530	.0328	.0013	.9	1.29
12.93	1.7630	.0341	.0013	.5	1.22
12.98	1.7730	.0355	.0014	.3	1.17
13.04	1.7810	.0366	.0011	.2	1.14
13.10	1.7883	.0376	.0010	.1	1.11
13.16	1.7956	.0387	.0010	.1	1.08

HYDROGRAPH PEAK= 1.63 cfs
 TIME TO PEAK= 12.57 Hours
 RUNOFF VOLUME= .56 Acre-Feet

PROJECT : PLATEAU MINING CULVERT #2 DESIGN

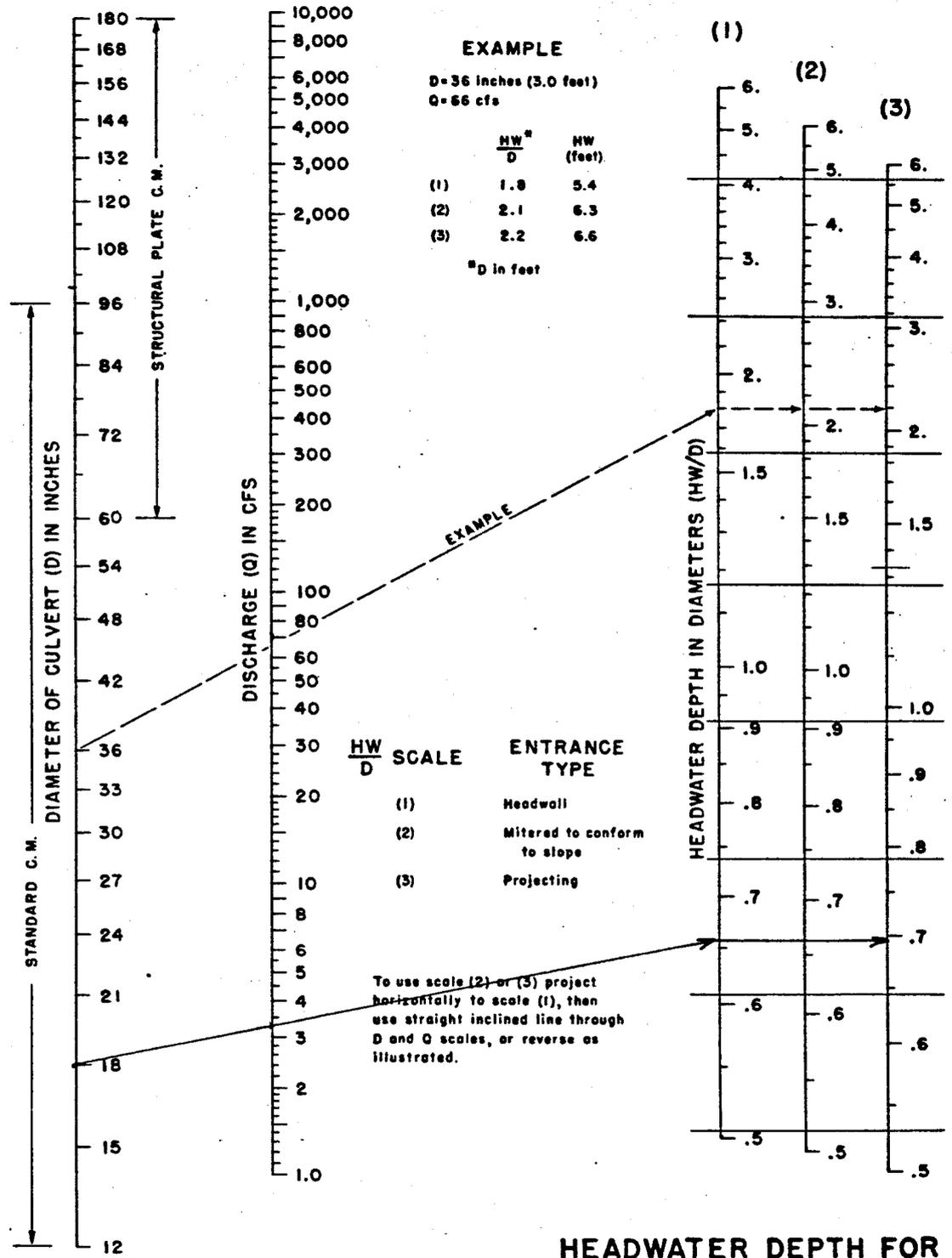
AREA= 99.7 ACRES
 AVERAGE BASIN SLOPE= 19.7 PERCENT
 CURVE NUMBER= 61.
 DESIGN STORM= 2.30 INCHES
 STORM DURATION= 24.0 HOURS
 HYDRAULIC LENGTH= 3500. FEET
 MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .3662 HOURS QPCFS= 205.92 CFS QPIN= 2.0483 INCHES
 C3= 10.0959 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.79	1.1579	.0000	.0000	.0	.00
11.86	1.2859	.0000	.0000	10.3	.00
11.94	1.4139	.0028	.0028	64.0	.03
12.01	1.5281	.0094	.0066	136.7	.25
12.08	1.5524	.0112	.0019	189.0	.82
12.16	1.5766	.0133	.0020	205.9	1.57
12.23	1.6009	.0155	.0022	192.9	2.23
12.30	1.6251	.0178	.0024	162.8	2.69
12.38	1.6494	.0203	.0025	127.4	2.97
12.45	1.6736	.0230	.0027	94.0	3.13
12.52	1.6943	.0254	.0024	66.2	3.23
12.60	1.7068	.0269	.0015	45.0	3.28
12.67	1.7192	.0284	.0015	29.6	3.26
12.74	1.7317	.0300	.0016	19.0	3.16
12.82	1.7442	.0316	.0016	11.9	3.00
12.89	1.7566	.0332	.0017	7.4	2.82
12.96	1.7691	.0349	.0017	4.5	2.66
13.03	1.7799	.0364	.0015	2.7	2.53
13.11	1.7890	.0377	.0013	1.6	2.43
13.18	1.7981	.0390	.0013	.9	2.33
13.25	1.8072	.0404	.0013	.5	2.24
13.33	1.8163	.0417	.0013	.3	2.14
13.40	1.8254	.0431	.0014	.2	2.06
13.47	1.8345	.0445	.0014	.1	2.00

HYDROGRAPH PEAK= 3.28 cfs
 TIME TO PEAK= 12.60 Hours
 RUNOFF VOLUME= 1.17 Acre-Feet

CHART 5



**HEADWATER DEPTH FOR
C. M. PIPE CULVERTS
WITH INLET CONTROL**