Newmont™
NORTH AMERICA

CRIPPLE CREEK & VICTOR
PO Box 191
100 N. 3rd Street
Victor CO 80860

newmont.com

June 26, 2023

ELECTRONIC DELIVERY

Mr. Elliott Russell
Environmental Protection Specialist
Colorado Department of Natural Resources
Division of Reclamation, Mining and Safety
Office of Mined Land Reclamation
1313 Sherman Street, Room 215
Denver, Colorado 80203

Re: Permit No. M-1980-244; Cripple Creek & Victor Gold Mining Company; Cresson Project; Technical Revision 137 – Initial Adequacy Review Response

Dear Mr. Russell:

On June 14, 2023, Newmont Corporation's Cripple Creek and Victor Gold Mining Company (CC&V) received the Division of Reclamation, Mining and Safety (DRMS) initial adequacy review of Technical Revision (TR) 137 to Permit M-1980-244, regarding the WHEX Clay Borrow Source. Below are DRMS comments in bold and CC&V's response in *italics*.

1. **TR 137 indicates reclamation for the WHEX clay borrow source will coincide with the current timeline for the WHEX/ECOSA reclamation which is anticipated to begin in 2032. The existing stormwater pond, EMP-18, will be partially mined through during this time; however, the entire stormwater pond will need to be recontoured to a final slope of 3H:1V, as shown on Figure 2A. Please update the reclamation cost estimate in Attachment 4 to include a line item for backfilling/grading EMP-18 to a 3H:1V slope.**

   Please see the revised attachment 4 – Reclamation Cost Estimate.

2. **Please update the legend in Attachment 1 Figure 1 and Attachment 2 Figure 2 to define the dashed line around the slopes and floor of the clay borrow source and EMP-18b. Is this the area of disturbance associated with this Technical Revision? If so, this boundary needs to be revised to include the existing EMP-18, EMP 18b, stormwater channels, and any disturbance related to the current excavation access road approved in TR133.**

   The dashed line represents a boundary between two surfaces. The closure contours for Figures 1 and 2 consist of a combination of the 2022 flyover surface and the future WHEX Pit closure surface. The figures have been updated so that the distinction between these two surfaces is clear, and a surface boundary line has also been added to the legend. The access road approved in TR133 is fully excavated and removed in the current excavation configuration.

3. **Watershed Area Boundary: The third bullet under section 1.0 Sediment Pond EMP-18B (NewFields Technical Memorandum WHEX POND Design, dated 10 May 2023) references the watershed area. Figure 2 presents the watershed boundary for the area contributing runoff to the proposed EMP-18b pond. There are multiple locations**

Newmont
NORTH AMERICA

CRIPPLE CREEK & VICTOR
PO Box 191
100 N. 3rd Street
Victor CO 80860

newmont.com

where the watershed boundary is at or near a 45° angle to the contour lines (see image capture below). Overland flow runoff will flow perpendicular to contour lines. As the watershed map is cutoff north of the errant boundary, it is unclear what the magnitude of the error is. Please re-delineate the watershed boundary using accurate and accepted watershed delineation practice

Minor adjustments have been made to the watershed boundary, and the viewport has been expanded to show more of the topography.

4. **Flow Path and Lag Time: The third bullet under section 1.0 also references the average slope and longest flow path of the watershed. The flow path is not illustrated on Figure 2. Given this watershed has both a paved road and a dirt road, as well as nine culverts diverting flows from natural or unaltered flow paths, the flow path used to determine lag time should be presented. Furthermore, the hydrologic analyses use the SCS lag equation to calculate basin lag time. This equation is based on agricultural watershed data and tends to overestimate in mixed areas such as this (Chow, Maidment & Mays, "*Applied Hydrology*," 1988). Given the extent this watershed is altered, the SCS/NRCS upland flow (using sheet, shallow concentrated and channel flow (USDA "*Urban Hydrology for Small WatershedsTR-55*", 1986) would be more appropriate for this watershed. HEC-HMS requires either basin lag or time of concentration (tc) depending on the modeling methodology used. Basin lag and tc are different calculations where tc = 1.67 x basin lag. It is not clear having no model generated input or output which is appropriate. Please revise and clarify the modeling approach as discussed in this Comment B.**

   The figure has been to display the flow path. Lag time has been re-calculated using the upload flow method. The assumptions and methodology described on the calculation cover sheet have also been updated. Watershed characteristics were obtained from AutoCAD Civil 3d and used to calculate lag time using the upload flow method, or the NRCS velocity method. Storm events are then modelled in HEC-HMS as SCS Type II storm events. Outputs from HEC-HMS are provided in the tables labelled HEC-HMS Results, and if applicable, are used in the corresponding rock chute calculations to verify the function of the inlet channels.

5. **Sediment Loading: The last paragraph on p. 1 of the NewFields Technical Memorandum states the "Universal Soil Loss Equation to calculate the total sediment" contributing to EMP-18b. This paragraph also states "soil and cover inputs used were the average values from Teller County." Finally, the second paragraph on p. 2 states the final pond has "27 years of storage". There are several papers and texts (e.g., Haan, Barfield & Hayes, "*Design Hydrology and Sedimentology for Small Catchments*," 1994; and Office of Surface Mining, "*Guidelines for the Use of the Revised Universal Soil Loss Equation (RUSLE) Version 1.06 on Mined Lands, Construction Sites and Reclaimed Lands*," 1998) stating the RUSLE is a better tool than the USLE for predicting sediment erosion as the revised version accounts for rilling, freeze/thaw effects; has a cover subfactor; and improves the slope/length factor. Please address the following:**

   i. **Justify the use of the USLE over using the RUSLE.**

Newmont
NORTH AMERICA

CRIPPLE CREEK & VICTOR
PO Box 191
100 N. 3rd Street
Victor CO 80860

newmont.com

The watershed sediment erosion calculation has been updated to utilize the Revised Universal Soil Loss Equation. The USDA tool RUSLE2 was used for this calculation.

ii. Why were "average" values for all of Teller County used instead of values specific to the area being analyzed?

The inputs into the RUSLE2 tool include climate typical average monthly precipitation depths, temperatures, and energy indices; those, along with the area's R factor (a USLE/RUSLE specific input) are included in the RUSLE2 climate database for several broad, non-site specific, locations. The most important of these inputs for the RUSLE equation is the R factor, which is based on a reference map. The map's resolution is not high enough to alter this value. The input soil type is based on local conditions and takes into account the local soil erodibility. These climate and soil type inputs were determined to be sufficient for this particular pond design, which is greatly oversized.

iii. What is meant and intended by 27 years of storage?

The pond was located and according to the pit geometry, and to comply with the design requirement of storing the 500-year, 24-hour storm runoff volume with 1 foot of freeboard. Volume in excess of these requirements is allocated in this analysis for sediment storage. Using this excess volume and the calculated soil erosion rate, the pond is now estimated to hold approximately 141 years of sediment.

6. ***Culvert 2:*** **The first sentence on p. 3 states "No channel was designed at the outlet of Culvert 2."; and provides a gentle sloping road to convey the culvert discharge to EMP-18b as justification. *Please note a 10% grade is not considered a gentle slope when applied to open channel hydraulics*. There is no road shown at the outlet of Culvert 2 on Figure 2. Furthermore, if the road is intended to convey flows, it should be designed and analyzed to demonstrate it is adequate to convey flows for closure. Please show the road at the Culvert 2 outlet and provide a demonstration it will be adequate to convey runoff flows**

   A channel has been added to convey flows from Culvert 2, and the appropriate rock chute calculations have been provided.

7. **Attachment A: Review of Attachment A found two concerns: i) apparent lack of consideration of the paved (impervious) CR 82 when estimating curve numbers (CN); and ii) inattention to units in the summary tables. The DRMS estimates CR 82 makes up roughly five acres of the watershed as delineated in Figure 2. This impervious area (CN = 98) should not be summarily dismissed in estimating the composite curve number for the watershed. Both the tables (first table for "Area 1"; second table for "West WHEX Pond Channel" and "East WHEX Pond Channel" showing lag time calculations indicate the units are in square miles. The values are in the millions, which is of course ridiculous. If the units are supposed to be square feet, then they appear to be correct (based on the watershed delineation on Figure 2. Please:**

i. Re-evaluate the composite CN to include CR 82.

Although the impervious area for CR 82 was in fact included as part of the initial evaluation, the table for the corresponding curve number was not provided. This table

Newmont™
NORTH AMERICA

CRIPPLE CREEK & VICTOR
PO Box 191
100 N. 3rd Street
Victor CO 80860

newmont.com

has been added for clarity. Please note that the addition of a new channel into the pond, as well as the minor watershed adjustments mentioned in Comment #3, have slightly altered the curve numbers for the channel watersheds from their previous values. The overall curve number for the pond remains the same.

ii. **Clarify the area shown in the two lag time calculation should be square feet.**

Yes, the areas shown were square feet. However, because these are meant to be used for inputs to the HEC-HMS model, the values have been corrected to display square miles.

Should you require further information, please do not hesitate to contact Johnna Gonzalez at (719)851-4190, Johnna.Gonzalez@Newmont.com, or myself at (719) 237-3442 or Katie.Blake@newmont.com.

Sincerely,

DocuSigned by:
Katie Blake
5A3D013B629844B...

Katie Blake
Sustainability & External Relations Manager
Cripple Creek & Victor Gold Mining Co

EC:

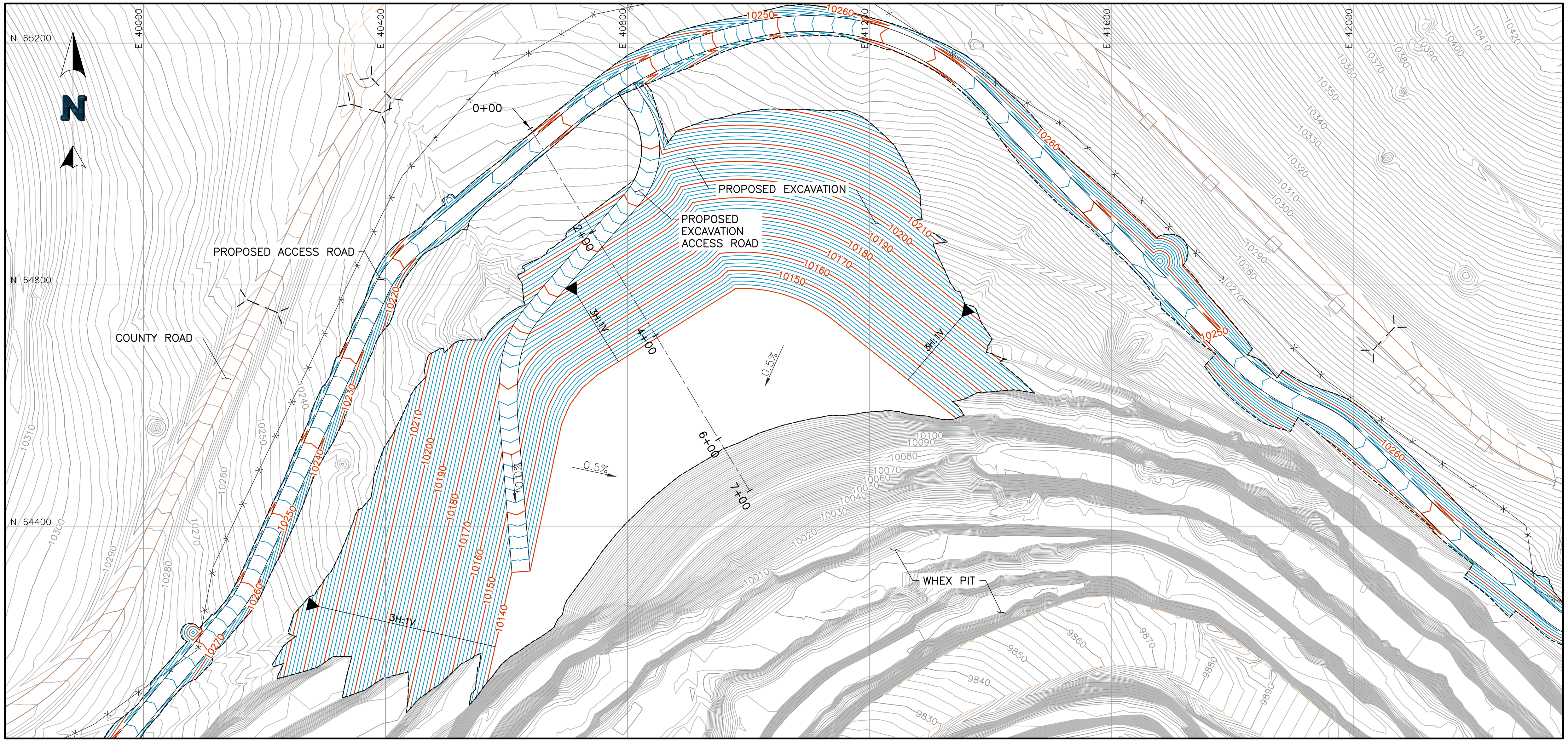
M. Cunningham – DRMS
T. Cazier – DRMS
N. Gagnon - DRMS
D. Swallow – Teller County
J. Gonzalez – CC&V
K. Blake – CC&V
N. Townley – CC&V

Attachments:
Figure 1 – WHEX Pit Clay Excavation
Figure 2 – WHEX Pit Excavation Reclamation REVB
Figure 3 – WHEX Pit Channel Watershed
Attachment 4 – WHEX Clay Reclamation Costs – Revised
Attachment 5 – RUSLE
Attachment 6 – WHEX Pond Hydrology
Attachment 7 – WHEX Pond Rock Chute Calcs
Attachment 8 – WHEX Pond Sizing and Filling Curve

File: S:\CrippleCreek\na.cc.admin\Environmental\New File Structure\2-Correspondence\DNR\DRMS\2023\June\Outgoing

Figure 1

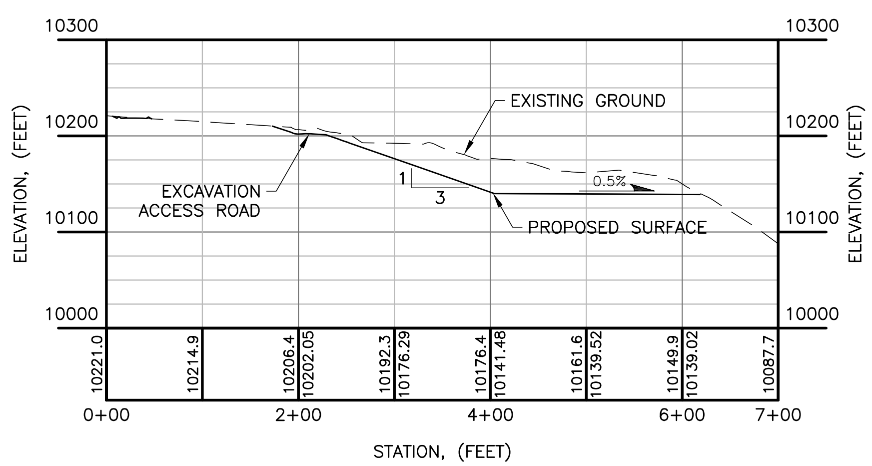
WHEX Pit Clay Excavation



LEGEND:

- EXISTING GROUND CONTOURS
- PROPOSED GROUND CONTOURS
- SURFACE BOUNDARY
- EXISTING ROADS/TRAILS
- EXISTING FENCE
- EXISTING CULVERT

0 100 200 FEET



0 100 200 FEET HORIZONTAL

0 100 200 FEET VERTICAL

NO EXAGGERATION

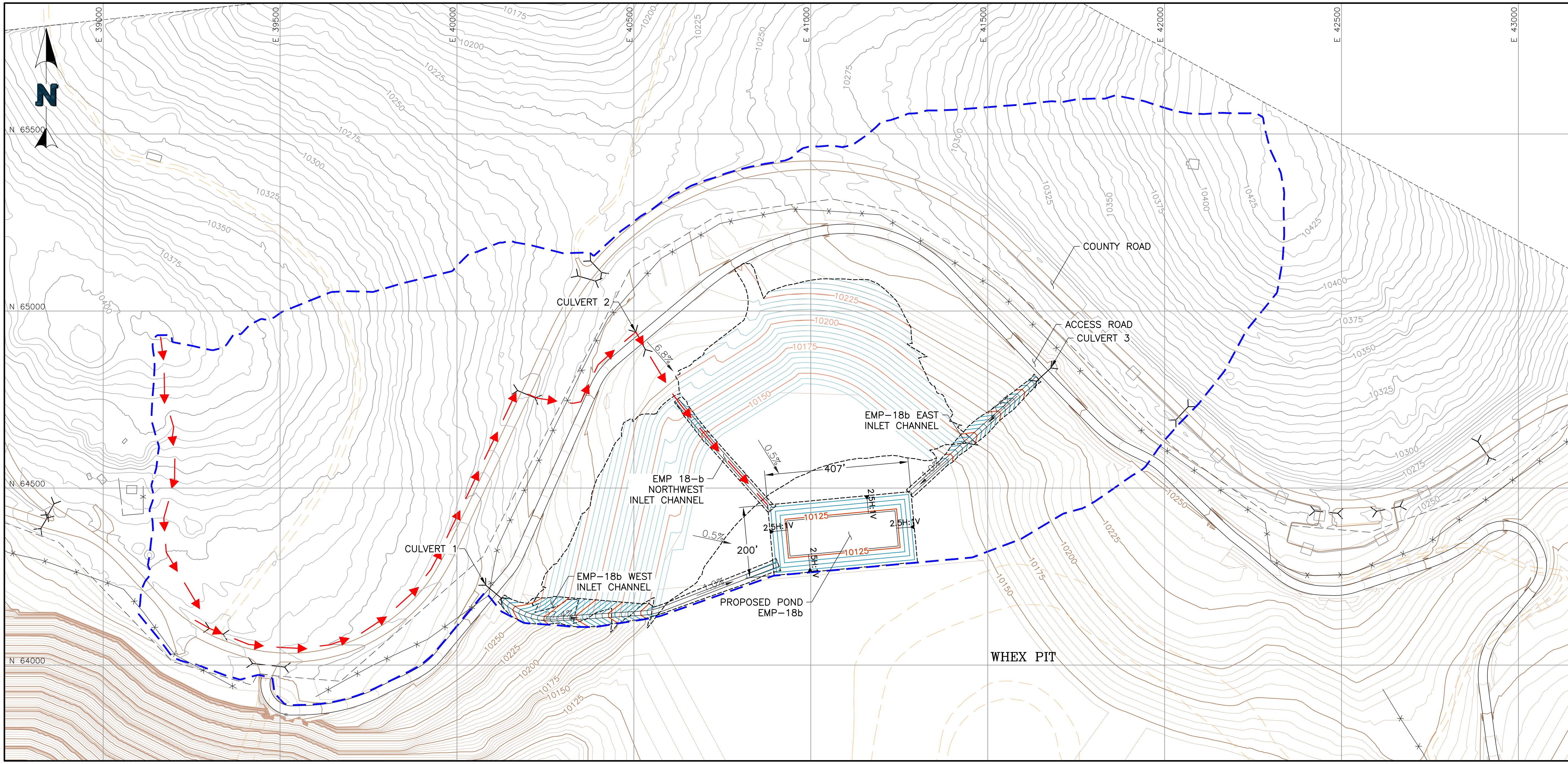
COLORADO REGISTERED PROFESSIONAL ENGINEER
JAY N. JANNEY-MOORE
37571
6-21-2023

NewFields	CLIENT: CRIPPLE CREEK & VICTOR GOLD MINING COMPANY
PROJECT	VLF2 PHASE 3
TITLE: WHEX PIT CLAY EXCAVATION – 10140'	FILENAME 0106.056.071F; FIGURE NO. 1; REVISION A

P:\Projects\0106.056 VLF2 Phase 3a COA\A-CAD\FIGS\0106.056.071F.dwg--2/20/2023 5:32 PM

Figure 2

WHEX Pit Clay Excavation Reclamation REVB



LEGEND:

- EXISTING GROUND CONTOURS
- WHEX PIT CLOSURE CONTOURS
- PROPOSED POND AND CHANNEL CONTOURS
- EXCAVATION CONTOURS
- SURFACE BOUNDARY
- EXISTING ROADS/TRAILS
- EXISTING FENCE
- EXISTING CULVERT
- POND WATERSHED BOUNDARY
- STORMWATER FLOW PATH
- PROPOSED CULVERT

NOTES:

1. DISTURBED AREAS WILL BE RE-VEGETATED IN ACCORDANCE WITH EXHIBIT E IN THE APPROVED RECLAMATION PLAN.

0 150 300 FEET

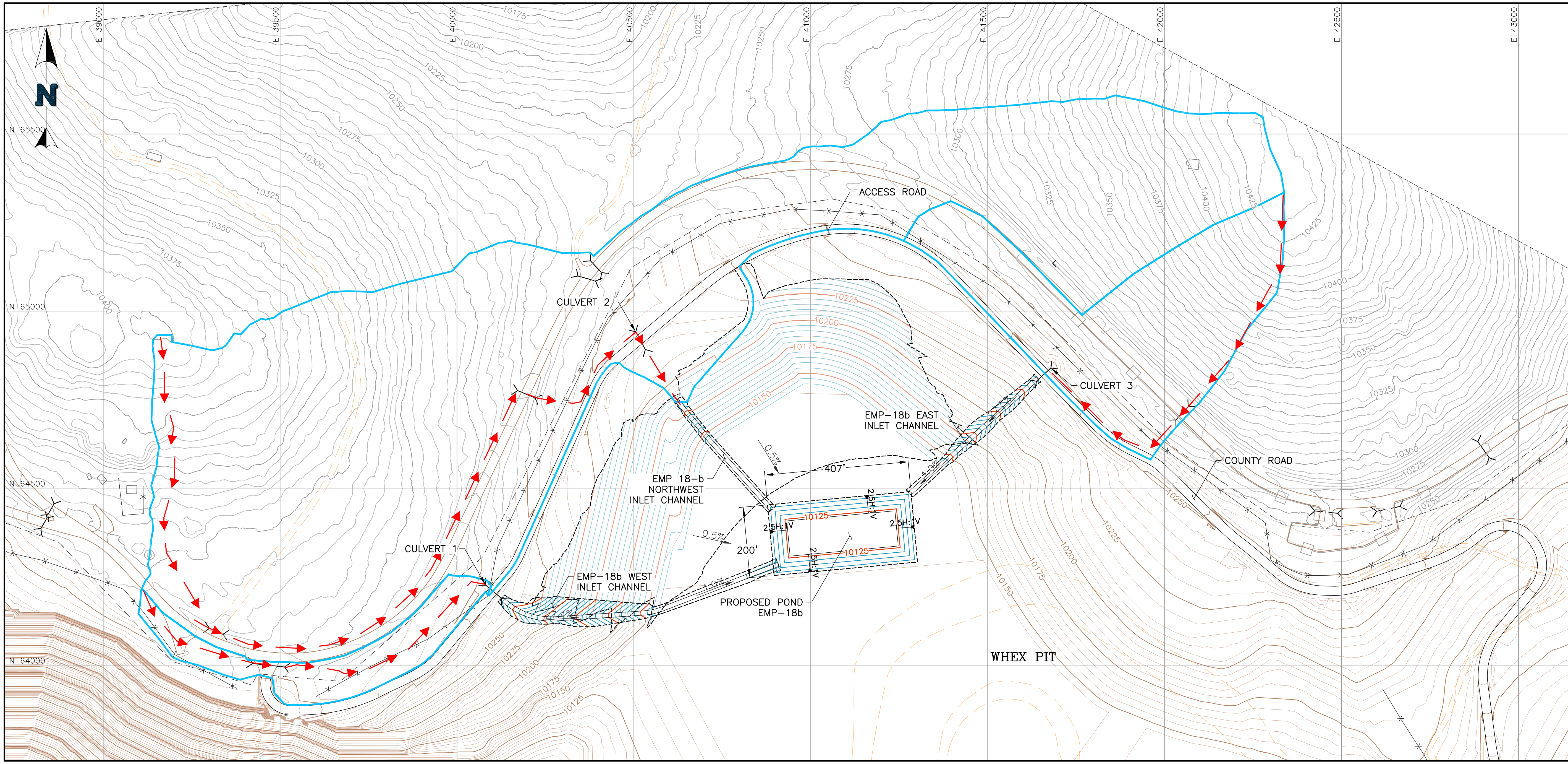
COLORADO REGISTERED PROFESSIONAL ENGINEER
JAY N. JANNEY-MOORE
37571
6-21-2023

NewFields	CLIENT: CRIPPLE CREEK & VICTOR GOLD MINING COMPANY
PROJECT	VLF2 PHASE 3
TITLE: WHEX PIT EXCAVATION RECLAMATION	FILENAME: 0106.056.095F; FIGURE NO.: 2; REVISION: B

P:\Projects\0106.056 VLF2 Phase 3a COA\A-CAD\FIGS\0106.056.095F.dwg--6/21/2023 8:28 AM

Figure 3

WHEX Pit Channel Watershed



LEGEND:

- EXISTING GROUND CONTOURS
- WHEX PIT CLOSURE CONTOURS
- PROPOSED POND AND CHANNEL CONTOURS
- EXCAVATION CONTOURS
- SURFACE BOUNDARY
- EXISTING ROADS/TRAILS
- EXISTING FENCE
- EXISTING CULVERT
- CHANNEL WATERSHED BOUNDARY
- STORMWATER FLOW PATH
- PROPOSED CULVERT

NOTES:

1. DISTURBED AREAS WILL BE RE-VEGETATED IN ACCORDANCE WITH EXHIBIT E IN THE APPROVED RECLAMATION PLAN.

0 150 300 FEET

NewFields	CLIENT: CRIPPLE CREEK & VICTOR GOLD MINING COMPANY	
PROJECT	VLF2 PHASE 3	
TITLE	WHEX PIT CHANNEL WATERSHEDS	FILENAME: 0106.056.097F; FIGURE NO.: 3; REVISION: A

P:\Projects\0106.056 VLF2 Phase 3a CQA\A-CAD\FIGS\0106.056.097F.dwg-6/21/2023 8:27 AM

Attachment 4

WHEX Clay Reclamation Costs Revised

Table 1: TR-137 Additional WHEX Clay Borrow Reclamation			
Task	**Unit**	**Unit Cost**	**Total Cost**
WHX Clay Borrow Regrade (EMP-18) (CY)	1870	$ 0.67	$ 1,250.00
WHEX Clay Borrow Topsoil (CY)	6575.0	$ 1.64	$ 10,757.36
WHEX Clay Borrow Revegetation (Acre)	8.2	$ 1,667.37	$ 13,589.07
DRMS Indirect Cost (28.5%)			$ 7,294.98
		Total:	**$ 32,891.40**

Current Bond Held	$ 209,491,188.00
Current Financial Warranty (TR-133 Update)	$ 208,742,229.26
TR-137 Liability Amount	$ 32,891.40
New Financial Warranty	$ 208,775,120.67
Surplus Financial Warranty	$ 716,067.33

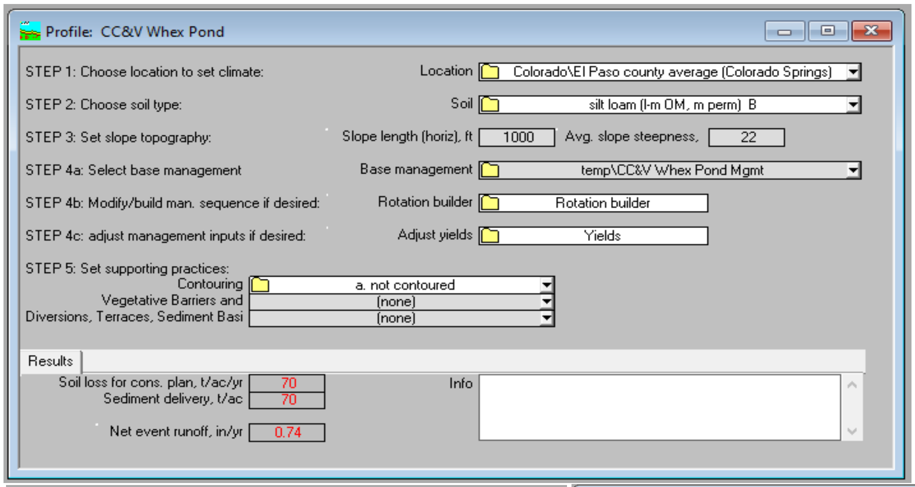
Attachment 5

RUSLE

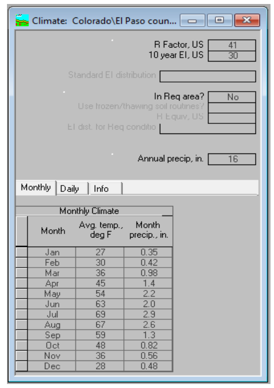
Cripple Creek and Victor Gold Mining Company
Whex Pond Hydrology
Revised Universal Soil Loss Equation (USDA RUSLE2)

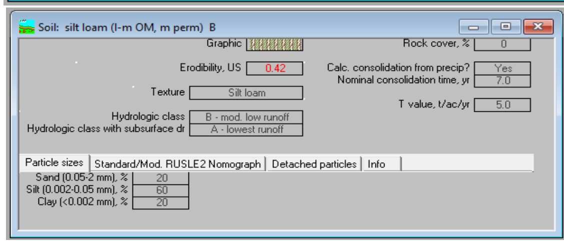
Inputs

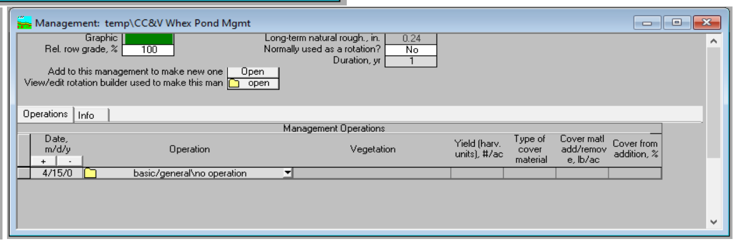
Notes:
Only inputs relevant to sediment loading are shown.
El Paso county is most applicable input within climate dataset
Base (land) management is set to "no operation" to inidcate no other erosion protection is used (or for base soil erosion estimate)
No land cover/management rotation or yeild (harvest) is assumed in model



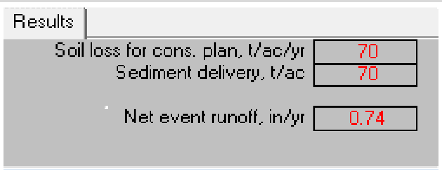
Default Climate Input:







Results



Total annual s **70** tons/year

Attachment 6

WHEX Pond Hydrology

NewFields		CALCULATION COVER SHEET		
Client	Cripple Creek & Victor Gold Mining Company	Preparer:	Roxanne Li	06/18/23
Project	VLF2 Phase 3	Checked:	Jay Moore	06/19/23
Title	Pond Sizing Calculations	Revision	C	

CALCULATION OBJECTIVE

1. Estimate the peak runoff from upstream watersheds to design the sediment pond.

2. Determine the required size of the diversion channels and erosion protection (if necessary)

ASSUMPTIONS

1. Composite SCS Curve numbers are calculated based on ground type.
2. Storm events will be sized according to previous meteorological studies.

2-Year, 24-hour:	1.77	inches
25-Year, 24-hour:	3.21	inches
100-Year, 24-hour:	4.39	inches
500-Year, 24-hour:	6.10	inches

METHODOLOGY

1. Area and length measurements were determined using AutoCAD Civil 3D.
2. Lag time was calculated using the velocity method.
3. HEC-HMS was used to model the storm events using the SCS Type II storm event.
4. Results from HEC-HMS were used in rock chute calculations to verify that they would function adequately.

REFERENCES

1. AutoCAD Civil 3D version 2022.
2. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). "Part 630 Hydrology National Engineering Handbook." 210-vi, NEH, May 2010.
3. United States Army Corps of Engineers. Hydrologic Modeling System (HEC-HMS) Version 4.10, Computer Program (April 2023)

CONCLUSIONS

1. See attached tables for channel and culvert sizing.

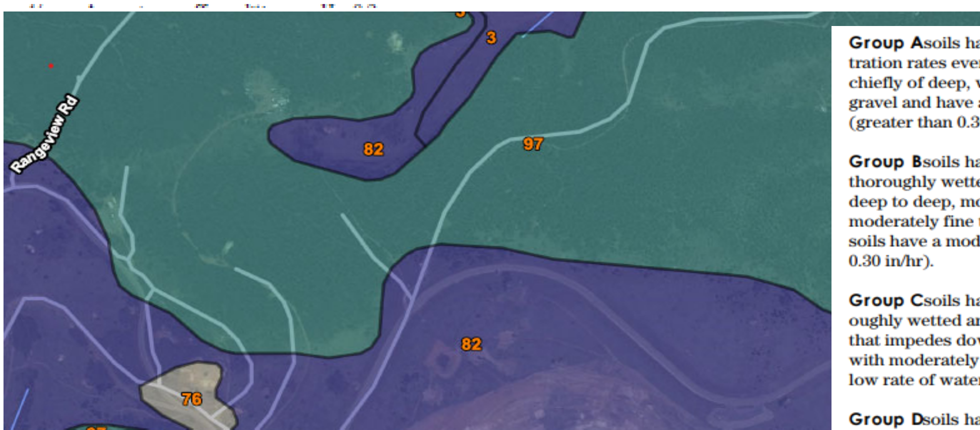
Filename:

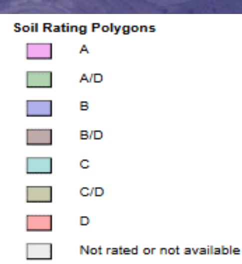
P:\Projects\0106.056 VLF2 Phase 3a CQA\H-CALCULATIONS\WHEX Pit Pond\[Whex Pond hydrology.xlsx]Hec Calc Cover

Whex Pond Hydrology

Table 9–1 Runoff curve numbers for agricultural lands [1] — Continued

Cover description: cover type	treatment [2]	hydrologic condition [3]	CN for hydrologic soil group: A	B	C	D
Pasture, grassland, or range-continuous forage for grazing [4]		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
Meadow-continuous grass, protected from grazing and generally mowed for hay		Good	30	58	71	78
Brush-brush-forbs-grass mixture with brush the major element [5]		Poor	48	67	77	83
		Fair	35	56	70	77
		Good	30 [6]	48	65	73
Woods-grass combination (orchard or tree farm) [7]		Poor	57	73	82	86
		Fair	43	65	76	82
		Good	32	58	72	79
Woods [8]		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	30	55	70	77
Farmstead–buildings, lanes, driveways, and surrounding lots		---	59	74	82	86
Roads (including right-of-way):						
Dirt		---	72	82	87	89
Gravel		---	76	85	89	91





Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 in/hr).

Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15-0.30 in/hr).

Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05-0.15 in/hr).

Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-0.05 in/hr).

In exhibit A-1, some of the listed soils have an added modifier; for example, "Abrazo, gravelly." This refers to a gravelly phase of the Abrazo series that is found in SCS soil map legends.

Table 2-2d Runoff curve numbers for arid and semiarid rangelands [1]

Cover description: Cover type	Hydrologic condition [2]	Curve numbers for hydrologic soil group: A [3]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

1 Average runoff condition, and $I_a = 0.2S$. For range in humid regions, use table 2-2c.
2 Poor: <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: > 70% ground cover.
3 Curve numbers for group A have been developed only for desert shrub.

Table 9–5 Runoff curve numbers for urban areas [1/]

Cover description cover type and hydrologic condition	Average percent impervious area [2/]	CN for hydrologic soil group A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)		77	86	91	94

1/ Average runoff condition, and $I_a = 0.2S$.

2/ The average percent impervious area shown was used to develop the composite CNs. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition.

3/ CNs shown are equivalent to those of pasture. Composite CNs may be computed for other combinations of open space type.

4/ Composite CNs for natural desert landscaping should be computed using figures 9–3 or 9–4 based on the impervious area percentage (CN=98) and the pervious area CN. The pervious area CNs are assumed equivalent to desert shrub in poor hydrologic condition.

NewFields

Cripple Creek and Victor Gold Mining Company
Whex Pond Hydrology
Watershed Characteristics

Variables

y	Avg. Watershed Slope (%)
CN	Composite Curve Number
S	1000/CN-10 (in.)
Ia	Initial Abstraction (0.2*S)
inputs	

Watershed Characteristics					
Watershed	**Area (mi^2)**	**CN**	**y**	**S**	**Ia**
Area 1	0.123	67	22.3%	4.94	0.99

NewFields

Cripple Creek and Victor Gold Mining Company
WHEX Pond Hydrology
Lag Time Calculation
WHEX Pond

Sheet Flow

1. Calculate length of sheet flow:

$$\ell = \frac{100\sqrt{S}}{n}$$

where:

l	=	sheet flow length, ft
S	=	slope of land surface, ft/ft
n	=	Manning's roughness coefficient (Table 15-1)

S:	0.095	ft/ft
n:	0.15	
l:	**205**	ft

2. Calculate sheet flow travel time:

$$T_t = \frac{0.007(n\ell)^{0.8}}{(P_2)^{0.5} S^{0.4}}$$

where:

P_2	=	2-year, 24-hour rainfall, in
T_t	=	travel time, h

P_2:	1.77	in
T_t:	**0.21**	h

Table 15–1 Manning's roughness coefficients for sheet flow (flow depth generally ≤ 0.1 ft)

Surface description	n [1]
Smooth surface (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤ 20%	0.06
Residue cover > 20%	0.17
Grass:	
Short-grass prairie	0.15
Dense grasses [2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods: [3]	
Light underbrush	0.40
Dense underbrush	0.80

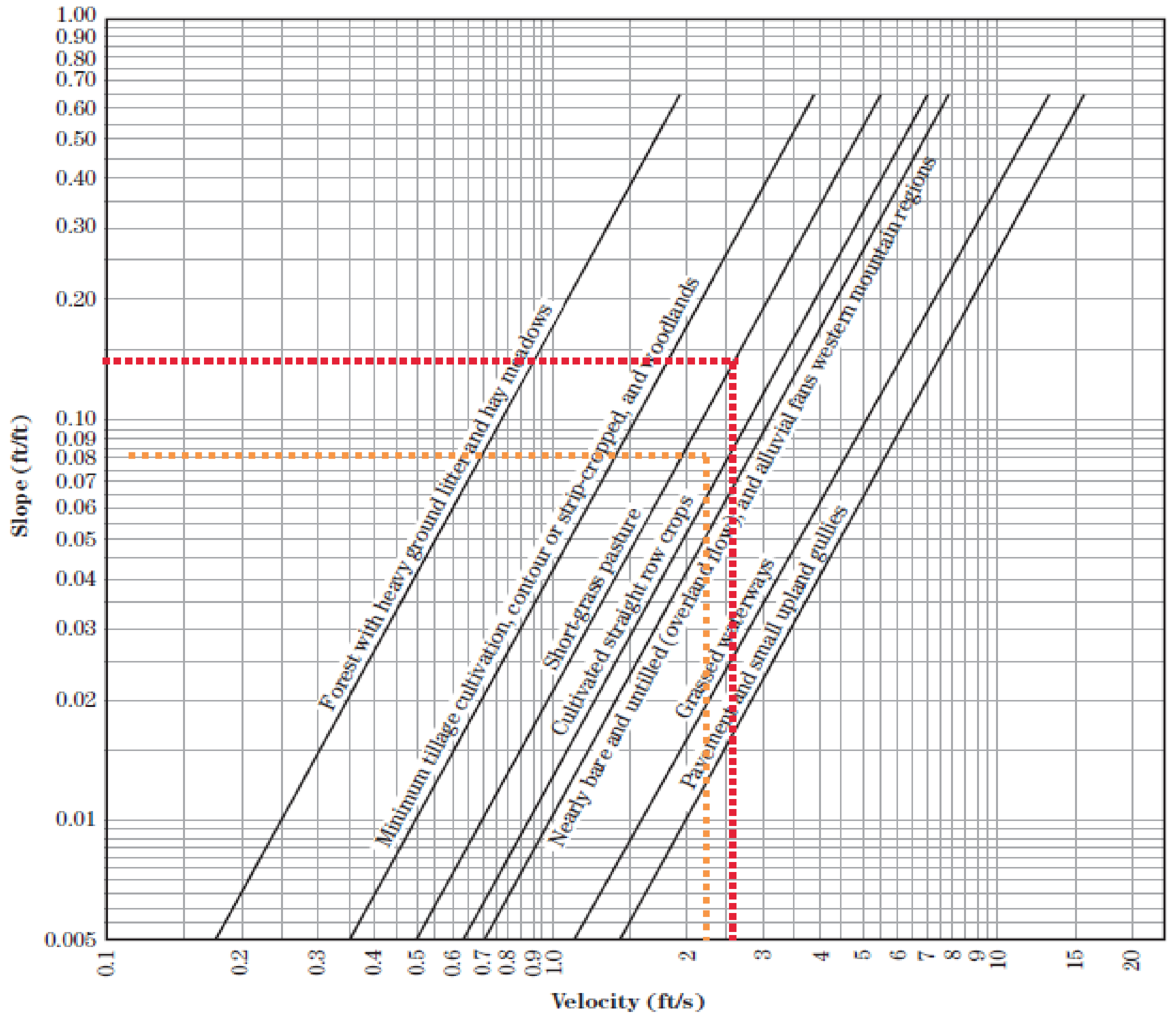
1 The Manning's n values are a composite of information compiled by Engman (1986).
2 Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
3 When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

NewFields

Shallow Concentrated Flow:

1. Estimate velocity from Figure 15-4

Figure 15–4 Velocity versus slope for shallow concentrated flow



1st Segment:			2nd Segment:		
Velocity:	**2.6**	ft/s	Velocity:	**1.9**	ft/s

2. Calculate shallow concentrated flow travel time:

$$T_t = \frac{\ell}{3,600V}$$

1st Segment:			2nd Segment:		
l:	760	ft	l:	685	ft
T_t:	**0.08**	h	T_t:	**0.10**	h

NewFields

Open Channel Flow:

1. Calculate hydraulic radius:

$r = a/P_w$

where:

r	=	hydraulic radius, ft
a	=	cross sectional flow area, ft^2
P_w	=	wetted perimeter, ft

1st Segment			2nd Segment			3rd Segment		
a:	60	ft^2	a:	43.2	ft^2	a:	43.2	ft^2
P_w	85	ft	P_w	48.9	ft	P_w	48.9	ft
r	**0.7**	ft	r	**0.9**	ft	r	**0.9**	ft

1. Calculate average flow velocity and travel time:

$$V = \frac{1.49 r^{\frac{2}{3}} s^{\frac{1}{2}}}{n}$$

where:

V	=	average velocity, ft/s
s	=	channel slope, ft/ft
n	=	Manning's n for open channel flow

1st Segment			2nd Segment			3rd Segment		
s:	0.057	ft/ft	s:	0.322	ft/ft	s:	0.008	ft/ft
n:	0.05		n:	0.05		n:	0.05	
V:	5.6	ft/s	V:	15.6	ft/s	V:	2.5	ft/s

2. Calculate open channel flow travel time:

$$T_t = \frac{\ell}{3{,}600V}$$

1st Segment			2nd Segment			3rd Segment		
l:	1,203	ft	l:	437	ft	l:	9,856	ft
T_t:	**0.06**	h	T_t:	**0.01**	h	T_t:	**1.12**	h

Time of Concentration:

$T_c = T_{t(sheet)} + T_{t(shallow)} + T_{t(channel)}$

T_c: 1.57 h

Lag Time:

$$L = 0.6T_c$$

L:	0.94	h
	56.65	min

NewFields

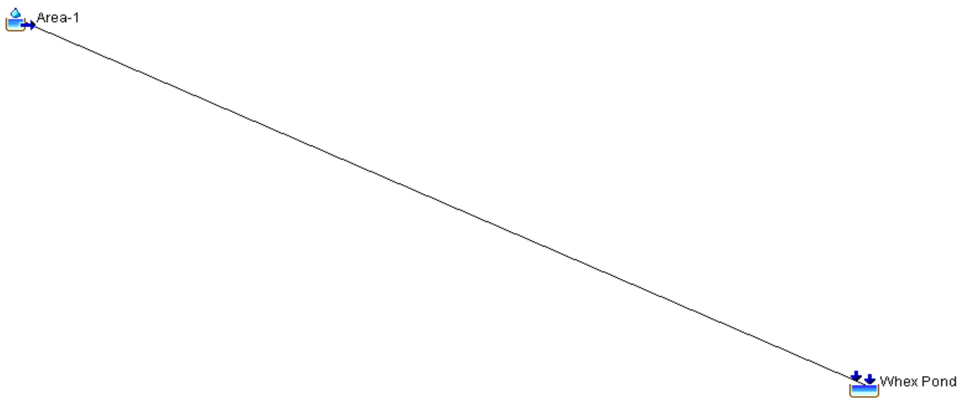
Cripple Creek & Victor Gold Mining Company
Whex Pond Sizing Calculations
Watershed Summary

500 Year-24 Hour Hec-HMS Results

Hydraulic Element	Drainage Area (Mi^2)	Peak Discharge (ft^3/s)	Volume (acre-ft)
Area-1	0.123	78.4	18.4
Whex Pond	0.123	78.4	18.4

NewFields

Cripple Creek & Victor Gold Mining Company
Whex Pond Sizing Calculations
Hec-HMS Overall View



NewFields

Cripple Creek and Victor Gold Mining Company
Whex Pond Inlet Channel Hydrology
Watershed Characteristics

Variables	
y	Avg. Watershed Slope (%)
CN	Composite Curve Number
S	1000/CN-10 (in.)
Ia	Initial Abstraction (0.2*S)
inputs	

Watershed Characteristics					
Watershed	**Area (mi^2)**	**CN**	**y**	**S**	**Ia**
West WHEX Pond Channel	0.004	64	11.7%	5.72	1.14
East WHEX Pond Channel	0.011	76	23.7%	3.17	0.63
NW WHEX Pond Channel	0.059	75	16.0%	3.33	0.67

Cripple Creek and Victor Gold Mining Company
WHEX Pond Hydrology
Lag Time Calculation
West WHEX Pond Channel

Sheet Flow

1. Calculate length of sheet flow:

$$\ell = \frac{100\sqrt{S}}{n}$$

where:

l	=	sheet flow length, ft
S	=	slope of land surface, ft/ft
n	=	Manning's roughness coefficient (Table 15-1)

S:	0.018	ft/ft
n:	0.15	
l:	**89**	ft

2. Calculate sheet flow travel time:

$$T_t = \frac{0.007(n\ell)^{0.8}}{(P_2)^{0.5} S^{0.4}}$$

where:

P_2	=	2-year, 24-hour rainfall, in
T_t	=	travel time, h

P_2:	1.77	in
T_t:	**0.21**	h

Table 15–1 Manning's roughness coefficients for sheet flow (flow depth generally ≤ 0.1 ft)

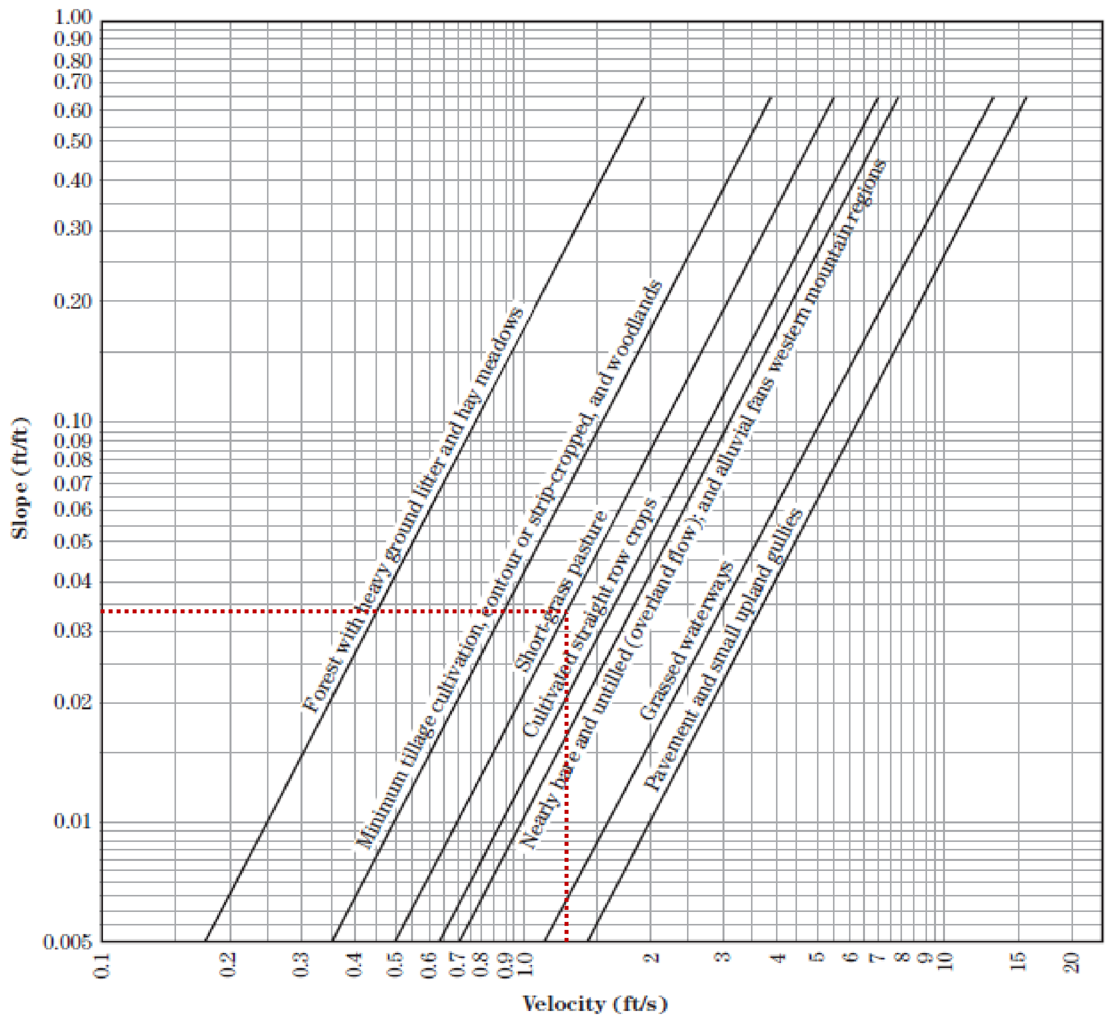
Surface description	n [1]
Smooth surface (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤ 20%	0.06
Residue cover > 20%	0.17
Grass:	
Short-grass prairie	0.15
Dense grasses [2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods: [3]	
Light underbrush	0.40
Dense underbrush	0.80

1 The Manning's *n* values are a composite of information compiled by Engman (1986).
2 Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
3 When selecting *n*, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

Shallow Concentrated Flow:

1. Estimate velocity from Figure 15-4

Figure 15–4 Velocity versus slope for shallow concentrated flow



1st Segment:			2nd Segment:		
Velocity:	**1.3**	ft/s	Velocity:	**1.6**	ft/s

2. Calculate shallow concentrated flow travel time:

$$T_t = \frac{\ell}{3{,}600V}$$

1st Segment:			2nd Segment:		
l:	305	ft	l:	356	ft
T_t:	**0.07**	h	T_t:	**0.06**	h

Open Channel Flow:

1. Calculate hydraulic radius:

$$r = a/P_w$$

where:

r	=	hydraulic radius, ft
a	=	cross sectional flow area, ft^2
P_w	=	wetted perimeter, ft

	1st Segment			2nd Segment	
a:	32.4	ft^2	a:	3.1	ft^2
P_w	68	ft	P_w	6.3	ft
r	**0.5**	ft	r	**0.5**	ft

1. Calculate average flow velocity and travel time:

$$V = \frac{1.49 r^{\frac{2}{3}} s^{\frac{1}{2}}}{n}$$

where:

V	=	average velocity, ft/s
s	=	channel slope, ft/ft
n	=	Manning's n for open channel flow

	1st Segment			2nd Segment	
s:	0.034	ft/ft	s:	0.03	ft/ft
n:	0.03		n:	0.024	
V:	5.6	ft/s	V:	6.8	ft/s

2. Calculate open channel flow travel time:

$$T_t = \frac{\ell}{3{,}600V}$$

	1st Segment			2nd Segment	
l:	315	ft	l:	91	ft
T_t:	**0.02**	h	T_t:	**0.004**	h

Time of Concentration:

$$T_c = T_{t(sheet)} + T_{t(shallow)} + T_{t(channel)}$$

T_c: 0.36 h

Lag Time:

$$L = 0.6T_c$$

L:	0.21	h
	12.81	min

NewFields

Cripple Creek and Victor Gold Mining Company
WHEX Pond Hydrology
Lag Time Calculation
East WHEX Pond Channel

Sheet Flow

1. Calculate length of sheet flow:

$$\ell = \frac{100\sqrt{S}}{n}$$

where:

l	=	sheet flow length, ft
S	=	slope of land surface, ft/ft
n	=	Manning's roughness coefficient (Table 15-1)

S:	0.042	ft/ft
n:	0.15	
l:	**137**	ft

Table 15–1 Manning's roughness coefficients for sheet flow (flow depth generally ≤ 0.1 ft)

Surface description	n [1]
Smooth surface (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤ 20%	0.06
Residue cover > 20%	0.17
Grass:	
Short-grass prairie	0.15
Dense grasses [2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods: [3]	
Light underbrush	0.40
Dense underbrush	0.80

1 The Manning's n values are a composite of information compiled by Engman (1986).
2 Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
3 When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

2. Calculate sheet flow travel time:

$$T_t = \frac{0.007(n\ell)^{0.8}}{(P_2)^{0.5} S^{0.4}}$$

where:

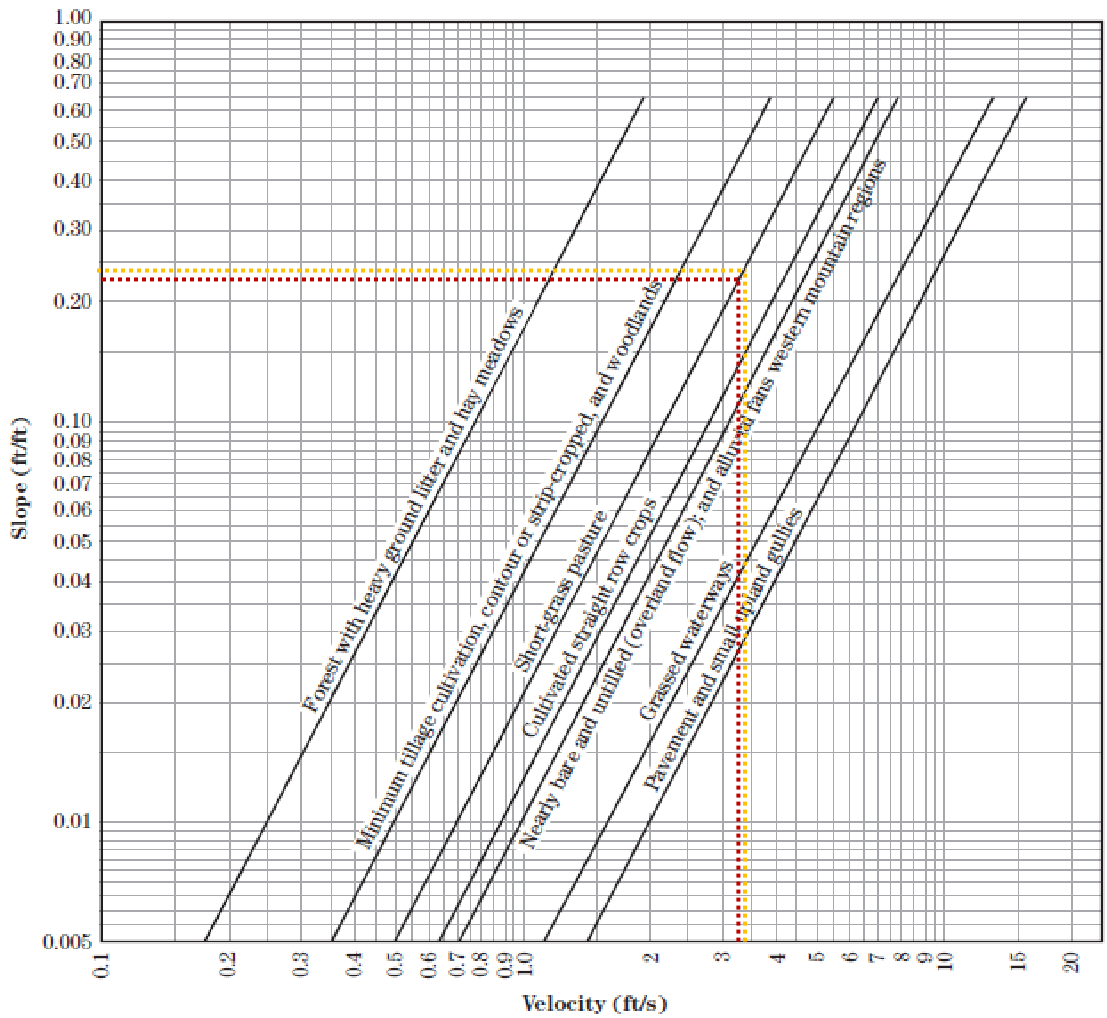
P_2	=	2-year, 24-hour rainfall, in
T_t	=	travel time, h

P_2:	1.77	in
T_t:	**0.21**	h

Shallow Concentrated Flow:

1. Estimate velocity from Figure 15-4

Figure 15–4 Velocity versus slope for shallow concentrated flow



1st Segment			2nd Segment		
Velocity:	**3.2**	ft/s	Velocity:	**3.3**	ft/s

2. Calculate shallow concentrated flow travel time:

$$T_t = \frac{\ell}{3,600V}$$

1st Segment			1st Segment		
l:	560	ft	l:	117	ft
T_t:	**0.05**	h	T_t:	**0.01**	h

Open Channel Flow:

1. Calculate hydraulic radius:

$r = a/P_w$

where:

r	=	hydraulic radius, ft
a	=	cross sectional flow area, ft^2
P_w	=	wetted perimeter, ft

	1st Segment			2nd Segment	
a:	3.9	ft^2	a:	3.1	ft^2
P_w	11.27	ft	P_w	6.3	ft
r	**0.3**	ft	r	**0.5**	ft

1. Calculate average flow velocity and travel time:

$$V = \frac{1.49 r^{\frac{2}{3}} s^{\frac{1}{2}}}{n}$$

where:

V	=	average velocity, ft/s
s	=	channel slope, ft/ft
n	=	Manning's n for open channel flow

	1st Segment			2nd Segment	
s:	0.03	ft/ft	s:	0.024	ft/ft
n:	0.05		n:	0.024	
V:	2.5	ft/s	V:	6.1	ft/s

2. Calculate open channel flow travel time:

$$T_t = \frac{\ell}{3,600V}$$

	1st Segment			2nd Segment	
l:	354	ft	l:	51	ft
T_t:	**0.04**	h	T_t:	**0.002**	h

Time of Concentration:

$T_c = T_{t(sheet)} + T_{t(shallow)} + T_{t(channel)}$

T_c:	0.31	h

Lag Time:

$$L = 0.6T_c$$

L:	0.19	h
	11.12	min

Cripple Creek and Victor Gold Mining Company
WHEX Pond Hydrology
Lag Time Calculation
Northwest WHEX Pond Channel

Sheet Flow

1. Calculate length of sheet flow:

$$\ell = \frac{100\sqrt{S}}{n}$$

where:

l	=	sheet flow length, ft
S	=	slope of land surface, ft/ft
n	=	Manning's roughness coefficient (Table 15-1)

S:	0.095	ft/ft
n:	0.15	
l:	**205**	ft

Table 15–1 Manning's roughness coefficients for sheet flow (flow depth generally ≤ 0.1 ft)

Surface description	n [1]
Smooth surface (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤ 20%	0.06
Residue cover > 20%	0.17
Grass:	
Short-grass prairie	0.15
Dense grasses [2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods: [3]	
Light underbrush	0.40
Dense underbrush	0.80

1 The Manning's *n* values are a composite of information compiled by Engman (1986).
2 Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
3 When selecting *n*, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

2. Calculate sheet flow travel time:

$$T_t = \frac{0.007(n\ell)^{0.8}}{(P_2)^{0.5} S^{0.4}}$$

where:

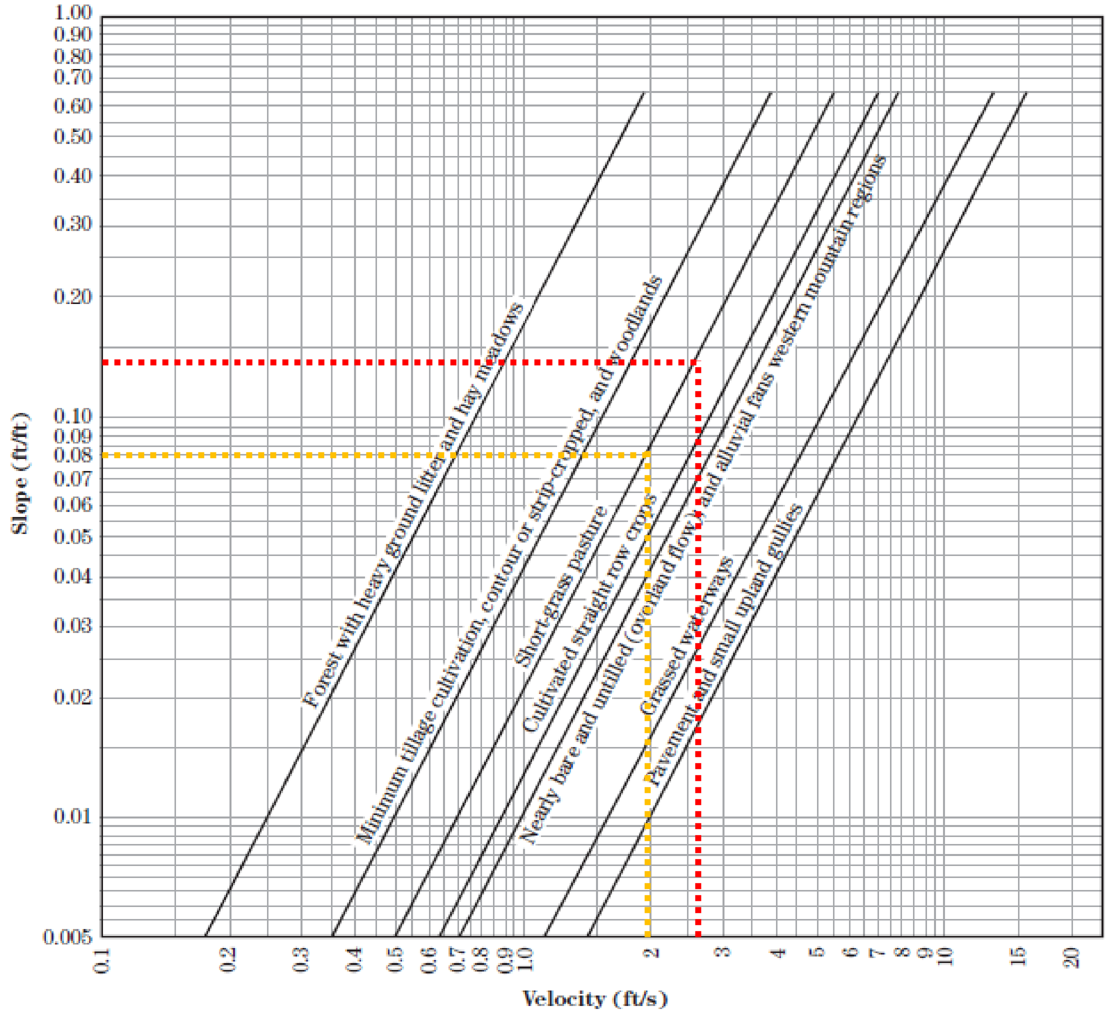
P_2	=	2-year, 24-hour rainfall, in
T_t	=	travel time, h

P_2:	1.77	in
T_t:	**0.21**	h

Shallow Concentrated Flow:

1. Estimate velocity from Figure 15-4

Figure 15–4 Velocity versus slope for shallow concentrated flow



1st Segment:

Velocity: **2.6** ft/s

1.9

2nd Segment:

Velocity: **1.9** ft/s

2. Calculate shallow concentrated flow travel time:

$$T_t = \frac{\ell}{3,600V}$$

1st Segment:

l: 760 ft

T_t: **0.08** h

2nd Segment:

l: 685 ft

T_t: **0.10** h

Open Channel Flow:

1. Calculate hydraulic radius:

$$r = a/P_w$$

where:

r	=	hydraulic radius, ft
a	=	cross sectional flow area, ft^2
P_w	=	wetted perimeter, ft

	1st Segment			2nd Segment			3rd Segment	
a:	3.1	ft^2	a:	24.3	ft^2	a:	3.1	ft^2
P_w	6.3	ft	P_w	53.1	ft	P_w	6.3	ft
r	**0.5**	ft	r	**0.5**	ft	r	**0.5**	ft

1. Calculate average flow velocity and travel time:

$$V = \frac{1.49 r^{\frac{2}{3}} s^{\frac{1}{2}}}{n}$$

where:

V	=	average velocity, ft/s
s	=	channel slope, ft/ft
n	=	Manning's n for open channel flow

	1st Segment			2nd Segment			3rd Segment	
s:	0.036	ft/ft	s:	0.035	ft/ft	s:	0.033	ft/ft
n:	0.024		n:	0.03		n:	0.024	
V:	7.4	ft/s	V:	5.5	ft/s	V:	7.1	ft/s

2. Calculate open channel flow travel time:

$$T_t = \frac{\ell}{3{,}600V}$$

	1st Segment			2nd Segment			3rd Segment	
l:	42	ft	l:	1,236	ft	l:	54	ft
T_t:	**0.002**	h	T_t:	**0.06**	h	T_t:	**0.002**	h

Time of Concentration:

$$T_c = T_{t(sheet)} + T_{t(shallow)} + T_{t(channel)}$$

T_c: 0.46 h

Lag Time:

$$L = 0.6T_c$$

L:	0.27	h
	16.44	min

Cripple Creek & Victor Gold Mining Company
Whex Channel Sizing Calculations
Watershed Summary

25 Year-24 Hour Hec-HMS Results

Hydraulic Element	Drainage Area (Mi^2)	Peak Discharge (ft^3/s)	Volume (acre-ft)
East Channel	0.011	10.7	0.8
Northwest Channel	0.059	38.2	4.1
West Channel	0.004	1.6	0.2

100 Year-24 Hour Hec-HMS Results

Hydraulic Element	Drainage Area (Mi^2)	Peak Discharge (ft^3/s)	Volume (acre-ft)
East Channel	0.011	18.3	1.4
Northwest Channel	0.059	66.9	6.9
West Channel	0.004	3.5	0.3

500 Year-24 Hour Hec-HMS Results

Hydraulic Element	Drainage Area (Mi^2)	Peak Discharge (ft^3/s)	Volume (acre-ft)
East Channel	0.011	30.0	2.2
Northwest Channel	0.059	112.7	11.4
West Channel	0.004	6.9	0.6

Cripple Creek & Victor Gold Mining Company
Whex Channel Sizing Calculations
Hec-HMS Overall View

Attachment 7

WHEX Pond Rock Chute Calcs

Rock Chute Design Data

(Version 4.01 - 04/23/03, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: *WHEX Pond West Inlet* **County:** *Teller*
Designer: *R. Li* **Checked by:** J. Moore
Date: 6/21/2023 **Date:** 06/21/23

Input Channel Geometry

Inlet Channel	Chute	Outlet Channel
Bw = *12.0* ft.	Bw = *12.0* ft.	Bw = *12.0* ft.
Side slopes = *2.5* (m:1)	Factor of safety = *1.20* (F_s)	Side slopes = *2.5* (m:1)
n-value = *0.050*	Side slopes = *2.5* (m:1) → ***2.0:1 max.***	n-value = *0.050*
Bed slope = *0.2740* ft./ft.	Bed slope (3.6:1) = *0.274* ft./ft. → ***2.5:1 max.***	Bed slope = *0.0100* ft./ft.
Freeboard = *1.0* ft.	Outlet apron depth, d = *0.0* ft.	Base flow = *0.0* cfs

Design Storm Data (Table 2, NHCP, NRCS Grade Stabilization Structure No. 410)

Drainage area = *2.4* acres Rainfall = ○ 0 - 3 in. ○ 3 - 5 in. ◉ 5+ in.

Apron elev. --- Inlet = *129.0* ft. --- Outlet = *0.0* ft. --- (H_{drop} = 129 ft.)

Chute capacity = Q25-year

Total capacity = Q100-year

Minimum capacity (based on a 5-year, 24-hour storm with a 5+ inch rainfall)

Q_{high} = *3.5* cfs High flow storm through chute → Tw (ft.) = *Program*

Q_{low} = *1.6* cfs Low flow storm through chute → Tw (ft.) = *Program*

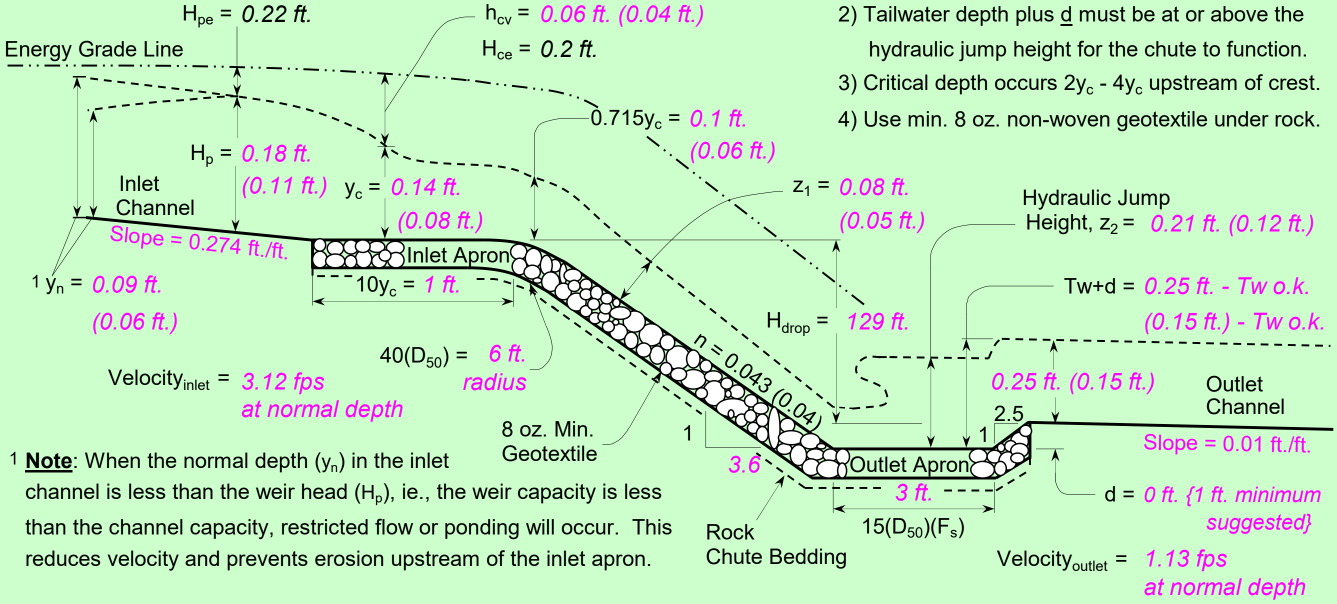
***Note**: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.*

***Input tailwater (Tw)**:*

Profile and Cross Section (Output)

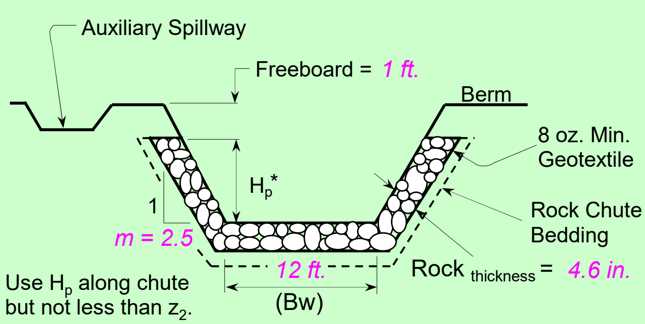
Notes:

1) Output given as ***High Flow (Low Flow)*** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.
4) Use min. 8 oz. non-woven geotextile under rock.



[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute



* Use H_p along chute but not less than z_2.

q_t =	0.29 cfs/ft.	Equivalent unit discharge
F_S =	1.20	Factor of safety (multiplier)
z_1 =	0.08 ft.	Normal depth in chute
n-value =	0.043	Manning's roughness coefficient
$D_{50}(F_s)$ =	2.3 in. (1 lbs. - 50% round / 50% angular)	
$2(D_{50})(F_s)$ =	4.6 in.	Rock chute thickness
Tw + d =	0.25 ft.	Tailwater above outlet apron
z_2 =	0.21 ft.	Hydraulic jump height
****** The outlet***	***will***	***function adequately***

Typical Cross Section **High Flow Storm Information**

Rock Chute Design Data

(Version 4.01 - 04/23/03, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: *WHEX Pond Northwest Inlet* **County:** *Teller*
Designer: *R. Li* **Checked by:** J. Moore
Date: 6/21/2023 **Date:** 06/21/23

Input Channel Geometry

Inlet Channel	Chute	Outlet Channel
Bw = *12.0* ft.	Bw = *12.0* ft.	Bw = *12.0* ft.
Side slopes = *2.5* (m:1)	Factor of safety = *1.20* (F_s)	Side slopes = *2.5* (m:1)
n-value = *0.050*	Side slopes = *2.5* (m:1) → ***2.0:1 max.***	n-value = *0.050*
Bed slope = *0.0420* ft./ft.	Bed slope (3.1:1) = *0.322* ft./ft. → ***2.5:1 max.***	Bed slope = *0.0050* ft./ft.
Freeboard = *1.0* ft.	Outlet apron depth, d = *0.0* ft.	Base flow = *0.0* cfs

Design Storm Data (Table 2, NHCP, NRCS Grade Stabilization Structure No. 410)

Drainage area = *38.0* acres Rainfall = ○ 0 - 3 in. ○ 3 - 5 in. ◉ 5+ in.

Apron elev. --- Inlet = *36.7* ft. --- Outlet = *0.0* ft. --- (H_{drop} = 36.7 ft.)

Chute capacity = Q25-year
Total capacity = Q100-year
Minimum capacity (based on a 5-year, 24-hour storm with a 5+ inch rainfall)

Q_{high} = *66.9* cfs High flow storm through chute → Tw (ft.) = *Program*

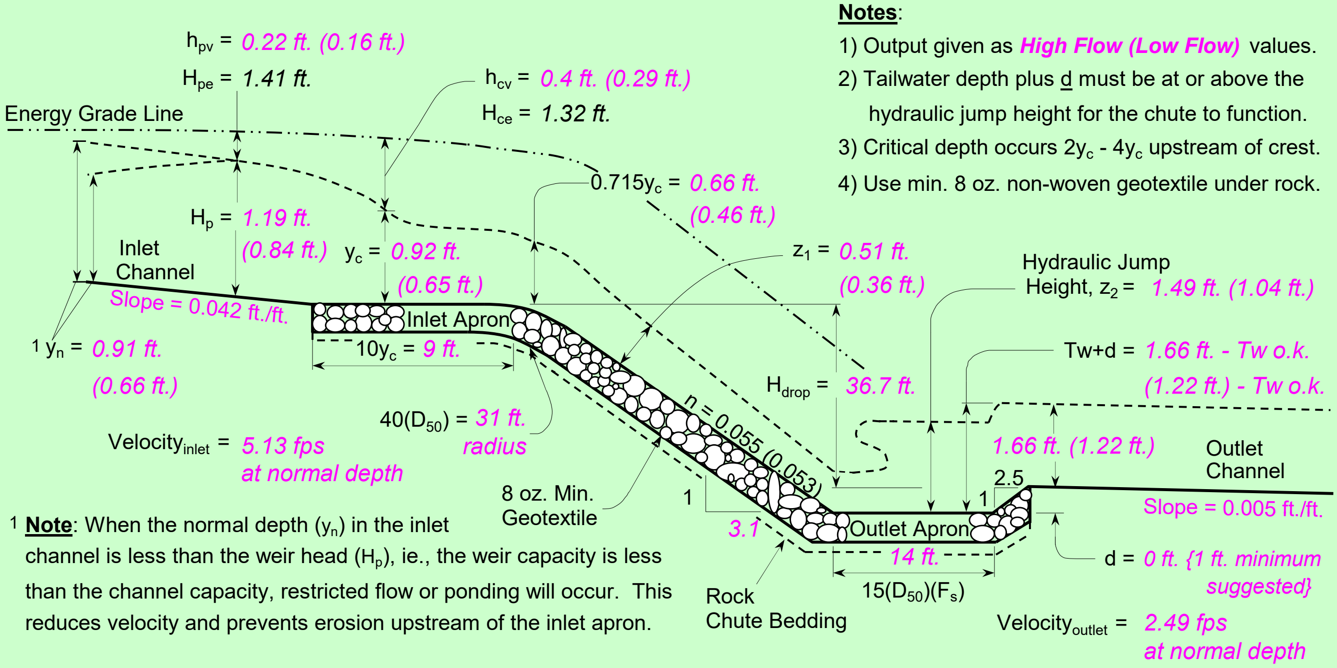
Q_{low} = *38.2* cfs Low flow storm through chute → Tw (ft.) = *Program*

***Note**: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.*

***Input tailwater (Tw)**:*

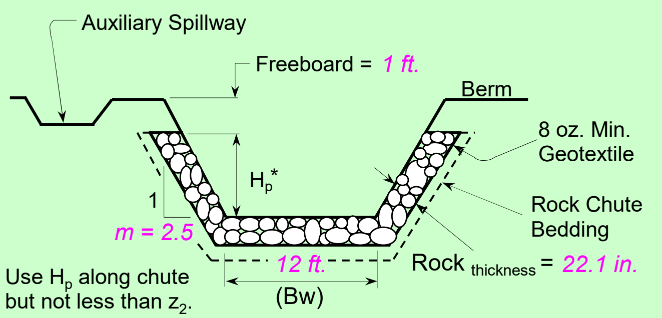
Profile and Cross Section (Output)

Notes:
1) Output given as ***High Flow (Low Flow)*** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.
4) Use min. 8 oz. non-woven geotextile under rock.



[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute



* Use H_p along chute but not less than z_2.

Typical Cross Section

q_t =	*5.04 cfs/ft.*	Equivalent unit discharge
F_S =	*1.20*	Factor of safety (multiplier)
z_1 =	*0.51 ft.*	Normal depth in chute
n-value =	*0.055*	Manning's roughness coefficient
$D_{50}(F_s)$ =	*11.1 in. (99 lbs. - 50% round / 50% angular)*	
$2(D_{50})(F_s)$ =	*22.1 in.*	Rock chute thickness
Tw + d =	*1.66 ft.*	Tailwater above outlet apron
z_2 =	*1.49 ft.*	Hydraulic jump height
****** The outlet***	***will***	***function adequately***

High Flow Storm Information

Rock Chute Design Data

(Version 4.01 - 04/23/03, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: *WHEX Pond East Inlet* **County:** *Teller*
Designer: *R. Li* **Checked by:** J. Moore
Date: 6/21/2023 **Date:** 06/21/23

Input Channel Geometry

Inlet Channel	Chute	Outlet Channel
Bw = *12.0* ft.	Bw = *12.0* ft.	Bw = *12.0* ft.
Side slopes = *2.5* (m:1)	Factor of safety = *1.20* (F_s)	Side slopes = *2.5* (m:1)
n-value = *0.050*	Side slopes = *2.5* (m:1) → ***2.0:1 max.***	n-value = *0.050*
Bed slope = *0.2750* ft./ft.	Bed slope (3.6:1) = *0.275* ft./ft. → ***2.5:1 max.***	Bed slope = *0.0100* ft./ft.
Freeboard = *1.0* ft.	Outlet apron depth, d = *0.0* ft.	Base flow = *0.0* cfs

Design Storm Data (Table 2, NHCP, NRCS Grade Stabilization Structure No. 410)

Drainage area = *7.2* acres   Rainfall = ○ 0 - 3 in. ○ 3 - 5 in. ◉ 5+ in.

Apron elev. --- Inlet = *107.0* ft. --- Outlet = *0.0* ft. --- (H_{drop} = 107 ft.)

Chute capacity = Q25-year
Total capacity = Q100-year
Minimum capacity (based on a 5-year, 24-hour storm with a 5+ inch rainfall)

Q_{high}= *18.3* cfs   High flow storm through chute → Tw (ft.) = *Program*   0.28

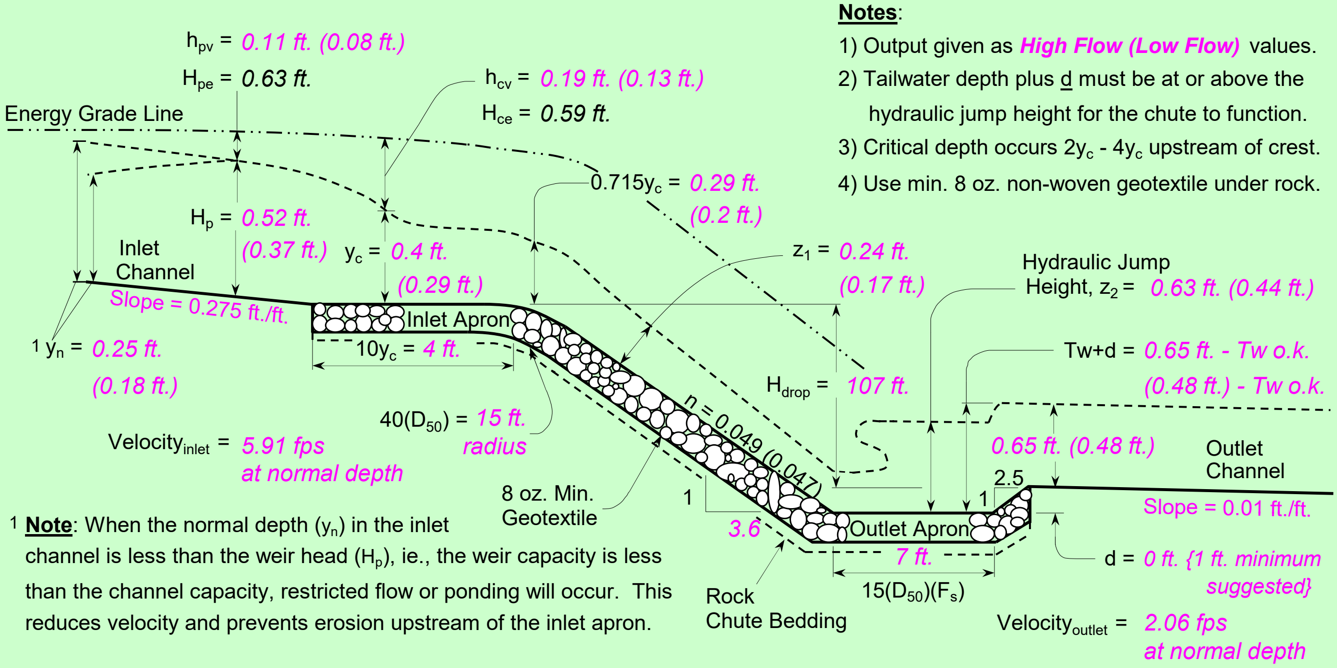
Q_{low} = *10.7* cfs   Low flow storm through chute → Tw (ft.) = *Program*

***Note**: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.*

***Input tailwater (Tw)**:*

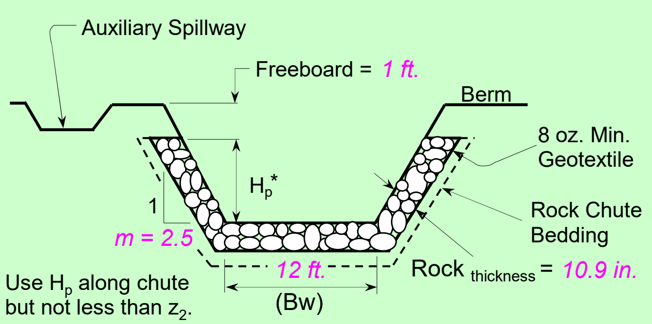
Profile and Cross Section (Output)

Notes:
1) Output given as ***High Flow (Low Flow)*** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.
4) Use min. 8 oz. non-woven geotextile under rock.



[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute



* Use H_p along chute but not less than z_2.

q_t =	*1.46 cfs/ft.*	Equivalent unit discharge
F_S =	*1.20*	Factor of safety (multiplier)
z_1 =	*0.24 ft.*	Normal depth in chute
n-value =	*0.049*	Manning's roughness coefficient
$D_{50}(F_s)$ =	*5.5 in. (12 lbs. - 50% round / 50% angular)*	
$2(D_{50})(F_s)$ =	*10.9 in.*	Rock chute thickness
Tw + d =	*0.65 ft.*	Tailwater above outlet apron
z_2 =	*0.63 ft.*	Hydraulic jump height
****** The outlet***	***will***	***function adequately***

Typical Cross Section   **High Flow Storm Information**

Attachment 8

WHEX Pond Sizing and Filling Curve

Cripple Creek & Victor Gold Mining Company

FILLING CURVE

WHEX EXCAVATION POND

500-yr, 24-hr storm volume: 29,685 c.y.
6.0 Mgal

Elevation	Area (sf)	Area (ac)	Incr. Volume (cf)	Cumulative Volume (cf)	(cy)	(Mgal)	(ac-ft)	Description
10123	30,700	0.70	**0**	**0**	0	0.00	0.00	
10124	32,760	0.75	31,730	31,730	1,175	0.24	0.73	
10125	34,870	0.80	33,815	65,545	2,428	0.49	1.50	
10126	37,030	0.85	35,950	101,495	3,759	0.76	2.33	
10127	39,240	0.90	38,135	139,630	5,171	1.04	3.21	
10128	41,500	0.95	40,370	180,000	6,667	1.35	4.13	**Top of Sediment**
10129	43,810	1.01	42,655	222,655	8,246	1.67	5.11	
10130	46,170	1.06	44,990	267,645	9,913	2.00	6.14	
10131	48,580	1.12	47,375	315,020	11,667	2.36	7.23	
10132	51,040	1.17	49,810	364,830	13,512	2.73	8.38	
10133	53,550	1.23	52,295	417,125	15,449	3.12	9.58	
10134	56,110	1.29	54,830	471,955	17,480	3.53	10.83	
10135	58,720	1.35	57,415	529,370	19,606	3.96	12.15	
10136	61,380	1.41	60,050	589,420	21,830	4.41	13.53	
10137	64,090	1.47	62,735	652,155	24,154	4.88	14.97	
10138	66,850	1.53	65,470	717,625	26,579	5.37	16.47	
10139	69,660	1.60	68,255	785,880	29,107	5.88	18.04	
10140	72,520	1.66	71,090	856,970	31,740	6.41	19.67	
10141	75,430	1.73	73,975	930,945	34,479	6.96	21.37	
10142	78,390	1.80	76,910	1,007,855	37,328	7.54	23.14	**Freeboard**
10143	81,400	1.87	79,895	1,087,750	40,287	8.14	24.97	**Crest**