Appendix A

Soil / Slag Volume Calculations

Volume Calculation - Slag Processing Area

PREPARED FOR: File

PREPARED BY: Heather Ziegelbauer

DATE: May 17, 2004

Using Microstation InRoads, 3 separate elevation models were created for the site: the existing topographic surface, the rough grading surface, and the final grading surface. These surfaces were then compared to each other, to estimate the amounts of grading and fill that are required to achieve these grades. The results are as follows:

	Surface Comparison		
	Existing grading, compared to rough grading	Rough grading, compared to final grading	Existing grading, compared to final grading
Cut (yds^3)	89,069	169	74,950
Fill (yds^3)	3,593	19,595	8,850
Net (yds^3)	85,475	-19,425	66,100

These results conclude that approximately 85,500 cubic yards (yds^3) of slag material will need to be excavated, transported and relocated to the Markland Avenue Quarry. Lead-impacted soil will be left on the Slag Processing Area site and spread over the slag fill area to meet rough grades. Therefore, additional slag material will be excavated and relocated instead of removing the lead-impacted soil pile. In addition, 19,600 yds^3 of clean import material will be needed for cover to meet final grade elevatons. The existing surface was compared to the final grades and indicates a large surplus of material is available for use as fill; however, there is little filling required to meet rough grades and the cut slag material can not be used as cover to meet final grades. Therefore, all cut slag material will be relocated as indicated above.

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Triangle Volume

  Triangle Volume Report

Original Surface: Survey
  Design Surface: ROUGH

            Mode: Entire Surface
      Cut Factor: 1.0
     Fill Factor: 1.0

             Cut: 2404868.1 cu ft
            Fill: 97025.4 cu ft
             Net: 2307842.7 cu ft

             Cut: 89069.2 cu yd
            Fill: 3593.5 cu yd
             Net: 85475.7 cu yd


Triangle Volume

  Triangle Volume Report

Original Surface: Survey
  Design Surface: FINAL

            Mode: Entire Surface
      Cut Factor: 1.0
     Fill Factor: 1.0

             Cut: 2023657.4 cu ft
            Fill: 238949.9 cu ft
             Net: 1784707.5 cu ft

             Cut: 74950.3 cu yd
            Fill: 8850.0 cu yd
             Net: 66100.3 cu yd


Triangle Volume

  Triangle Volume Report

Original Surface: ROUGH
  Design Surface: FINAL

            Mode: Entire Surface
      Cut Factor: 1.0
     Fill Factor: 1.0

             Cut: 4564.9 cu ft
            Fill: 529064.8 cu ft
             Net: -524499.9 cu ft

             Cut: 169.1 cu yd
            Fill: 19595.0 cu yd
             Net: -19425.9 cu yd
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Appendix B
Stormwater and Erosion Design Calculations

Attachment B-1

Stormwater Design Calculations

DITCH DESIGN FOR OU 6 AAFA

AREAS:

(A) = 1.41 acre

(B) = 1.30 acre

USE RATIONAL METHOD

$Q = CIA$ $C = 0.30$ Hydrologic Group C TURF

TIME OF CONCENTRATION

$$T_c = \left(\frac{2 \cdot L \cdot n}{3\sqrt{S}}\right)^{0.47}$$

sheet flow $n = 0.15$ and concentrated flow $n = 0.15$

(A) sheet Flow: $L = 136$ Ft
$S = 0.088$ ft/ft
$T_c = 6$ min

Concentrated Flow:
$L = 512$ Ft
$S = 0.0039$
$T_c = 23.4$ min
$\therefore T_c = 29.4$ min

(B) sheet flow => same as area (A)
$T_c = 6$ min

Concentrated Flow
$L = 480$ Ft
$S = 0.0052$
$T_c = 21.2$

$\therefore T_c = 27.2$ min

Intensity

T_c = 29 and 27 min use 30 min

10-yr recurrence

$I = 3.14$ in/hr

Flow

$Q_A = (0.30)(3.14)(1.41) = 1.33$ cfs

$Q_B = (0.30)(3.14)(1.3) = 1.22$ cfs

Ditch Sizing Vegetated and New Construction

manning ⇒ Vegetated = 0.045
New Construction = 0.020

3:1 (H:V) SIDE SLOPES

V-ditches

(A) S = 0.39 %

	Vegetated	New Construction
DEPTH =	0.68 ft	0.50 ft
Q =	1.33 cfs	1.33 cfs
V =	0.97 FPS	1.78 fps
Shear Stress =	0.16 lb/ft²	0.12 lb/ft²

(B) S = 0.52 %

DEPTH =	0.62 ft	0.46 ft
Q =	1.22 cfs	1.22 cfs
V =	1.06 1.94 fps	1.94 fps
Shear Stress =	0.20 lb/ft²	0.15 lb/ft²

CH2MHILL

SUBJECT: Continental Steel 006
SLAG PROCESSING AREA

BY: BAB
SHEET NO. 1 of
DATE: 1-27-04
PROJECT NO.

PURPOSE: CALCULATE PRE & POST GRADING PEAK RUNOFF RATES. FOR SLAG AREA.

PLANIMETER AREA = 57.133 in^2 SCALE = 1" = 80'

AREA = 57.133 in^2 · $\frac{6400\ ft^2}{1\ in^2}$ => 8.40 acres

RATIONAL METHOD: Q = CIA

10-YEAR STORM

EXISTING CONDITIONS

C: ROCK, NO-LITTLE VEG, SLAG

C = 0.40 - 0.60 FOR GRAVEL

∴ USE C = 0.50

TIME OF CONCENTRATION

- SHEET FLOW
- MODERATELY ROUGH SURFACE, POOR GRASS n = 0.20

SLOPE RANGE BETWEEN 70% - < 1%.
∴ USE S = 6%

L = 500 ft

T_c = 14 min => USE 15 min

INTENSITY

Duration = 15 min DEPTH = 1.15 inches

I = 4.6 in/hr

REV 12/01 FORM 12

FLOW

$Q = CIA$

$Q = (0.50)(4.6)(8.40)$

$\therefore Q = \underline{19.32 \text{ cfs}}$

PROPOSED CONDITIONS

SEE "CONTINENTAL STEEL OU6" 5-19-04 CALCULATIONS FOR T_c & C DERIVATIONS.

$T_c = 27$ and 29 min $\Rightarrow$ USE $T_c = 30$ min

$I = 3.14$ in/hr

$C = 0.30$

$A = 8.40$ acres

$Q = CIA$

$Q = (0.30)(3.14)(8.40)$

$\therefore \underline{Q = 7.9 \text{ cfs}}$

$\therefore$ PROPOSED GRADING AND SITE CONDITIONS REDUCE 10-YR PEAK FLOWS BY 11.4 CFS, A 60% REDUCTION OVER EXISTING CONDITIONS. THEREFORE NO ADDITIONAL STORMWATER MANAGEMENT IS REQUIRED.

Mark D. Mittag/MKE

Purpose: Compute the flow that occurs in a ditch with two differenent side slopes and a bottom width.		
Assume Manning's formula.		
Created by: Mark Mittag/MKE		z1 = ditch side slope 1
		z2 = ditch side slope 2
		b = bottom width
z1:	3	Slope = slope along flow line of ditch
z2:	3	Manning's n = Manning's roughness factor
b:	0	Depth = depth of flow in the ditch
Slope (ft./ft.):	0.00520	Area = cross-sectional area of flow in ditch
Manning's n:	0.045	W.P. = wetted perimeter of ditch
Depth (ft.):	0.62	Flow = flow through ditch using Manning's equation
Area:	1.15	Velocity = velocity of flow in the ditch
W.P.:	3.92	Top Width = top width water flowing in ditch
Flow (cfs):	1.22	Hydraulic Depth = defined as Area/Top width
Velocity (ft./sec.):	1.06	Froude Number = defined as Vel/(sqrt(g*Hydraulic Depth))
Top Width (ft.):	3.72	Conjugate Depth = (Depth/2)*(sqrt(1+8*F#)-1)
Hydraulic Depth (ft.):	0.31	Shear Stress = (62.4)*depth*slope
Froude Number:	0.33	
Conjugate Depth (ft.):	0.12	
Shear Stress (lb/ft^2):	0.20	

Established grass -

Ditch B

Mark D. Mittag/MKE

Purpose: Compute the flow that occurs in a ditch with two differenent side slopes and a bottom width.								
Assume Manning's formula.								
Created by: Mark Mittag/MKE			z1 = ditch side slope 1					
			z2 = ditch side slope 2					
			b = bottom width					
z1:	3		Slope = slope along flow line of ditch					
z2:	3		Manning's n = Manning's roughness factor					
b:	0		Depth = depth of flow in the ditch					
Slope (ft./ft.):	0.00390		Area = cross-sectional area of flow in ditch					
Manning's n:	0.020		W.P. = wetted perimeter of ditch					
Depth (ft.):	0.50		Flow = flow through ditch using Manning's equation					
Area:	0.75		Velocity = velocity of flow in the ditch					
W.P.:	3.16		Top Width = top width water flowing in ditch					
Flow (cfs):	1.33		Hydraulic Depth = defined as Area/Top width					
Velocity (ft./sec.):	1.78		Froude Number = defined as Vel/(sqrt(g*Hydraulic Depth))					
Top Width (ft.):	2.99		Conjugate Depth = (Depth/2)*(sqrt(1+8*F#)-1)					
Hydraulic Depth (ft.):	0.25		Shear Stress = (62.4)*depth*slope					
Froude Number:	0.63							
Conjugate Depth (ft.):	0.26							
Shear Stress (lb/ft^2):	0.12							

New construction

Ditch A

Mark D. Mittag/MKE

Purpose: Compute the flow that occurs in a ditch with two differenent side slopes and a bottom width.		
Assume Manning's formula.		
Created by: Mark Mittag/MKE		z1 = ditch side slope 1
		z2 = ditch side slope 2
		b = bottom width
z1:	3	Slope = slope along flow line of ditch
z2:	3	Manning's n = Manning's roughness factor
b:	0	Depth = depth of flow in the ditch
Slope (ft./ft.):	0.00520	Area = cross-sectional area of flow in ditch
Manning's n:	0.020	W.P. = wetted perimeter of ditch
Depth (ft.):	0.46	Flow = flow through ditch using Manning's equation
Area:	0.63	Velocity = velocity of flow in the ditch
W.P.:	2.90	Top Width = top width water flowing in ditch
Flow (cfs):	1.22	Hydraulic Depth = defined as Area/Top width
Velocity (ft./sec.):	1.94	Froude Number = defined as Vel/(sqrt(g*Hydraulic Depth))
Top Width (ft.):	2.75	Conjugate Depth = (Depth/2)*(sqrt(1+8*F#)-1)
Hydraulic Depth (ft.):	0.23	Shear Stress = (62.4)*depth*slope
Froude Number:	0.71	
Conjugate Depth (ft.):	0.29	
Shear Stress (lb/ft^2):	0.15	

New construction

Ditch B

Mark D. Mittag/MKE

Purpose: Compute the flow that occurs in a ditch with two differenent side slopes and a bottom width.		
Assume Manning's formula.		
Created by: Mark Mittag/MKE		z1 = ditch side slope 1
		z2 = ditch side slope 2
		b = bottom width
z1:	3	Slope = slope along flow line of ditch
z2:	3	Manning's n = Manning's roughness factor
b:	0	Depth = depth of flow in the ditch
Slope (ft./ft.):	0.00390	Area = cross-sectional area of flow in ditch
Manning's n:	0.045	W.P. = wetted perimeter of ditch
Depth (ft.):	0.68	Flow = flow through ditch using Manning's equation
Area:	1.37	Velocity = velocity of flow in the ditch
W.P.:	4.28	Top Width = top width water flowing in ditch
Flow (cfs):	1.33	Hydraulic Depth = defined as Area/Top width
Velocity (ft./sec.):	0.97	Froude Number = defined as Vel/(sqrt(g*Hydraulic Depth))
Top Width (ft.):	4.06	Conjugate Depth = (Depth/2)*(sqrt(1+8*F#)-1)
Hydraulic Depth (ft.):	0.34	Shear Stress = (62.4)*depth*slope
Froude Number:	0.29	
Conjugate Depth (ft.):	0.10	
Shear Stress (lb/ft^2):	0.16	

Established Grass —

Ditch A