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DIVISION OF
OIL, GAS & MINING

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September 18, 1986

FILE COPY

Mr. Lowell Braxton
Administrator
Division of Oil, Gas & Mining
Three Triad Center
Salt Lake City, Utah 84180

Re: Hardscrabble Canyon Diversion D-6

Dear Mr. Braxton:

The attached engineering calculations are being furnished to you as requested in your letter dated 21 August 1986.

The HEC II computer run on the as build configuration of the channel (attachment #1) shows a decrease in velocity and lowering of computed water elevations as compared to the original design. The summary table on page 4 of attachment #1 shows all computed water surface elevations have at least .3 feet of freeboard.

Attachment #4 of this letter is a calculation which shows that the existing cobble bank of D-6 channel bottom does not require a filter blanket to prevent erosion within the placed rip-rap.

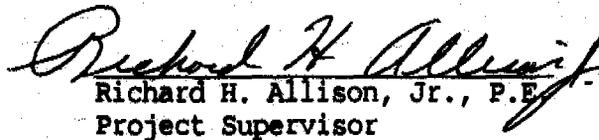
Also enclosed (attachment #5) is a calculation which was previously given to DOGM that justifies the use of the eight inch rip-rap for erosion protection in channel D-6.

cc4.1042

Mr. Lowell Braxton
September 18, 1986
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Any questions on these justifications can be directed to me at our
Helper office.

Sincerely,


Richard H. Allison, Jr., P.E.
Project Supervisor

RHA:sk

Attachments

cc: Dave Miller
Project file
Chrono

cc4.1042

9/8/86

RIPRAP BEDDING CALCULATION

$$\frac{D_{15} \text{ Riprap}}{D_{85} \text{ Bank}} < 5 < \frac{D_{15} \text{ Riprap}}{D_{15} \text{ Bank}} \quad 40$$

$$\frac{3.0''}{1.5''} = 2 \text{ which is less than } 5$$

#4 Mesh passed 15% of bank material

$$\frac{3.0}{.185} = 16.21 \text{ which is greater than } 5 \text{ but less than } 40.$$

The above calculation was done based on a bank sieve analysis done by Commercial Testing of Price, Utah, and riprap sieve analysis done by Lowder-Milk Rock Products, Helper, Utah.

This calculation is documented in Use of Riprap for Bank Protection, U. S. Department of Transportation Hydraulic Circulum No. 11, p. 16. This reference was furnished to the Division through Mr. Rick Summers.

The conclusion of this analysis and calculation is that the existing bank material is adequate bedding for riprap placed in diversion D-6.

THIS RUN EXECUTED 09/09/86 15:42:55

 HEC2 RELEASE DATED NOV 76 UPDATED MAR. 1982
 ERROR CORR - 01,02,03,04,05
 MODIFICATION - 50,51,52,53,54,55

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

DIVERSION D-6 AS-BUILT

SUMMARY PRINTOUT TABLE 150

<i>section no.</i> SECNO	<i>distance between sections</i> XLCH	ELTRD	ELLC	<i>minimum elevation</i> ELMIN	<i>discharge</i> Q	<i>computed wsel</i> CWSEL	<i>critical wsel</i> CRIWS	<i>energy gradient elev. CWSEL + HV</i> EG	10K* <i>S</i>	<i>mean velocity</i> VCH	AREA	.01K
* 70.000	0.00	0.00	0.00	6583.80	368.00	6586.81	6586.81	6587.93	258.77	8.47	43.46	22.88
* 290.000	220.00	0.00	0.00	6599.80	368.00	6603.19	6603.19	6604.25	261.21	8.28	44.45	22.77
* 700.000	410.00	0.00	0.00	6623.00	352.00	6626.74	6626.74	6627.97	274.00	8.91	39.52	21.26
* 900.000	200.00	0.00	0.00	6637.00	352.00	6640.44	6640.44	6641.64	258.86	8.79	40.05	21.88
* 1300.000	400.00	0.00	0.00	6663.90	352.00	6667.29	6667.29	6668.27	242.98	7.95	44.30	22.58
* 1575.000	275.00	0.00	0.00	6693.60	352.00	6696.90	6696.90	6697.93	274.21	8.14	43.27	21.26

DESIGN OF RIPRAP BLANKET FOR DIVERSION D-6

(From Use of Riprap for Bank Protection, Hydraulic Engineering Circular No. 11, U.S. Department of Transportation, Bureau of Public Roads, June 1967)

CHANNEL CHARACTERISTICS

BOTTOM WIDTH (B) = 6 FEET
SIDE SLOPES = 3H:1V (LEFT) & 0.75H:1V (RIGHT)
FLOW DEPTH (D) = 5.2 FEET
AVERAGE VELOCITY (V) = 10.5 FEET/SECOND

DETERMINE STONE SIZE REQUIRED TO RESIST DISPLACEMENT

ASSUME K (d50 STONE SIZE) = 0.75 FEET = 9 INCHES

$$K/D = 0.75/5.2 = 0.14$$

$$\therefore V_s/V = 0.56 \text{ (FROM FIGURE 1, HEC-11)}$$

$$\therefore V_s = 0.56 \times 10.5 = 5.88 \text{ FEET/SECOND}$$

HEC-11 RECOMMENDS MULTIPLYING V_s BY A FACTOR OF BETWEEN 1.0 AND 2.0 TO ACCOUNT FOR CHANNEL SINUOSITY (1.0 FOR STRAIGHT CHANNELS & 2.0 FOR VERY SINUOUS CHANNELS).

DUE TO SLIGHT BENDS IN CHANNEL, INCREASE V_s BY 1.5 TIMES

$$\therefore V_s = 1.5 \times 5.88 = 8.82 \text{ FEET/SECOND}$$

FROM FIGURE 2 (HEC-11) FOR $V_s = 8.82$ AND 3:1 SIDE SLOPES, $d_{50} = 0.7$ FEET

THE ASSUMED STONE SIZE (0.75 FEET) \cong COMPUTED STONE SIZE (0.70 FEET)

\therefore USE ASSUMED STONE SIZE, $d_{50} = 0.75$ feet = 9 inches

Document Information Form

Mine Number: C/007/004

File Name: Incoming
Castle-Gate

To: Lowell Braxton

From:

Person Richard H. Allison

Company Castle Gate

Date Received: 9-23-86

Explanation: Graph - Attachment #2 Diversion
Ditch D-6

cc: