Tyrone
Open Pit Waiver Area
Cost Estimate
Summary Report

Prepared for

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1.0 INTRODUCTION

1.1 Purpose & Summary

The cost estimates presented herein are one part of the justification that Freeport McMoRan Tyrone, Inc. (Tyrone) is assembling for the open pit reclamation waiver. Costs are provided for both complete and partial backfilling of the Main, Savanna, Gettysburg, and Copper Mountain Pits.

The purpose of this document is to present the estimate along with a concise explanation of the underlying assumptions and references to the supporting documentation. This work was completed in coordination with MWH who developed the reclamation designs and the quantity take-offs. Telesto developed the unit costs and compiled the cost estimate.

This document is organized as follows:

- Section 2 describes the assumptions specific to the earthwork reclamation areas.
- Section 3 describes the assumptions specific to the water management.
- A summary of the complete backfill cost estimate is included in Table 1a.
- A summary of the partial backfill cost estimate is included in Table 1b.
- Unit cost bases for fuel, labor and equipment are summarized in Table 2.
- Miscellaneous unit cost bases are provided in Table 3.
- Equipment production factors are provided in Table 4.
- Partial backfill plan view is shown on Drawing 1 and cross sections are shown on Drawings 2 through 4.
- A summary of cost calculations is provided in Appendix A.
- Supporting documentation is presented in Appendix B.
- Engineering take-offs produced by MWH are presented in Appendix C.
- The spreadsheets containing the cost estimates are provided electronically in Appendix D.

2.0 EARTHWORK COST ESTIMATE

This earthwork reclamation cost estimate has been developed based on a template created by the New Mexico Energy, Minerals and Natural Resources Department, Mining and Minerals Division (MMD), using September, 2009 topography. The original MMD cost estimating spreadsheet templates were modified slightly to provide flexibility for evaluating each type of facility independently. The four original linked spreadsheets were combined for each facility type, thus eliminating the possibility of the sheets referencing the wrong spreadsheet file. The formulas and organization of the individual sheets remained unchanged with a few minor exceptions: 1) truck trip time and dozer production rate data that were previously entered manually from the Caterpillar Handbook charts (Caterpillar, 2004 and 2008) were replaced with equivalent formulas derived from the Caterpillar Handbook charts, 2) "Other items" specific to a particular facility were retained with each associated facility (e.g., ditch construction for a particular facility).

2.1 Cost Estimate Assumptions

Several working assumptions that are used in the cost estimates include:

- **Labor Rates**: Labor rates were developed based on the New Mexico Department of Labor (DOL) Type H (Heavy Engineering) labor rates (Table 2). These rates include the base, fringe benefit and apprenticeship contribution rates. The following were added to the labor rates to obtain the total per hour labor rate: FICA, Medicare, Federal un-employment, State un-employment and Workman's Compensation Insurance (Table 2).
- **Equipment Rates**: The equipment rates were taken from EquipmentWatch Custom Cost Evaluator (Penton Media, Inc. Version: 4.0.4A, 2010).
- **Fuel Costs**: The off-road diesel fuel cost is based on a quote obtained from Porter Oil Co., Inc. located in Bayard, New Mexico.
- **Revegetation Unit Costs**: The revegetation unit cost (Table 2) is based on a quote obtained from Rocky Mountain Reclamation.
- **Rip Rap Production**: The rip rap unit cost is based on a bid received by the Tyrone Mine for on-site rip rap production.
- **Indirect Costs**: Total indirect costs of 39.6% were applied to the direct costs. The indirect costs are comprised of: Mobilization and Demobilization (1.1%),

Contingencies (2.0%), Engineering Redesign Fee (4.5%), Contractor Profit and Overhead (25.0%), Project Management Fee (5.0%), State Procurement Cost (2.0%). Contractor Profit and Overhead includes: Profit and Office Overhead (10%) and Project Overhead (15%). Project Overhead usually consists of the following except when it is a direct item: salaried and administrative personnel, field office, shop and facilities, temporary utilities, fees and insurance except those applicable to labor and equipment, MSHA and site specific training, performance and payment bonds, quality assurance/quality control, safety, surveying, construction equipment general (salaried pickups, buses, ambulance, etc.).

- **Operations and Maintenance Costs**: Assumed to be equivalent to 15.39% of the indirect costs. This is based on the Tyrone Mine Closure/Closeout Plan Update (Golder, 2007) operations and maintenance (O&M) costs divided by the total earthwork costs. O&M includes: erosion control, wildlife monitoring, and road maintenance.
- **Revegetation Maintenance**: Calculated as 5% of the direct revegetation costs for a 12 year period and is included with the indirect costs. Borrow area revegetation is included in the Tyrone Mine Closure/Closeout Plan Update (Golder, 2007) and is therefore not included in this cost estimate.
- **Haul Distances**: Haul distances are calculated along a preferred route assumed to originate at the approximate centroid of the cover borrow source and terminate at the approximate centroid of the reclamation area. A maximum of three segments are used for each haul route.
- **Borrow Areas**: Borrow areas will be left in a condition such that they can be directly revegetated and will require no cover to be hauled from other sources.
- **Dozer Push Distances**: Dozer push distances represent the distance from the centroid of the cut block to the centroid of the fill block.
- **Miscellaneous Unit Costs**: Miscellaneous unit costs were taken from several sources including R.S. Means Heavy Construction Cost Data Edition 24 (R.S. Means, 2010). All costs taken from R.S. Means and were adjusted using the location factor for Las Cruces. Miscellaneous unit costs are summarized in Table 3.
- **Equipment Production Factors**: Productions factors for each type of equipment are presented in Table 4.
- **Material Swell**: Swell of stockpile, tailing and cover material added to volume is shown on Table 4.
- **Pullback Operations**: All pullback operations will be completed using a Hitachi 5300-3 hydraulic shovel and Komatsu 530M mechanical rear dump truck.

2.2 Reclamation Areas

The complete backfill scenario is based on completely backfilling the pits to a level surface. The conceptual designs and associated earthwork cost estimate for the partial backfill scenario are based on an interbench outslope gradient of 2.5:1 (horizontal:vertical), approximate 25-foot wide terrace benches, and maximum 175-foot inter-bench slope lengths to allow for flexibility in the final design of the terrace benches and associated surface water conveyance channels. With these designs, the overall outslope gradient is 2.88H:1V.

The main activities that will occur in complete backfill scenario are:

- Hauling and grading backfill material from the closest stockpile source
- Hauling and grading cover material
- Ripping and revegetation of covered areas
- Installing three pit dewatering wells
- Sampling and monitoring one of the three pit dewatering wells
- Completing surface water channels to route storm water.

The main activities that will occur in partial backfill scenario are:

- Hauling and grading backfill material from the closest stockpile source
- Hauling and grading cover material
- Constructing top, terrace/outslope channels, and downdrains/spillways for water collection on backfilled surface
- Ripping and revegetation of covered areas
- Installing three pit dewatering wells
- Installing pit sumps, pumps, pipelines, and electrical infrastructure
- Sampling and monitoring each of the pit sumps and one of the three pit dewatering wells.

The major assumptions for this cost estimate include:

- **Engineering (partial backfill scenario)**: interbench outslope gradient of 2.5:1, approximate 25-foot wide terrace benches, maximum 175-foot inter-bench slope lengths (overall outslope gradient of 2.88H:1V.).
- **Cover**: 36" cover thickness – tops and outslopes.
- **Pullback**: Trucks and loaders with dozer assist perform required pullback of stockpile material.

- **Cover Placement:** Trucks and loaders with dozer assist perform all cover loading and distribution. The economic optimum number of trucks per loader is used for each haul route.
- **Ripping:** Ripping (scarifying) of the final surface is performed at the same time as the revegetation and is included in the revegetation quote.
- **Dust Suppression/Road Maintenance:** Full time water truck and motor grader during reclamation.
- **Channels:** All surface water will be routed to the pit sumps and will not be diverted.

2.3 Earthwork Cost Summary

The interior area earthwork reclamation costs are exhibited in Tables 1a and 1b. Detailed calculations and a summary of material quantities and other engineering take-offs including supporting figures are provided in Appendix A through D of this cost estimate.

3.0 WATER MANAGEMENT

The water management cost estimate includes 100 years of O&M. The cost estimate summary is presented in Tables 1a and 1b.

3.1 Cost Estimate Methods and Assumptions

Water management costs were estimated by:

- Establishing the quantity of water to be managed
- Identifying collection and conveyance system infrastructure requirements
- Estimating infrastructure replacement frequency
- Estimating costs of infrastructure construction, O&M, and removal.

The water management cost estimate is divided into six components: (1) pit sumps, (2) pumps, (3) pipelines, (4) electrical infrastructure, (5) water quality monitoring, and (6) pit dewatering wells. Each component includes any infrastructure required during post-reclamation. Costs are included for construction, equipment replacement and removal (as needed).

It is assumed that surface water captured in the partially backfilled pit will meet applicable standards and will not require treatment. It is also assumed that water captured with the pit dewatering wells will require treatment and the treatment costs are included in the estimate provided in the Tyrone Mine Closure/Closeout Plan Update (Golder, 2007). However, costs are included for post-reclamation water quality monitoring.

Unit costs were taken from several sources including R.S. Means (2010). Miscellaneous unit costs are summarized in Table 3.

3.2 Quantity of Water to be Managed

The sources and quantities of water used in the cost estimate were determined by estimating the average annual storm water runoff from all reclaimed areas.

The average annual storm water runoff from reclaimed areas was determined using the SCS Curve Number Method (USDA, 2004a). A 100-year stochastic daily precipitation data set was developed using the stochastic weather generator CLIGEN (USDA, 2004b). This data set was created by first developing a synthetic 100-year data set for Ft. Bayard, New Mexico, and then scaling the data for Tyrone so that the mean annual precipitation was equal to the 16.0 inches reported in Golder (2007). Areas for each facility were determined using the predicted earthwork revegetation areas. Using a Curve Number of 80 (WMC, 2007) for reclaimed areas, runoff is approximately 4% of the average annual precipitation.

3.3 Water Collection and Conveyance

The following sections present the methods and assumptions used in developing costs for component construction, annual maintenance, periodic replacement and removal. For purposes of this estimate, it was assumed that vegetation would be established and storm water would not require treatment. Cost calculation summaries for pit sumps, pumps, pipelines, and electrical infrastructure are presented in Appendix A. Engineering takeoffs can be found in Appendix C.

3.3.1 Pit Sumps

Assumptions and methods for this portion of the cost estimate include:

- The necessary surface impoundment (ponds) infrastructure will be built during reclamation.
- Membrane lined ponds have a life expectancy of 30 years.
- New and replacement costs were taken from R.S. Means (2010). Miscellaneous unit costs are summarized in Table 3.

- Annual O&M cost for ponds is two percent of the total replacement cost.

Pit sumps were sized to accommodate the 100-year, 24-hour storm event. Runoff from reclaimed areas was determined using the SCS Curve Number Method (USDA, 2004a) and a 100-year, 24-hour rainfall depth of 3.7 inches (WMC, 2007). Areas for each facility were determined using the predicted earthwork revegetation areas. It was assumed that the ponds must accommodate the entire runoff from a single 100-yr, 24-hour event and that each pond had a maximum depth of 20 feet (Appendix A).

3.3.2 Pumps

Assumptions and methods for this portion of the cost estimate include:

- Pump infrastructure will be built during reclamation.
- Pumps have a life expectancy of 20 years.
- Electricity costs $0.06/kWh.
- Pumps will remain in operation during the post-reclamation period.
- New and replacement costs for pumps with capacities greater than 450 gpm were taken from R.S. Means (2010). Miscellaneous unit costs are summarized in Table 3.
- Pipe head loss calculations assume that only a single pump operates when multiple pumps are present.
- Calculations of annual pumping time assume that only a single pump operates when multiple pumps are present (additional pumps are for contingency use only).
- The Chezy head loss coefficient for all pipelines is 150.
- The average pump/motor efficiency is 70 percent.
- Pump station removal costs are $5,000 per installation.
- Annual O&M cost for pumps is five percent of their total replacement cost.

3.3.3 Pipelines

Assumptions and methods for this portion of the cost estimate include:

- Pipeline infrastructure will be built during reclamation.
- Pipeline lengths takeoffs provided by MWH.
- Pipeline diameters were calculated to be sufficiently large to accommodate flow velocities of three feet per second or less.
- HDPE Pipeline life expectancy is 100 years but replaced prior to end-of-life, at 85 years.

- Pipelines will remain in operation during the post-reclamation period.
- New, removal, and replacement costs for pipelines were taken from R.S. Means (2010). Miscellaneous unit costs are summarized in Table 3.
- Annual O&M cost for pipelines is one percent of the total replacement cost.

3.3.4 Electrical Infrastructure

Assumptions and methods for this portion of the cost estimate include:

- Electrical infrastructure will be built during reclamation.
- Electric power lines follow pipeline corridors.
- Power poles will be 30-feet high and spaced at a distance of 100 feet.
- Electrical infrastructure will remain in operation during the post-reclamation period.
- New and replacement costs for electrical power lines were taken from R.S. Means (2010). Miscellaneous unit costs are summarized in Table 3.
- All power lines are high voltage and require a 13-26 kV transformer.
- Each electrical substation and pump control setup costs $5,000.
- Annual O&M cost for electrical systems is one percent of the total replacement cost.

3.3.5 Pit Dewatering Wells

Assumptions and methods for this portion of the cost estimate include:

- Three pit dewatering wells are installed in the Main Pit (24-inch diameter wells with stainless steel 12-inch inner casings).
- The well installation cost for three 275-foot deep wells was obtained from Badger Western and is all inclusive. Therefore the indirect costs of 39.6% were not included in this portion of the estimate.
- The depths of the wells for complete (950 feet) and partial backfill (360 feet) were obtained from MWH. The well installation unit costs were adjusted accordingly.
- Annual O&M cost for channels is 34% of the total construction cost. This is equal to about $10,000 per year for all three wells.
- Pit dewatering wells have a life expectancy of 60 years, and pit pumps 20 years.

3.4 Water Monitoring

Post-closure monitoring of surface and groundwater is generally required in the New Mexico Energy and Natural Resources Department, Mining and Minerals Division permits and New Mexico Environmental Department supplemental discharge permit. For

the first 12 years, sampling and analysis will be completed on a quarterly basis, decreasing to semi-annually for years 13 through 20 and then to annually for years 21 through year 100. The change in number of samples collected and analyzed is accounted for in the long-term O&M cost estimate. Sampling locations, schedule, and cost calculation summaries are presented in Appendix A.

Assumptions for post-reclamation sampling include:

- No labor cost is assigned to the sampling effort. It is assumed that the sampling will be a routine duty for site personnel and does not need an additional cost.
- Analytical costs are estimated based on laboratory pricing guide (Energy Laboratories Inc., 2009). Costs include packaging, handling, shipping, quality assurance/quality control, and lab result report preparation.

3.5 Water Management Cost Summary

The cost estimate presented herein reflects the cost to construct, operate, and maintain the Tyrone incremental interior area water management system during the post-reclamation period. Annual costs estimated for each subsystem were summed to generate a total cost estimate for operational year 1 through year 100. Summaries of the current dollar costs are presented in Tables 1a and 1b.

4.0 REFERENCES

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TABLES

Table 1a Complete Backfill Cost Estimate Summary

Item	Subtotal, Direct Costs	Subtotal, Indirect Costs 39.6%	Total Current Dollar Cost
EARTHWORK			
Main Pit	$700,315,268	$277,324,846	$977,640,115
Savanna	$87,403,880	$34,611,937	$122,015,817
Gettysburg	$116,027,166	$45,946,758	$161,973,924
Copper Mountain	$65,022,547	$25,748,928	$90,771,475
Total Capital Earthwork	**$968,768,861**	**$383,632,469**	**$1,352,401,330**
Total Earthwork Operations and Maintenance	**$149,093,528**	**$59,041,037**	**$208,134,565**
Total Earthwork	**$1,117,862,389**	**$442,673,506**	**$1,560,535,895**
WATER MANAGEMENT			
Environmental Sampling	**$38,680**	**$0**	**$38,680**
Pit Dewatering Wells			
Construction	$7,522,720	$0	$7,522,720
Maintenance	$10,230,445	$0	$10,230,445
Total Wells	**$17,753,165**	**$0**	**$17,753,165**
Total Capital Water Management	**$7,522,720**	**$0**	**$7,522,720**
Total Replacement and Maintenance	**$10,269,125**	**$0**	**$10,269,125**
Total Water Management	**$17,791,845**	**$0**	**$17,791,845**
TOTAL	**$1,135,654,234**	**$442,673,506**	**$1,578,327,739**

Table 1b Partial Backfill Cost Estimate Summary

Item	Subtotal, Direct Costs	Subtotal, Indirect Costs 39.6%	Total Current Dollar Cost
EARTHWORK			
Main Pit	$367,970,021	$145,716,128	$513,686,149
Savanna	$38,528,168	$15,257,155	$53,785,323
Gettysburg	$40,991,199	$16,232,515	$57,223,714
Copper Mountain	$29,044,520	$11,501,630	$40,546,150
Total Capital Earthwork	**$476,533,908**	**$188,707,428**	**$665,241,335**
Total Earthwork Operations and Maintenance	**$73,338,568**	**$29,042,073**	**$102,380,642**
Total Earthwork	**$549,872,476**	**$217,749,501**	**$767,621,977**
WATER MANAGEMENT			
Pit Sumps			
Capital Costs	$218,920	$86,693	$305,613
Replacement Costs	$656,761	$260,078	$916,839
Operations & Maintenance	$437,841	$173,385	$611,226
Total Ponds	**$1,313,523**	**$520,155**	**$1,833,678**
Pumps			
Capital Costs	$147,461	$58,395	$205,856
Replacement Costs	$468,653	$185,586	$654,239
Operations & Maintenance	$1,695,054	$671,241	$2,366,295
Total Pumps	**$2,311,167**	**$915,222**	**$3,226,390**
Pipelines			
Capital Costs	$369,425	$146,292	$515,717
Cost Removal and Replacement	$436,070	$172,684	$608,754
Operations & Maintenance	$805,495	$318,976	$1,124,471
Total Pipelines	**$1,610,991**	**$637,952**	**$2,248,943**
Electrical Infrastructure			
Capital Costs	$575,032	$227,713	$802,745
Cost Removal and Replacement	$0	$0	$0
Operations & Maintenance	$575,032	$227,713	$802,745
Total Electrical Infrastructure	**$1,150,065**	**$455,426**	**$1,605,491**
Environmental Sampling	**$193,400**	**$0**	**$193,400**
Pit Dewatering Wells			
Construction	$2,947,270	$0	$2,947,270
Maintenance	$4,099,342	$0	$4,099,342
Total Wells	**$7,046,612**	**$0**	**$7,046,612**
Total Capital Water Management	**$4,258,109**	**$519,092**	**$4,777,201**
Total Replacement and Maintenance	**$9,367,649**	**$2,009,663**	**$11,377,312**
Total Water Management	**$13,625,757**	**$2,528,755**	**$16,154,513**
TOTAL	**$563,498,233**	**$220,278,256**	**$783,776,490**

Table 2 Fuel, Labor, and Equipment Unit Costs

Parameter	Value	Comment
Revegetation	$1,112.50/acre	Rocky Mountain Reclamation Quote 1/14/10
Fuel	$2.49/gal	Porter Oil Fuel Quote 1/14/10
Dozer Operator	$33.81/hr	Based on NM DOL Rates
Motor Grader (Rough)	$33.81/hr	Based on NM DOL Rates
Mechanic	$33.10/hr	Based on NM DOL Rates
Truck Operator	$24.65/hr	Based on NM DOL Rates
Loader Operator	$33.96/hr	Based on NM DOL Rates
Caterpillar D11R	$413.67/hr	Standard Crawler Dozer
Caterpillar D9R	$176.15/hr	Standard Crawler Dozer
Caterpillar D6R	$70.29/hr	Standard Crawler Dozer
Caterpillar 777F	$282.72/hr	Mechanical Drive Rear Dump
Komatsu 530M	$311.95/hr	Mechanical Drive Rear Dump
Caterpillar 992G	$345.66/hr	4-WD Articulated Loader
Caterpillar 16M	$148.02/hr	Articulated Frame Motor Grader
Off-Highway Water Tanker Truck	$160.04/hr	10,000 Gallon
Hitachi EX3500-3	$774.19/hr	Crawler Mounted Hydraulic Excavator

Description Notes: Labor rates are based on New Mexico Department of Labor Type H labor rates effective January 1, 2010. Equipment hourly rates were obtained from EquipmentWatch (Penton Media, Inc. 2010). Equipment rates were adjusted using a fuel cost of $2.49/gal, mechanics wage of $33.10/hr, sales tax of 7.5%, and annual use hours were increased to reflect a 60 minute work hour. The 50 minute work hour is accounted for in the equipment production calculation.

Table 3 Miscellaneous Unit Costs

Activity	Base No Overhead and Profit[1] Unit Cost $/unit	Units	Scaled Cost Las Cruces 83.5%[2]	Means Line Item	Means Page	Reference
Wood Electrical Utility Poles	733	ea	612	337116.33 6600	348	30' high, excludes excavation, backfill and cast-in-place concrete, R-3 crew
Electrical Cross Arms	283	ea	236	337116.33 7600	348	4' long, includes hardware and insulators, 1 Electrical Crew
Utility Pole Installation a.)	1,160	ea	969	337116.20 0105	347	Digging holes in rock-R-5 Crew
Utility Pole Installation b.)	2,291	ea	1913	337116.20 0250	347	Erect wood poles and backfill holes in rock
Utility Pole Installation c.)	89.2	mi	74	337116.20 0260	347	Disposal of pole and hardware surplus material
Utility Pole Installation d.)	926	ea	773	337116.20 0510	348	Guys, anchors and hardware for pole in rock
Cross Arm Installation a.)	128	ea	107	337116.20 0310	347	Material handling and spotting
Cross Arm Installation b.)	939	ea	784	337116.20 0320	347	Install cross arms
Cross Arm Installation c.)	46.55	mi	39	337116.20 0330	347	Disposal of cross arms and hardware surplus material
Electrical Wiring Installation a.)	536	wire mi	448	337139.13 0110	351	Material handling and spotting-conductors, primary circuits
Electrical Wiring Installation b.)	10,325	wire mi	8621	337139.13 0150	351	Conductors, per wire, 210-636 kcmil
Potential Transformers	4,533	ea	3785	337126.26 4100	351	13 to 26 kV
Pipe Removal	2.95	lf	2	024113.38-1800	25	Site Demo, pipe removal, sewer/water no exc., plastic pipe, 10"-18" diameter
Pipe Disposal	6.44	cy	5	02220.875-5500	-	Site demolition, disposal on site updated from $6.44 in 2008
Excavation of Soil	5.11	cy	4	G1030120 1600	432	3/4 C.Y. backhoe, three 8 C.Y. dump trucks, 1 mi round trip. This value removes the profit for equipment (10%) and the profit/overhead for labor of the operator of a shovel (49.7%).
Reservoir Liners HDPE	1.9	sf	2	334713.53 1200	338	Membrane lining, 2X60 mil thick
Utility Pump	22,075	ea	18433	221123.10 3190	170	Single stage, double suction 75 HP, 2500 gpm pump
Water Supply Piping	52.05	lf	43	331113.35 0700	319	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 16" diameter
Well Construction	$2,585	lf	-	-	-	Well Construction with 24” casing advance. Badger - Western Exploration, July 2, 2010,
Pump	$12,500	ea	-	-	-	- 500gpm at 250 nph; Includes associated install, wiring, etc. Badger - Western Exploration, July 2, 2010,
Pit Dewatering Well Construction	$39,323	ea	-	-	-	Cost includes: Mobilization & Demobilization, well head completion, well development, pumping test support, and non-drill time. Badger - Western Exploration, July 2, 2010,
Riprap or Gravel	15.98	cy	-	-	-	2007 August Production - McCain Springs Quarry, escalated to 2009 costs.
Spillway Grading (stockpiles)	7.53	ft	-	-	-	Excavate and waste material on slopes with D11R, 175-foot downslope excavation, 200-foot lateral waste push. Finish grade with D6R, 175-foot typical push distance, unit volume per LF. Uses dozer sheet adjustment factors.
Bench Grading	1.44	ft	-	-	-	Excavate and waste material on slopes with D11R, 175 ft downslope excavation. Finish grade benches using D9R. Three passes per bench, 1 MPH operating speed. Grading benches 15 ft wide, 4.33 cy cut-to-fill/ft of bench.
Terrace Channel	1.58	ft	-	-	-	Excavate and waste material with D11R, 175-foot excavation, 200-foot lateral waste push. Finish grade with D6R, 175-foot typical push distance, unit volume per LF. Uses dozer sheet adjustment factors.
Top/Outslope Channel	8.59	ft	-	-	-	Excavate and waste material with D11R, 175-foot excavation, 200-foot lateral waste push. Finish grade with D6R, 175-foot typical push distance, unit volume per LF. Uses dozer adjustment factors.
Rip Rap or Gravel Haul	9.39	cy	7.84	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile RT.
Rip Rap or Gravel Backfill	1.46	cy	1.22	312323.14 5200 312323.23 5040	227, 251	Gravel Backfill, 300 hp dozer & compactors, 150' haul, 6” lifts, 4 passes.

1) Overhead and Profit are not included in the direct costs.
2) City Cost Index Las Cruces-Total 83.5% R.S. Means Heavy Construction Cost Data 24th Annual Edition 2010 pg. 534.
3) R.S. Means Heavy Construction Cost Data 24th Annual Edition 2010.
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Table 4 Equipment Production Factors

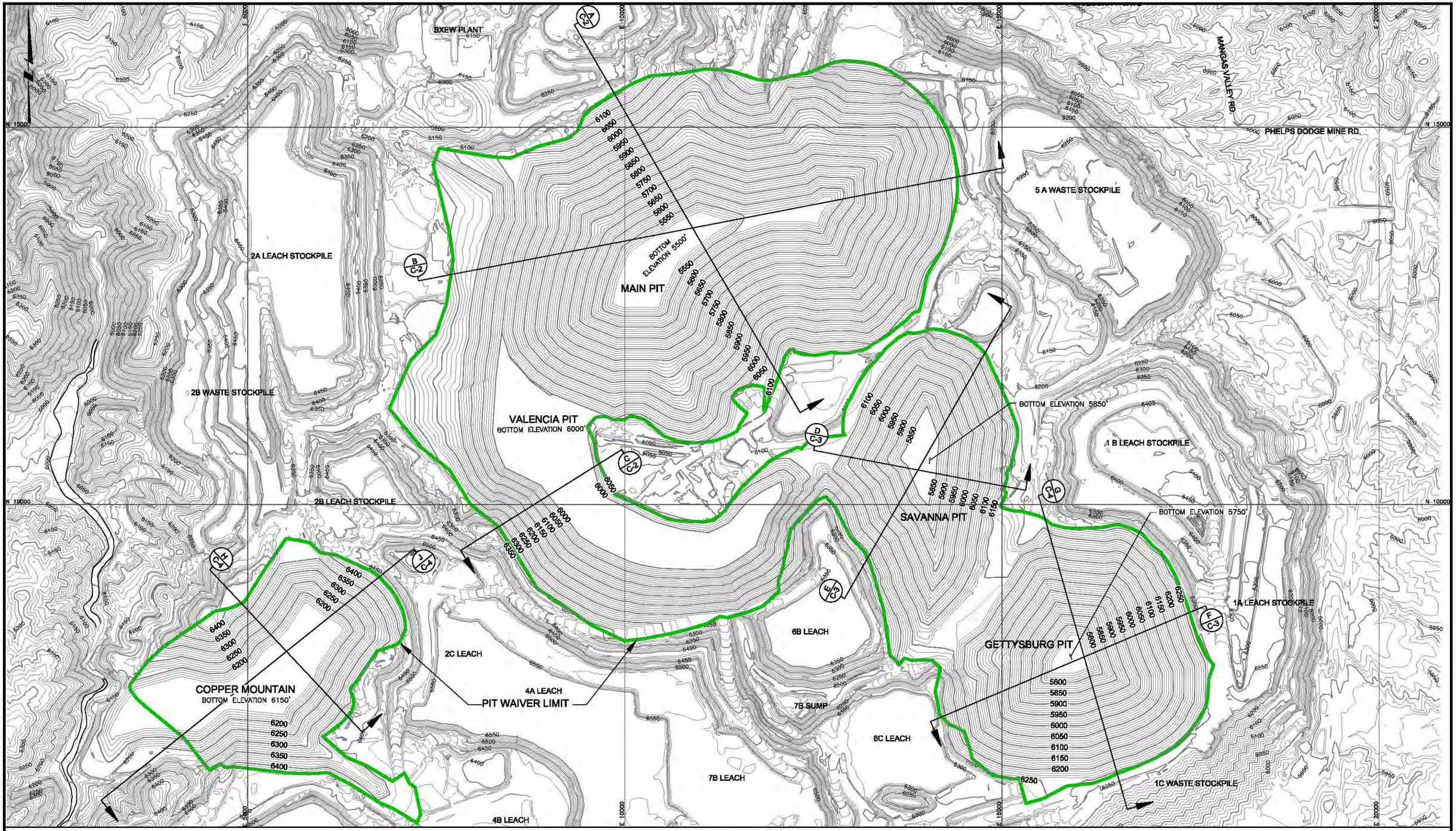
Parameter	Value	Comment/Reference
Swell Factor Stockpiles	15% Pushdown 15% Load cover 15% Haul cover	-
Grading (D11R, D9R, D6R)		
Operator Factor	0.75 Stockpile	(CPH 38, 1-46)
Material Factor	1.2 - Cover	(CPH 38, 1-46)
Work Hour	50 min Stockpile	-
Grade Factor – Tops	0.98 - Stockpile	(CPH 38, 1-46)
Soil Weight	2900 lb/cy Gila Conglomerate	-
Production Method/ Blade Factor	1.2 – Slot	(CPH 38, 1-46)
Visibility Factor	1.0	Clear (CPH 38, 1-46)
Elevation Factor	1.0	(CPH 38, 27-5)
Direct Drive Transmission	1.0	-
Loader (992G)		
Rated Bucket Capacity (cy)	16.00	(CPH 38, 12-59)
Loader Cycle Time	0.65	Use D11R dozer assist while loading (CPH 38, 12-80) Avg 0.6-0.7
Bucket Fill Factor	0.875	(CPH 38, 12-80) Avg 0.85-0.90 Loose Material 1" and over
Work Hour (min/hr)	50	-
Shovel (Hitachi EX3500-3 / CAT 5230B FS) [(1)]		
Rated Bucket Capacity (cy)	23.5	(CPH 35, 4-233)
Loader Cycle Time	0.45	(CPH 35, 4-236, 5230B FS)
Bucket Fill Factor	1.025	(CPH 35, 4-236) Avg Rock-Earth Mix 100-105%
Work Hour (min/hr)	50	-
Trucks (777F)		
Struck Capacity (cy)	54.8	(CPH 38, 9-5)
Heaped Capacity(cy)	78.8	(CPH 38, 9-5)
Rolling Resistance (%)	4.0%	(CPH 38, 27-1)
Truck Exchange Time (min)	0.7	(CPH 38, 9-12) Avg. 0.6-0.8
Dump/Maneuver Time (min)	1.1	(CPH 38, 9-12) Avg 1.0-1.2
Work Hour (min/hr)	50	-
Trucks (Komatsu 530M / CAT 785C) [(2)]		
Struck Capacity 530M (cy)	74	Equipment Watch Spec Sheet
Heaped Capacity 530M (cy)	102	(CPH 38, 9-6)
Rolling Resistance (%)	4.0%	(CPH 38, 27-1)
Truck Exchange Time (min)	0.7	(CPH 38, 9-12) Avg. 0.6-0.8
Dump/Maneuver Time (min)	1.1	(CPH 38, 9-12) Avg 1.0-1.2
Work Hour (min/hr)	50	-

CPH = Caterpillar Performance Handbook Edition 35 or 38 (Caterpillar, 2004 and 2008).

[(1)] Performance information is unavailable for the Hitachi EX3500-3; therefore, performance information for the Caterpillar 5230B FS has been used.

[(2)] Performance information is unavailable for the Komatsu 530M, therefore, performance information for the Caterpillar 785C has been used.

DRAWINGS



PLAN

SCALE
600 0 600 1200 FEET
CONTOUR INTERVAL = 10 FEET

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
A	ISSUED FOR REVIEW	C.C.L.	T.E.L.	07/10

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DRAWING REFERENCE(S):
THIS MAP HAS BEEN PRODUCED ACCORDING TO PROCEDURES THAT COMPLY WITH NATIONAL STANDARD FOR SPATIAL DATA ACCURACY (NSSDA) FOR A CONTOUR INTERVAL OF 10—FDOT AND A MAP SCALE OF 1"=400'.THIS COMPUTER PLOTTED MAP WAS GENERATED FROM DATA COMPILED BY DIGITAL STEREO METHODS USING AERIAL PHOTOGRAPHY TAKEN ON SEPTEMBER 11, 2008 BY COOPER AERIAL SURVEYS CO.

DESIGNED BY	T. LEIDICH	04/10
DRAWN BY	C. LEE	07/10
CHECKED BY	P. HERRIN	07/10
APPROVED BY		
PROJECT MANAGER	T. LEIDICH	07/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

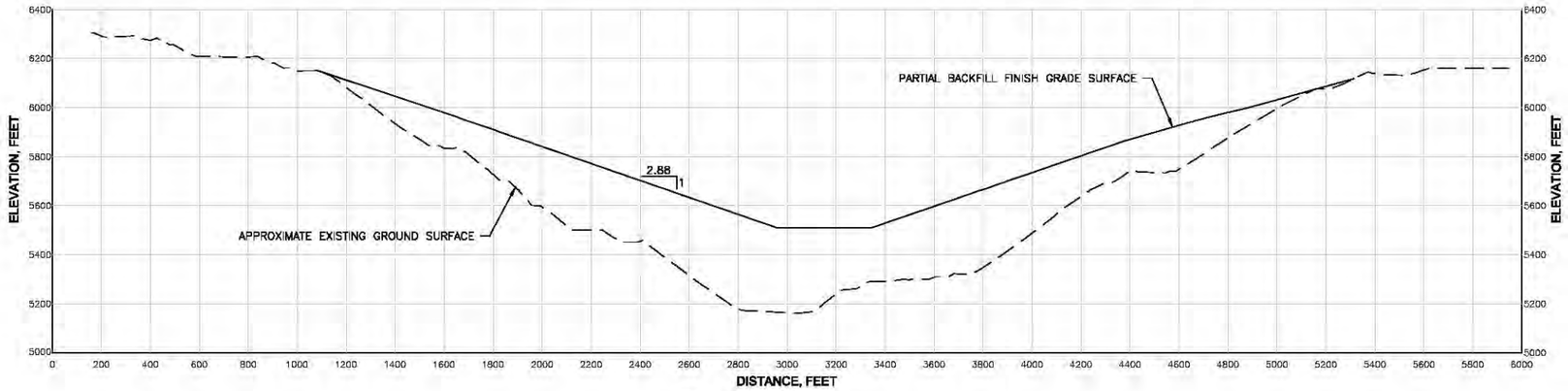
FREEPORT-McMoRAN COPPER & GOLD INC.

PROJECT LOCATION: TYRONE MINE SITE
PROJECT: PARTIAL BACKFILL CONCEPT
TITLE: PLAN VIEW - PARTIAL PIT BACKFILL FOR PIT WAIVER ANALYSIS

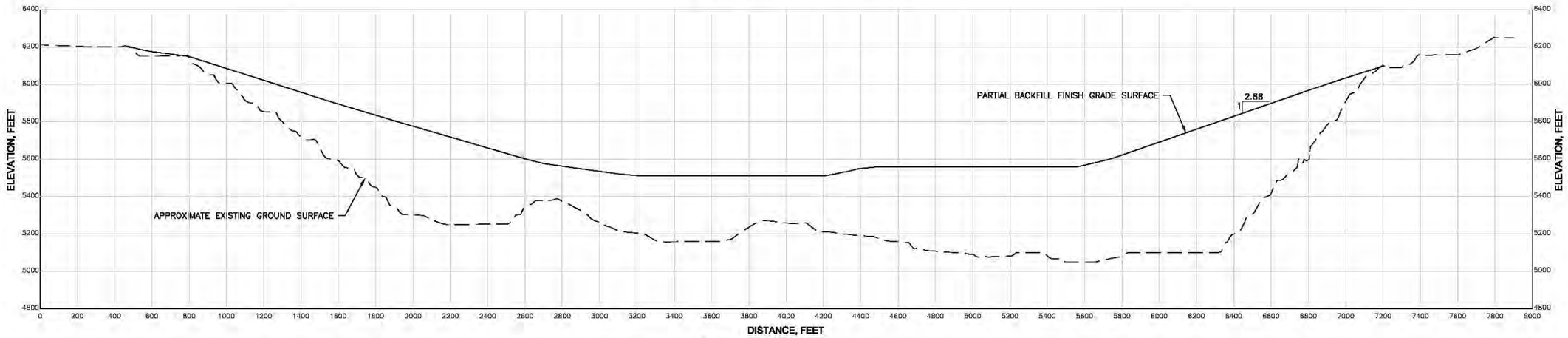
MWH

DRAWING: C-1 REVISION: A
FILE NAME: 1008011D003

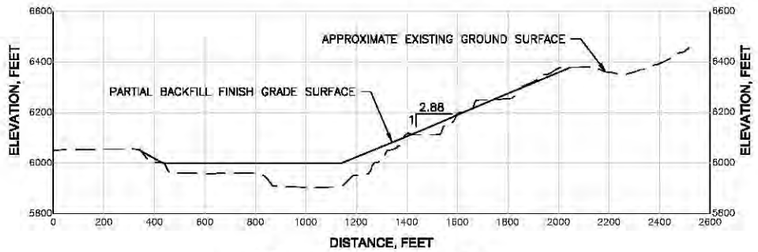
M:\Clients-A-H\Freeport McMoRan\1008011 - G & K TYRONE BOND\03-Sheet Set\1008011D003



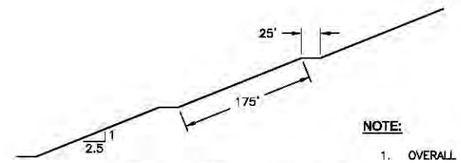
A / C-1 **MAIN PIT**
(LOOKING NORTHEAST)
SCALE 300 0 300 600 FEET



B / C-1 **MAIN PIT**
(LOOKING NORTHWEST)
SCALE 300 0 300 600 FEET



C / C-1 **MAIN PIT (VALENCIA)**
(LOOKING SOUTHEAST)
SCALE 300 0 300 600 FEET



NOTE:
1. OVERALL SLOPE 2.88H:1V

SLOPE CONFIGURATION
(TYPICAL)
SCALE 100 0 100 200 FEET

REV	DESCRIPTION	C.C.L.	T.E.L.	DATE
A	ISSUED FOR REVIEW	TECH	ENG	07/10

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PROJECT MANAGER	T. LEIDICH	07/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

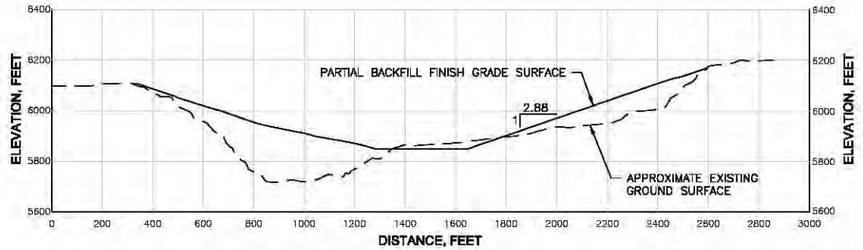
FREEPORT-McMoRAN COPPER & GOLD INC.

PROJECT LOCATION: TYRONE MINE SITE
PROJECT: PARTIAL BACKFILL CONCEPT
TITLE: CROSS SECTIONS - PARTIAL PIT BACKFILL FOR PIT WAIVER ANALYSIS

MWH

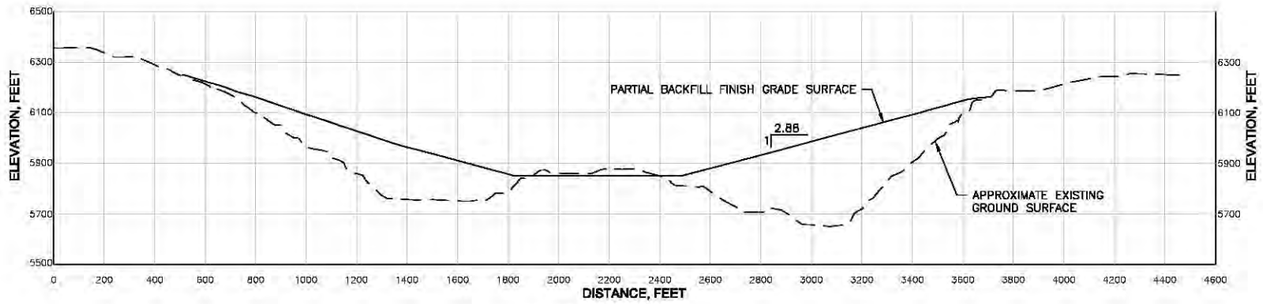
DRAWING: C-2 | REVISION: A
FILE NAME: 1008011D004

M:\Clients-A-H\Freeport McMoRan\1008011 - O & K TYRONE BOND\013 - Sheet Set\1008011D004



D C-1 **SAVANNA PIT**
(LOOKING NORTHEAST)

SCALE
300 0 300 600 FEET



E C-1 **SAVANNA PIT**
(LOOKING NORTHWEST)

SCALE
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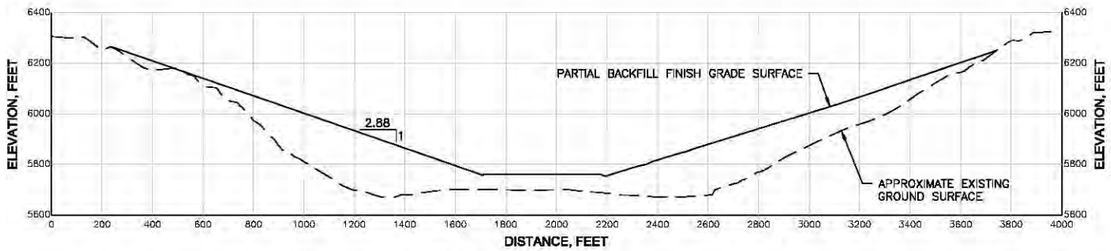
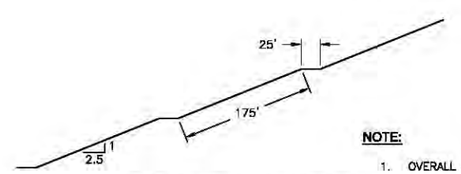


F C-1 **GETTYSBURG PIT**
(LOOKING SOUTHEAST)

SCALE
300 0 300 600 FEET



NOTE:

1. OVERALL SLOPE 2.88H:1V

SLOPE CONFIGURATION
(TYPICAL)

SCALE
100 0 100 200 FEET

ISSUE REV	DESCRIPTION	C.C.L. TECH	T.E.L. ENG	DATE
A	ISSUED FOR REVIEW	C.C.L.	T.E.L.	07/10

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PROJECT MANAGER	T. LEIDICH	07/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

FREEPORT-McMoRAN COPPER & GOLD INC.

PROJECT LOCATION: TYRONE MINE SITE
PROJECT: PARTIAL BACKFILL CONCEPT
TITLE: CROSS SECTIONS - PARTIAL PIT BACKFILL FOR PIT WAIVER ANALYSIS

MWH

DRAWING: C-3
REVISION: A
FILE NAME: 1008011D005

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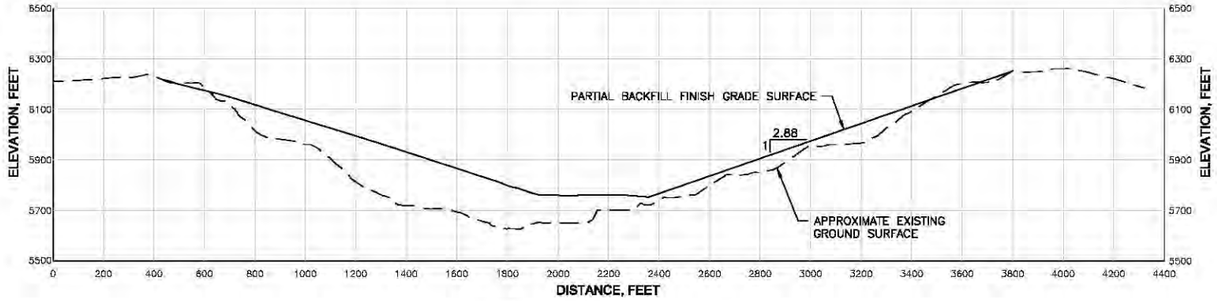
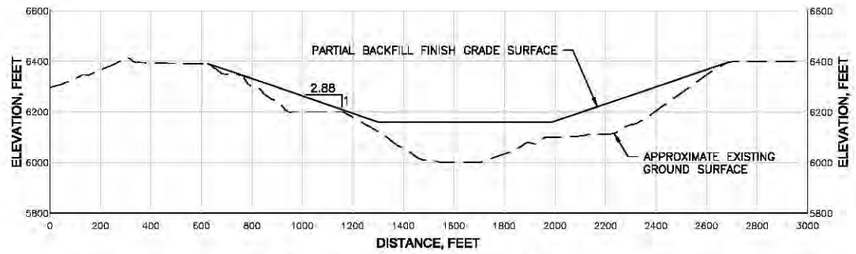
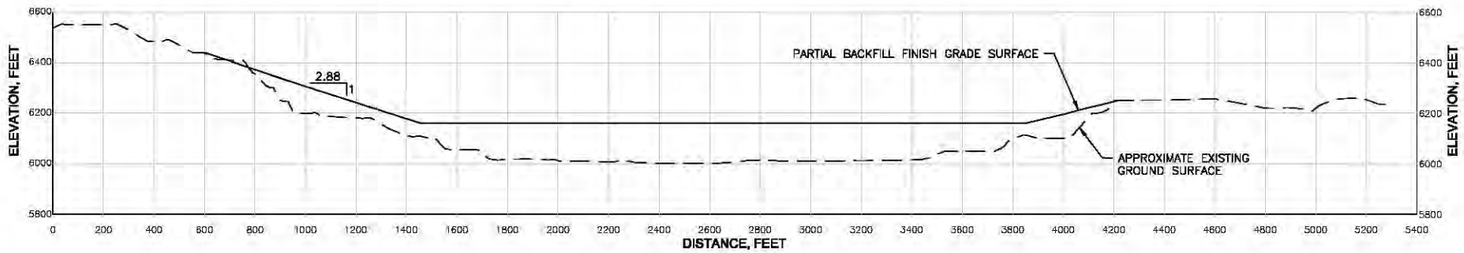


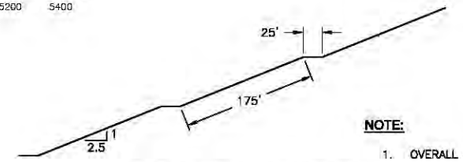
G C-1 **GETTYSBURG PIT**
(LOOKING NORTHEAST)
SCALE 300 0 300 600 FEET



H C-1 **COPPER MOUNTAIN PIT**
(LOOKING NORTHEAST)
SCALE 300 0 300 600 FEET



J C-1 **COPPER MOUNTAIN PIT**
(LOOKING SOUTHEAST)
SCALE 300 0 300 600 FEET



NOTE:
1. OVERALL SLOPE 2.88H:1V

SLOPE CONFIGURATION
(TYPICAL)
SCALE 100 0 100 200 FEET

ISSUE REV	DESCRIPTION	C.C.L. TECH	T.E.L. ENG	DATE
A	ISSUED FOR REVIEW	C.C.L.	T.E.L.	07/10

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CLIENT APPROVAL		
CLIENT REFERENCE NO.		

FREEPORT-McMoRAN COPPER & GOLD INC.

PROJECT LOCATION: TYRONE MINE SITE
PROJECT: PARTIAL BACKFILL CONCEPT
TITLE: CROSS SECTIONS - PARTIAL PIT BACKFILL FOR PIT WAIVER ANALYSIS

MWH

DRAWING: C-4 REVISION: A
FILE NAME: 1008011D008

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APPENDIX A
COST CALCULATION SUMMARY

Partial Backfill

Total Cost Calculation — Tyrone

New Mexico Mining and Minerals Division

General Information — 7/2/2010

Applicant		
Disturbed Surface Area (acres)	1371.0	
Type of Operation	Existing/Surface/Copper	
Recommended MMD Bond		
Current value before escalation and discounting	**$767,621,977**	**Partial Pit Backfill Pit Waiver Reclamation**

Demo cost are addressed elsewhere.

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Item	Description	Location 1	Location 2	Total Haul/Push Distance (ft)	Grade (%)	Equipment
Stockpile Areas						
1138	Dozer Assist	Closest stockpile source	Main Pit truck/shovel	-	see dozer	D11R
1139	Dozer Assist	borrow area 5A	Main Pit Top	-	see dozer	D11R
1141	Dozer Assist	Closest stockpile source	Savanna truck/shovel	-	see dozer	D11R
1142	Dozer Assist	borrow area 5A	Savanna Top	-	see dozer	D11R
1144	Dozer Assist	Closest stockpile source	Gettysburg truck/shovel	-	see dozer	D11R
1145	Dozer Assist	borrow area 5A	Gettysburg Top	-	see dozer	D11R
1147	Dozer Assist	Closest stockpile source	Copper Mtn slope truck/shovel	-	see dozer	D11R
1148	Dozer Assist	borrow area 5A	Copper Mtn Top	-	see dozer	D11R
1202	Load soil	Closest stockpile source	Main Pit truck/shovel			EX3500
1203	Load cover soil	borrow area 5A	Main Pit Top			992G
1205	Load soil	Closest stockpile source	Savanna truck/shovel			EX3500
1206	Load cover soil	borrow area 5A	Savanna Top			992G
1208	Load soil	Closest stockpile source	Gettysburg truck/shovel			EX3500
1209	Load cover soil	borrow area 5A	Gettysburg Top			992G
1211	Load soil	Closest stockpile source	Copper Mtn slope truck/shovel			EX3500
1212	Load cover soil	borrow area 5A	Copper Mtn Top			992G
1252	Haul soil	Closest stockpile source	Main Pit truck/shovel	5,000	see Trucks	530M
1253	Haul cover soil	borrow area 5A	Main Pit Top	6,000	see Trucks	777F
1255	Haul soil	Closest stockpile source	Savanna truck/shovel	3,000	see Trucks	530M
1256	Haul cover soil	borrow area 5A	Savanna Top	4,000	see Trucks	777F
1258	Haul soil	Closest stockpile source	Gettysburg truck/shovel	4,000	see Trucks	530M
1259	Haul cover soil	borrow area 5A	Gettysburg Top	6,000	see Trucks	777F
1261	Haul Soil	Closest stockpile source	Copper Mtn slope truck/shovel	3,500	see Trucks	530M
1262	Haul cover soil	borrow area 5A	Copper Mtn Top	12,000	see Trucks	777F
Other						
1801	Off-Hwy Water Tanker Truck					10,000 gal
1802	Motor Grader					16M

Item	Description	Location 1	Location 2	Area (ac)	Cover Depth (in)	Bank Volume (bcy)	Swell Factor (%)	Over-size Factor (%)	Loose Volume (lcy)
Stockpile Areas									
1138	Dozer Assist	Closest stockpile source	Main Pit truck/shovel			213,300,000	15%		245,295,000
1139	Dozer Assist	borrow area 5A	Main Pit Top			3,915,560	15%		4,502,894
1141	Dozer Assist	Closest stockpile source	Savanna truck/shovel			23,900,000	15%		27,485,000
1142	Dozer Assist	borrow area 5A	Savanna Top			808,280	15%		929,522
1144	Dozer Assist	Closest stockpile source	Gettysburg truck/shovel			22,500,000	15%		25,875,000
1145	Dozer Assist	borrow area 5A	Gettysburg Top			1,118,040	15%		1,285,746
1147	Dozer Assist	Closest stockpile source	Copper Mtn slope truck/shovel			18,900,000	15%		21,735,000
1148	Dozer Assist	borrow area 5A	Copper Mtn Top			793,760	15%		912,824
1202	Load soil	Closest stockpile source	Main Pit truck/shovel			213,300,000	15%		245,295,000
1203	Load cover soil	borrow area 5A	Main Pit Top	809.0	36	3,915,560	15%		4,502,894
1205	Load soil	Closest stockpile source	Savanna truck/shovel			23,900,000	15%		27,485,000
1206	Load cover soil	borrow area 5A	Savanna Top	167.0	36	808,280	15%		929,522
1208	Load soil	Closest stockpile source	Gettysburg truck/shovel			22,500,000	15%		25,875,000
1209	Load cover soil	borrow area 5A	Gettysburg Top	231.0	36	1,118,040	15%		1,285,746
1211	Load soil	Closest stockpile source	Copper Mtn slope truck/shovel			18,900,000	15%		21,735,000
1212	Load cover soil	borrow area 5A	Copper Mtn Top	164.0	36	793,760	15%		912,824
1252	Haul soil	Closest stockpile source	Main Pit truck/shovel			213,300,000	15%		245,295,000
1253	Haul cover soil	borrow area 5A	Main Pit Top			3,915,560	15%		4,502,894
1255	Haul soil	Closest stockpile source	Savanna truck/shovel			23,900,000	15%		27,485,000
1256	Haul cover soil	borrow area 5A	Savanna Top			808,280	15%		929,522
1258	Haul soil	Closest stockpile source	Gettysburg truck/shovel			22,500,000	15%		25,875,000
1259	Haul cover soil	borrow area 5A	Gettysburg Top			1,118,040	15%		1,285,746
1261	Haul Soil	Closest stockpile source	Copper Mtn slope truck/shovel			18,900,000	15%		21,735,000
1262	Haul cover soil	borrow area 5A	Copper Mtn Top			793,760	15%		912,824
1602	Grade cover soil	Main Pit Top	-			3,915,560	15%		4,502,894
1604	Grade cover soil	Savanna Top	-			808,280	15%		929,522
1606	Grade cover soil	Gettysburg Top	-			1,118,040	15%		1,285,746
1608	Grade cover soil	Copper Mtn Top	-			793,760	15%		912,824

Total Cost Calculation — Tyrone
New Mexico Mining and Minerals Division — Worksheet #5
Productivity and Hours Required for Dozer Use---Earthmoving — 07/02/10

							PERFORMANCE FACTORS												
Task Description	Location 1	Location 2	Equipment	Material Handling Multiplier (cy)	Productivity (cy/hr)	Total Task Time (hours)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.	Grade (%)
Stockpile Areas																		
Dozer Assist	Closest stockpile source	Main Pit truck/shovel	D11R	N/A	N/A	91,651	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	borrow area 5A	Main Pit Top	D11R	N/A	N/A	4,181	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	Closest stockpile source	Savanna truck/shovel	D11R	N/A	N/A	10,269	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	borrow area 5A	Savanna Top	D11R	N/A	N/A	863	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	Closest stockpile source	Gettysburg truck/shovel	D11R	N/A	N/A	9,668	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	borrow area 5A	Gettysburg Top	D11R	N/A	N/A	1,194	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	Closest stockpile source	Copper Mtn slope truck/shovel	D11R	N/A	N/A	8,121	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	borrow area 5A	Copper Mtn Top	D11R	N/A	N/A	848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Total Cost Calculation — Tyrone
New Mexico Mining and Minerals Division — Worksheet #6
Productivity and Hours Required for Dozer Use---Grading — 07/02/10

							PERFORMANCE FACTORS											
Task Description	Location 1	Location 2	Equipment	Volume (cy)	Productivity (cy/hr)	Task Time (hours)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.	Grade (%)	Operator	Maximum Push Distance (feet)	Normal Production (cy/hr)
Stockpile Areas																		
Grade cover soil	Main Pit Top	-	D11R	4,502,894	2,071.9	2,173.3	1.2	1.0	2,900	1.20	50	1.00	1.00	1.00	1.0	0.75	100	2962
Grade cover soil	Savanna Top	-	D11R	929,522	2,071.9	448.6	1.2	1.0	2,900	1.20	50	1.00	1.00	1.00	1.0	0.75	100	2962
Grade cover soil	Gettysburg Top	-	D11R	1,285,746	2,071.9	620.6	1.2	1.0	2,900	1.20	50	1.00	1.00	1.00	1.0	0.75	100	2962
Grade cover soil	Copper Mtn Top	-	D11R	912,824	2,071.9	440.6	1.2	1.0	2,900	1.20	50	1.00	1.00	1.00	1.0	0.75	100	2962

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												PERFORMANCE FACTORS							
Task Description	Location 1	Location 2	Equipment	Volume (cy)	Truck Cycle Time (min)	Optimum No. of Trucks	Productivity (cy/hr)	Task Time (hrs)	Struck Capacity (cy)	Heaped Capacity (cy)	Loader Cycles per Truck	Total Haul Distance (feet)	**Haul Distance Segment 1 (feet)	**Haul Distance Segment 2 (feet)	**Haul Distance Segment 3 (feet)	**Haul Grade Segment 1 (%)	**Haul Grade Segment 2 (%)	**Haul Grade Segment 3 (%)	Rolling Resistance (%)
Stockpile Areas																			
Haul soil	Closest stockpile source	Main Pit truck/shovel	530M	245,295,000	9.3	5	2,597	94,468	74.0	102.0	4	5,000	5,000	-	-	-10.0%	-	-	4.0%
Haul cover soil	borrow area 5A	Main Pit Top	777F	4,502,894	11.5	3	917	4,912	54.8	78.8	5	6,000	6,000	-	-	2.00%	-	-	4.0%
Haul soil	Closest stockpile source	Savanna truck/shovel	530M	27,485,000	7.0	4	2,751	10,269	74.0	102.0	4	3,000	3,000	-	-	-10.00%	-	-	4.0%
Haul cover soil	borrow area 5A	Savanna Top	777F	929,522	9.3	3	1,127	863	54.8	78.8	5	4,000	4,000	-	-	2.00%	-	-	4.0%
Haul soil	Closest stockpile source	Gettysburg truck/shovel	530M	25,875,000	8.1	4	2,367	10,932	74.0	102.0	4	4,000	4,000	-	-	-10.00%	-	-	4.0%
Haul cover soil	borrow area 5A	Gettysburg Top	777F	1,285,746	11.5	3	917	1,403	54.8	78.8	5	6,000	6,000	-	-	2.00%	-	-	4.0%
Haul Soil	Closest stockpile source	Copper Mtn slope truck/shovel	530M	21,735,000	7.6	4	2,544	8,542	74.0	102.0	4	3,500	3,500	-	-	-10.00%	-	-	4.0%
Haul cover soil	borrow area 5A	Copper Mtn Top	777F	912,824	17.9	5	980	932	54.8	78.8	5	12,000	12,000	-	-	2.00%	-	-	4.0%

Task Description	Location 1	Location 2	Haul Distance Segment 1 (meters)	Haul Effective Grade Segment 1 (%)	Return Effective Grade Segment 1 (%)	Haul Time (min)	Return Time (min)	Loading Time (min)	Load/ Maneuver Time (min)	Dump/ Maneuver Time (min)	Work Hour (min/hr)	Travel Time Loaded Segment 1 (min/m)	Travel Time Empty Segment 1 (min/m)
Stockpile Areas													
Haul soil	Closest stockpile source	Main Pit truck/shovel	1,524	0%	14%	1.7	4.0	1.8	0.7	1.1	50	0.00110	0.00262
Haul cover soil	borrow area 5A	Main Pit Top	1,829	6%	2%	4.9	1.5	3.3	0.7	1.1	50	0.00269	0.00081
Haul soil	Closest stockpile source	Savanna truck/shovel	914	0%	14%	1.0	2.4	1.8	0.7	1.1	50	0.00110	0.00262
Haul cover soil	borrow area 5A	Savanna Top	1,219	6%	2%	3.3	1.0	3.3	0.7	1.1	50	0.00269	0.00081
Haul soil	Closest stockpile source	Gettysburg truck/shovel	1,219	0%	14%	1.3	3.2	1.8	0.7	1.1	50	0.00110	0.00262
Haul cover soil	borrow area 5A	Gettysburg Top	1,829	6%	2%	4.9	1.5	3.3	0.7	1.1	50	0.00269	0.00081
Haul Soil	Closest stockpile source	Copper Mtn slope truck/shovel	1,067	0%	14%	1.2	2.8	1.8	0.7	1.1	50	0.00110	0.00262
Haul cover soil	borrow area 5A	Copper Mtn Top	3,658	6%	2%	9.8	3.0	3.3	0.7	1.1	50	0.00269	0.00081

Total Cost Calculation — Tyrone
New Mexico Mining and Minerals Division — Worksheet #10
Productivity for Front End Loader — 7/2/2010

Task Description	Location 1	Location 2	Equipment	Volume (cy)	Net Bucket Capacity (cy)	Loader Cycle Time (min)	Productivity (cy/hr)	Task Time (hours)	PERFORMANCE FACTORS: Rated Bucket Capacity (cy)	PERFORMANCE FACTORS: Bucket Fill Factor	PERFORMANCE FACTORS: Work Hour (min/hr)
Stockpile Areas											
Load soil	Closest stockpile source	Main Pit truck/shovel	EX3500	245,295,000	24.1	0.45	2,676	91,651	23.50	1.025	50
Load cover soil	borrow area 5A	Main Pit Top	992G	4,502,894	14.0	0.65	1,077	4,181	16.00	0.875	50
Load soil	Closest stockpile source	Savanna truck/shovel	EX3500	27,485,000	24.1	0.45	2,676	10,269	23.50	1.025	50
Load cover soil	borrow area 5A	Savanna Top	992G	929,522	14.0	0.65	1,077	863	16.00	0.875	50
Load soil	Closest stockpile source	Gettysburg truck/shovel	EX3500	25,875,000	24.1	0.45	2,676	9,668	23.50	1.025	50
Load cover soil	borrow area 5A	Gettysburg Top	992G	1,285,746	14.0	0.65	1,077	1,194	16.00	0.875	50
Load soil	Closest stockpile source	Copper Mtn slope truck/shovel	EX3500	21,735,000	24.1	0.45	2,676	8,121	23.50	1.025	50
Load cover soil	borrow area 5A	Copper Mtn Top	992G	912,824	14.0	0.65	1,077	848	16.00	0.875	50

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Total Cost Calculation
New Mexico Mining and Minerals Division
Summary Calculation of Earthmoving Costs

Tyrone
Worksheet #13
07/02/10

Equipment Type	Task	Location 1	Location 2	Owning and Operating Cost ($/hr)	Labor Cost ($/hr)	Number of Units (Equipment)	Time Req'd (hrs)	Total Cost ($)	Total Production	Prod. Unit	Unit Cost ($/unit)
Stockpile Areas											
Dozers-Earthmoving											
D11R	Dozer Assist	Closest stockpile source	Main Pit truck/shovel	413.67	33.81	2	91,651	82,024,728	213,300,000	cy	0.38
D11R	Dozer Assist	borrow area 5A	Main Pit Top	413.67	33.81	1	4,181	1,871,037	3,915,560	cy	0.48
D11R	Dozer Assist	Closest stockpile source	Savanna truck/shovel	413.67	33.81	2	10,269	9,190,769	23,900,000	cy	0.38
D11R	Dozer Assist	borrow area 5A	Savanna Top	413.67	33.81	1	863	386,234	808,280	cy	0.48
D11R	Dozer Assist	Closest stockpile source	Gettysburg truck/shovel	413.67	33.81	2	9,668	8,652,398	22,500,000	cy	0.38
D11R	Dozer Assist	borrow area 5A	Gettysburg Top	413.67	33.81	1	1,194	534,252	1,118,040	cy	0.48
D11R	Dozer Assist	Closest stockpile source	Copper Mtn slope truck/shovel	413.67	33.81	2	8,121	3,634,007	18,900,000	cy	0.19
D11R	Dozer Assist	borrow area 5A	Copper Mtn Top	413.67	33.81	1	848	379,296	793,760	cy	0.48
Dozers-Grading											
D11R	Grade cover soil	Main Pit Top	-	413.67	33.81	1	2,173.3	972,531	4,502,894.0	cy	0.22
D11R	Grade cover soil	Savanna Top	-	413.67	33.81	1	448.6	200,757	929,522.0	cy	0.22
D11R	Grade cover soil	Gettysburg Top	-	413.67	33.81	1	620.6	277,694	1,285,746.0	cy	0.22
D11R	Grade cover soil	Copper Mtn Top	-	413.67	33.81	1	440.6	197,151	912,824.0	cy	0.22
Loaders											
EX3500	Load soil	Closest stockpile source	Main Pit truck/shovel	774.19	33.96	1	94,468	76,343,866	245,295,000	cy	0.31
992G	Load cover soil	borrow area 5A	Main Pit Top	345.66	33.96	1	4,912	1,864,802	4,502,894	cy	0.41
EX3500	Load soil	Closest stockpile source	Savanna truck/shovel	774.19	33.96	1	10,269	8,299,230	27,485,000	cy	0.30
992G	Load cover soil	borrow area 5A	Savanna Top	345.66	33.96	1	863	327,662	929,522	cy	0.35
EX3500	Load soil	Closest stockpile source	Gettysburg truck/shovel	774.19	33.96	1	10,932	8,834,459	25,875,000	cy	0.34
992G	Load cover soil	borrow area 5A	Gettysburg Top	345.66	33.96	1	1,403	532,471	1,285,746	cy	0.41
EX3500	Load soil	Closest stockpile source	Copper Mtn slope truck/shovel	774.19	33.96	1	8,542	6,903,514	21,735,000	cy	0.32
992G	Load cover soil	borrow area 5A	Copper Mtn Top	345.66	33.96	1	932	353,640	912,824	cy	0.39
Trucks											
530M	Haul soil	Closest stockpile source	Main Pit truck/shovel	311.95	24.65	5	472,338	158,987,586	245,295,000	cy	0.65
777F	Haul cover soil	borrow area 5A	Main Pit Top	282.72	24.65	3	14,737	4,529,699	4,502,894	cy	1.01
530M	Haul soil	Closest stockpile source	Savanna truck/shovel	311.95	24.65	4	41,078	13,826,646	27,485,000	cy	0.50
777F	Haul cover soil	borrow area 5A	Savanna Top	282.72	24.65	3	2,589	795,908	929,522	cy	0.86
530M	Haul soil	Closest stockpile source	Gettysburg truck/shovel	311.95	24.65	4	43,727	14,718,346	25,875,000	cy	0.57
777F	Haul cover soil	borrow area 5A	Gettysburg Top	282.72	24.65	3	4,208	1,293,400	1,285,746	cy	1.01
530M	Haul Soil	Closest stockpile source	Copper Mtn slope truck/shovel	311.95	24.65	4	34,170	11,501,362	21,735,000	cy	0.53
777F	Haul cover soil	borrow area 5A	Copper Mtn Top	282.72	24.65	5	4,658	1,431,682	912,824	cy	1.57
Water Truck and Grader											
Off-Hwy Water Tanker Truck		Main Pit truck/shovel		160.04	24.65	-	94,468	17,447,571			
Off-Hwy Water Tanker Truck		Main Pit Top		160.04	24.65	-	4,912	907,264			
Off-Hwy Water Tanker Truck		Savanna truck/shovel		160.04	24.65	-	10,269	1,896,700			
Off-Hwy Water Tanker Truck		Savanna Top		160.04	24.65	-	863	159,414			
Off-Hwy Water Tanker Truck		Gettysburg truck/shovel		160.04	24.65	-	10,932	2,019,021			
Off-Hwy Water Tanker Truck		Gettysburg Top		160.04	24.65	-	1,403	259,058			
Off-Hwy Water Tanker Truck		Copper Mtn slope truck/shovel		160.04	24.65	-	8,542	1,577,724			
Off-Hwy Water Tanker Truck		Copper Mtn Top		160.04	24.65	-	932	172,053			
Motor Grader		Main Pit truck/shovel		148.02	33.81	-	94,467.6	17,177,228			
Motor Grader		Main Pit Top		148.02	33.81	-	4,912.3	893,206			
Motor Grader		Savanna truck/shovel		148.02	33.81	-	10,269.4	1,867,311			
Motor Grader		Savanna Top		148.02	33.81	-	863.1	156,944			
Motor Grader		Gettysburg truck/shovel		148.02	33.81	-	10,931.7	1,987,737			
Motor Grader		Gettysburg Top		148.02	33.81	-	1,402.6	255,044			
Motor Grader		Copper Mtn slope truck/shovel		148.02	33.81	-	8,542.4	1,553,278			
Motor Grader		Copper Mtn Top		148.02	33.81	-	931.6	169,387			

Main Pit truck/shovel	351,980,979
Main Pit Top	11,038,539
Savanna truck/shovel	35,080,655
Savanna Top	2,026,920
Gettysburg truck/shovel	36,211,959
Gettysburg Top	3,151,919
Copper Mtn slope truck/sh	25,169,884
Copper Mtn Top	2,703,208
Total Cost	**$467,364,062**
Q/A Check ->	$ 467,364,062

EQUIPMENT Equipment Description	Fuel Consumption (gal/hr)	Fuel Cost ($/hr)	Owning and Operating Cost (w/out fuel) ($/hr)	Fuel-Adjusted Own/Op Cost ($/hr)	Reference
Cat D11R Bulldozer w/universal blade	29.75	$74.05	$339.62	$413.67	1
Cat D9R Bulldozer w/semi universal blade	14.35	$35.72	$140.43	$176.15	1
Cat D6R Series II Bulldozer	6.44	$16.02	$54.27	$70.29	1
Cat 777F Truck	18.76	$46.69	$236.03	$282.72	1
Cat 992G Loader	25.31	$63.00	$282.66	$345.66	1
Cat 16M Motor Grader	9.51	$23.66	$124.36	$148.02	1
Off-Hwy Water Tanker Truck, 10,000-gal.	15.35	$38.19	$121.85	$160.04	1
Komatsu 530M	27.54	$68.55	$243.40	$311.95	1
Hitachi EX3500-3	71.90	$178.95	$595.24	$774.19	1

1. Equipment Watch Version 4.0.4A (http://www.equipmentwatch.com). See attachments for rate development.

FUEL

Oil Broker Quote	$2.5 per gallon	2

2. Porter Oil, Bayard, NM (January 14, 2010).

LABOR Labor Description	NMDOL Type A Operator Group	NMDOL Type A Operator Classification	Nominal Total Rate ($/hr)	
Cat D11R Bulldozer w/universal blade	Equipment Operator IV	Bulldozer (mult. Units)	33.814	3
Cat D9R Bulldozer w/semi universal blade	Equipment Operator IV	Bulldozer (mult. Units)	33.814	3
Cat D6R Series II Bulldozer	Equipment Operator IV	Bulldozer (mult. Units)	33.814	3
Haul Truck	Equipment Operator III	Teamster	24.65	3
Loader	Equipment Operator VI	Loader (over 10 cy)	33.962	3
Cat 16H Motor Grader	Equipment Operator IV	Motor Grader	33.814	3
Off-Hwy Water Tanker Truck, 10,000-gal.	Equipment Operator III	Teamster	24.65	3
Light Duty Truck, 4x4, 1 ton, 195 HP (Mecha	Equipment Operator VI	Mechanic	$33.10	3

3. Labor rates based on NM Department of Labor Type H (Heavy Engineering) labor rates. See attachments for rate development.

Data Sources:

Equipment Watch
https:www.equipmentwatch.com

Total Cost Calculation — Tyrone
New Mexico Mining and Minerals Division — Worksheet #14
Revegetation Costs — 07/02/10

Description:

Plow; apply fertilizer, seed mix, and mulch; and crimp mulch

Unit or Disturbance	(acres)	Unit Cost ($/acre)	Subtotal Cost ($)	Area Reference
Stockpile Areas				
Main Pit Top	809	1,112.50	900,013	Rocky Mountain Reclamation, Larmie WY (January, 2010). Quote includes cost for scarifying (ripping) surface.
Savanna Top	167	1,112.50	185,788	Rocky Mountain Reclamation, Larmie WY (January, 2010). Quote includes cost for scarifying (ripping) surface.
Gettysburg Top	231	1,112.50	256,988	Rocky Mountain Reclamation, Larmie WY (January, 2010). Quote includes cost for scarifying (ripping) surface.
Copper Mtn Top	164	1,112.50	182,450	Rocky Mountain Reclamation, Larmie WY (January, 2010). Quote includes cost for scarifying (ripping) surface.

Main Pit Top	900,013
Savanna Top	185,788
Gettysburg Top	256,988
Copper Mtn Top	182,450
Total Cost	**$1,525,238**
Q/A check->	$1,525,238

Stockpiles Area	Activity	Quantity	Unit	Unit Cost ($/unit)	Current Item Cost ($)	Reference	Means Line Item	Means Page	Description
Spillways									
Main Pit Outslope	Spillway Grading	6,800	ft	7.53	51,204	Estimate			See Note 3 for unit cost
Savanna Outslope	Spillway Grading	3,900	ft	7.53	29,367	Estimate			See Note 3 for unit cost
Gettysburg Outslope	Spillway Grading	3,500	ft	7.53	26,355	Estimate			See Note 3 for unit cost
Copper Mtn Outslope	Spillway Grading	1,300	ft	7.53	9,789	Estimate			See Note 3 for unit cost
Main Pit Outslope	Spillway Riprap and Gravel (Processed), Haul	32,600	cy	7.84	255,605	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile
Savanna Outslope	Spillway Riprap and Gravel (Processed), Haul	18,700	cy	7.84	146,620	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile
Gettysburg Outslope	Spillway Riprap and Gravel (Processed), Haul	16,800	cy	7.84	131,723	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile
Copper Mtn Outslope	Spillway Riprap and Gravel (Processed), Haul	6,200	cy	7.84	48,612	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile
Main Pit Outslope	Spillway Riprap and Gravel (processed), Backfill	32,600	cy	1.22	39,743	Means	312323.14 5200	227, 251	Gravel backfill…see note 2 for full description
Savanna Outslope	Spillway Riprap and Gravel (processed), Backfill	18,700	cy	1.22	22,797	Means	312323.23 5040	227, 251	Gravel backfill…see note 2 for full description
Gettysburg Outslope	Spillway Riprap and Gravel (processed), Backfill	16,800	cy	1.22	20,481	Means	312323.23 5040	227, 251	Gravel backfill…see note 2 for full description
Copper Mtn Outslope	Spillway Riprap and Gravel (processed), Backfill	6,200	cy	1.22	7,558	Means	312323.14 5200	227, 251	Gravel backfill…see note 2 for full description
Main Pit Outslope	Bench Grading	187,000	ft	1.44	269,280	See Note 4			Grading benches 15 ft wide, 4.22 cy cut-to-fill/ft of benc
Savanna Outslope	Bench Grading	48,000	ft	1.44	69,120	See Note 4			Grading benches 15 ft wide, 4.22 cy cut-to-fill/ft of benc
Gettysburg Outslope	Bench Grading	59,000	ft	1.44	84,960	See Note 4			Grading benches 15 ft wide, 4.22 cy cut-to-fill/ft of benc
Copper Mtn Outslope	Bench Grading	30,000	ft	1.44	43,200	See Note 4			Grading benches 15 ft wide, 4.22 cy cut-to-fill/ft of benc
Channel Excavation									
Main Pit Outslope	Outslope Terrace Channels	187,000	feet	1.58	295,460				Excavation…see note 1 for full description
Savanna Outslope	Outslope Terrace Channels	48,000	feet	1.58	75,840				Excavation…see note 1 for full description
Gettysburg Outslope	Outslope Terrace Channels	59,000	feet	1.58	93,220				Excavation…see note 1 for full description
Copper Mtn Outslope	Outslope Terrace Channels	30,000	feet	1.58	47,400				Excavation…see note 1 for full description
Main Pit Top	Top Channels	3,200	feet	8.59	27,488				Excavation…see note 1 for full description
Copper Mtn Top	Top Channels	5,000	feet	8.59	42,950				Excavation…see note 1 for full description
Riprap & Gravel									
Main Pit Outslope	Outslope Channel Gravel, Haul	74,800	cy	7.84	586,481	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile
Savanna Outslope	Outslope Channel Gravel, Haul	19,200	cy	7.84	150,540	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile
Gettysburg Outslope	Outslope Channel Gravel, Haul	23,600	cy	7.84	185,039	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile
Copper Mtn Outslope	Outslope Channel Gravel, Haul	12,000	cy	7.84	94,088	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile
Main Pit Top	Top Channel Riprap (processed), Haul	4,700	cy	7.84	36,851	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile
Copper Mtn Top	Top Channel Riprap (processed), Haul	7,400	cy	7.84	58,021	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile
Main Pit Top	Top Channel Gravel, Haul	2,400	cy	7.84	18,818	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile
Copper Mtn Top	Top Channel Gravel, Haul	3,800	cy	7.84	29,794	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mile
Main Pit Outslope	Outslope Channel Gravel, Backfill	74,800	cy	1.22	91,189	Means	312323.23 5040	227, 251	Gravel backfill…see note 2 for full description
Savanna Outslope	Outslope Channel Gravel, Backfill	19,200	cy	1.22	23,407	Means	312323.23 5040	227, 251	Gravel backfill…see note 2 for full description
Gettysburg Outslope	Outslope Channel Gravel, Backfill	23,600	cy	1.22	28,771	Means	312323.14 5200	227, 251	Gravel backfill…see note 2 for full description
Copper Mtn Outslope	Outslope Channel Gravel, Backfill	12,000	cy	1.22	14,629	Means	312323.23 5040	227, 251	Gravel backfill…see note 2 for full description
Main Pit Top	Top Channel Riprap, (processed) Backfill	4,700	cy	1.22	5,730	Means	312323.14 5200	227, 251	Gravel backfill…see note 2 for full description
Copper Mtn Top	Top Channel Riprap, (processed) Backfill	7,400	cy	1.22	9,021	Means	312323.23 5040	227, 251	Gravel backfill…see note 2 for full description
Main Pit Top	Top Channel Gravel, Backfill	2,400	cy	1.22	2,926	Means	312323.23 5040	227, 251	Gravel backfill…see note 2 for full description
Copper Mtn Top	Top Channel Gravel, Backfill	3,800	cy	1.22	4,633	Means	312323.23 5040	227, 251	Gravel backfill…see note 2 for full description
Main Pit Outslope	Riprap production (processed)	107,400	cy	15.98	1,716,252	2007 August Production - McCain Springs Quarry, escalated to 2009 costs.			
Main Pit Top	Riprap production (processed)	7,100	cy	15.98	113,458	2007 August Production - McCain Springs Quarry, escalated to 2009 costs.			
Savanna Outslope	Riprap production (processed)	37,900	cy	15.98	605,642	2007 August Production - McCain Springs Quarry, escalated to 2009 costs.			
Gettysburg Outslope	Riprap production (processed)	40,400	cy	15.98	645,592	2007 August Production - McCain Springs Quarry, escalated to 2009 costs.			
Copper Mtn Outslope	Riprap production (processed)	18,200	cy	15.98	290,836	2007 August Production - McCain Springs Quarry, escalated to 2009 costs.			
Copper Mtn Top	Riprap production (processed)	11,200	cy	15.98	178,976	2007 August Production - McCain Springs Quarry, escalated to 2009 costs.			

Main Pit Outslope	3,305,213
Main Pit Top	205,270
Savanna Outslope	1,123,334
Gettysburg Outslope	1,216,141
Copper Mtn Outslope	556,112
Copper Mtn Top	323,395
Total	**$6,729,465**

Q/A check-> $6,729,465

Description Notes:

1) Excavate and waste material with D11R, 175-foot excavation, 200-foot lateral waste push. Finish grade with D6R, 175-foot typical push distance, unit volume per LF. Uses dozer sheet adjustment factors. See attachment Channel Linear Foot Cost
2) Gravel Backfill, 300 hp dozer & compactors, 150' haul, 6" lifts, 4 passes
3) Excavate and waste material on slopes with D11R, 175-foot downslope excavation, 200-foot lateral waste push. Finish grade with D6R, 175-foot typical push distance, unit volume per LF. Uses dozer sheet adjustment factors. See attachment spillway
4) Excavate and waste material on slopes with D11R, 175 ft downslope excavation. Finish grade benches using D9R. Three passes per bench, 1 MPH operating speed.
5) D7R LGP, 198.2 cy/lf of material, 200-foot push. Uses dozer sheet adjustment factors. See attachment spillway cost

Data Sources: RS Means Heavy Construction Cost Data (24th Annual Edition 2010)

Location adjustment:

New Mexico 880 Las Cruces	83.5%

Tyrone Mine Partial Pit Backfil Reclamation

			Current Value
Task Description	Facility and Structure Removal[1]		$0
	Earthmoving		$467,364,062
	Revegetation	160%	$2,440,380
	Other		$6,729,465
	Subtotal, Direct Costs		**$476,533,908**
OPERATIONS AND MAINTENANCE	Includes: Road Maintenance, Wildlife Monitoring and Erosion Control	15.39%	**$73,338,568**
INDIRECT COSTS	Mobilization and Demobilization (0%-10%)	1.1%	$6,048,597
	Contingencies (3%-5%)	2.0%	$10,997,450
	Engineering Redesign Fee (2.5%-6%)	4.5%	$24,744,261
	Contractor Profit and Overhead (15%-30%)[2]	25.0%	$137,468,119
	Project Management Fee (2%-7%)	5.0%	$27,493,624
	State Procurement Cost	2.0%	$10,997,450
	Indirect Percentage Sum =	39.6%	
	Subtotal, Indirect Costs		**$217,749,501**
GROSS RECEIPTS TAX	Grant County (unincorporated areas) (applied to sum of indirect and direct costs)	0.0%	**$0**
TOTAL COST			**$767,621,977**

Data Sources:
US Office of Surface Mining, 2000. *Calculation of Reclamation Bond Amounts* .

Notes:

1) The portion of the financial assurance amount for Facility and Structure Removal is to be evaluated through the MMD permit revision process for establishing a closeout plan under the New Mexico Mining Act.

2) Profit and Office Overhead 10%, Project Overhead 15%
Project Overhead usually consists of the following except when it is a direct item:
Salaried and Admin Personal
Field Office, Shop and Facilities
Temporary Utilities
Fees and Insurance except those applicable to labor and equipment
MSHA and Site Specific Training.
Performance and Payment Bonds
QA/QC
Safety
Surveying
Construction Equipment General (salaried pickups, buses, ambulance, etc.)

			Main Pit	Savanna	Gettysburg	Copper Mtn	Totals
DIRECT COSTS							
	Facility and Structure Removal[1]		$0	$0	$0	$0	**$0**
	Earthmoving		$363,019,517	$37,107,575	$39,363,878	$27,873,092	**$467,364,062**
	Revegetation	160.0%	$1,440,020	$297,260	$411,180	$291,920	**$2,440,380**
	Other		$3,510,483	$1,123,334	$1,216,141	$879,508	**$6,729,465**
	Subtotal, Direct Costs		**$367,970,021**	**$38,528,168**	**$40,991,199**	**$29,044,520**	**$476,533,908**
OPERATIONS AND MAINTENANCE	Includes: Road Maintenance, Wildlife Monitor and Erosion Control	15.4%	**$56,630,586**	**$5,929,485**	**$6,308,546**	**$4,469,952**	**$73,338,568**
INDIRECT COSTS	Mobilization and Demobilization (0%-10%)	1.1%	$4,670,607	$489,034	$520,297	$368,659	**$6,048,597**
	Contingencies (3%-5%)	2.0%	$8,492,012	$889,153	$945,995	$670,289	**$10,997,450**
	Engineering Redesign Fee (2.5%-6%)	4.5%	$19,107,027	$2,000,594	$2,128,489	$1,508,151	**$24,744,261**
	Contractor Profit and Overhead (15%-30%)	25.0%	$106,150,152	$11,114,413	$11,824,936	$8,378,618	**$137,468,119**
	Project Management Fee (2%-7%)	5.0%	$21,230,030	$2,222,883	$2,364,987	$1,675,724	**$27,493,624**
	State Procurement Cost	2.0%	$8,492,012	$889,153	$945,995	$670,289	**$10,997,450**
	Indirect Percentage Sum =	39.6%					
	Subtotal, Indirect Costs		**$168,141,840**	**$17,605,231**	**$18,730,699**	**$13,271,731**	**$217,749,501**
GROSS RECEIPTS TAX	Grant County (unincorporated areas) (applied to sum of indirect and direct costs)	0.0%	**$0**	**$0**	**$0**	**$0**	**$0**
TOTAL COST PER STOCKPILE			**$592,742,447**	**$62,062,884**	**$66,030,443**	**$46,786,202**	**$767,621,977**
TOTAL COST			**$767,621,977**				

Facility	Main Pit	Savanna	Gettysburg	Copper Mtn
WITHOUT OPERATIONS AND MAINTENANCE				
Reclamation Acres	809.0	167.0	231.0	164.0
Item	Capital Cost	Capital Cost	Capital Cost	Capital Cost
Cover Material	$15,409,800	$2,829,580	$4,400,079	$3,773,678
Truck/Shovel	$491,365,446	$48,972,595	$50,551,895	$35,137,158
Top/Outslope Adjustment	$0	$0	$0	$0
Seed & Mulch	$2,010,268	$414,975	$574,007	$407,520
Channels, Conduits & Berms	$4,900,635	$1,568,174	$1,697,733	$1,227,793
Other	0	$0	$0	$0
Capital Cost Totals	$513,686,149	$53,785,323	$57,223,714	$40,546,150
Capital Cost/Acre	**$634,964**	**$322,068**	**$247,722**	**$247,233**
Capital Cost/Acre Cover	$19,048	$16,944	$19,048	$23,010
Capital Cost/Acre Truck Shovel	$607,374	$293,249	$218,839	$214,251
Capital Cost/Acre Top/Outslope Adjustment	$0	$0	$0	$0
Capital Cost/Acre Earthwork Total	$626,422	$310,193	$237,887	$237,261
Capital Cost/Acre Reveg	$2,485	$2,485	$2,485	$2,485
Capital Cost/Acre Other	$6,058	$9,390	$7,349	$7,487
WITH OPERATIONS AND MAINTENANCE				
Operations and Maintenance	$79,056,298	$8,277,561	$8,806,730	$6,240,052
Total Cost	$592,742,447	$62,062,884	$66,030,443	$46,786,202
Total Cost/Acre	**$732,685**	**$371,634**	**$285,846**	**$285,282**

Water Management Cost Summary

Item	Subtotal Direct Costs	Subtotal, Indirect Costs	Total Current Cost
		39.6%	
Pit Sumps			
Capital Costs	$218,920	$86,693	$305,613
Replacement Costs	$656,761	$260,078	$916,839
Operations & Maintenance	$437,841	$173,385	$611,226
Total Ponds	**$1,313,523**	**$520,155**	**$1,833,678**
Pumps			
Capital Costs	$147,461	$58,395	$205,856
Replacement Costs	$468,653	$185,586	$654,239
Operations & Maintenance	$1,695,054	$671,241	$2,366,295
Total Pumps	**$2,311,167**	**$915,222**	**$3,226,390**
Pipelines			
Capital Costs	$369,425	$146,292	$515,717
Cost Removal and Replacement	$436,070	$172,684	$608,754
Operations & Maintenance	$805,495	$318,976	$1,124,471
Total Pipelines	**$1,610,991**	**$637,952**	**$2,248,943**
Electrical Infrastructure			
Capital Costs	$575,032	$227,713	$802,745
Cost Removal and Replacement	$0	$0	$0
Operations & Maintenance	$575,032	$227,713	$802,745
Total Electrical Infrastructure	**$1,150,065**	**$455,426**	**$1,605,491**
Environmental Sampling	**$193,400**	**$0**	**$193,400**
Pit Dewatering Wells			
Construction	$2,947,270	$0	$2,947,270
Maintenance	$4,099,342	$0	$4,099,342
Total Wells	**$7,046,612**	**$0**	**$7,046,612**
Total Capital	**$4,258,109**	**$519,092**	**$4,777,201**
Total Replacement and Maintenance	**$9,367,649**	**$2,009,663**	**$11,377,312**
Total	**$13,625,757**	**$2,528,755**	**$16,154,513**

	Capital Costs	Cost Removal and Replacement	Operations & Maintenance	Subtotal, Direct Costs	Subtotal, Indirect Costs 39.6%	Total MMD Bond Amounts
Main	$363,627	$379,630	$917,473	$1,660,730	$642,332	**$2,303,062**
Savanna	$417,281	$415,866	$1,028,971	$1,862,118	$722,081	**$2,584,199**
Gettysburg	$347,663	$506,360	$1,211,673	$2,065,695	$802,698	**$2,868,393**
Copper Mountain	$182,268	$259,629	$510,026	$951,923	$361,644	**$1,313,567**
Pit Dewatering Wells	$2,947,270	$3,097,270	$1,040,752	$7,085,292	$0	**$7,085,292**
Totals	**$4,258,109**	**$4,658,754**	**$4,708,894**	**$13,625,757**	**$2,528,755**	**$16,154,513**

Sample Collection, Analysis, and Reporting Cost

Pit Sump Water Quality Sampling	Total Cost Per Pit Sump and Well
Quarterly Sampling Cost	$ 1,070
Semi-Annual Sampling Cost	$ 530
Annual Sampling Cost	$ 270

Sampling Schedule and Cost

	Pit Sumps & 1 Well							
Year	Quarterly	Semi-Annual	Annual	Total Locations	Quarterly Cost	Semi-Annual Cost	Annual Cost	Total Yearly Cost
1	5			5	$ 5,350	$ -	$ -	$ 5,350
2	5			5	$ 5,350	$ -	$ -	$ 5,350
3	5			5	$ 5,350	$ -	$ -	$ 5,350
4	5			5	$ 5,350	$ -	$ -	$ 5,350
5	5			5	$ 5,350	$ -	$ -	$ 5,350
6	5			5	$ 5,350	$ -	$ -	$ 5,350
7	5			5	$ 5,350	$ -	$ -	$ 5,350
8	5			5	$ 5,350	$ -	$ -	$ 5,350
9	5			5	$ 5,350	$ -	$ -	$ 5,350
10	5			5	$ 5,350	$ -	$ -	$ 5,350
11	5			5	$ 5,350	$ -	$ -	$ 5,350
12	5			5	$ 5,350	$ -	$ -	$ 5,350
13		5		5	$ -	$ 2,650	$ -	$ 2,650
…		5		5	$ -	$ 2,650	$ -	$ 2,650
20		5		5	$ -	$ 2,650	$ -	$ 2,650
…			5	5	$ -	$ -	$1,350	$ 1,350
100			5	5	$ -	$ -	$1,350	$ 1,350
							Total	$ 193,400

Environmental Sampling, Analysis and Reporting [1]

		Shipping and Analysis					Reporting					
Sample Basis Type	Samples per Year	Number of Shipping Coolers per Sample	Shipping Cost per Cooler	Shipping Cost	Analysis Cost per Sample [2]	Analysis and Shipping Cost	Report Work per Sample (Hours)	Report Work Hourly Rate	Review Work per Sample (Hours)	Review Work Hourly Rate	Reporting Cost	Total Sample Cost
Quarterly Sampling	4	0.10	$ 50	$ 20	$ 225	$ 920	0.500	$ 60	0.100	$ 70	$ 150	$ 1,070
Semi-Annual Sampling	2	0.10	$ 50	$ 10	$ 225	$ 460	0.500	$ 60	0.100	$ 70	$ 70	$ 530
Annual Sampling	1	0.10	$ 50	$ 5	$ 225	$ 230	0.500	$ 60	0.100	$ 70	$ 40	$ 270

[1] Sampling labor, vehicle and equipment are assumed to be included in the routine duty for site personnel.

[2] 23 Constituents. Energy Laboratories, Inc, 2009. Published price list (www.energylab.com).

Water Management System Components

Variables

RSMeans NM Discount Rate	0.84	Pump Replacement Age (yr)	20
Membrane Lined Pond Life Expectancy (yr)	30	Chezy Head Loss Coefficient	150
Annual Pond Maintenance to Capital Factor	2.00%	HDPE Pipeline Life Expectancy (yr)	100
Pump / Motor Efficiency	0.70	Annual Pipeline Maintenance to Capita	1.00%
Electric Rate ($/kWh)	0.06	Power Pole Spacing (ft)	100
Pump / Substation Removal Cost	$5,000	Substation Electric Panel Cost	$5,000
		Annual Electrical Infrastructure Maintenance to	
Annual Pump Maintenance to Capital Factor	5.00%	Capital Factor	1.00%
		100 year WellMaintenance to Capital Cost	34.00%

Sumps

	Location	Post Closure Purpose	Construction Type	Capacity (gallons)	Capacity (cy)	Sump Area (acres)	Age at Reclamation (yr)	First Replacement Year (yr)	Second Replacement Year (yr)	Third Replacement Year (yr)	Number of Replacements	Cost New and Replacement ($)	Adjusted Cost New and Replacement ($)	**Actual Cost New and Replacement ($)**	**Cost Maintenance Years 1-12 ($/yr)**	**Cost Maintenance Years 13-100 ($/yr)**
1	Pit Sump	discharge point	lined	2,439,278	12,078	0.37	0	30	60	90	3	$51,529	$43,027	$172,107	$861	$861
2	Pit Sump	discharge point	lined	2,639,299	13,068	0.40	0	30	60	90	3	$55,754	$46,555	$186,220	$931	$931
3	Pit Sump	discharge point	lined	5,512,769	27,296	0.85	0	30	60	90	3	$116,456	$97,241	$388,962	$1,945	$1,945
4	Pit Sump	discharge point	lined	1,819,702	9,010	0.28	0	30	60	90	3	$38,441	$32,098	$128,392	$642	$642
															$4,378	**$4,378**
														$875,682	**$52,541**	**$385,300**
															Total Present Cost	**$1,313,523**

Pumps

	From	To	Number	Type	Age at Reclamation (yr)	First Replacement Year (yr)	Second Replacement Year (yr)	Third Replacement Year (yr)	Fourth Replacement Year (yr)	Fifth Replacement Year (yr)	Number of Replacements	Pump Cost New ($/ea)	Pump Cost Replacement ($/ea)	Operational Pumping Rate (ea. pump) (gpm)
1	Pit Sump	discharge point	2	Booster	0	20	40	60	80	100	5	$18,433	$5,000	1500
2	Pit Sump	discharge point	2	Booster	0	20	40	60	80	100	5	$18,433	$5,000	1500
3	Pit Sump	discharge point	2	Booster	0	20	40	60	80	100	5	$18,433	$5,000	1500
4	Pit Sump	discharge point	2	Booster	0	20	40	60	80	100	5	$18,433	$5,000	1500
					0									

Pumps (Continued) — **Years 1 - 12** — **Years 13 - 100**

	From	To	Starting Elevation (ft)	Maximum Elevation (ft)	Head Loss (ft)	Head on Pump (ft)	HP	Operational Kilowatts (kW)	Capture Area (ac)	Average Pumping Rate (gal/yr) Year 1 - 12	Average Pumping Rate (gal/yr) Year 13 - 100	Operating Time (hr/yr)	Annual Electrical Usage (kWh/yr)	Annual Operational Cost ($)	Operating Time (hr/yr)	Annual Electrical Usage (kWh/yr)	**Annual Operational Cost ($)**	**Pump Actual Cost New and Replacement ($)**	**Cost Maintenance Years 1-12 ($/yr)**	**Cost Maintenance Years 13-100 ($/yr)**
1	Pit Sump	discharge point	0	360	2.66	362.66	196.2	146.3	50.0	868,950	868,950	9.7	1,412.9	84.8	9.7	1,412.9	84.8	$154,028	$2,343	$2,343
2	Pit Sump	discharge point	0	400	3.18	403.18	218.2	162.7	54.1	940,204	940,204	10.4	1,699.6	102.0	10.4	1,699.6	102.0	$154,028	$2,343	$2,343
3	Pit Sump	discharge point	0	490	1.95	491.95	266.2	198.5	113.0	1,963,827	1,963,827	21.8	4,331.5	259.9	21.8	4,331.5	259.9	$154,028	$2,343	$2,343
4	Pit Sump	discharge point	0	45	0.92	45.92	24.8	18.5	37.3	648,237	648,237	7.2	133.5	8.0	7.2	133.5	8.0	$154,028	$2,343	$2,343
												49.1	**$7,577**		49.1	**$7,577**		**$616,114**	**$9,373**	**$9,373**
													$90,930			**$666,819**		**$616,114**	**$112,477**	**$824,828**
																			Total Present Cost	**$2,311,167**

$$H_f = \frac{10.44\,Q^{1.85}}{C^{1.85}\,D_i^{4.865}}$$

$$P_{hp} = \frac{Q\ h}{3{,}960}$$

$$1\text{-acre} \cdot \left(16\ \frac{\text{in}}{\text{yr}} \cdot 10\%\right) = 4.345 \times 10^4\ \frac{\text{gal}}{\text{yr}}$$

Pipelines

	From	To	Material	Length (ft)	Inside Diameter (in)	Life Expectancy (yr)	Reclamation Replacement Year (yr)	Cost New and Replacement ($/ft)	Cost Removal ($/ft)	Adjusted Cost New and Replacement ($)	Adjusted Cost New and Replacement ($)	**Cost Maintenance Years 1-12 ($/yr)**	**Cost Maintenance Years 13-100 ($/yr)**
1	Pit Sump	discharge point	HDPE	2,600	16	100	85	$52.05	$9.39	$246,387	$246,387	$2,463.87	$2,463.87
2	Pit Sump	discharge point	HDPE	3,100	16	100	85	$52.05	$9.39	$293,769	$293,769	$2,937.69	$2,937.69
3	Pit Sump	discharge point	HDPE	1,900	16	100	85	$52.05	$9.39	$180,052	$180,052	$1,800.52	$1,800.52
4	Pit Sump	discharge point	HDPE	900	16	100	85	$52.05	$9.39	$85,288	$85,288	$852.88	$852.88
												$8,055	**$8,055**
											$805,495	**$96,659**	**$708,836**
												Total	**$1,610,991**

Electrical Infrastructure

	From	To	Line (ft)	Number of Poles	Cost Removal	Cost Pole	Cost Pole Crossarm	Cost Pole Installation	Cost Crossarm Installation	Cost Wiring Installation	Number Transformer Stations	Cost Transformer	Cost Electrical Panel	Adjusted Cost New ($)	**Adjusted Cost Removal ($)**	**Actual Cost New and Replacement ($)**	**Cost Maintenance Years 1-12 ($/yr)**	**Cost Maintenance Years 13-100 ($/yr)**
1		Pit Sump	2,600	27		$19,791	$7,641	$120,587	$30,063	$5,348	2	$9,065	$10,000	$170,734	0	$170,734	$1,707	$1,707
2		Pit Sump	3,100	32		$23,456	$9,056	$142,918	$35,630	$6,377	2	$9,065	$10,000	$199,130	$0	$199,130	$1,991	$1,991
3		Pit Sump	1,900	20		$14,660	$5,660	$89,324	$22,269	$3,908	2	$9,065	$10,000	$130,980	$0	$130,980	$1,310	$1,310
4		Pit Sump	900	10		$7,330	$2,830	$44,662	$11,135	$1,851	2	$9,065	$10,000	$74,189	$0	$74,189	$742	$742
																	$5,750	**$5,750**
															$0	**$575,032**	**$69,004**	**$506,029**
																	Total Present Cost	**$1,150,065**

Pit Dewatering Wells

	From	To	Description	Depth (ft)	Well Construction ($/ft)	Mobe and Demob ($/well)	Pump- 500gpm at 250 nph; Includes associated install, wiring,	Well-head completion	Well development (24hr/well)	Pumping Test Support (10hr per well)	Non-drill time (10 hr per well)	First Replacement Year (yr)	Second Replacement Year (yr)	Well and Pump Replacement Year (yr)	Third Replacement Year (yr)	Fourth Replacement Year (yr)	Pump Cost New and Replacement ($)	Well and Pump Cost New and Replacement ($)	**Total Cost ($)**	**Total Maintenance Cost (Years 1-100)**
			See MWH Takeoffs																	
1	Main Pit well 1	top of pit for water treatment		360	$2,585	$13,333	$12,500	$4,500	$ 9,240	$ 6,000	$ 6,250	20	40	60	80	100	$12,500	$982,423	$2,014,847	$334,024
2	Main Pit well 2	top of pit for water treatment		360	$2,585	$13,333	$12,500	$4,500	$ 9,240	$ 6,000	$ 6,250	20	40	60	80	100	$12,500	$982,423	$2,014,847	$334,024
3	Main Pit well 3	top of pit for water treatment		360	$2,585	$13,333	$12,500	$4,500	$ 9,240	$ 6,000	$ 6,250	20	40	60	80	100	$12,500	$982,423	$2,014,847	$334,024
																	$37,500	**$2,947,270**		**$10,021**
																			$6,044,540	**$1,002,072**
																			Total	**$7,046,612**

Operations & Maintenance

Indirect Costs Multiplier 1.396

Pit Sumps	Years 1-12
	4,378
	Years 13-100
	4,378

PUMPS	Years 1-12
	16,951
	Years 13-100
	16,951

PIPELINES	Years 1-12
	8,055
	Years 13-100
	8,055

Year	Capital Annual Current Cost	O&M Annual Current Cost ($)
2010	218,920	4,378
2011		4,378
2012		4,378
2013		4,378
2014		4,378
2015		4,378
2016		4,378
2017		4,378
2018		4,378
2019		4,378
2020		4,378
2021		4,378
2022		4,378
2023		4,378
2024		4,378
2025		4,378
2026		4,378
2027		4,378
2028		4,378
2029		4,378
2030		4,378
2031		4,378
2032		4,378
2033		4,378
2034		4,378
2035		4,378
2036		4,378
2037		4,378
2038		4,378
2039	218,920	4,378
2040		4,378
2041		4,378
2042		4,378
2043		4,378
2044		4,378
2045		4,378
2046		4,378
2047		4,378
2048		4,378
2049		4,378
2050		4,378
2051		4,378
2052		4,378
2053		4,378
2054		4,378
2055		4,378
2056		4,378
2057		4,378
2058		4,378
2059		4,378
2060		4,378
2061		4,378
2062		4,378
2063		4,378
2064		4,378
2065		4,378
2066		4,378
2067		4,378
2068		4,378
2069	218,920	4,378
2070		4,378
2071		4,378
2072		4,378
2073		4,378
2074		4,378
2075		4,378
2076		4,378
2077		4,378
2078		4,378
2079		4,378
2080		4,378
2081		4,378
2082		4,378
2083		4,378
2084		4,378
2085		4,378
2086		4,378
2087		4,378
2088		4,378
2089		4,378

Year	Capital Annual Current, Replacement, & Removal Cost	O&M Annual Current Cost ($)
2010	147461	16,951
2011		16,951
2012		16,951
2013		16,951
2014		16,951
2015		16,951
2016		16,951
2017		16,951
2018		16,951
2019		16,951
2020		16,951
2021		16,951
2022		16,951
2023		16,951
2024		16,951
2025		16,951
2026		16,951
2027		16,951
2028		16,951
2029	93730.5	16,951
2030		16,951
2031		16,951
2032		16,951
2033		16,951
2034		16,951
2035		16,951
2036		16,951
2037		16,951
2038		16,951
2039		16,951
2040		16,951
2041		16,951
2042		16,951
2043		16,951
2044		16,951
2045		16,951
2046		16,951
2047		16,951
2048		16,951
2049	93730.5	16,951
2050		16,951
2051		16,951
2052		16,951
2053		16,951
2054		16,951
2055		16,951
2056		16,951
2057		16,951
2058		16,951
2059		16,951
2060		16,951
2061		16,951
2062		16,951
2063		16,951
2064		16,951
2065		16,951
2066		16,951
2067		16,951
2068		16,951
2069	93730.5	16,951
2070		16,951
2071		16,951
2072		16,951
2073		16,951
2074		16,951
2075		16,951
2076		16,951
2077		16,951
2078		16,951
2079		16,951
2080		16,951
2081		16,951
2082		16,951
2083		16,951
2084		16,951
2085		16,951
2086		16,951
2087		16,951
2088		16,951
2089	93730.5	16,951

Year	Capital Annual Current Cost	Removal Annual Current Cost	Maintenance Annual Current Cost ($)
2010	369,425		8,055
2011			8,055
2012			8,055
2013			8,055
2014			8,055
2015			8,055
2016			8,055
2017			8,055
2018			8,055
2019			8,055
2020			8,055
2021			8,055
2022			8,055
2023			8,055
2024			8,055
2025			8,055
2026			8,055
2027			8,055
2028			8,055
2029			8,055
2030			8,055
2031			8,055
2032			8,055
2033			8,055
2034			8,055
2035			8,055
2036			8,055
2037			8,055
2038			8,055
2039			8,055
2040			8,055
2041			8,055
2042			8,055
2043			8,055
2044			8,055
2045			8,055
2046			8,055
2047			8,055
2048			8,055
2049			8,055
2050			8,055
2051			8,055
2052			8,055
2053			8,055
2054			8,055
2055			8,055
2056			8,055
2057			8,055
2058			8,055
2059			8,055
2060			8,055
2061			8,055
2062			8,055
2063			8,055
2064			8,055
2065			8,055
2066			8,055
2067			8,055
2068			8,055
2069			8,055
2070			8,055
2071			8,055
2072			8,055
2073			8,055
2074			8,055
2075			8,055
2076			8,055
2077			8,055
2078			8,055
2079			8,055
2080			8,055
2081			8,055
2082			8,055
2083			8,055
2084			8,055
2085			8,055
2086			8,055
2087			8,055
2088			8,055
2089			8,055

Operations & Maintenance

Indirect Costs Multiplier 1.396

Pit Sumps	Years 1-12	PUMPS	Years 1-12	PIPELINES	Years 1-12
	4,378		16,951		8,055
	Years 13-100		Years 13-100		Years 13-100
	4,378		16,951		8,055

Year	Capital Annual Current Cost	O&M Annual Current Cost ($)	Year	Capital Annual Current, Replacement, & Removal Cost	O&M Annual Current Cost ($)	Year	Capital Annual Current Cost	Removal Annual Current Cost	Maintenance Annual Current Cost ($)
2090		4,378	2090		16,951	2090			8,055
2091		4,378	2091		16,951	2091			8,055
2092		4,378	2092		16,951	2092			8,055
2093		4,378	2093		16,951	2093			8,055
2094		4,378	2094		16,951	2094	369,425	66,646	8,055
2095		4,378	2095		16,951	2095			8,055
2096		4,378	2096		16,951	2096			8,055
2097		4,378	2097		16,951	2097			8,055
2098		4,378	2098		16,951	2098			8,055
2099	218,920	4,378	2099		16,951	2099			8,055
2100		4,378	2100		16,951	2100			8,055
2101		4,378	2101		16,951	2101			8,055
2102		4,378	2102		16,951	2102			8,055
2103		4,378	2103		16,951	2103			8,055
2104		4,378	2104		16,951	2104			8,055
2105		4,378	2105		16,951	2105			8,055
2106		4,378	2106		16,951	2106			8,055
2107		4,378	2107		16,951	2107			8,055
2108		4,378	2108		16,951	2108			8,055
2109		4,378	2109	93730.5	16,951	2109			8,055
2110		---	2110		---	2110			---
2111		---	2111		---	2111			---
2112		---	2112		---	2112			---
2113		---	2113		---	2113			---
2114		---	2114		---	2114			---
2115		---	2115		---	2115			---
Direct Cost	875,682	437,841		616,114	1,695,054		738,850	66,646	805,495
W/ Indirects	1,222,452	611,226		860,094	2,366,295		1,031,434	93,037	1,124,471

2010 Current Cost **$16,154,513**

ELECTRICAL INFRASTRUCTURE

Years 1-12
5,750
Years 13-100
5,750

Year	Capital Annual	Maintenance Annual	Current Cost ($)
2010	575,032		5,750
2011			5,750
2012			5,750
2013			5,750
2014			5,750
2015			5,750
2016			5,750
2017			5,750
2018			5,750
2019			5,750
2020			5,750
2021			5,750
2022			5,750
2023			5,750
2024			5,750
2025			5,750
2026			5,750
2027			5,750
2028			5,750
2029			5,750
2030			5,750
2031			5,750
2032			5,750
2033			5,750
2034			5,750
2035			5,750
2036			5,750
2037			5,750
2038			5,750
2039			5,750
2040			5,750
2041			5,750
2042			5,750
2043			5,750
2044			5,750
2045			5,750
2046			5,750
2047			5,750
2048			5,750
2049			5,750
2050			5,750
2051			5,750
2052			5,750
2053			5,750
2054			5,750
2055			5,750
2056			5,750
2057			5,750
2058			5,750
2059			5,750
2060			5,750
2061			5,750
2062			5,750
2063			5,750
2064			5,750
2065			5,750
2066			5,750
2067			5,750
2068			5,750
2069			5,750
2070			5,750
2071			5,750
2072			5,750
2073			5,750
2074			5,750
2075			5,750
2076			5,750
2077			5,750
2078			5,750
2079			5,750
2080			5,750
2081			5,750
2082			5,750
2083			5,750
2084			5,750
2085			5,750
2086			5,750
2087			5,750
2088			5,750
2089			5,750

ENVIRONMENTAL SAMPLING

Years 1-12
$5,350.00
Years 13-20
$2,650.00
Years 21-100
$1,350.00

Year	Current Cost ($)
2010	5,350.00
2011	5,350.00
2012	5,350.00
2013	5,350.00
2014	5,350.00
2015	5,350.00
2016	5,350.00
2017	5,350.00
2018	5,350.00
2019	5,350.00
2020	5,350.00
2021	5,350.00
2022	2,650.00
2023	2,650.00
2024	2,650.00
2025	2,650.00
2026	2,650.00
2027	2,650.00
2028	2,650.00
2029	2,650.00
2030	1,350.00
2031	1,350.00
2032	1,350.00
2033	1,350.00
2034	1,350.00
2035	1,350.00
2036	1,350.00
2037	1,350.00
2038	1,350.00
2039	1,350.00
2040	1,350.00
2041	1,350.00
2042	1,350.00
2043	1,350.00
2044	1,350.00
2045	1,350.00
2046	1,350.00
2047	1,350.00
2048	1,350.00
2049	1,350.00
2050	1,350.00
2051	1,350.00
2052	1,350.00
2053	1,350.00
2054	1,350.00
2055	1,350.00
2056	1,350.00
2057	1,350.00
2058	1,350.00
2059	1,350.00
2060	1,350.00
2061	1,350.00
2062	1,350.00
2063	1,350.00
2064	1,350.00
2065	1,350.00
2066	1,350.00
2067	1,350.00
2068	1,350.00
2069	1,350.00
2070	1,350.00
2071	1,350.00
2072	1,350.00
2073	1,350.00
2074	1,350.00
2075	1,350.00
2076	1,350.00
2077	1,350.00
2078	1,350.00
2079	1,350.00
2080	1,350.00
2081	1,350.00
2082	1,350.00
2083	1,350.00
2084	1,350.00
2085	1,350.00
2086	1,350.00
2087	1,350.00
2088	1,350.00
2089	1,350.00

PIT DEWATERING WELLS

Years 1-100
$10,020.72

Year	Capital Annual	Annual	Current Cost ($)
2010	2,947,270		10,020.72
2011			10,020.72
2012			10,020.72
2013			10,020.72
2014			10,020.72
2015			10,020.72
2016			10,020.72
2017			10,020.72
2018			10,020.72
2019			10,020.72
2020			10,020.72
2021			10,020.72
2022			10,020.72
2023			10,020.72
2024			10,020.72
2025			10,020.72
2026			10,020.72
2027			10,020.72
2028			10,020.72
2029			10,020.72
2030	37,500		10,020.72
2031			10,020.72
2032			10,020.72
2033			10,020.72
2034			10,020.72
2035			10,020.72
2036			10,020.72
2037			10,020.72
2038			10,020.72
2039			10,020.72
2040			10,020.72
2041			10,020.72
2042			10,020.72
2043			10,020.72
2044			10,020.72
2045			10,020.72
2046			10,020.72
2047			10,020.72
2048			10,020.72
2049			10,020.72
2050	37,500		10,020.72
2051			10,020.72
2052			10,020.72
2053			10,020.72
2054			10,020.72
2055			10,020.72
2056			10,020.72
2057			10,020.72
2058			10,020.72
2059			10,020.72
2060			10,020.72
2061			10,020.72
2062			10,020.72
2063			10,020.72
2064			10,020.72
2065			10,020.72
2066			10,020.72
2067			10,020.72
2068			10,020.72
2069			10,020.72
2070	2,947,270		10,020.72
2071			10,020.72
2072			10,020.72
2073			10,020.72
2074			10,020.72
2075			10,020.72
2076			10,020.72
2077			10,020.72
2078			10,020.72
2079			10,020.72
2080			10,020.72
2081			10,020.72
2082			10,020.72
2083			10,020.72
2084			10,020.72
2085			10,020.72
2086			10,020.72
2087			10,020.72
2088			10,020.72
2089			10,020.72

ELECTRICAL INFRASTRUCTURE

	Years 1-12	Years 13-100
	5,750	5,750
	Capital Annual	Maintenance Annual

Year	Current Cost	Current Cost ($)
2090		5,750
2091		5,750
2092		5,750
2093		5,750
2094		5,750
2095		5,750
2096		5,750
2097		5,750
2098		5,750
2099		5,750
2100		5,750
2101		5,750
2102		5,750
2103		5,750
2104		5,750
2105		5,750
2106		5,750
2107		5,750
2108		5,750
2109		5,750
2110		---
2111		---
2112		---
2113		---
2114		---
2115		---
	575,032	575,032
	802,745	802,745

ENVIRONMENTAL SAMPLING

	Years 1-12	Years 13-20	Years 21-100
	$5,350.00	$2,650.00	$1,350.00
			Annual

Year	Current Cost ($)
2090	1,350.00
2091	1,350.00
2092	1,350.00
2093	1,350.00
2094	1,350.00
2095	1,350.00
2096	1,350.00
2097	1,350.00
2098	1,350.00
2099	1,350.00
2100	1,350.00
2101	1,350.00
2102	1,350.00
2103	1,350.00
2104	1,350.00
2105	1,350.00
2106	1,350.00
2107	1,350.00
2108	1,350.00
2109	1,350.00
2110	---
2111	---
2112	---
2113	---
2114	---
2115	---
	193,400
	193,400

PIT DEWATERING WELLS

	Years 1-100	
	$10,020.72	
	Capital Annual	Annual

Year	Current Cost	Current Cost ($)
2090	37,500	10,020.72
2091		10,020.72
2092		10,020.72
2093		10,020.72
2094		10,020.72
2095		10,020.72
2096		10,020.72
2097		10,020.72
2098		10,020.72
2099		10,020.72
2100		10,020.72
2101		10,020.72
2102		10,020.72
2103		10,020.72
2104		10,020.72
2105		10,020.72
2106		10,020.72
2107		10,020.72
2108		10,020.72
2109	37,500	10,020.72
2110		---
2111		---
2112		---
2113		---
2114		---
2115		---
	6,044,540	1,002,072
	6,044,540	1,002,072

Water Treatment Unit Costs

Activity	Base No Overhead and Profit[2] Unit Cost $/unit	Units	Scaled Cost Las Cruces 83.5%[1]	Means Line Item	Means Page	Reference
Wood Electrical Utility Poles	733	ea	612	337116.33 6600	348	30' high, excludes excavation, backfill and cast-in-place concrete, R-3 crew
Electrical Cross Arms	283	ea	236	337116.33 7600	348	4' long, includes hardware and insulators, 1 Elec Crew
Utility Pole Installation a.)	1,160	ea	969	337116.20 0105	347	Digging holes in rock-R-5 Crew
Utility Pole Installation b.)	2,291	ea	1913	337116.20 0250	347	Erect wood poles and backfill holes in rock
Utility Pole Installation c.)	89.2	mi	74	337116.20 0260	347	Disposal of pole and hardware surplus material
Utility Pole Installation d.)	926	ea	773	337116.20 0510	348	Guys, anchors and hardware for pole in rock
Cross Arm Installation a.)	128	ea	107	337116.20 0310	347	Material handling and spotting
Cross Arm Installation b.)	939	ea	784	337116.20 0320	347	Install crossarms
Cross Arm Installation c.)	46.55	mi	39	337116.20 0330	347	Disposal of crossarms and hardware surplus material
Electrical Wiring Installation a.)	536	wire mi	448	337139.13 0110	351	Material handling and spotting-conductors, primary circuits
Electrical Wiring Installation b.)	10,325	wire mi	8621	337139.13 0150	351	Conductors, per wire, 210-636 kcmil
Potential Transformers	4,533	ea	3785	337126.26 4100	351	13 to 26 kV
Pipe Removal	2.95	lf	2	024113.38-1800	25	Site Demo, pipe removal, sewer/water no exc., plastic pipe, 10"-18" diam
Pipe Disposal	6.44	cy	5	02220.875-5500	-	Site demolition, disposal on site updated from $6.44 in 2008
Excavation of Soil	5.11	cy	4	G1030120 1600	432	3/4 C.Y. backhoe, three 8 C.Y. dump trucks, 1 mi round trip. This value removes the profit for equipment (10%) and the profit/overhead for labor of the operator of a shovel (49.7%).
Reservoir Liners HDPE	1.9	sf	2	334713.53 1200	338	Membrane lining, 2X60 mil thick
Utility Pump	22,075	ea	18433	221123.10 3190	170	Single stage, double suction 75 HP, 2500 gpm pump
Water Supply Piping	52.05	lf	43	331113.35 0700	319	Butt fusion joints, SDR 21, HDPE 40' lengths not including excavation or backfill, 16" diam

Description Notes:

1) Overhead and Profit are added in with the indirect costs.

2) City Cost Index Las Cruces-Total 83.5% RSMeans Heavy Construction Cost Data 24rd Annual Edition 2010 pg. 534.

3) RSMeans Heavy Construction Cost Data 24rd Annual Edition 2010.

Complete Backfill

Total Cost Calculation — Tyrone

New Mexico Mining and Minerals Division

General Information — 7/2/2010

Applicant		
Disturbed Surface Area (acres)	1371.0	
Type of Operation	Existing/Surface/Copper	
Recommended MMD Bond		
Current value before escalation and discounting	**$1,560,535,895**	**Complete Backfill Pit Waiver Reclamation**

Demo cost are addressed elsewhere.

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Item	Description	Location 1	Location 2	Total Haul/Push Distance (ft)	Grade (%)	Equipment
Stockpile Areas						
1138	Dozer Assist	Closest stockpile source	Main Pit truck/shovel	-	see dozer	D11R
1139	Dozer Assist	borrow area 5A	Main Pit Top	-	see dozer	D11R
1141	Dozer Assist	Closest stockpile source	Savanna truck/shovel	-	see dozer	D11R
1142	Dozer Assist	borrow area 5A	Savanna Top	-	see dozer	D11R
1144	Dozer Assist	Closest stockpile source	Gettysburg truck/shovel	-	see dozer	D11R
1145	Dozer Assist	borrow area 5A	Gettysburg Top	-	see dozer	D11R
1147	Dozer Assist	Closest stockpile source	Copper Mtn slope truck/shovel	-	see dozer	D11R
1148	Dozer Assist	borrow area 5A	Copper Mtn Top	-	see dozer	D11R
1202	Load soil	Closest stockpile source	Main Pit truck/shovel			EX3500
1203	Load cover soil	borrow area 5A	Main Pit Top			992G
1205	Load soil	Closest stockpile source	Savanna truck/shovel			EX3500
1206	Load cover soil	borrow area 5A	Savanna Top			992G
1208	Load soil	Closest stockpile source	Gettysburg truck/shovel			EX3500
1209	Load cover soil	borrow area 5A	Gettysburg Top			992G
1211	Load soil	Closest stockpile source	Copper Mtn slope truck/shovel			EX3500
1212	Load cover soil	borrow area 5A	Copper Mtn Top			992G
1252	Haul soil	Closest stockpile source	Main Pit truck/shovel	4,000	see Trucks	530M
1253	Haul cover soil	borrow area 5A	Main Pit Top	6,000	see Trucks	777F
1255	Haul soil	Closest stockpile source	Savanna truck/shovel	2,600	see Trucks	530M
1256	Haul cover soil	borrow area 5A	Savanna Top	4,000	see Trucks	777F
1258	Haul soil	Closest stockpile source	Gettysburg truck/shovel	3,000	see Trucks	530M
1259	Haul cover soil	borrow area 5A	Gettysburg Top	6,000	see Trucks	777F
1261	Haul Soil	Closest stockpile source	Copper Mtn slope truck/shovel	3,000	see Trucks	530M
1262	Haul cover soil	borrow area 5A	Copper Mtn Top	12,000	see Trucks	777F
1602	Grade cover soil	Main Pit Top	-			D11R
1604	Grade cover soil	Savanna Top	-			D11R
1606	Grade cover soil	Gettysburg Top	-			D11R
1608	Grade cover soil	Copper Mtn Top	-			D11R
Other						
1801	Off-Hwy Water Tanker Truck					10,000 gal
1802	Motor Grader					16M

Item	Description	Location 1	Location 2	Area (ac)	Cover Depth (in)	Bank Volume (bcy)	Swell Factor (%)	Over-size Factor (%)	Loose Volume (lcy)
Stockpile Areas									
1138	Dozer Assist	Closest stockpile source	Main Pit truck/shovel			427,100,000	15%		491,165,000
1139	Dozer Assist	borrow area 5A	Main Pit Top			3,915,560	15%		4,502,894
1141	Dozer Assist	Closest stockpile source	Savanna truck/shovel			57,700,000	15%		66,355,000
1142	Dozer Assist	borrow area 5A	Savanna Top			808,280	15%		929,522
1144	Dozer Assist	Closest stockpile source	Gettysburg truck/shovel			76,400,000	15%		87,860,000
1145	Dozer Assist	borrow area 5A	Gettysburg Top			1,118,040	15%		1,285,746
1147	Dozer Assist	Closest stockpile source	Copper Mtn slope truck/shovel			48,400,000	15%		55,660,000
1148	Dozer Assist	borrow area 5A	Copper Mtn Top			793,760	15%		912,824
1202	Load soil	Closest stockpile source	Main Pit truck/shovel			427,100,000	15%		491,165,000
1203	Load cover soil	borrow area 5A	Main Pit Top	809.0	36	3,915,560	15%		4,502,894
1205	Load soil	Closest stockpile source	Savanna truck/shovel			57,700,000	15%		66,355,000
1206	Load cover soil	borrow area 5A	Savanna Top	167.0	36	808,280	15%		929,522
1208	Load soil	Closest stockpile source	Gettysburg truck/shovel			76,400,000	15%		87,860,000
1209	Load cover soil	borrow area 5A	Gettysburg Top	231.0	36	1,118,040	15%		1,285,746
1211	Load soil	Closest stockpile source	Copper Mtn slope truck/shovel			48,400,000	15%		55,660,000
1212	Load cover soil	borrow area 5A	Copper Mtn Top	164.0	36	793,760	15%		912,824
1252	Haul soil	Closest stockpile source	Main Pit truck/shovel			427,100,000	15%		491,165,000
1253	Haul cover soil	borrow area 5A	Main Pit Top			3,915,560	15%		4,502,894
1255	Haul soil	Closest stockpile source	Savanna truck/shovel			57,700,000	15%		66,355,000
1256	Haul cover soil	borrow area 5A	Savanna Top			808,280	15%		929,522
1258	Haul soil	Closest stockpile source	Gettysburg truck/shovel			76,400,000	15%		87,860,000
1259	Haul cover soil	borrow area 5A	Gettysburg Top			1,118,040	15%		1,285,746
1261	Haul Soil	Closest stockpile source	Copper Mtn slope truck/shovel			48,400,000	15%		55,660,000
1262	Haul cover soil	borrow area 5A	Copper Mtn Top			793,760	15%		912,824
1602	Grade cover soil	Main Pit Top	-			3,915,560	15%		4,502,894
1604	Grade cover soil	Savanna Top	-			808,280	15%		929,522
1606	Grade cover soil	Gettysburg Top	-			1,118,040	15%		1,285,746
1608	Grade cover soil	Copper Mtn Top	-			793,760	15%		912,824

Total Cost Calculation — Tyrone
New Mexico Mining and Minerals Division — Worksheet #5
Productivity and Hours Required for Dozer Use---Earthmoving — 07/02/10

							PERFORMANCE FACTORS												
Task Description	Location 1	Location 2	Equipment	Material Handling Multiplier (cy)	Productivity (cy/hr)	Total Task Time (hours)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.	Grade (%)
Stockpile Areas																		
Dozer Assist	Closest stockpile source	Main Pit truck/shovel	D11R	N/A	N/A	183,518	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	borrow area 5A	Main Pit Top	D11R	N/A	N/A	4,181	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	Closest stockpile source	Savanna truck/shovel	D11R	N/A	N/A	24,793	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	borrow area 5A	Savanna Top	D11R	N/A	N/A	863	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	Closest stockpile source	Gettysburg truck/shovel	D11R	N/A	N/A	32,828	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	borrow area 5A	Gettysburg Top	D11R	N/A	N/A	1,194	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	Closest stockpile source	Copper Mtn slope truck/shovel	D11R	N/A	N/A	20,797	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer Assist	borrow area 5A	Copper Mtn Top	D11R	N/A	N/A	848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Total Cost Calculation — Tyrone
New Mexico Mining and Minerals Division — Worksheet #6
Productivity and Hours Required for Dozer Use---Grading — 07/02/10

PERFORMANCE FACTORS

Task Description	Location 1	Equipment	Volume (cy)	Productivity (cy/hr)	Task Time (hours)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.	Grade (%)	Operator	Maximum Push Distance (feet)	Normal Production (cy/hr)
Stockpile Areas																	
Grade cover soil	Main Pit Top	D11R	4,502,894	2,071.9	2,173.3	1.2	1.0	2,900	1.20	50	1.00	1.00	1.00	1.0	0.75	100	2962
Grade cover soil	Savanna Top	D11R	929,522	2,071.9	448.6	1.2	1.0	2,900	1.20	50	1.00	1.00	1.00	1.0	0.75	100	2962
Grade cover soil	Gettysburg Top	D11R	1,285,746	2,071.9	620.6	1.2	1.0	2,900	1.20	50	1.00	1.00	1.00	1.0	0.75	100	2962
Grade cover soil	Copper Mtn Top	D11R	912,824	2,071.9	440.6	1.2	1.0	2,900	1.20	50	1.00	1.00	1.00	1.0	0.75	100	2962

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Total Cost Calculation
New Mexico Mining and Minerals Division
Productivity and Hours Required for Truck Use

Tyrone
Worksheet #9
07/02/10

Task Description	Location 1	Location 2	Equipment	Volume (cy)	Truck Cycle Time (min)	Optimum No. of Trucks	Productivity (cy/hr)	Task Time (hrs)	PERFORMANCE FACTORS Struck Capacity (cy)	Heaped Capacity (cy)	Loader Cycles per Truck	Total Haul Distance (feet)	**Haul Distance Segment 1 (feet)	**Haul Grade Segment 1 (%)	Rolling Resistance (%)	Haul Distance Segment 1 (meters)	Haul Effective Grade Segment 1 (%)
Stockpile Areas																	
Haul soil	Closest stockpile source	Main Pit truck/shovel	530M	491,165,000	8.1	4	2,367	207,508	74.0	102.0	4	4,000	4,000	-10.0%	4.0%	1,219	0%
Haul cover soil	borrow area 5A	Main Pit Top	777F	4,502,894	11.5	3	917	4,912	54.8	78.8	5	6,000	6,000	2.00%	4.0%	1,829	6%
Haul soil	Closest stockpile source	Savanna truck/shovel	530M	66,355,000	6.6	4	2,941	24,793	74.0	102.0	4	2,600	2,600	-10.00%	4.0%	792	0%
Haul cover soil	borrow area 5A	Savanna Top	777F	929,522	9.3	3	1,127	863	54.8	78.8	5	4,000	4,000	2.00%	4.0%	1,219	6%
Haul soil	Closest stockpile source	Gettysburg truck/shovel	530M	87,860,000	7.0	4	2,751	32,828	74.0	102.0	4	3,000	3,000	-10.00%	4.0%	914	0%
Haul cover soil	borrow area 5A	Gettysburg Top	777F	1,285,746	11.5	3	917	1,403	54.8	78.8	5	6,000	6,000	2.00%	4.0%	1,829	6%
Haul Soil	Closest stockpile source	Copper Mtn slope truck/shovel	530M	55,660,000	7.0	4	2,751	20,797	74.0	102.0	4	3,000	3,000	-10.00%	4.0%	914	0%
Haul cover soil	borrow area 5A	Copper Mtn Top	777F	912,824	17.9	5	980	932	54.8	78.8	5	12,000	12,000	2.00%	4.0%	3,658	6%

Task Description	Location 1	Location 2	Return Effective Grade Segment 1 (%)	Haul Time (min)	Return Time (min)	Loading Time (min)	Load/ Maneuver Time (min)	Dump/ Maneuver Time (min)	Work Hour (min/hr)	Travel Time Loaded Segment 1 (min/m)	Travel Time Empty Segment 1 (min/m)
Stockpile Areas											
Haul soil	Closest stockpile source	Main Pit truck/shovel	14%	1.3	3.2	1.8	0.7	1.1	50	0.00110	0.00262
Haul cover soil	borrow area 5A	Main Pit Top	2%	4.9	1.5	3.3	0.7	1.1	50	0.00269	0.00081
Haul soil	Closest stockpile source	Savanna truck/shovel	14%	0.9	2.1	1.8	0.7	1.1	50	0.00110	0.00262
Haul cover soil	borrow area 5A	Savanna Top	2%	3.3	1.0	3.3	0.7	1.1	50	0.00269	0.00081
Haul soil	Closest stockpile source	Gettysburg truck/shovel	14%	1.0	2.4	1.8	0.7	1.1	50	0.00110	0.00262
Haul cover soil	borrow area 5A	Gettysburg Top	2%	4.9	1.5	3.3	0.7	1.1	50	0.00269	0.00081
Haul Soil	Closest stockpile source	Copper Mtn slope truck/shovel	14%	1.0	2.4	1.8	0.7	1.1	50	0.00110	0.00262
Haul cover soil	borrow area 5A	Copper Mtn Top	2%	9.8	3.0	3.3	0.7	1.1	50	0.00269	0.00081

Total Cost Calculation
New Mexico Mining and Minerals Division
Productivity for Front End Loader

Tyrone
Worksheet #10
7/2/2010

Task Description	Location 1	Location 2	Equipment	Volume (cy)	Net Bucket Capacity (cy)	Loader Cycle Time (min)	Productivity (cy/hr)	Task Time (hours)	PERFORMANCE FACTORS Rated Bucket Capacity (cy)	Bucket Fill Factor	Work Hour (min/hr)
Stockpile Areas											
Load soil	Closest stockpile source	Main Pit truck/shovel	EX3500	491,165,000	24.1	0.45	2,676	183,518	23.50	1.025	50
Load cover soil	borrow area 5A	Main Pit Top	992G	4,502,894	14.0	0.65	1,077	4,181	16.00	0.875	50
Load soil	Closest stockpile source	Savanna truck/shovel	EX3500	66,355,000	24.1	0.45	2,676	24,793	23.50	1.025	50
Load cover soil	borrow area 5A	Savanna Top	992G	929,522	14.0	0.65	1,077	863	16.00	0.875	50
Load soil	Closest stockpile source	Gettysburg truck/shovel	EX3500	87,860,000	24.1	0.45	2,676	32,828	23.50	1.025	50
Load cover soil	borrow area 5A	Gettysburg Top	992G	1,285,746	14.0	0.65	1,077	1,194	16.00	0.875	50
Load cover soil	borrow area 5A	Copper Mtn Top	992G	912,824	14.0	0.65	1,077	848	16.00	0.875	50

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Equipment Type	Task	Location 1	Location 2	Owning and Operating Cost ($/hr)	Labor Cost ($/hr)		Number of Units (Equipment)	Time Req'd (hrs)	Total Cost ($)	Total Production	Prod. Unit	Unit Cost ($/unit)
Stockpile Areas												
Dozers-Earthmoving												
D11R	Dozer Assist	Closest stockpile source	Main Pit truck/shovel	413.67	33.81		2	183,518	164,241,732	427,100,000	cy	0.38
D11R	Dozer Assist	borrow area 5A	Main Pit Top	413.67	33.81		1	4,181	1,871,037	3,915,560	cy	0.48
D11R	Dozer Assist	Closest stockpile source	Savanna truck/shovel	413.67	33.81		2	24,793	22,188,593	57,700,000	cy	0.38
D11R	Dozer Assist	borrow area 5A	Savanna Top	413.67	33.81		1	863	386,234	808,280	cy	0.48
D11R	Dozer Assist	Closest stockpile source	Gettysburg truck/shovel	413.67	33.81		2	32,828	29,379,696	76,400,000	cy	0.38
D11R	Dozer Assist	borrow area 5A	Gettysburg Top	413.67	33.81		1	1,194	534,252	1,118,040	cy	0.48
D11R	Dozer Assist	Closest stockpile source	Copper Mtn slope truck/shovel	413.67	33.81		2	20,797	9,306,134	48,400,000	cy	0.19
D11R	Dozer Assist	borrow area 5A	Copper Mtn Top	413.67	33.81		1	848	379,296	793,760	cy	0.48
Dozers-Grading												
D11R	Grade cover soil	Main Pit Top	-	413.67	33.81		1	2,173.3	972,531	4,502,894.0	cy	0.22
D11R	Grade cover soil	Savanna Top	-	413.67	33.81		1	448.6	200,757	929,522.0	cy	0.22
D11R	Grade cover soil	Gettysburg Top	-	413.67	33.81		1	620.6	277,694	1,285,746.0	cy	0.22
D11R	Grade cover soil	Copper Mtn Top	-	413.67	33.81		1	440.6	197,151	912,824.0	cy	0.22
Loaders												
EX3500	Load soil	Closest stockpile source	Main Pit truck/shovel	774.19	33.96		1	207,508	167,697,656	491,165,000	cy	0.34
992G	Load cover soil	borrow area 5A	Main Pit Top	345.66	33.96		1	4,912	1,864,802	4,502,894	cy	0.41
EX3500	Load soil	Closest stockpile source	Savanna truck/shovel	774.19	33.96		1	24,793	20,036,215	66,355,000	cy	0.30
992G	Load cover soil	borrow area 5A	Savanna Top	345.66	33.96		1	863	327,662	929,522	cy	0.35
EX3500	Load soil	Closest stockpile source	Gettysburg truck/shovel	774.19	33.96		1	32,828	26,529,755	87,860,000	cy	0.30
992G	Load cover soil	borrow area 5A	Gettysburg Top	345.66	33.96		1	1,403	532,471	1,285,746	cy	0.41
EX3500	Load soil	Closest stockpile source	Copper Mtn slope truck/shovel	774.19	33.96		1	20,797	16,806,808	55,660,000	cy	0.30
992G	Load cover soil	borrow area 5A	Copper Mtn Top	345.66	33.96		1	932	353,640	912,824	cy	0.39
Trucks												
530M	Haul soil	Closest stockpile source	Main Pit truck/shovel	311.95	24.65		4	830,034	279,386,906	491,165,000	cy	0.57
777F	Haul cover soil	borrow area 5A	Main Pit Top	282.72	24.65		3	14,737	4,529,699	4,502,894	cy	1.01
530M	Haul soil	Closest stockpile source	Savanna truck/shovel	311.95	24.65		4	99,171	33,380,647	66,355,000	cy	0.50
777F	Haul cover soil	borrow area 5A	Savanna Top	282.72	24.65		3	2,589	795,908	929,522	cy	0.86
530M	Haul soil	Closest stockpile source	Gettysburg truck/shovel	311.95	24.65		4	131,311	44,198,984	87,860,000	cy	0.50
777F	Haul cover soil	borrow area 5A	Gettysburg Top	282.72	24.65		3	4,208	1,293,400	1,285,746	cy	1.01
530M	Haul Soil	Closest stockpile source	Copper Mtn slope truck/shovel	311.95	24.65		4	83,187	28,000,404	55,660,000	cy	0.50
777F	Haul cover soil	borrow area 5A	Copper Mtn Top	282.72	24.65		5	4,658	1,431,682	912,824	cy	1.57
Water Truck and Grader												
Off-Hwy Water Tanker Truck		Main Pit truck/shovel		160.04	24.65	-		207,508	38,325,500			
Off-Hwy Water Tanker Truck		Main Pit Top		160.04	24.65	-		4,912	907,264			
Off-Hwy Water Tanker Truck		Savanna truck/shovel		160.04	24.65	-		24,793	4,579,062			
Off-Hwy Water Tanker Truck		Savanna Top		160.04	24.65	-		863	159,414			
Off-Hwy Water Tanker Truck		Gettysburg truck/shovel		160.04	24.65	-		32,828	6,063,091			
Off-Hwy Water Tanker Truck		Gettysburg Top		160.04	24.65	-		1,403	259,058			
Off-Hwy Water Tanker Truck		Copper Mtn slope truck/shovel		160.04	24.65	-		20,797	3,841,016			
Off-Hwy Water Tanker Truck		Copper Mtn Top		160.04	24.65	-		932	172,053			
Motor Grader		Main Pit truck/shovel		148.02	33.81	-		207,508.4	37,731,661			
Motor Grader		Main Pit Top		148.02	33.81	-		4,912.3	893,206			
Motor Grader		Savanna truck/shovel		148.02	33.81	-		24,792.7	4,508,111			
Motor Grader		Savanna Top		148.02	33.81	-		863.1	156,944			
Motor Grader		Gettysburg truck/shovel		148.02	33.81	-		32,827.8	5,969,145			
Motor Grader		Gettysburg Top		148.02	33.81	-		1,402.6	255,044			
Motor Grader		Copper Mtn slope truck/shovel		148.02	33.81	-		20,796.7	3,781,501			
Motor Grader		Copper Mtn Top		148.02	33.81	-		931.6	169,387			

Main Pit truck/shovel		687,383,456
Main Pit Top		11,038,539
Savanna truck/shovel		84,692,628
Savanna Top		2,026,920
Gettysburg truck/shovel		112,140,672
Gettysburg Top		3,151,919
Copper Mtn slope truck/shovel		61,735,862
Copper Mtn Top		2,703,208
Total Cost		**$964,873,203**
Q/A Check ->	$	964,873,203

EQUIPMENT

Equipment Description	Fuel Consumption (gal/hr)	Fuel Cost ($/hr)	Owning and Operating Cost (w/out fuel) ($/hr)	Fuel-Adjusted Own/Op Cost ($/hr)		Reference
Cat D11R Bulldozer w/universal blade	29.75	$74.05	$339.62	$413.67		1
Cat D9R Bulldozer w/semi universal blade	14.35	$35.72	$140.43	$176.15		1
Cat D6R Series II Bulldozer	6.44	$16.02	$54.27	$70.29		1
Cat 777F Truck	18.76	$46.69	$236.03	$282.72		1
Cat 992G Loader	25.31	$63.00	$282.66	$345.66	$447.48	1
Cat 16M Motor Grader	9.51	$23.66	$124.36	$148.02	$209.96	1
Off-Hwy Water Tanker Truck, 10,000-gal.	15.35	$38.19	$121.85	$160.04	$104.10	1
Komatsu 530M	27.54	$68.55	$243.40	$311.95		1
Hitachi EX3500-3	71.90	$178.95	$595.24	$774.19		1

1. Equipment Watch Version 4.0.4A (http://www.equipmentwatch.com). See attachments for rate development.

FUEL

Oil Broker Quote $2.5 per gallon 2

2. Porter Oil, Bayard, NM (January 14, 2010).

LABOR

Labor Description	NMDOL Type A Operator Group	NMDOL Type A Operator Classification	Nominal Total Rate ($/hr)	
Cat D11R Bulldozer w/universal blade	Equipment Operator IV	Bulldozer (mult. Units)	33.814	3
Cat D9R Bulldozer w/semi universal blade	Equipment Operator IV	Bulldozer (mult. Units)	33.814	3
Cat D6R Series II Bulldozer	Equipment Operator IV	Bulldozer (mult. Units)	33.814	3
Haul Truck	Equipment Operator III	Teamster	24.65	3
Loader	Equipment Operator VI	Loader (over 10 cy)	33.962	3
Cat 16H Motor Grader	Equipment Operator IV	Motor Grader	33.814	3
Off-Hwy Water Tanker Truck, 10,000-gal.	Equipment Operator III	Teamster	24.65	3
Light Duty Truck, 4x4, 1 ton, 195 HP (Mecha	Equipment Operator VI	Mechanic	$33.10	3

3. Labor rates based on NM Department of Labor Type H (Heavy Engineering) labor rates. See attachments for rate development.

Data Sources:

Equipment Watch
https:www.equipmentwatch.com

Total Cost Calculation — Tyrone
New Mexico Mining and Minerals Division — Worksheet #14
Revegetation Costs — 07/02/10

Description:

Plow; apply fertilizer, seed mix, and mulch; and crimp mulch

Unit or Disturbance	(acres)	Unit Cost ($/acre)	Subtotal Cost ($)	Area Reference
Stockpile Areas				
Main Pit Top	809	1,112.50	900,013	Rocky Mountain Reclamation, Larmie WY (January, 2010). Quote includes cost for scarifying (ripping) surface.
Savanna Top	167	1,112.50	185,788	Rocky Mountain Reclamation, Larmie WY (January, 2010). Quote includes cost for scarifying (ripping) surface.
Gettysburg Top	231	1,112.50	256,988	Rocky Mountain Reclamation, Larmie WY (January, 2010). Quote includes cost for scarifying (ripping) surface.
Copper Mtn Top	164	1,112.50	182,450	Rocky Mountain Reclamation, Larmie WY (January, 2010). Quote includes cost for scarifying (ripping) surface.

Main Pit Top	900,013
Savanna Top	185,788
Gettysburg Top	256,988
Copper Mtn Top	182,450
Total Cost	**$1,525,238**
Q/A check->	$1,525,238

Abondon
Replace

Stockpiles Area	Activity	Quantity	Unit	Unit Cost ($/unit)	Current Item Cost ($)	Means Reference	Means Line Item	Means Page	Description
Spillways									
Main Pit Top	Top Channels	7,000	feet	8.59	60,130				Excavation…see note 1 for full description
Savanna Top	Top Channels	6,000	feet	8.59	51,540				Excavation…see note 1 for full description
Gettysburg Top	Top Channels	5,000	feet	8.59	42,950				Excavation…see note 1 for full description
Copper Mtn Top	Top Channels	4,500	feet	8.59	38,655				Excavation…see note 1 for full description
Riprap & Gravel									
Main Pit Top	Top Channel Riprap (processed), Haul	10,400	cy	7.84	81,543	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mi
Savanna Top	Top Channel Riprap (processed), Haul	8,900	cy	7.84	69,782	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mi
Gettysburg Top	Top Channel Riprap (processed), Haul	7,400	cy	7.84	58,021	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mi
Copper Mtn Top	Top Channel Riprap (processed), Haul	6,700	cy	7.84	52,532	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mi
Main Pit Top	Top Channel Gravel, Haul	5,300	cy	7.84	41,555	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mi
Savanna Top	Top Channel Gravel, Haul	4,500	cy	7.84	35,283	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mi
Gettysburg Top	Top Channel Gravel, Haul	3,800	cy	7.84	29,794	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mi
Copper Mtn Top	Top Channel Gravel, Haul	3,400	cy	7.84	26,658	Means	G1030 150 7600	441	Load & Haul rock, 5-cy loader, 12 20-cy trailers, 3-mi
Main Pit Top	Top Channel Riprap, (processed) Back	10,400	cy	1.22	12,679	Means	312323.14 5200 312323.23 5040 312323.14 5200	227, 251	Gravel backfill…see note 2 for full description
Savanna Top	Top Channel Riprap, (processed) Back	8,900	cy	1.22	10,850	Means	312323.14 5200 312323.23 5040 312323.14 5200	227, 251	Gravel backfill…see note 2 for full description
Gettysburg Top	Top Channel Riprap, (processed) Back	7,400	cy	1.22	9,021	Means	312323.14 5200 312323.23 5040 312323.14 5200	227, 251	Gravel backfill…see note 2 for full description
Copper Mtn Top	Top Channel Riprap, (processed) Back	6,700	cy	1.22	8,168	Means	312323.14 5200 312323.23 5040 312323.14 5200	227, 251	Gravel backfill…see note 2 for full description
Main Pit Top	Top Channel Gravel, Backfill	5,300	cy	1.22	6,461	Means	312323.14 5200 312323.23 5040 312323.14 5200	227, 251	Gravel backfill…see note 2 for full description
Savanna Top	Top Channel Gravel, Backfill	4,500	cy	1.22	5,486	Means	312323.14 5200 312323.23 5040 312323.14 5200	227, 251	Gravel backfill…see note 2 for full description
Gettysburg Top	Top Channel Gravel, Backfill	3,800	cy	1.22	4,633	Means	312323.14 5200 312323.23 5040 312323.14 5200	227, 251	Gravel backfill…see note 2 for full description
Copper Mtn Top	Top Channel Gravel, Backfill	3,400	cy	1.22	4,145	Means	312323.14 5200 312323.23 5040 312323.14 5200	227, 251	Gravel backfill…see note 2 for full description
Main Pit Top	Riprap production (processed)	15,700	cy	15.98	250,886	2007 August Production - McCain Springs Quarry, escalated to 2009 costs.			
Savanna Top	Riprap production (processed)	13,400	cy	15.98	214,132	2007 August Production - McCain Springs Quarry, escalated to 2009 costs.			
Gettysburg Top	Riprap production (processed)	11,200	cy	15.98	178,976	2007 August Production - McCain Springs Quarry, escalated to 2009 costs.			
Copper Mtn Top	Riprap production (processed)	10,100	cy	15.98	161,398	2007 August Production - McCain Springs Quarry, escalated to 2009 costs.			

Main Pit Top	453,254
Savanna Top	387,073
Gettysburg Top	323,395
Copper Mtn Top	291,556
Total	**$1,455,278**

Q/A check-> $1,455,278

Description Notes:

1) Excavate and waste material with D11R, 175-foot excavation, 200-foot lateral waste push. Finish grade with D6R, 175-foot typical push distance, unit volume per LF. Uses dozer sheet adjustment factors. See attachment Channel Linear Foot Cost

2) Gravel Backfill, 300 hp dozer & compactors, 150' haul, 6" lifts, 4 passes

3) Excavate and waste material on slopes with D11R, 175-foot downslope excavation, 200-foot lateral waste push. Finish grade with D6R, 175-foot typical push distance, unit volume per LF. Uses dozer sheet adjustment factors. See attachment spillway excavation. Finish grade benches using D9R. Three passes per bench, 1 MPH operating speed.

4) D7R LGP, 198.2 cy/lf of material, 200-foot push. Uses dozer sheet adjustment factors. See attachment spillway cost

5)

Data Sources: RS Means Heavy Construction Cost Data (24th Annual Edition 2010)

Location adjustment:

New Mexico 880 Las Cruces	83.5%

Tyrone Mine Full Pit Backfill Reclamation

			Current Value
	Facility and Structure Removal[1]		$0
	Earthmoving		$964,873,203
Task Description	Revegetation	160%	$2,440,380
	Other		$1,455,278
	Subtotal, Direct Costs		**$968,768,861**
OPERATIONS AND MAINTENANCE	Includes: Road Maintenance, Wildlife Monitoring, and Erosion Control	15.39%	**$149,093,528**
INDIRECT COSTS	Mobilization and Demobilization (0%-10%)	1.1%	$12,296,486
	Contingencies (3%-5%)	2.0%	$22,357,248
	Engineering Redesign Fee (2.5%-6%)	4.5%	$50,303,807
	Contractor Profit and Overhead (15%-30%)[2]	25.0%	$279,465,597
	Project Management Fee (2%-7%)	5.0%	$55,893,119
	State Procurement Cost	2.0%	$22,357,248
	Indirect Percentage Sum =	39.6%	
	Subtotal, Indirect Costs		**$442,673,506**
GROSS RECEIPTS TAX	Grant County (unincorporated areas) (applied to sum of indirect and direct costs)	0.0%	**$0**
TOTAL COST			**$1,560,535,895**

Data Sources:
US Office of Surface Mining, 2000. *Calculation of Reclamation Bond Amounts* .

Notes:

1) The portion of the financial assurance amount for Facility and Structure Removal is to be evaluated through the MMD permit revision process for establishing a closeout plan under the New Mexico Mining Act.

2) Profit and Office Overhead 10%, Project Overhead 15%
Project Overhead usually consists of the following except when it is a direct item:
Salaried and Admin Personal
Field Office, Shop and Facilities
Temporary Utilities
Fees and Insurance except those applicable to labor and equipment
MSHA and Site Specific Training.
Performance and Payment Bonds
QA/QC
Safety
Surveying
Construction Equipment General (salaried pickups, buses, ambulance, etc.)

			Main Pit	Savanna	Gettysburg	Copper Mtn	Totals
DIRECT COSTS							
	Facility and Structure Removal[1]		$0	$0	$0	$0	**$0**
	Earthmoving		$698,421,994	$86,719,547	$115,292,591	$64,439,070	**$964,873,203**
	Revegetation	160.0%	$1,440,020	$297,260	$411,180	$291,920	**$2,440,380**
	Other		$453,254	$387,073	$323,395	$291,556	**$1,455,278**
	Subtotal, Direct Costs		**$700,315,268**	**$87,403,880**	**$116,027,166**	**$65,022,547**	**$968,768,861**
OPERATIONS AND MAINTENANCE	Includes: Road Maintenance, Wildlife Monitori and Erosion Control	15.4%	**$107,778,520**	**$13,451,457**	**$17,856,581**	**$10,006,970**	**$149,093,528**
INDIRECT COSTS	Mobilization and Demobilization (0%-10%)	1.1%	$8,889,032	$1,109,409	$1,472,721	$825,325	**$12,296,486**
	Contingencies (3%-5%)	2.0%	$16,161,876	$2,017,107	$2,677,675	$1,500,590	**$22,357,248**
	Engineering Redesign Fee (2.5%-6%)	4.5%	$36,364,220	$4,538,490	$6,024,769	$3,376,328	**$50,303,807**
	Contractor Profit and Overhead (15%-30%)	25.0%	$202,023,447	$25,213,834	$33,470,937	$18,757,379	**$279,465,597**
	Project Management Fee (2%-7%)	5.0%	$40,404,689	$5,042,767	$6,694,187	$3,751,476	**$55,893,119**
	State Procurement Cost	2.0%	$16,161,876	$2,017,107	$2,677,675	$1,500,590	**$22,357,248**
	Indirect Percentage Sum =	39.6%					
	Subtotal, Indirect Costs		**$320,005,140**	**$39,938,714**	**$53,017,964**	**$29,711,689**	**$442,673,506**
GROSS RECEIPTS TAX	Grant County (unincorporated areas) (applied to sum of indirect and direct costs)	0.0%	**$0**	**$0**	**$0**	**$0**	**$0**
TOTAL COST PER STOCKPILE			**$1,128,098,928**	**$140,794,051**	**$186,901,711**	**$104,741,205**	**$1,560,535,895**
TOTAL COST			**$1,560,535,895**				

Facility	Main Pit	Savanna	Gettysburg	Copper Mtn
WITHOUT OPERATIONS AND MAINTENANCE				
Reclamation Acres	809.0	167.0	231.0	164.0
Item	Capital Cost	Capital Cost	Capital Cost	Capital Cost
Cover Material	$15,409,800	$2,829,580	$4,400,079	$3,773,678
Truck/Shovel	$959,587,304	$118,230,909	$156,548,378	$86,183,264
Top/Outslope Adjustment	$0	$0	$0	$0
Seed & Mulch	$2,010,268	$414,975	$574,007	$407,520
Channels, Conduits & Berms	$632,743	$540,353	$451,460	$407,013
Other	$0	$0	$0	$0
Capital Cost Totals	$977,640,115	$122,015,817	$161,973,924	$90,771,475
Capital Cost/Acre	**$1,208,455**	**$730,634**	**$701,186**	**$553,485**
Capital Cost/Acre Cover	$19,048	$16,944	$19,048	$23,010
Capital Cost/Acre Truck Shovel	$1,186,140	$707,970	$677,699	$525,508
Capital Cost/Acre Top/Outslope Adjustment	$0	$0	$0	$0
Capital Cost/Acre Earthwork Total	$1,205,188	$724,913	$696,747	$548,518
Capital Cost/Acre Reveg	$2,485	$2,485	$2,485	$2,485
Capital Cost/Acre Other	$782	$3,236	$1,954	$2,482
WITH OPERATIONS AND MAINTENANCE				
Operations and Maintenance	$150,458,814	$18,778,234	$24,927,787	$13,969,730
Total Cost	$1,128,098,928	$140,794,051	$186,901,711	$104,741,205
Total Cost/Acre	**$1,394,436**	**$843,078**	**$809,098**	**$638,666**

Water Management Cost Summary

Item	Subtotal Direct Costs	Subtotal, Indirect Costs	Total Current Cost
		39.6%	
Environmental Sampling	**$38,680**	**$0**	**$38,680**
Pit Dewatering Wells			
Construction	$7,522,720	$0	$7,522,720
Maintenance	$10,230,445	$0	$10,230,445
Total Wells	**$17,753,165**	**$0**	**$17,753,165**
Total Capital	**$7,522,720**	**$0**	**$7,522,720**
Total Replacement and Maintenance	**$10,269,125**	**$0**	**$10,269,125**
Total	**$17,791,845**	**$0**	**$17,791,845**

Variables

100 year WellMaintenance to Capital Cost	34.00%

Pit Dewatering Wells

	From	To	Description	Depth (ft)	Well Construction ($/ft)	Mobe and Demob ($/well)	Pump- 500gpm at 250 nph; Includes associated install, wiring, etc.	Well-head completion	Well development (24hr/well)	Pumping Test Support (10hr per well)	Non-drill time (10 hr per well)	First Replacement Year (yr)	Second Replacement Year (yr)	Well and Pump Replacement Year (yr)	Third Replacement Year (yr)	Fourth Replacement Year (yr)	Pump Cost New and Replacement ($)	Well and Pump Cost New and Replacement ($)	**Total Cost ($)**	**Total Maintenance Cost (Years 1-100)**
			See MWH Takeoffs																	
1	Main Pit well 1	top of pit for water treatment		950	$2,585	$13,333	$12,500	$4,500	$ 9,240	$ 6,000	$ 6,250	20	40	60	80	80	$12,500	$2,507,573	$5,065,147	$852,575
2	Main Pit well 2	top of pit for water treatment		950	$2,585	$13,333	$12,500	$4,500	$ 9,240	$ 6,000	$ 6,250	20	40	60	80	80	$12,500	$2,507,573	$5,065,147	$852,575
3	Main Pit well 3	top of pit for water treatment		950	$2,585	$13,333	$12,500	$4,500	$ 9,240	$ 6,000	$ 6,250	20	40	60	80	80	$12,500	$2,507,573	$5,065,147	$852,575
																	$37,500	**$7,522,720**		**$25,577**
																			$15,195,440	**$2,557,725**
																			Total	**$17,753,165**

Operations & Maintenance

ENVIRONMENTAL SAMPLING

Years 1-12
$1,070.00
Years 13-20
$530.00
Years 21-100
$270.00

Pit Dewatering Wells

Years 1-100
$25,577.25

	Year	Annual Current Cost ($)	Year	Capital Annual Current Cost	Annual Current Cost ($)
1	2010	1,070.00	2010	7,522,720	25,577.25
2	2011	1,070.00	2011		25,577.25
3	2012	1,070.00	2012		25,577.25
4	2013	1,070.00	2013		25,577.25
5	2014	1,070.00	2014		25,577.25
6	2015	1,070.00	2015		25,577.25
7	2016	1,070.00	2016		25,577.25
8	2017	1,070.00	2017		25,577.25
9	2018	1,070.00	2018		25,577.25
10	2019	1,070.00	2019		25,577.25
11	2020	1,070.00	2020		25,577.25
12	2021	1,070.00	2021		25,577.25
13	2022	530.00	2022		25,577.25
14	2023	530.00	2023		25,577.25
15	2024	530.00	2024		25,577.25
16	2025	530.00	2025		25,577.25
17	2026	530.00	2026		25,577.25
18	2027	530.00	2027		25,577.25
19	2028	530.00	2028		25,577.25
20	2029	530.00	2029		25,577.25
21	2030	270.00	2030	37,500	25,577.25
22	2031	270.00	2031		25,577.25
23	2032	270.00	2032		25,577.25
24	2033	270.00	2033		25,577.25
25	2034	270.00	2034		25,577.25
26	2035	270.00	2035		25,577.25
27	2036	270.00	2036		25,577.25
28	2037	270.00	2037		25,577.25
29	2038	270.00	2038		25,577.25
30	2039	270.00	2039		25,577.25
31	2040	270.00	2040		25,577.25
32	2041	270.00	2041		25,577.25
33	2042	270.00	2042		25,577.25
34	2043	270.00	2043		25,577.25
35	2044	270.00	2044		25,577.25
36	2045	270.00	2045		25,577.25
37	2046	270.00	2046		25,577.25
38	2047	270.00	2047		25,577.25
39	2048	270.00	2048		25,577.25
40	2049	270.00	2049		25,577.25
41	2050	270.00	2050	37,500	25,577.25
42	2051	270.00	2051		25,577.25
43	2052	270.00	2052		25,577.25
44	2053	270.00	2053		25,577.25
45	2054	270.00	2054		25,577.25
46	2055	270.00	2055		25,577.25
47	2056	270.00	2056		25,577.25
48	2057	270.00	2057		25,577.25
49	2058	270.00	2058		25,577.25
50	2059	270.00	2059		25,577.25
51	2060	270.00	2060		25,577.25
52	2061	270.00	2061		25,577.25
53	2062	270.00	2062		25,577.25
54	2063	270.00	2063		25,577.25
55	2064	270.00	2064		25,577.25
56	2065	270.00	2065		25,577.25
57	2066	270.00	2066		25,577.25
58	2067	270.00	2067		25,577.25
59	2068	270.00	2068		25,577.25
60	2069	270.00	2069		25,577.25
61	2070	270.00	2070	7,522,720	25,577.25
62	2071	270.00	2071		25,577.25
63	2072	270.00	2072		25,577.25
64	2073	270.00	2073		25,577.25
65	2074	270.00	2074		25,577.25
66	2075	270.00	2075		25,577.25
67	2076	270.00	2076		25,577.25
68	2077	270.00	2077		25,577.25
69	2078	270.00	2078		25,577.25
70	2079	270.00	2079		25,577.25
71	2080	270.00	2080		25,577.25
72	2081	270.00	2081		25,577.25
73	2082	270.00	2082		25,577.25
74	2083	270.00	2083		25,577.25
75	2084	270.00	2084		25,577.25
76	2085	270.00	2085		25,577.25
77	2086	270.00	2086		25,577.25
78	2087	270.00	2087		25,577.25
79	2088	270.00	2088		25,577.25
80	2089	270.00	2089		25,577.25
81	2090	270.00	2090	37,500	25,577.25
82	2091	270.00	2091		25,577.25
83	2092	270.00	2092		25,577.25
84	2093	270.00	2093		25,577.25
85	2094	270.00	2094		25,577.25
86	2095	270.00	2095		25,577.25
87	2096	270.00	2096		25,577.25
88	2097	270.00	2097		25,577.25
89	2098	270.00	2098		25,577.25
90	2099	270.00	2099		25,577.25
91	2100	270.00	2100		25,577.25
92	2101	270.00	2101		25,577.25
93	2102	270.00	2102		25,577.25
94	2103	270.00	2103		25,577.25
95	2104	270.00	2104		25,577.25
96	2105	270.00	2105		25,577.25
97	2106	270.00	2106		25,577.25
98	2107	270.00	2107		25,577.25
99	2108	270.00	2108		25,577.25
100	2109	270.00	2109	37,500	25,577.25
101	2110	---	2110		---
102	2111	---	2111		---
103	2112	---	2112		---
104	2113	---	2113		---
105	2114	---	2114		---
106	2115	---	2115		---
Direct Cost		38,680		15,195,440	2,557,725
W/ Indirects		38,680		15,195,440	2,557,725

2010 Current Cost

17,753,165

References:

Current Value	**$**	**17,791,845**

Sample Collection, Analysis, and Reporting Cost

Pit Sump Water Quality Sampling	Total Cost Per Well
Quarterly Sampling Cost	$ 1,070
Semi-Annual Sampling Cost	$ 530
Annual Sampling Cost	$ 270

Sampling Schedule and Cost

	1 Well							
Year	Quarterly	Semi-Annual	Annual	Total Locations	Quarterly Cost	Semi-Annual Cost	Annual Cost	Total Yearly Cost
1	1			1	$ 1,070	$ -	$ -	$ 1,070
2	1			1	$ 1,070	$ -	$ -	$ 1,070
3	1			1	$ 1,070	$ -	$ -	$ 1,070
4	1			1	$ 1,070	$ -	$ -	$ 1,070
5	1			1	$ 1,070	$ -	$ -	$ 1,070
6	1			1	$ 1,070	$ -	$ -	$ 1,070
7	1			1	$ 1,070	$ -	$ -	$ 1,070
8	1			1	$ 1,070	$ -	$ -	$ 1,070
9	1			1	$ 1,070	$ -	$ -	$ 1,070
10	1			1	$ 1,070	$ -	$ -	$ 1,070
11	1			1	$ 1,070	$ -	$ -	$ 1,070
12	1			1	$ 1,070	$ -	$ -	$ 1,070
13		1		1	$ -	$ 530	$ -	$ 530
…		1		1	$ -	$ 530	$ -	$ 530
20		1		1	$ -	$ 530	$ -	$ 530
…			1	1	$ -	$ -	$ 270	$ 270
100			1	1	$ -	$ -	$ 270	$ 270
							Total	$ 38,680

Environmental Sampling, Analysis and Reporting[1]

	Sampling	Shipping and Analysis					Reporting					
Sample Basis Type	Samples per Year	Number of Shipping Coolers per Sample	Shipping Cost per Cooler	Shipping Cost	Analysis Cost per Sample [2]	Analysis and Shipping Cost	Report Work per Sample (Hours)	Report Work Hourly Rate	Review Work per Sample (Hours)	Review Work Hourly Rate	Reporting Cost	Total Sample Cost
Quarterly Sampling	4	0.10	$ 50	$ 20	$ 225	$ 920	0.500	$ 60	0.100	$ 70	$ 150	$ 1,070
Semi-Annual Sampling	2	0.10	$ 50	$ 10	$ 225	$ 460	0.500	$ 60	0.100	$ 70	$ 70	$ 530
Annual Sampling	1	0.10	$ 50	$ 5	$ 225	$ 230	0.500	$ 60	0.100	$ 70	$ 40	$ 270

[1] Sampling labor, vehicle and equipment are assumed to be included in the routine duty for site personnel.

[2] 23 Constituents. Energy Laboratories, Inc, 2009. Published price list (www.energylab.com).

APPENDIX B
SUPPORTING DOCUMENTATION

Appendix B-1
Labor Rates

Labor Rate Detail

Labor	Equipment	Zone	Group	Base rate	Zone Pay	Fringes	Apprentice Rate	Subtotal	FICA 6.200%	Medicare 1.450%	Fed Unempl.	State Unempl.	Workmens Comp	Total per Hour
Power Equipment Operator	Front End Loaders		VI	$22.26		$6.77	$0.34	$29.37	$1.82	$0.43	$0.03	$0.20	$2.119	**$33.962**
Power Equipment Operator	Dozer		IV	$22.11		$6.77	$0.34	$29.22	$1.81	$0.42	$0.03	$0.20	$2.132	**$33.814**
Power Equipment Operator	Scrapers		IV	$22.11		$6.77	$0.34	$29.22	$1.81	$0.42	$0.03	$0.20	$2.132	**$33.814**
Power Equipment Operator	Motor Grader (Rough)		IV	$22.11		$6.77	$0.34	$29.22	$1.81	$0.42	$0.03	$0.20	$2.132	**$33.814**
Power Equipment Operator	Excavator		VIII	$22.46		$6.77	$0.34	$29.57	$1.83	$0.43	$0.03	$0.20	$2.107	**$34.165**
Power Equipment Operator	Mechanic		VI	$22.26		$6.77	$0.34	$29.37	$1.82	$0.43	$0.03	$0.20	$1.261	**$33.104**
Teamster	Haul Trucks		III	$15.45		$4.94	$0.26	$20.65	$1.28	$0.30	$0.03	$0.20	$2.193	**$24.650**
Teamster	Oiler		II	$21.51		$6.77	$0.34	$28.62	$1.77	$0.41	$0.03	$0.20	$2.193	**$33.229**

	Federal Unemployment - 0.8% on the first $7,000	New Mexico Unemployment - 2% on the first $20,800
$ Max	$7,000	$20,800
Unemployment Tax	0.80%	2.00% new employees' first 4 yrs
Unemployment Taxes Paid	$56.00	$416.00
Hours per Yr	2,085 (365 * 5/7 * 8 = 2085.71)	2,085
Unemployment rate per Hour	$0.03	$0.20

Class	Class Code	Workmens Comp (WC) Rate / $100	Base Rate W/ Fringes & Apprentice	Base rate / $100 * Base Wage per Hour = WC/Hour $/hr	$10 /$100 of Total Payroll (Surcharge) [1] $/hr	0.031 cents /$100 of Total Payroll (Terrorist Premium) [1] $/hr	Total Workmans Comp / $100 $/hr
Operators							
Front End Loaders	6217	$6.380	$29.370	$1.874	$0.187	$0.058	$2.119
Excavator	6217	$6.380	$29.220	$1.864	$0.186	$0.056	$2.107
All Others	6217	$6.380	$29.570	$1.887	$0.189	$0.057	$2.132
Teamster	7228	$9.400	$20.650	$1.941	$0.194	$0.058	$2.193
Mechanic	8380	$3.800	$29.370	$1.116	$0.112	$0.033	$1.261

[1] based on WC hours

References 1/1/2010

Base Rate, Fringes, Apprentice Rate	http://www.wia.state.nm.us/Tax/2010Rates.pdf
FICA, Medicare	http://www.ssa.gov/OACT/ProgData/taxRates.html
New Mexico Unemployment Tax	http://www.dws.state.nm.us/dws-newstax.html
Federal Unemployment Tax	http://workforcesecurity.doleta.gov/unemploy/uitaxtopic.asp
Workmans Comp	Vendor Quote 1/23/2009, John L. Anna Co West Insurance 823 So. Perry St. #260 Castle Rock, CO 80104

TYPE "H" - HEAVY ENGINEERING

Effective January 1, 2010

Trade Classification	Base Rate	Fringe Rate	Apprenticeship
Asbestos Worker - Heat & Frost Insulator	27.35	10.23	0.20
Boilermaker	18.50	3.31	0.56
Bricklayer/Blocklayer/StoneMason	20.78	4.73	0.54
Carpenter/Lather	20.86	6.00	0.35
Millwright/Piledriver	26.38	5.96	0.40
Cement Mason	21.83	6.98	0.40
Electricians			
Outside Classifications			
Groundman	21.14	10.23	0.25
Equipment Operator	23.96	10.23	0.25
Lineman/Tech	24.55	10.23	0.25
Cable Splicer	25.73	10.23	0.25
Inside Classifications			
Wireman/Tech	26.85	8.36	0.54
Cable Splicer	28.58	8.36	0.54
Sound Classifications			
Installer	0.00	0.00	0.00
Technician	0.00	0.00	0.00
Soundman	0.00	0.00	0.00
Glazier	0.00	0.00	0.00
Ironworker	31.04	9.40	0.42
Painter (Brush/Roller/Spray)	16.00	3.78	0.00
Plumber/Pipefitter	28.30	11.00	0.32
Roofer	19.56	11.34	0.23
SheetmetalWorker	27.56	14.20	0.42
Operators			
Group I	21.31	6.77	0.34
Group II	21.51	6.77	0.34
Group III	22.09	6.77	0.34
Group IV	22.11	6.77	0.34
Group V	22.11	6.77	0.34
Group VI	22.26	6.77	0.34
Group VII	22.31	6.77	0.34
Group VIII	22.46	6.77	0.34
Group IX	22.96	6.77	0.34
Group X	23.76	6.77	0.34

TYPE "H" - HEAVY ENGINEERING

Effective January 1, 2010

Trade Classification	Base Rate	Fringe Rate	Apprenticeship
Laborers			
Group I	14.95	4.27	$0.26
Group II	15.25	4.27	$0.26
Group III	15.55	4.27	$0.26
Group IV	16.12	4.27	$0.26
Group V	16.37	4.27	$0.26
Group VI	15.10	4.27	$0.26
Group VII	15.04	4.27	$0.26
Group VIII	15.50	4.27	$0.26
Group IX	15.70	4.27	$0.26
Group X	16.37	4.27	$0.26
Truck Drivers			
Group I	15.05	4.94	$0.26
Group II	15.25	4.94	$0.26
Group III	15.45	4.94	$0.26
Group IV	15.65	4.94	$0.26

NOTE: SUBSISTENCE AND INCENTIVE PAY DO NOT APPLY TO TYPE "H" CONSTRUCTION.

Appendix B-2
Equipment Rates
(Equipment Watch)
and Fuel Quote

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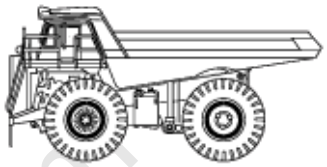
Custom Cost Evaluator

February 8, 2010

Komatsu 530M (disc. 2000)

Mechanical Drive Rear Dumps



Size Class:
Rated Tonnage Capacity: 140 - 169 MTons
Weight:
220,440 lbs.

Configuration for 530M

Power Mode	**Diesel**	Rated Payload	**150.0 MT**
Body Capacity (Struck - Heaped)	**71.0 - 102.0 cy**	Net Horsepower	**1,377.0**

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$68.35/hr	$69.99/hr	+2.4%
Cost of Facilities Capital (CFC)	$31.21/hr	$28.90/hr	-7.4%
Overhead	$16.16/hr	$14.87/hr	-7.98%
Overhaul Labor	$28.15/hr	$18.53/hr	-34.17%
Overhaul Parts	$35.77/hr	$32.92/hr	-7.97%
Total Hourly Ownership Cost:	**$179.64/hr**	**$165.21/hr**	**-8.03%**

User Defined Adjustments: Annual Use Hours (1,850 hrs -> 2,010 hrs) Sales Tax (5.4% -> 7.5%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$16.26/hr	$10.70/hr	-34.19%
Field Parts	$16.38/hr	$15.08/hr	-7.94%
Ground Engaging Component (GEC)	$0.00/hr	$0.00/hr	-
Tires	$32.81/hr	$32.81/hr	-
Electrical/Fuel	$60.59/hr	$68.55/hr	+13.14%
Lube	$19.60/hr	$19.60/hr	-
Total Hourly Operating Cost:	**$145.64/hr**	**$146.74/hr**	**+0.76%**

User Defined Adjustments: Annual Field Parts ($25,250.85 -> $25,250.85) Diesel Cost ($2.20/gal -> $2.49/gal) Mechanics Wage ($46.29 -> $33.10)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$179.64/hr	$165.21/hr	**-8.03%**
Hourly Operating Cost	$145.64/hr	$146.74/hr	**+0.76%**
Total Hourly Cost	**$325.28/hr**	**$311.95/hr**	**-4.1%**

Revised Date: 2nd Half 2009

EQUIPMENT WATCH

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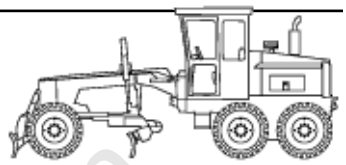
Custom Cost Evaluator

February 8, 2010

Caterpillar 16M

Articulated Frame Graders



Size Class:
250 HP & Over
Weight:
57,452 lbs.

Configuration for 16M

Power Mode	**Diesel**	Operator Protection	**EROPS**
Moldboard Size	**16'**	Net Horsepower	**297.0**

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$35.22/hr	$36.14/hr	+2.61%
Cost of Facilities Capital (CFC)	$18.45/hr	$15.22/hr	-17.51%
Overhead	$22.90/hr	$18.66/hr	-18.52%
Overhaul Labor	$5.95/hr	$3.47/hr	-41.68%
Overhaul Parts	$19.90/hr	$16.22/hr	-18.49%
Total Hourly Ownership Cost:	**$102.42/hr**	**$89.71/hr**	**-12.41%**

User Defined Adjustments: Annual Use Hours (1,400 hrs -> 1,718 hrs) Sales Tax (5.4% -> 7.5%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$4.96/hr	$2.89/hr	-41.73%
Field Parts	$19.30/hr	$15.73/hr	-18.5%
Ground Engaging Component (GEC)	$1.61/hr	$1.31/hr	-18.63%
Tires	$8.14/hr	$8.14/hr	-
Electrical/Fuel	$20.91/hr	$23.66/hr	+13.15%
Lube	$6.58/hr	$6.58/hr	-
Total Hourly Operating Cost:	**$61.50/hr**	**$58.31/hr**	**-5.19%**

User Defined Adjustments: Diesel Cost ($2.20/gal -> $2.49/gal) Mechanics Wage ($46.29 -> $33.10)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$102.42/hr	$89.71/hr	**-12.41%**
Hourly Operating Cost	$61.50/hr	$58.31/hr	**-5.19%**
Total Hourly Cost	**$163.92/hr**	**$148.02/hr**	**-9.7%**

Revised Date: 2nd Half 2009

EQUIPMENT WATCH

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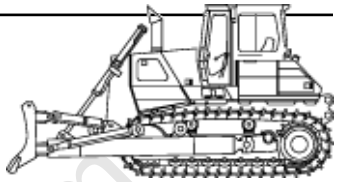
Custom Cost Evaluator

February 8, 2010

Caterpillar D11R (disc. 2007)

Standard Crawler Dozers



Size Class:
Net Hp: 520 HP & Over
Weight:
202,847 lbs.

Configuration for D11R

Power Mode	**Diesel**	Dozer Type	**U Blade**
Operator Protection	**EROPS**	Net Horsepower	**850.0**

Equipment Notes: Includes dozer blade and operator protection as listed.

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$87.05/hr	$89.16/hr	+2.42%
Cost of Facilities Capital (CFC)	$41.74/hr	$35.20/hr	-15.67%
Overhead	$42.43/hr	$35.38/hr	-16.62%
Overhaul Labor	$13.56/hr	$8.08/hr	-40.41%
Overhaul Parts	$80.91/hr	$67.46/hr	-16.62%
Total Hourly Ownership Cost:	**$265.69/hr**	**$235.28/hr**	**-11.45%**

User Defined Adjustments: Annual Use Hours (1,400 hrs -> 1,679 hrs) Sales Tax (5.4% -> 7.5%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$15.87/hr	$9.46/hr	-40.39%
Field Parts	$78.80/hr	$65.71/hr	-16.61%
Ground Engaging Component (GEC)	$12.40/hr	$10.34/hr	-16.61%
Tires	$0.00/hr	$0.00/hr	-
Electrical/Fuel	$65.45/hr	$74.05/hr	+13.14%
Lube	$18.83/hr	$18.83/hr	-
Total Hourly Operating Cost:	**$191.35/hr**	**$178.39/hr**	**-6.77%**

User Defined Adjustments: Diesel Cost ($2.20/gal -> $2.49/gal) Mechanics Wage ($46.29 -> $33.10)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$265.69/hr	$235.28/hr	**-11.45%**
Hourly Operating Cost	$191.35/hr	$178.39/hr	**-6.77%**
Total Hourly Cost	**$457.04/hr**	**$413.67/hr**	**-9.49%**

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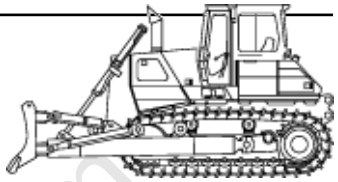
Custom Cost Evaluator

February 8, 2010

Caterpillar D9R (disc. 2005)

Standard Crawler Dozers



Size Class:
Net Hp: 360 - 519 HP
Weight:
90,234 lbs.

Configuration for D9R

Power Mode	**Diesel**	Dozer Type	**Semi-U**
Operator Protection	**EROPS**	Net Horsepower	**410.0**

Equipment Notes: Includes dozer blade and operator protection as listed.

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$31.18/hr	$31.94/hr	+2.44%
Cost of Facilities Capital (CFC)	$15.15/hr	$12.78/hr	-15.64%
Overhead	$17.16/hr	$14.31/hr	-16.61%
Overhaul Labor	$13.56/hr	$8.08/hr	-40.41%
Overhaul Parts	$31.89/hr	$26.59/hr	-16.62%
Total Hourly Ownership Cost:	**$108.94/hr**	**$93.70/hr**	**-13.99%**

User Defined Adjustments: Annual Use Hours (1,400 hrs -> 1,679 hrs) Sales Tax (5.4% -> 7.5%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$15.87/hr	$9.46/hr	-40.39%
Field Parts	$31.06/hr	$25.90/hr	-16.61%
Ground Engaging Component (GEC)	$4.50/hr	$3.75/hr	-16.67%
Tires	$0.00/hr	$0.00/hr	-
Electrical/Fuel	$31.57/hr	$35.72/hr	+13.15%
Lube	$7.62/hr	$7.62/hr	-
Total Hourly Operating Cost:	**$90.62/hr**	**$82.45/hr**	**-9.02%**

User Defined Adjustments: Diesel Cost ($2.20/gal -> $2.49/gal) Mechanics Wage ($46.29 -> $33.10)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$108.94/hr	$93.70/hr	**-13.99%**
Hourly Operating Cost	$90.62/hr	$82.45/hr	**-9.02%**
Total Hourly Cost	**$199.56/hr**	**$176.15/hr**	**-11.73%**

Revised Date: 2nd Half 2009

EQUIPMENT WATCH

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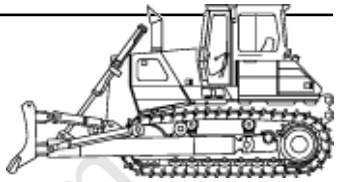
February 8, 2010

Caterpillar D6R SERIES II (disc. 2005)

Standard Crawler Dozers



Size Class:
Net Hp: 160 - 189 HP
Weight:
40,400 lbs.

Configuration for D6R SERIES II

Power Mode	**Diesel**	Dozer Type	**Semi-U**
Operator Protection	**EROPS**	Net Horsepower	**165.0**

Equipment Notes: Includes dozer blade and operator protection as listed.

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$12.71/hr	$13.07/hr	+2.83%
Cost of Facilities Capital (CFC)	$6.79/hr	$5.53/hr	-18.56%
Overhead	$5.87/hr	$4.72/hr	-19.59%
Overhaul Labor	$7.75/hr	$4.46/hr	-42.45%
Overhaul Parts	$10.70/hr	$8.61/hr	-19.53%
Total Hourly Ownership Cost:	**$43.82/hr**	**$36.39/hr**	**-16.96%**

User Defined Adjustments: Annual Use Hours (1,285 hrs -> 1,597 hrs) Sales Tax (5.4% -> 7.5%) Overhaul Parts ($13,752.15 -> $13,752.15)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$9.55/hr	$5.49/hr	-42.51%
Field Parts	$10.37/hr	$8.34/hr	-19.58%
Ground Engaging Component (GEC)	$1.50/hr	$1.21/hr	-19.33%
Tires	$0.00/hr	$0.00/hr	-
Electrical/Fuel	$14.16/hr	$16.02/hr	+13.14%
Lube	$2.84/hr	$2.84/hr	-
Total Hourly Operating Cost:	**$38.42/hr**	**$33.90/hr**	**-11.76%**

User Defined Adjustments: Diesel Cost ($2.20/gal -> $2.49/gal) Mechanics Wage ($46.29 -> $33.10)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$43.82/hr	$36.39/hr	**-16.96%**
Hourly Operating Cost	$38.42/hr	$33.90/hr	**-11.76%**
Total Hourly Cost	**$82.24/hr**	**$70.29/hr**	**-14.53%**

Revised Date: 2nd Half 2009

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Custom Cost Evaluator

February 8, 2010

Caterpillar 992G (disc. 2008)

4-Wd Articulated Wheel Loaders

Size Class:
Net Hp: 500 - 999 HP
Weight:
210,424 lbs.

Configuration for 992G

Power Mode	**Diesel**	Bucket Capacity-Heaped	**16.00 cy**
Net Horsepower	**791.0**	Operator Protection	**EROPS**

Equipment Notes: Includes General Purpose bucket and ROPS, unless otherwise noted.
Configuration Notes: with EROPS

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$95.23/hr	$97.82/hr	+2.72%
Cost of Facilities Capital (CFC)	$45.18/hr	$37.80/hr	-16.33%
Overhead	$49.70/hr	$41.02/hr	-17.46%
Overhaul Labor	$8.01/hr	$4.73/hr	-40.95%
Overhaul Parts	$26.87/hr	$22.18/hr	-17.45%
Total Hourly Ownership Cost:	**$224.99/hr**	**$203.55/hr**	**-9.53%**

User Defined Adjustments: Annual Use Hours (1,445 hrs -> 1,751 hrs) Sales Tax (5.4% -> 7.5%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$9.77/hr	$5.77/hr	-40.94%
Field Parts	$29.65/hr	$24.47/hr	-17.47%
Ground Engaging Component (GEC)	$3.87/hr	$3.19/hr	-17.57%
Tires	$29.10/hr	$29.10/hr	-
Electrical/Fuel	$55.69/hr	$63.00/hr	+13.13%
Lube	$16.58/hr	$16.58/hr	-
Total Hourly Operating Cost:	**$144.66/hr**	**$142.11/hr**	**-1.76%**

User Defined Adjustments: Annual Field Parts ($36,463.28 -> $36,463.29) Annual Misc. Supply Parts ($6,381.07 -> $6,381.07) Diesel Cost ($2.20/gal -> $2.49/gal) Mechanics Wage ($46.29 -> $33.10)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$224.99/hr	$203.55/hr	**-9.53%**
Hourly Operating Cost	$144.66/hr	$142.11/hr	**-1.76%**
Total Hourly Cost	**$369.65/hr**	**$345.66/hr**	**-6.49%**

Revised Date: 2nd Half 2009

EQUIPMENT WATCH

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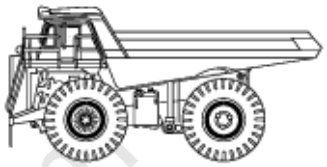
February 8, 2010

Caterpillar 777F

Mechanical Drive Rear Dumps

Size Class:
90 - 104 MTons
Weight:
154,753 lbs.



Configuration for 777F

Power Mode	**Diesel**	Rated Payload	**90.9 MT**
Body Capacity (Struck - Heaped)	**78.0 cy**	Net Horsepower	**938.0**

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$73.22/hr	$74.97/hr	+2.39%
Cost of Facilities Capital (CFC)	$30.58/hr	$27.91/hr	-8.73%
Overhead	$30.54/hr	$27.64/hr	-9.5%
Overhaul Labor	$23.02/hr	$14.90/hr	-35.27%
Overhaul Parts	$28.04/hr	$25.38/hr	-9.49%
Total Hourly Ownership Cost:	**$185.40/hr**	**$170.80/hr**	**-7.87%**

User Defined Adjustments: Annual Use Hours (1,850 hrs -> 2,044 hrs) Sales Tax (5.4% -> 7.5%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$14.14/hr	$9.15/hr	-35.29%
Field Parts	$17.31/hr	$15.66/hr	-9.53%
Ground Engaging Component (GEC)	$0.00/hr	$0.00/hr	-
Tires	$23.12/hr	$23.12/hr	-
Electrical/Fuel	$41.27/hr	$46.69/hr	+13.13%
Lube	$17.30/hr	$17.30/hr	-
Total Hourly Operating Cost:	**$113.14/hr**	**$111.92/hr**	**-1.08%**

User Defined Adjustments: Diesel Cost ($2.20/gal -> $2.49/gal) Mechanics Wage ($46.29 -> $33.10)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$185.40/hr	$170.80/hr	**-7.87%**
Hourly Operating Cost	$113.14/hr	$111.92/hr	**-1.08%**
Total Hourly Cost	**$298.54/hr**	**$282.72/hr**	**-5.3%**

Revised Date: 2nd Half 2009

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Custom Cost Evaluator

February 8, 2010

Off-Highway Water Tanker Trucks

Miscellaneous Models

Configuration for Off-Highway Water Tanker Trucks

Power Mode	**Diesel**	Tank Capacity	**10,000 gal**
Horsepower	**450.0**		

Equipment Notes: Rates include off-highway prime mover complete with a semi-trailer water tanker, hydraulic drive centrifugal pump and rear spraybar.

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$37.27/hr	$38.25/hr	+2.63%
Cost of Facilities Capital (CFC)	$15.32/hr	$13.03/hr	-14.95%
Overhead	$11.85/hr	$9.92/hr	-16.29%
Overhaul Labor	$10.18/hr	$6.09/hr	-40.18%
Overhaul Parts	$8.97/hr	$7.51/hr	-16.28%
Total Hourly Ownership Cost:	**$83.59/hr**	**$74.80/hr**	**-10.52%**

User Defined Adjustments: Annual Use Hours (1,500 hrs -> 1,793 hrs) Sales Tax (5.4% -> 7.5%)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$24.69/hr	$14.77/hr	-40.18%
Field Parts	$17.32/hr	$14.49/hr	-16.34%
Ground Engaging Component (GEC)	$0.00/hr	$0.00/hr	-
Tires	$10.41/hr	$10.41/hr	-
Electrical/Fuel	$33.76/hr	$38.19/hr	+13.12%
Lube	$7.38/hr	$7.38/hr	-
Total Hourly Operating Cost:	**$93.56/hr**	**$85.24/hr**	**-8.89%**

User Defined Adjustments: Diesel Cost ($2.20/gal -> $2.49/gal) Mechanics Wage ($46.29 -> $33.10)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$83.59/hr	$74.80/hr	**-10.52%**
Hourly Operating Cost	$93.56/hr	$85.24/hr	**-8.89%**
Total Hourly Cost	**$177.15/hr**	**$160.04/hr**	**-9.66%**

Revised Date: 2nd Half 2009

EQUIPMENT WATCH

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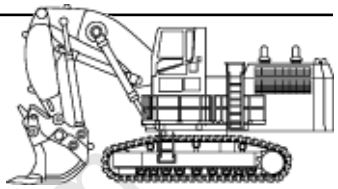
Custom Cost Evaluator

February 8, 2010

Hitachi EX3500-3 (disc. 2001)

Hydraulic Shovels



Size Class:
Operating Weight: 150.1 MTons & Over
Weight:
736,000 lbs.

Configuration for EX3500-3

Power Mode	**Diesel**	Bucket Capacity - Heaped	**23.5 cy**
Operating Weight	**334.0 MT**	Net Horsepower	**1,634.0**

Equipment Notes: Bucket included in rate, unless otherwise noted.

Hourly Ownership Costs

	Standard Value	User Adjusted Value	Variance
Depreciation	$150.10/hr	$153.56/hr	+2.31%
Cost of Facilities Capital (CFC)	$71.18/hr	$65.04/hr	-8.63%
Overhead	$34.77/hr	$31.56/hr	-9.23%
Overhaul Labor	$24.02/hr	$15.59/hr	-35.1%
Overhaul Parts	$128.99/hr	$117.09/hr	-9.23%
Total Hourly Ownership Cost:	**$409.06/hr**	**$382.84/hr**	**-6.41%**

User Defined Adjustments: Annual Use Hours (1,850 hrs -> 2,038 hrs) Sales Tax (5.4% -> 7.5%) Overhaul Parts ($238,637.22 -> $238,637.23)

Hourly Operating Costs

	Standard Value	User Adjusted Value	Variance
Field Labor	$31.90/hr	$20.71/hr	-35.08%
Field Parts	$141.24/hr	$128.21/hr	-9.23%
Ground Engaging Component (GEC)	$18.91/hr	$17.17/hr	-9.2%
Tires	$0.00/hr	$0.00/hr	-
Electrical/Fuel	$158.17/hr	$178.95/hr	+13.14%
Lube	$46.31/hr	$46.31/hr	-
Total Hourly Operating Cost:	**$396.53/hr**	**$391.35/hr**	**-1.31%**

User Defined Adjustments: Diesel Cost ($2.20/gal -> $2.49/gal) Mechanics Wage ($46.29 -> $33.10)

Total

	Standard Value	User Adjusted Value	Variance
Hourly Ownership Cost	$409.06/hr	$382.84/hr	**-6.41%**
Hourly Operating Cost	$396.53/hr	$391.35/hr	**-1.31%**
Total Hourly Cost	**$805.59/hr**	**$774.19/hr**	**-3.9%**

Revised Date: 2nd Half 2009

	Water Truck	16M	992G	777F	D11R	D9R	D6R	530M	EX-3500-3
Hours per year	2085	2085	2085	2085	2085	2085	2085	2085	2085
Annual overhaul hours	330	180	250	920	410	410	215	1125	960
Subtotal	1755	1905	1835	1165	1675	1675	1870	960	1125
50 minute hour	293	318	306	194	279	279	312	160	188
Equipment Watch Annual Use Hours	1500	1400	1445	1850	1400	1400	1285	1850	1850
Adjusted Annual Use Hours	**1793**	**1718**	**1751**	**2044**	**1679**	**1679**	**1597**	**2010**	**2038**

January 14, 2010

Re: Fuel cost estimate update for FMI Tyrone Mines/ Little Rock Reclamation

Ms. April Tischer
Telestro Solutions, Inc.
8670 Wolff Court, Suite 205
Westminister, Co.

Ms. Tischer,

As requested:

Off-road low sulphur diesel delivered to Tyrone, New Mexico

Via tank transport truck with approximately 7,500 gallon capacity:
El Paso refinery rack cost plus $.25 per gallon.
e.g. Today's rack @$2.239 = $2.489 delivered.

Via bob-tail tank truck gallons with 1500 to 2100 gallons capacity:
Established monthly purchase order price for FMI, Chino Mines.
e.g. January price delivered was $2.60/gallon.
This price is usually good for the entire month.

Prices stated are not static and subject to change as market volatility dictates.

If you have any questions please feel free to call me.

Sincerely,

J.P. Jones
Porter Oil Co., Inc.
P.O. Box 100
Bayard, N.M. 88023
575-537-3376 (ph)
575-537-3469 (fax)
jpjones@porteroil.com

Appendix B-3
Unit Costs
(RS Means)

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Price is subject to change without prior notice.

0160

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2010

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02 41 13 – Selective Site Demolition

	02 41 13.34 Selective Demolition, Utility Materials	Crew	Daily Output	Labor-Hours	Unit	2010 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**SELECTIVE DEMOLITION, UTILITY MATERIALS** R024119-10									
0015	Excludes excavation									
0020	See other utility items in Div. 02 41 13.33									
0100	Fire Hydrant extensions	B-20	14	1.714	Ea.		63.50		63.50	97.50
0200	Precast Utility boxes up to 8' x 14' x 7'	B-13	2	28			1,000	375	1,375	1,925
0300	Handholes and meter pits	B-6	2	12			430	169	599	840
0400	Utility valves 4"-12"	B-20	4	6			222		222	340
0500	14"-24"	B-21	2	14			530	69	599	890
	02 41 13.36 Selective Demolition, Utility Valves and Accessories									
0010	**SELECTIVE DEMOLITION, UTILITY VALVES & ACCESSORIES**									
0015	Excludes excavation									
0100	Utility valves 4"-12" diam.	B-20	4	6	Ea.		222		222	340
0200	14"-24" diam.	B-21	2	14			530	69	599	890
0300	Crosses 4"-12"	B-20	8	3			111		111	171
0400	14"-24"	B-21	4	7			266	34.50	300.50	450
0500	Utility cut-in valves 4"-12" diam.	B-20	20	1.200			44.50		44.50	68.50
0600	Curb boxes	"	20	1.200			44.50		44.50	68.50
	02 41 13.38 Selective Demo., Water & Sewer Piping & Fittings									
0010	**SELECTIVE DEMOLITION, WATER & SEWER PIPING AND FITTINGS**									
0015	Excludes excavation									
0020	See other utility items in Div. 02 41 13.33									
0090	Concrete pipe 4"-10" dia	B-6	250	.096	L.F.		3.44	1.35	4.79	6.75
0100	42"-48" diameter	B-13B	96	.583			21	12.60	33.60	46
0200	60"-84" diameter	"	80	.700			25	15.10	40.10	54.50
0300	96" diameter	B-13C	80	.700			25	21.50	46.50	62
0400	108"-144" diameter	"	64	.875			31.50	27	58.50	78
0450	Concrete fittings 12" diameter	B-6	24	1	Ea.		36	14.10	50.10	70
0480	Concrete end pieces 12" diameter		200	.120	L.F.		4.30	1.69	5.99	8.40
0485	15" diameter		150	.160			5.75	2.25	8	11.25
0490	18" diameter		150	.160			5.75	2.25	8	11.25
0500	24" -36" diameter		100	.240			8.60	3.38	11.98	16.80
0600	Concrete fittings 24"-36" diameter		12	2	Ea.		71.50	28	99.50	140
0700	48"-84" diameter	B-13B	12	4.667			167	101	268	365
0800	96" diameter	"	8	7			250	151	401	545
0900	108"-144" diameter	B-13C	4	14			500	435	935	1,250
1000	Ductile iron pipe 4" diameter	B-21B	200	.200	L.F.		7.15	3.28	10.43	14.55
1100	6"-12" diameter		175	.229			8.15	3.75	11.90	16.60
1200	14"-24" diameter		120	.333			11.90	5.45	17.35	24.50
1300	Ductile iron fittings 4"-12" diameter		24	1.667	Ea.		59.50	27.50	87	121
1400	14"-16" diameter		18	2.222			79.50	36.50	116	162
1500	18"-24" diameter		12	3.333			119	54.50	173.50	242
1600	Plastic pipe 3/4"-4" diameter	B-20	700	.034	L.F.		1.27		1.27	1.95
1700	6"-8" diameter		500	.048			1.77		1.77	2.73
1800	10"-18" diameter		300	.080			2.95		2.95	4.55
1900	20"-36" diameter		200	.120			4.43		4.43	6.85
1910	42"-48" diameter		180	.133			4.92		4.92	7.60
1920	54"-60" diameter		160	.150			5.55		5.55	8.55
2000	Plastic fittings 4"- 8" diameter	B-6	75	.320	Ea.		11.45	4.51	15.96	22.50
2100	10"-14" diameter		50	.480			17.20	6.75	23.95	33.50
2200	16"-24" diameter		20	1.200			43	16.90	59.90	84
2210	30"-36" diameter		15	1.600			57.50	22.50	80	113
2220	42 "- 48" diameter		12	2			71.50	28	99.50	140

22 11 Facility Water Distribution

22 11 19 – Domestic Water Piping Specialties

	22 11 19.42 Backflow Preventers	Crew	Daily Output	Labor-Hours	Unit	2010 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
5080	3" pipe size	Q-1	4.50	3.556	Ea.	3,700	167		3,867	4,325
5100	4" pipe size		3	5.333		4,650	250		4,900	5,475
5120	6" pipe size	Q-2	3	8		6,725	390		7,115	7,975
5200	Flanged, iron, valves are gate									
5210	2-1/2" pipe size	Q-1	5	3.200	Ea.	2,475	150		2,625	2,950
5220	3" pipe size		4.50	3.556		2,575	167		2,742	3,075
5230	4" pipe size		3	5.333		3,500	250		3,750	4,225
5240	6" pipe size	Q-2	3	8		4,925	390		5,315	6,000
5250	8" pipe size		2	12		8,825	585		9,410	10,600
5260	10" pipe size		1	24		12,500	1,175		13,675	15,500
5600	Flanged, iron, valves are OS&Y									
5660	2-1/2" pipe size	Q-1	5	3.200	Ea.	1,925	150		2,075	2,350
5680	3" pipe size		4.50	3.556		2,950	167		3,117	3,500
5700	4" pipe size		3	5.333		3,800	250		4,050	4,550
5720	6" pipe size	Q-2	3	8		5,375	390		5,765	6,475
5740	8" pipe size		2	12		9,450	585		10,035	11,300
5760	10" pipe size		1	24		12,700	1,175		13,875	15,700

22 11 19.64 Hydrants

0010	**HYDRANTS**									
0050	Wall type, moderate climate, bronze, encased									
0200	3/4" IPS connection	1 Plum	16	.500	Ea.	600	26		626	700
0300	1" IPS connection	"	14	.571		690	29.50		719.50	805
0500	Anti-siphon type, 3/4" connection					520			520	570
1000	Non-freeze, bronze, exposed									
1100	3/4" IPS connection, 4" to 9" thick wall	1 Plum	14	.571	Ea.	405	29.50		434.50	490
1120	10" to 14" thick wall	"	12	.667		520	34.50		554.50	620
1280	For anti-siphon type, add					106			106	117
2000	Non-freeze bronze, encased, anti-siphon type									
2100	3/4" IPS connection, 5" to 9" thick wall	1 Plum	14	.571	Ea.	1,025	29.50		1,054.50	1,175
2140	15" to 19" thick wall	"	12	.667	"	1,100	34.50		1,134.50	1,275
3000	Ground box type, bronze frame, 3/4" IPS connection									
3080	Non-freeze, all bronze, polished face, set flush									
3100	2 feet depth of bury	1 Plum	8	1	Ea.	765	52		817	925
3180	6 feet depth of bury		7	1.143		1,000	59.50		1,059.50	1,200
3220	8 feet depth of bury		5	1.600		1,125	83.50		1,208.50	1,350
3400	For 1" IPS connection, add					15%	10%			
3550	For 2" connection, add					445%	24%			
3600	For tapped drain port in box, add					69.50			69.50	76
5000	Moderate climate, all bronze, polished face									
5020	and scoriated cover, set flush									
5100	3/4" IPS connection	1 Plum	16	.500	Ea.	530	26		556	625
5120	1" IPS connection	"	14	.571		655	29.50		684.50	765
5200	For tapped drain port in box, add					69.50			69.50	76

22 11 23 – Domestic Water Pumps

22 11 23.10 General Utility Pumps

0010	**GENERAL UTILITY PUMPS**									
2000	Single stage									
3000	Double suction,									
3190	75 HP, to 2500 GPM	Q-3	.28	114	Ea.	16,400	5,675		22,075	26,500
3220	100 HP, to 3000 GPM		.26	123		20,600	6,100		26,700	31,800
3240	150 HP, to 4000 GPM		.24	133		31,700	6,600		38,300	44,800

	31 23 23.13 Backfill	Crew	Daily Output	Labor-Hours	Unit	2010 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
1100	Vibrating plate, add	A-1E	90	.089	E.C.Y.		2.94	.48	3.42	5.05
3000	For flowable fill, see Div. 03 31 05.35									
	31 23 23.14 Backfill, Structural									
0010	**BACKFILL, STRUCTURAL**									
0011	Dozer or F.E. loader									
0020	From existing stockpile, no compaction									
2000	80 H.P., 50' haul, sand & gravel	B-10L	1100	.011	L.C.Y.		.43	.40	.83	1.09
2010	Sandy clay & loam		1070	.011			.44	.41	.85	1.12
2020	Common earth		975	.012			.49	.45	.94	1.23
2040	Clay		850	.014			.56	.51	1.07	1.42
2200	150' haul, sand & gravel		550	.022			.87	.79	1.66	2.18
2210	Sandy clay & loam		535	.022			.89	.82	1.71	2.24
2220	Common earth		490	.024			.97	.89	1.86	2.45
2240	Clay		425	.028			1.12	1.03	2.15	2.82
2400	300' haul, sand & gravel		370	.032			1.29	1.18	2.47	3.24
2410	Sandy clay & loam		360	.033			1.32	1.21	2.53	3.33
2420	Common earth		330	.036			1.44	1.32	2.76	3.64
2440	Clay		290	.041			1.64	1.51	3.15	4.14
3000	105 H.P., 50' haul, sand & gravel	B-10W	1350	.009			.35	.49	.84	1.07
3010	Sandy clay & loam		1325	.009			.36	.50	.86	1.09
3020	Common earth		1225	.010			.39	.54	.93	1.18
3040	Clay		1100	.011			.43	.60	1.03	1.31
3200	150' haul, sand & gravel		670	.018			.71	.99	1.70	2.15
3210	Sandy clay & loam		655	.018			.73	1.01	1.74	2.21
3220	Common earth		610	.020			.78	1.08	1.86	2.37
3240	Clay		550	.022			.87	1.20	2.07	2.63
3300	300' haul, sand & gravel		465	.026			1.02	1.42	2.44	3.11
3310	Sandy clay & loam		455	.026			1.05	1.45	2.50	3.18
3320	Common earth		415	.029			1.15	1.59	2.74	3.48
3340	Clay		370	.032			1.29	1.78	3.07	3.90
4000	200 H.P., 50' haul, sand & gravel	B-10B	2500	.005			.19	.48	.67	.81
4010	Sandy clay & loam		2435	.005			.20	.49	.69	.84
4020	Common earth		2200	.005			.22	.54	.76	.93
4040	Clay		1950	.006			.24	.61	.85	1.04
4200	150' haul, sand & gravel		1225	.010			.39	.97	1.36	1.66
4210	Sandy clay & loam		1200	.010			.40	.99	1.39	1.69
4220	Common earth		1100	.011			.43	1.08	1.51	1.84
4240	Clay		975	.012			.49	1.22	1.71	2.09
4400	300' haul, sand & gravel		805	.015			.59	1.48	2.07	2.52
4410	Sandy clay & loam		790	.015			.60	1.51	2.11	2.57
4420	Common earth		735	.016			.65	1.62	2.27	2.76
4440	Clay		660	.018			.72	1.81	2.53	3.08
5000	300 H.P., 50' haul, sand & gravel	B-10M	3170	.004			.15	.50	.65	.78
5010	Sandy clay & loam		3110	.004			.15	.51	.66	.79
5020	Common earth		2900	.004			.16	.55	.71	.85
5040	Clay		2700	.004			.18	.59	.77	.92
5200	150' haul, sand & gravel		2200	.005			.22	.72	.94	1.13
5210	Sandy clay & loam		2150	.006			.22	.74	.96	1.14
5220	Common earth		1950	.006			.24	.82	1.06	1.27
5240	Clay		1700	.007			.28	.94	1.22	1.45
5400	300' haul, sand & gravel		1500	.008			.32	1.06	1.38	1.65
5410	Sandy clay & loam		1470	.008			.32	1.08	1.40	1.68

	31 23 23.20 Hauling	Crew	Daily Output	Labor-Hours	Unit	2010 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
9680	cycle 20 miles	B-34I	144	.056	L.C.Y.		1.84	5.80	7.64	9.20
9682	cycle 30 miles		108	.074			2.46	7.75	10.21	12.30
9684	cycle 40 miles		90	.089			2.95	9.30	12.25	14.75
9686	cycle 50 miles		72	.111			3.68	11.65	15.33	18.40
9694	45 MPH ave, cycle 8 miles		216	.037			1.23	3.88	5.11	6.15
9696	cycle 10 miles		198	.040			1.34	4.23	5.57	6.70
9698	cycle 20 miles		144	.056			1.84	5.80	7.64	9.20
9700	cycle 30 miles		126	.063			2.10	6.65	8.75	10.50
9702	cycle 40 miles		108	.074			2.46	7.75	10.21	12.30
9704	cycle 50 miles		90	.089			2.95	9.30	12.25	14.75
9706	50 MPH ave, cycle 10 miles		198	.040			1.34	4.23	5.57	6.70
9708	cycle 20 miles		162	.049			1.64	5.20	6.84	8.20
9710	cycle 30 miles		126	.063			2.10	6.65	8.75	10.50
9712	cycle 40 miles		108	.074			2.46	7.75	10.21	12.30
9714	cycle 50 miles		90	.089			2.95	9.30	12.25	14.75
	31 23 23.23 Compaction									
0010	**COMPACTION**									
5000	Riding, vibrating roller, 6" lifts, 2 passes	B-10Y	3000	.004	E.C.Y.		.16	.17	.33	.43
5020	3 passes		2300	.005			.21	.22	.43	.56
5040	4 passes		1900	.006			.25	.27	.52	.68
5050	8" lifts, 2 passes		4100	.003			.12	.13	.25	.32
5060	12" lifts, 2 passes		5200	.002			.09	.10	.19	.25
5080	3 passes		3500	.003			.14	.15	.29	.37
5100	4 passes		2600	.005			.18	.20	.38	.50
5600	Sheepsfoot or wobbly wheel roller, 6" lifts, 2 passes	B-10G	2400	.005			.20	.52	.72	.87
5620	3 passes		1735	.007			.27	.72	.99	1.20
5640	4 passes		1300	.009			.37	.96	1.33	1.60
5680	12" lifts, 2 passes		5200	.002			.09	.24	.33	.40
5700	3 passes		3500	.003			.14	.36	.50	.60
5720	4 passes		2600	.005			.18	.48	.66	.81
6000	Towed sheepsfoot or wobbly wheel roller, 6" lifts, 2 passes	B-10D	10000	.001			.05	.17	.22	.25
6020	3 passes		2000	.006			.24	.84	1.08	1.28
6030	4 passes		1500	.008			.32	1.12	1.44	1.71
6050	12" lifts, 2 passes		6000	.002			.08	.28	.36	.43
6060	3 passes		4000	.003			.12	.42	.54	.64
6070	4 passes		3000	.004			.16	.56	.72	.86
6200	Vibrating roller, 6" lifts, 2 passes	B-10C	2600	.005			.18	.63	.81	.97
6210	3 passes		1735	.007			.27	.94	1.21	1.44
6220	4 passes		1300	.009			.37	1.25	1.62	1.93
6250	12" lifts, 2 passes		5200	.002			.09	.31	.40	.48
6260	3 passes		3465	.003			.14	.47	.61	.73
6270	4 passes		2600	.005			.18	.63	.81	.97
7000	Walk behind, vibrating plate 18" wide, 6" lifts, 2 passes	A-1D	200	.040			1.32	.17	1.49	2.23
7020	3 passes		185	.043			1.43	.19	1.62	2.41
7040	4 passes		140	.057			1.89	.24	2.13	3.19
7200	12" lifts, 2 passes	A-1E	560	.014			.47	.08	.55	.82
7220	3 passes		375	.021			.71	.12	.83	1.22
7240	4 passes		280	.029			.95	.16	1.11	1.63
7500	Vibrating roller 24" wide, 6" lifts, 2 passes	B-10A	420	.029			1.13	.36	1.49	2.10
7520	3 passes		280	.043			1.70	.53	2.23	3.16
7540	4 passes		210	.057			2.27	.71	2.98	4.20
7600	12" lifts, 2 passes		840	.014			.57	.18	.75	1.06

	33 11 13.25 Water Supply, Polyvinyl Chloride Pipe	Crew	Daily Output	Labor-Hours	Unit	2010 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
8220	6" diameter	B-20	90	.267	Ea.	92	9.85		101.85	116
8240	8" diameter		50	.480		173	17.75		190.75	218
8260	10" diameter		50	.480		273	17.75		290.75	330
8280	12" diameter		30	.800		365	29.50		394.50	445
8300	Reducing tee 6" x 4"		100	.240		120	8.85		128.85	146
8320	8" x 6"		90	.267		290	9.85		299.85	335
8330	10" x 6"		90	.267		335	9.85		344.85	385
8340	10" x 8"		90	.267		360	9.85		369.85	410
8350	12" x 6"		90	.267		450	9.85		459.85	510
8360	12" x 8"		90	.267		500	9.85		509.85	565
8400	Tapped service tee (threaded type) 6" x 6" x 3/4"		100	.240		78	8.85		86.85	99.50
8430	6" x 6" x 1"		90	.267		78	9.85		87.85	101
8440	6" x 6" x 1 1/2"		90	.267		78	9.85		87.85	101
8450	6" x 6" x 2"		90	.267		78	9.85		87.85	101
8460	8" x 8" x 3/4"		90	.267		123	9.85		132.85	151
8470	8" x 8" x 1"		90	.267		123	9.85		132.85	151
8480	8" x 8" x 1 1/2"		90	.267		123	9.85		132.85	151
8490	8" x 8" x 2"		90	.267		123	9.85		132.85	151
8500	Repair coupling 4"		100	.240		108	8.85		116.85	133
8520	6" diameter		90	.267		131	9.85		140.85	159
8540	8" diameter		50	.480		155	17.75		172.75	198
8560	10" diameter		50	.480		198	17.75		215.75	246
8580	12" diameter		50	.480		234	17.75		251.75	285
8600	Plug end 4"		100	.240		38	8.85		46.85	55.50
8620	6" diameter		90	.267		73.50	9.85		83.35	96
8640	8" diameter		50	.480		79	17.75		96.75	115
8660	10" diameter		50	.480		126	17.75		143.75	167
8680	12" diameter		50	.480		156	17.75		173.75	200
8700	PVC pipe, joint restraint									
8710	4" diameter	B-20A	32	1	Ea.	38.50	40.50		79	104
8720	6" diameter		25.60	1.250		46.50	50.50		97	128
8730	8" diameter		21.33	1.500		67	60.50		127.50	166
8740	10" diameter		18.28	1.751		124	71		195	243
8750	12" diameter		16.84	1.900		131	77		208	261
8760	14" diameter		16	2		206	81		287	350
8770	16" diameter		11.64	2.749		263	111		374	460
8780	18" diameter		11.03	2.901		325	117		442	540
8785	20" diameter		9.14	3.501		405	142		547	660
8790	24" diameter		7.53	4.250		470	172		642	775

	33 11 13.35 Water Supply, HDPE									
0010	**WATER SUPPLY, HDPE**									
0011	Butt fusion joints, SDR 21,40' lengths not including excavation or backfill									
0100	4" diameter	B-22A	400	.095	L.F.	3.65	3.54	.97	8.16	10.55
0200	6" diameter		380	.100		10.70	3.73	1.02	15.45	18.55
0300	8" diameter		320	.119		12.35	4.43	1.21	17.99	21.50
0400	10" diameter		300	.127		19.10	4.73	1.29	25.12	29.50
0500	12" diameter		260	.146		27	5.45	1.49	33.94	39.50
0600	14" diameter		220	.173		32.50	6.45	1.76	40.71	48
0700	16" diameter		180	.211		42	7.90	2.15	52.05	61
0800	18" diameter		140	.271		53.50	10.15	2.77	66.42	77.50
0900	24" diameter		100	.380		95.50	14.20	3.88	113.58	131
1000	Fittings									

33 47 Ponds and Reservoirs

33 47 13 – Pond and Reservoir Liners

33 47 13.53 Reservoir Liners HDPE		Crew	Daily Output	Labor-Hours	Unit	2010 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**RESERVOIR LINERS HDPE**									
0011	Membrane lining									
1100	30 mil thick	3 Skwk	1850	.013	S.F.	.27	.55		.82	1.15
1200	60 mil thick		1600	.015	"	.31	.64		.95	1.32
1220	60 mil thick		1.60	15	M.S.F.	310	640		950	1,325
1300	120 mil thick		1440	.017	S.F.	.38	.71		1.09	1.51

33 49 Storm Drainage Structures

33 49 13 – Storm Drainage Manholes, Frames, and Covers

33 49 13.10 Storm Drainage Manholes, Frames and Covers

0010	**STORM DRAINAGE MANHOLES, FRAMES & COVERS**									
0020	Excludes footing, excavation, backfill (See line items for frame & cover)									
0050	Brick, 4' inside diameter, 4' deep	D-1	1	16	Ea.	440	605		1,045	1,400
0100	6' deep		.70	22.857		625	860		1,485	1,975
0150	8' deep		.50	32		800	1,200		2,000	2,700
0200	For depths over 8', add		4	4	V.L.F.	167	151		318	410
0400	Concrete blocks (radial), 4' I.D., 4' deep		1.50	10.667	Ea.	365	400		765	1,000
0500	6' deep		1	16		490	605		1,095	1,450
0600	8' deep		.70	22.857		615	860		1,475	1,975
0700	For depths over 8', add		5.50	2.909	V.L.F.	64.50	110		174.50	236
0800	Concrete, cast in place, 4' x 4', 8" thick, 4' deep	C-14H	2	24	Ea.	475	985	15.10	1,475.10	2,075
0900	6' deep		1.50	32		690	1,325	20	2,035	2,800
1000	8' deep		1	48		990	1,975	30	2,995	4,150
1100	For depths over 8', add		8	6	V.L.F.	108	246	3.78	357.78	505
1110	Precast, 4' I.D., 4' deep	B-22	4.10	7.317	Ea.	450	281	50.50	781.50	980
1120	6' deep		3	10		800	385	69	1,254	1,550
1130	8' deep		2	15		925	575	104	1,604	2,025
1140	For depths over 8', add		16	1.875	V.L.F.	75	72	12.95	159.95	207
1150	5' I.D., 4' deep	B-6	3	8	Ea.	1,100	287	113	1,500	1,750
1160	6' deep		2	12		1,200	430	169	1,799	2,175
1170	8' deep		1.50	16		1,300	575	225	2,100	2,550
1180	For depths over 8', add		12	2	V.L.F.	184	71.50	28	283.50	340
1190	6' I.D., 4' deep		2	12	Ea.	1,825	430	169	2,424	2,850
1200	6' deep		1.50	16		1,975	575	225	2,775	3,300
1210	8' deep		1	24		2,700	860	340	3,900	4,650
1220	For depths over 8', add		8	3	V.L.F.	310	107	42	459	550
1250	Slab tops, precast, 8" thick									
1300	4' diameter manhole	B-6	8	3	Ea.	195	107	42	344	425
1400	5' diameter manhole		7.50	3.200		400	115	45	560	665
1500	6' diameter manhole		7	3.429		555	123	48.50	726.50	850
3800	Steps, heavyweight cast iron, 7" x 9"	1 Bric	40	.200		13.10	8.35		21.45	27
3900	8" x 9"		40	.200		19.60	8.35		27.95	34
3928	12" x 10-1/2"		40	.200		22.50	8.35		30.85	37
4000	Standard sizes, galvanized steel		40	.200		18.90	8.35		27.25	33.50
4100	Aluminum		40	.200		25.50	8.35		33.85	41

33 63 Steam Energy Distribution

33 63 13 – Underground Steam and Condensate Distribution Piping

	33 63 13.10 Calcium Silicate Insulated System	Crew	Daily Output	Labor-Hours	Unit	2010 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
7480	2-1/2" diameter pipe size	Q-17	31	.516	L.F.	60.50	24	1.89	86.39	105
7490	3" diameter pipe size		27	.593		71	27.50	2.17	100.67	122
7500	4" diameter pipe size		21	.762		92.50	35.50	2.79	130.79	159
7510	5" diameter pipe size		17	.941		128	44	3.44	175.44	210
7520	6" diameter pipe size	Q-18	22	1.091		141	53	2.66	196.66	237
7530	8" diameter pipe size		18	1.333		211	64.50	3.25	278.75	335
7540	10" diameter pipe size		15	1.600		251	77.50	3.90	332.40	395
7550	12" diameter pipe size		13	1.846		310	89.50	4.50	404	480
7590	For 2" thick insulation, add					13%				
7640	For 2-1/2" thick insulation, add					18%				
7680	For 3" thick insulation, add					24%				

33 71 Electrical Utility Transmission and Distribution

33 71 13 – Electrical Utility Towers

33 71 13.23 Line Towers and Fixtures

0010	**LINE TOWERS & FIXTURES**									
0100	Excavation and backfill, earth	R-5	135.38	.650	C.Y.		28	10.85	38.85	53.50
0105	Rock		21.46	4.101	"		175	68.50	243.50	340
0200	Steel footings (grillage) in earth		3.91	22.506	Ton	1,775	960	375	3,110	3,825
0205	In rock		3.20	27.500	"	1,775	1,175	460	3,410	4,200
0290	See also Div. 33 05 23.19									
0300	Rock anchors	R-5	5.87	14.991	Ea.	465	640	251	1,356	1,750
0400	Concrete foundations	"	12.85	6.848	C.Y.	123	293	115	531	700
0490	See also Div. 03 30 53.40									
0500	Towers-material handling and spotting	R-7	22.56	2.128	Ton		73.50	9	82.50	122
0540	Steel tower erection	R-5	7.65	11.503		1,725	490	192	2,407	2,825
0550	Lace and box		7.10	12.394		1,725	530	207	2,462	2,900
0560	Painting total structure		1.47	59.864	Ea.	375	2,550	1,000	3,925	5,325
0570	Disposal of surplus material	R-7	20.87	2.300	Mile		79.50	9.70	89.20	132
0600	Special towers-material handling and spotting	"	12.31	3.899	Ton		135	16.45	151.45	223
0640	Special steel structure erection	R-6	6.52	13.497		2,125	575	495	3,195	3,725
0650	Special steel lace and box	"	6.29	13.990		2,125	600	515	3,240	3,775
0670	Disposal of surplus material	R-7	7.87	6.099	Mile		211	25.50	236.50	350

33 71 13.80 Transmission Line Right of Way

0010	**TRANSMISSION LINE RIGHT OF WAY**									
0100	Clearing right of way	B-87	6.67	5.997	Acre		246	390	636	800
0200	Restoration & seeding	B-10D	4	3	"	1,050	119	420	1,589	1,800

33 71 16 – Electrical Utility Poles

33 71 16.20 Line Poles and Fixtures

0010	**LINE POLES & FIXTURES**									
0100	Digging holes in earth, average	R-5	25.14	3.500	Ea.		150	58.50	208.50	289
0105	In rock, average	"	4.51	19.512			835	325	1,160	1,600
0200	Wood poles, material handling and spotting	R-7	6.49	7.396			256	31	287	425
0220	Erect wood poles & backfill holes, in earth	R-5	6.77	12.999		1,400	555	217	2,172	2,625
0250	In rock	"	5.87	14.991		1,400	640	251	2,291	2,775
0260	Disposal of pole & hardware surplus material	R-7	20.87	2.300	Mile		79.50	9.70	89.20	132
0300	Crossarms for wood pole structure									
0310	Material handling and spotting	R-7	14.55	3.299	Ea.		114	13.90	127.90	189
0320	Install crossarms	R-5	11	8	"	465	340	134	939	1,175
0330	Disposal of crossarms & hardware surplus material	R-7	40	1.200	Mile		41.50	5.05	46.55	68.50

33 71 Electrical Utility Transmission and Distribution

33 71 16 – Electrical Utility Poles

	33 71 16.20 Line Poles and Fixtures	Crew	Daily Output	Labor-Hours	Unit	2010 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0400	Formed plate pole structure									
0410	Material handling and spotting	R-7	2.40	20	Ea.		690	84.50	774.50	1,150
0420	Erect steel plate pole	R-5	1.95	45.128		8,775	1,925	755	11,455	13,400
0500	Guys, anchors and hardware for pole, in earth		7.04	12.500		530	535	209	1,274	1,625
0510	In rock		17.96	4.900		635	209	82	926	1,100
0900	Foundations for line poles									
0920	Excavation, in earth	R-5	135.38	.650	C.Y.		28	10.85	38.85	53.50
0940	In rock		20	4.400			188	73.50	261.50	365
0960	Concrete foundations		11	8		123	340	134	597	795

33 71 16.33 Wood Electrical Utility Poles

0010	**WOOD ELECTRICAL UTILITY POLES**									
0011	Excludes excavation, backfill and cast-in-place concrete									
6200	Electric & tel sitework, 20' high, treated wd, see Div. 26 56 13.10	R-3	3.10	6.452	Ea.	266	310	44.50	620.50	805
6400	25' high		2.90	6.897		281	335	47.50	663.50	860
6600	30' high		2.60	7.692		310	370	53	733	955
6800	35' high		2.40	8.333		405	400	57.50	862.50	1,100
7000	40' high		2.30	8.696		495	420	60	975	1,225
7200	45' high		1.70	11.765		605	570	81.50	1,256.50	1,600
7400	Cross arms with hardware & insulators									
7600	4' long	1 Elec	2.50	3.200	Ea.	126	157		283	370
7800	5' long		2.40	3.333		146	163		309	405
8000	6' long		2.20	3.636		169	178		347	450

33 71 19 – Electrical Underground Ducts and Manholes

33 71 19.15 Underground Ducts and Manholes

0010	**UNDERGROUND DUCTS AND MANHOLES**									
0011	Not incl. excavation, backfill and concrete, in slab or duct bank									
1000	Direct burial									
1010	PVC, schedule 40, w/coupling, 1/2" diameter	1 Elec	340	.024	L.F.	.47	1.15		1.62	2.23
1020	3/4" diameter		290	.028		.62	1.35		1.97	2.69
1030	1" diameter		260	.031		.93	1.51		2.44	3.26
1040	1-1/2" diameter		210	.038		1.52	1.87		3.39	4.45
1050	2" diameter		180	.044		1.99	2.18		4.17	5.45
1060	3" diameter	2 Elec	240	.067		3.79	3.27		7.06	9.05
1070	4" diameter		160	.100		5.35	4.90		10.25	13.15
1080	5" diameter		120	.133		7.75	6.55		14.30	18.20
1090	6" diameter		90	.178		10.25	8.70		18.95	24
1110	Elbows, 1/2" diameter	1 Elec	48	.167	Ea.	1.40	8.15		9.55	13.70
1120	3/4" diameter		38	.211		1.57	10.30		11.87	17.10
1130	1" diameter		32	.250		2.47	12.25		14.72	21
1140	1-1/2" diameter		21	.381		4.70	18.65		23.35	33
1150	2" diameter		16	.500		6.80	24.50		31.30	44
1160	3" diameter		12	.667		19.90	32.50		52.40	70.50
1170	4" diameter		9	.889		34	43.50		77.50	103
1180	5" diameter		8	1		60	49		109	139
1190	6" diameter		5	1.600		102	78.50		180.50	229
1210	Adapters, 1/2" diameter		52	.154		.47	7.55		8.02	11.70
1220	3/4" diameter		43	.186		.84	9.10		9.94	14.45
1230	1" diameter		39	.205		1.06	10.05		11.11	16.10
1240	1-1/2" diameter		35	.229		1.64	11.20		12.84	18.45
1250	2" diameter		26	.308		2.36	15.10		17.46	25
1260	3" diameter		20	.400		5.90	19.60		25.50	35.50
1270	4" diameter		14	.571		10.25	28		38.25	53

33 71 26 – Transmission and Distribution Equipment

	33 71 26.13 Capacitor Banks	Crew	Daily Output	Labor-Hours	Unit	2010 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010	**CAPACITOR BANKS**									
0300	Station capacitors									
0350	Synchronous, 13 to 26 kV	R-11	3.11	18.006	MVAR	6,350	830	276	7,456	8,525
0360	46 kV		3.33	16.817		8,100	775	258	9,133	10,300
0370	69 kV		3.81	14.698		7,950	680	225	8,855	10,000
0380	161 kV		6.51	8.602		7,450	395	132	7,977	8,925
0390	500 kV		10.37	5.400		6,475	249	82.50	6,806.50	7,575
0450	Static, 13 to 26 kV		3.11	18.006		5,375	830	276	6,481	7,475
0460	46 kV		3.01	18.605		6,800	860	285	7,945	9,075
0470	69 kV		3.81	14.698		6,600	680	225	7,505	8,525
0480	161 kV		6.51	8.602		6,125	395	132	6,652	7,500
0490	500 kV		10.37	5.400		5,600	249	82.50	5,931.50	6,600
1600	Voltage regulators, 13 to 26 kV		.75	74.667	Ea.	240,500	3,450	1,150	245,100	271,500
	33 71 26.23 Current Transformers									
0010	**CURRENT TRANSFORMERS**									
4050	Current transformers, 13 to 26 kV	R-11	14	4	Ea.	2,950	185	61.50	3,196.50	3,600
4060	46 kV		9.33	6.002		8,650	277	92	9,019	10,000
4070	69 kV		7	8		8,950	370	123	9,443	10,500
4080	161 kV		1.87	29.947		29,000	1,375	460	30,835	34,500
	33 71 26.26 Potential Transformers									
0010	**POTENTIAL TRANSFORMERS**									
4100	Potential transformers, 13 to 26 kV	R-11	11.20	5	Ea.	4,225	231	76.50	4,532.50	5,075
4110	46 kV		8	7		8,700	325	107	9,132	10,200
4120	69 kV		6.22	9.003		9,225	415	138	9,778	10,900
4130	161 kV		2.24	25		19,900	1,150	385	21,435	24,000
4140	500 kV		1.40	40		59,500	1,850	615	61,965	69,000

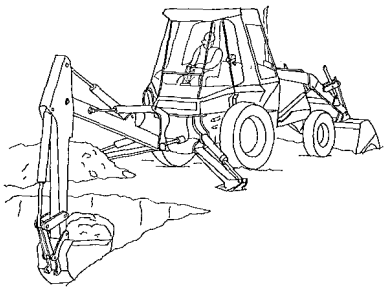
33 71 39 – High-Voltage Wiring

33 71 39.13 Overhead High-Voltage Wiring

0010	**OVERHEAD HIGH-VOLTAGE WIRING**									
0100	Conductors, primary circuits									
0110	Material handling and spotting	R-5	9.78	8.998	W.Mile		385	151	536	740
0120	For river crossing, add		11	8			340	134	474	655
0150	Conductors, per wire, 210 to 636 kcmil		1.96	44.898		7,650	1,925	750	10,325	12,100
0160	795 to 954 kcmil		1.87	47.059		11,500	2,000	785	14,285	16,500
0170	1000 to 1600 kcmil		1.47	59.864		18,200	2,550	1,000	21,750	24,900
0180	Over 1600 kcmil		1.35	65.185		24,400	2,775	1,100	28,275	32,200
0200	For river crossing, add, 210 to 636 kcmil		1.24	70.968			3,025	1,175	4,200	5,850
0220	795 to 954 kcmil		1.09	80.734			3,450	1,350	4,800	6,650
0230	1000 to 1600 kcmil		.97	90.722			3,875	1,525	5,400	7,475
0240	Over 1600 kcmil		.87	101			4,325	1,700	6,025	8,325
0300	Joints and dead ends	R-8	6	8	Ea.	1,375	345	57	1,777	2,075
0400	Sagging	R-5	7.33	12.001	W.Mile		515	201	716	990
0500	Clipping, per structure, 69 kV	R-10	9.60	5	Ea.		231	62	293	415
0510	161 kV		5.33	9.006			415	112	527	745
0520	345 to 500 kV		2.53	18.972			875	235	1,110	1,550
0600	Make and install jumpers, per structure, 69 kV	R-8	3.20	15		370	650	107	1,127	1,500
0620	161 kV		1.20	40		740	1,725	285	2,750	3,725
0640	345 to 500 kV		.32	150		1,250	6,500	1,075	8,825	12,300
0700	Spacers	R-10	68.57	.700		74	32.50	8.70	115.20	139
0720	For river crossings, add	"	60	.800			37	9.95	46.95	66
0800	Installing pulling line (500 kV only)	R-9	1.45	44.138	W.Mile	650	1,775	236	2,661	3,650

G10 Site Preparation

G1030 Site Earthwork



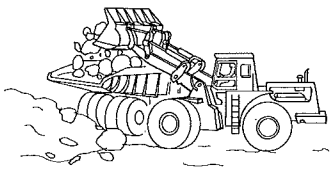
The Excavation of Common Earth System balances the productivity of the excavating equipment to the hauling equipment. It is assumed that the hauling equipment will encounter light traffic and will move up no considerable grades on the haul route. No mobilization cost is included. All costs given in these systems include a swell factor of 25% for hauling.

The Expanded System Listing shows Excavation systems using backhoes ranging from 1/2 Cubic Yard capacity to 3-1/2 Cubic Yards. Power shovels indicated range from 1/2 Cubic Yard to 3 Cubic Yards. Dragline bucket rigs range from 1/2 Cubic Yard to 3 Cubic Yards. Truck capacities range from 8 Cubic Yards to 20 Cubic Yards. Each system lists the number of trucks involved and the distance (round trip) that each must travel.

System Components	QUANTITY	UNIT	COST PER C.Y. EQUIP.	LABOR	TOTAL
SYSTEM G1030 120 1000					
EXCAVATE COMMON EARTH, 1/2 CY BACKHOE, TWO 8 CY DUMP TRUCKS, 1 MRT					
Excavating, bulk hyd. backhoe wheel mtd., 1/2 C.Y.	1.000	B.C.Y.	.84	1.86	2.70
Hauling, 8 CY truck,cycle 0.5 mile, 20 MPH, 15 min. wait/Ld./Uld.	1.280	L.C.Y.	2.44	2.23	4.67
Spotter at earth fill dump or in cut	.020	Hr.		.82	.82
TOTAL			3.28	4.91	8.19

G1030 120	Excavate Common Earth	COST PER C.Y. EQUIP.	LABOR	TOTAL
1000	Excavate common earth, 1/2 C.Y. backhoe,two 8 C.Y. dump trucks, 1MRT	3.28	4.91	8.19
1200	Three 8 C.Y. dump trucks, 3 mile round trip	6.80	8.20	15
1400	Two 12 C.Y. dump trucks, 4 mile round trip	7.40	6.35	13.75
1600	3/4 C.Y. backhoe, three 8 C.Y. dump trucks, 1 mile round trip	3.42	4.03	7.45
1700	Five 8 C.Y. dump trucks, 3 mile round trip	6.80	7.60	14.40
1800	Two 12 C.Y. dump trucks, 2 mile round trip	6.30	4.89	11.19
1900	Two 16 C.Y. dump trailers, 3 mile round trip	5.90	4.13	10.03
2000	Two 20 C.Y. dump trailers, 4 mile round trip	5.65	4.10	9.75
2200	1-1/2 C.Y. backhoe, eight 8 C.Y. dump trucks, 3 mile round trip	6.70	6.70	13.40
2300	Four 12 C.Y. dump trucks, 2 mile round trip	6	4.15	10.15
2400	Six 12 C.Y. dump trucks, 4 mile round trip	7.25	4.77	12.02
2500	Three 16 C.Y. dump trailers, 2 mile round trip	4.85	3.08	7.93
2600	Two 20 C.Y. dump trailers, 1 mile round trip	3.85	2.54	6.39
2700	Three 20 C.Y. dump trailer, 3 mile round trip	5.10	3.15	8.25
2800	2-1/2 C.Y. excavator, six 12 C.Y. dump trucks, 1 mile round trip	4.41	2.80	7.21
2900	Eight 12 C.Y. dump trucks, 3 mile round trip	6.30	3.90	10.2
3000	Four 16 C.Y. dump trailers, 1 mile round trip	4.33	2.53	6.8
3100	Six 16 C.Y. dump trailers, 3 mile round trip	5.80	3.44	9.2
3200	Six 20 C.Y. dump trailers, 4 mile round trip	5.40	3.19	8.5
3400	3-1/2 C.Y. backhoe, six 16 C.Y. dump trailers, 1 mile round trip	4.48	2.43	6.9
3600	Ten 16 C.Y. dump trailers, 4 mile round trip	6.40	3.42	9.8
3800	Eight 20 C.Y. dump trailers, 3 mile round trip	5.10	2.72	7.8
4000	1/2 C.Y. pwr. shovel, four 8 C.Y. dump trucks, 2 mile round trip	5.85	6.10	11.9
4100	Two 12 C.Y. dump trucks, 1 mile round trip	4.82	3.81	8.6
4200	Four 12 C.Y. dump trucks, 4 mile round trip	7.45	5.05	12.5
4300	Two 16 C.Y. dump trailers, 2 mile round trip	5.05	3.72	8.7
4400	Two 20 C.Y. dump trailers, 4 mile round trip	5.85	4.27	10.1
4800	3/4 C.Y. pwr. shovel, six 8 C.Y. dump trucks, 2 mile round trip	5.75	5.90	11.6
4900	Three 12 C.Y. dump trucks, 1 mile round trip	4.73	3.26	7.9
5000	Five 12 C.Y. dump trucks, 4 mile round trip	7.55	4.86	12.4
5100	Three 16 C.Y. dump trailers, 3 mile round trip	6.15	3.94	10.1
5200	Three 20 C.Y. dump trailers, 4 mile round trip	5.75	3.68	9.
5400	1-1/2 C.Y. pwr. shovel, six 12 C.Y. dump trucks, 1 mile round trip	4.37	2.79	7.
5500	Ten 12 C.Y. dump trucks, 4 mile round trip	7.15	4.39	11.

G1030 Site Earthwork



The Loading and Hauling of Rock System balances the productivity of loading equipment to hauling equipment. It is assumed that the hauling equipment will encounter light traffic and will move up no considerable grades on the haul route.

The Expanded System Listing shows Loading and Hauling systems that use either a track or wheel front-end loader. Track loaders indicated range from 1-1/2 Cubic Yards capacity to 4-1/2 Cubic Yards capacity. Wheel loaders range from 1-1/2 Cubic Yards to 5 Cubic Yards. Trucks for hauling range from 8 Cubic Yards capacity to 20 Cubic Yards capacity. Each system lists the number of trucks involved and the distance (round trip) that each must travel.

System Components	QUANTITY	UNIT	COST PER C.Y. EQUIP.	LABOR	TOTAL
SYSTEM G1030 150 1000					
LOAD & HAUL ROCK, 1-1/2 C.Y. TRACK LOADER, SIX 8 C.Y. TRUCKS, 1 MRT					
Excavating bulk, F.E. loader, track mtd., 1.5 C.Y.	1.000	B.C.Y.	.83	1.24	2.07
8 CY truck, cycle 2 miles	1.650	L.C.Y.	5.36	4.90	10.26
Spotter at earth fill dump or in cut	.010	Hr.		.71	.71
TOTAL			6.19	6.85	13.04

G1030 150	Load & Haul Rock	COST PER C.Y. EQUIP.	LABOR	TOTAL
1000	Load & haul rock, 1-1/2 C.Y. track loader, six 8 C.Y.trucks, 1 MRT	6.20	6.85	13.05
1200	Nine 8 C.Y. dump trucks, 3 mile round trip	8.45	9	17.45
1400	Six 12 C.Y. dump trucks, 4 mile round trip	9.25	6.65	15.90
1600	Three 16 C.Y. dump trucks, 2 mile round trip	6.15	4.52	10.67
2000	2-1/2 C.Y. track loader, twelve 8 C.Y. dump trucks, 3 mile round trip	8.85	8.50	17.35
2200	Five 12 C.Y. dump trucks, 1 mile round trip	6	3.84	9.84
2400	Eight 12 C.Y. dump trucks, 4 mile round trip	9.65	6.15	15.80
2600	Four 16 C.Y. dump trailers, 2 mile round trip	6.60	4.07	10.67
3000	3-1/2 C.Y. track loader, eight 12 C.Y. dump trucks, 2 mile round trip	7.90	4.82	12.72
3200	Five 16 C.Y. dump trucks, 1 mile round trip	5.75	3.27	9.02
3400	Seven 16 C.Y. dump trailers, 3 mile round trip	7.70	4.49	12.19
3600	Seven 20 C.Y. dump trailers, 4 mile round trip	7.20	4.16	11.36
4000	4-1/2 C.Y. track loader, nine 12 C.Y. dump trucks, 1 mile round trip	6	3.48	9.48
4200	Eight 16 C.Y. dump trailers, 2 mile round trip	6.50	3.53	10.03
4400	Eleven 16 C.Y. dump trailers, 4 mile round trip	8.30	4.48	12.78
4600	Seven 20 C.Y. dump trailers, 2 mile round trip	5.65	3.07	8.72
5000	1-1/2 C.Y. wheel loader, nine 8 C.Y. dump trucks, 2 mile round trip	6.65	7.20	13.85
5200	Four 12 C.Y. dump trucks, 1 mile round trip	5.45	4.11	9.56
5400	Seven 12 C.Y. dump trucks, 4 mile round trip	9.05	6.35	15.40
5600	Five 16 C.Y. dump trailers, 4 mile round trip	7.75	5.10	12.85
6000	3 C.Y. wheel loader, eight 12 C.Y. dump trucks, 2 mile round trip	7.05	4.62	11.67
6200	Five 16 C.Y. dump trailers, 1 mile round trip	4.93	3.07	8
6400	Seven 16 C.Y. dump trailers, 3 mile round trip	5.95	3.81	9.76
6600	Seven 20 C.Y. dump trailers, 4 mile round trip	6.35	3.95	10.30
7000	5 C.Y. wheel loader, twelve 12 C.Y. dump trucks, 1 mile round trip	5.40	3.25	8.65
7200	Nine 16 C.Y. dump trailers, 1 mile round trip	5.20	2.97	8.17
7400	Eight 20 C.Y. dump trailers, 1 mile round trip	4.44	2.53	6.97
7600	Twelve 20 C.Y. dump trailers, 3 mile round trip	6.05	3.34	9.39

Location Factors

STATE/ZIP	CITY	MAT.	INST.	TOTAL
MICHIGAN (CONT'D)				
496	Traverse City	92.2	79.8	86.8
497	Gaylord	93.4	74.2	84.9
498-499	Iron mountain	95.5	88.8	92.5
MINNESOTA				
550-551	Saint Paul	99.3	123.4	109.9
553-555	Minneapolis	99.7	126.3	111.5
556-558	Duluth	98.6	114.6	105.6
MINNESOTA (CONT'd)				
559	Rochester	98.5	107.8	102.6
560	Mankato	96.2	105.5	100.3
561	Windom	94.8	77.8	87.3
562	Willmar	94.4	84.4	90.0
563	St. Cloud	96.2	124.2	108.6
564	Brainerd	96.1	107.4	101.1
565	Detroit Lakes	97.9	97.7	97.8
566	Bemidji	97.2	100.1	98.5
567	Thief River Falls	96.7	96.4	96.6
MISSISSIPPI				
386	Clarksdale	95.8	57.8	79.0
387	Greenville	99.6	67.9	85.6
388	Tupelo	97.3	60.4	81.0
389	Greenwood	97.1	57.3	79.5
390-392	Jackson	97.8	67.0	84.2
393	Meridian	96.1	68.6	84.0
394	Laurel	97.1	60.9	81.2
395	Biloxi	97.9	62.2	82.1
396	Mccomb	95.5	56.8	78.4
397	Columbus	97.0	59.2	80.4
MISSOURI				
630-631	St. Louis	98.6	107.2	102.4
633	Bowling Green	97.0	86.6	92.4
634	Hannibal	95.8	76.8	87.4
635	Kirksville	98.9	70.7	86.5
636	Flat River	98.0	87.4	93.3
637	Cape Girardeau	98.4	83.8	92.0
638	Sikeston	96.0	74.2	86.4
639	Poplar Bluff	95.4	74.7	86.3
640-641	Kansas City	98.7	108.2	102.9
644-645	St. Joseph	98.0	87.2	93.3
646	Chillicothe	94.7	66.1	82.1
647	Harrisonville	94.2	94.8	94.5
648	Joplin	96.8	65.2	82.9
650-651	Jefferson City	95.6	85.0	90.9
652	Columbia	96.8	88.2	93.0
653	Sedalia	95.7	78.8	88.2
654-655	Rolla	94.0	75.8	86.0
656-658	Springfield	97.7	77.8	88.9
MONTANA				
590-591	Billings	102.0	72.9	89.2
592	Wolf Point	101.5	68.6	87.0
593	Miles City	99.0	70.4	86.4
594	Great Falls	103.4	72.2	89.6
595	Havre	100.3	71.3	87.5
596	Helena	101.9	70.6	88.1
597	Butte	102.0	72.3	88.9
598	Missoula	99.2	72.7	87.5
599	Kalispell	97.8	70.9	86.0
NEBRASKA				
680-681	Omaha	99.8	75.6	89.2
683-685	Lincoln	97.8	74.1	87.3
686	Columbus	95.8	73.4	85.9
687	Norfolk	97.5	77.1	88.5
688	Grand Island	97.9	79.2	89.6
689	Hastings	96.8	81.5	90.0
690	Mccook	96.5	72.2	85.8
691	North Platte	97.2	81.6	90.4
692	Valentine	98.5	70.6	86.2
693	Alliance	98.7	68.7	85.5
NEVADA				
889-891	Las Vegas	101.0	113.8	106.7
893	Ely	99.6	69.1	86.1
894-895	Reno	100.0	90.5	95.8
897	Carson City	99.9	89.5	95.3
898	Elko	98.2	74.4	87.7
NEW HAMPSHIRE				
030	Nashua	99.9	87.0	94.2
031	Manchester	100.4	87.0	94.5

STATE/ZIP	CITY	MAT.	INST.	TOTAL
NEW HAMPSHIRE (CONT'D)				
032-033	Concord	98.5	83.3	91.8
034	Keene	96.3	51.3	76.4
035	Littleton	96.1	58.2	79.3
036	Charleston	95.8	48.8	75.0
037	Claremont	94.7	48.8	74.5
038	Portsmouth	97.3	90.9	94.4
NEW JERSEY				
070-071	Newark	101.9	124.3	111.8
072	Elizabeth	100.1	123.8	110.6
073	Jersey City	99.0	124.7	110.3
074-075	Paterson	100.9	124.3	111.2
076	Hackensack	98.8	124.8	110.3
077	Long Branch	98.5	122.4	109.1
078	Dover	99.1	124.3	110.2
079	Summit	99.0	123.8	110.0
080,083	Vineland	97.1	122.2	108.2
081	Camden	99.0	122.9	109.5
082,084	Atlantic City	97.6	122.2	108.5
085-086	Trenton	99.0	123.4	109.8
087	Point Pleasant	99.2	122.2	109.3
088-089	New Brunswick	99.7	123.6	110.2
NEW MEXICO				
870-872	Albuquerque	99.8	74.8	88.8
873	Gallup	100.0	74.8	88.9
874	Farmington	100.4	74.8	89.1
875	Santa Fe	101.8	74.8	89.9
877	Las Vegas	98.2	74.6	87.8
878	Socorro	97.8	74.8	87.6
879	Truth/Consequences	97.9	68.9	85.1
880	Las Cruces	96.8	66.7	83.5
881	Clovis	98.5	72.7	87.1
882	Roswell	100.4	72.8	88.2
883	Carrizozo	100.8	74.8	89.3
884	Tucumcari	99.3	72.7	87.6
NEW YORK				
100-102	New York	107.0	166.3	133.2
103	Staten Island	103.1	162.5	129.3
104	Bronx	100.8	162.5	128.0
105	Mount Vernon	100.6	136.0	116.2
106	White Plains	100.7	136.0	116.3
107	Yonkers	105.7	136.1	119.2
108	New Rochelle	100.9	136.0	116.4
109	Suffern	100.7	126.7	112.2
110	Queens	101.8	162.4	128.6
111	Long Island City	103.5	162.4	129.5
112	Brooklyn	103.9	162.4	129.7
113	Flushing	103.4	162.4	129.4
114	Jamaica	101.5	162.4	128.4
115,117,118	Hicksville	101.6	146.4	121.4
116	Far Rockaway	103.6	162.4	129.5
119	Riverhead	102.4	145.9	121.6
120-122	Albany	97.7	97.6	97.7
123	Schenectady	98.2	97.3	97.8
124	Kingston	101.2	117.9	108.6
125-126	Poughkeepsie	100.3	134.3	115.3
127	Monticello	99.6	122.5	109.7
128	Glens Falls	92.2	90.5	91.5
129	Plattsburgh	97.1	87.3	92.8
130-132	Syracuse	99.3	93.0	96.5
133-135	Utica	97.2	88.9	93.5
136	Watertown	99.1	91.9	95.9
137-139	Binghamton	98.8	89.5	94.7
140-142	Buffalo	100.3	102.8	101.4
143	Niagara Falls	97.7	100.8	99.1
144-146	Rochester	99.8	97.4	98.7
147	Jamestown	96.6	86.9	92.3
148-149	Elmira	96.3	87.8	92.6
NORTH CAROLINA				
270,272-274	Greensboro	99.2	49.2	77.1
271	Winston-Salem	99.1	47.8	76.5
275-276	Raleigh	100.3	49.4	77.8
277	Durham	100.3	49.7	78.0
278	Rocky Mount	96.3	40.3	71.6
279	Elizabeth City	97.3	41.6	72.7
280	Gastonia	98.2	47.2	75.7
281-282	Charlotte	99.8	49.7	77.7
283	Fayetteville	100.0	50.1	78.0
284	Wilmington	96.9	47.6	75.1
285	Kinston	94.6	41.6	71.2

Installing Contractor's Overhead & Profit

Below are the **average** installing contractor's percentage mark-ups applied to base labor rates to arrive at typical billing rates.

Column A: Labor rates are based on union wages averaged for 30 major U.S. cities. Base rates including fringe benefits are listed hourly and daily. These figures are the sum of the wage rate and employer-paid fringe benefits such as vacation pay, employer-paid health and welfare costs, pension costs, plus appropriate training and industry advancement funds costs.

Column B: Workers' Compensation rates are the national average of state rates established for each trade.

Column C: Column C lists average fixed overhead figures for all trades. Included are Federal and State Unemployment costs set at 6.2%; Social Security Taxes (FICA) set at 7.65%; Builder's Risk Insurance costs set at 0.44%; and Public Liability costs set at 2.02%. All the percentages except those for Social Security Taxes vary from state to state as well as from company to company.

Columns D and E: Percentages in Columns D and E are based on the presumption that the installing contractor has annual billing of $4,000,000 and up. Overhead percentages may increase with smaller annual billing. The overhead percentages for any given contractor may vary greatly and depend on a number of factors, such as the contractor's annual volume, engineering and logistical support costs, and staff requirements. The figures for overhead and profit will also vary depending on the type of job, the job location, and the prevailing economic conditions. All factors should be examined very carefully for each job.

Column F: Column F lists the total of Columns B, C, D, and E.

Column G: Column G is Column A (hourly base labor rate) multiplied by the percentage in Column F (O&P percentage).

Column H: Column H is the total of Column A (hourly base labor rate) plus Column G (Total O&P).

Column I: Column I is Column H multiplied by eight hours.

		A		B	C	D	E	F	G	H	I
		Base Rate Incl. Fringes		Workers' Comp. Ins.	Average Fixed Overhead	Overhead	Profit	Total Overhead & Profit		Rate with O & P	
Abbr.	Trade	Hourly	Daily					%	Amount	Hourly	Daily
Skwk	Skilled Workers Average (35 trades)	$42.60	$340.80	14.4%	16.3%	13.0%	10%	53.7%	$22.90	$65.50	$524.00
	Helpers Average (5 trades)	31.60	252.80	16.0		11.0		53.3	16.85	48.45	387.60
	Foreman Average, Inside ($.50 over trade)	43.10	344.80	14.4		13.0		53.7	23.15	66.25	530.00
	Foreman Average, Outside ($2.00 over trade)	44.60	356.80	14.4		13.0		53.7	23.95	68.55	548.40
Clab	Common Building Laborers	33.10	264.80	16.9		11.0		54.2	17.95	51.05	408.40
Asbe	Asbestos/Insulation Workers/Pipe Coverers	45.55	364.40	13.1		16.0		55.4	25.25	70.80	566.40
Boil	Boilermakers	52.25	418.00	10.6		16.0		52.9	27.65	79.90	639.20
Bric	Bricklayers	41.75	334.00	13.5		11.0		50.8	21.20	62.95	503.60
Brhe	Bricklayer Helpers	33.65	269.20	13.5		11.0		50.8	17.10	50.75	406.00
Carp	Carpenters	41.55	332.40	16.9		11.0		54.2	22.50	64.05	512.40
Cefi	Cement Finishers	39.70	317.60	8.7		11.0		46.0	18.25	57.95	463.60
Elec	Electricians	49.00	392.00	6.4		16.0		48.7	23.85	72.85	582.80
Elev	Elevator Constructors	61.70	493.60	6.3		16.0		48.6	30.00	91.70	733.60
Eqhv	Equipment Operators, Crane or Shovel	44.40	355.20	9.4		14.0		49.7	22.05	66.45	531.60
Eqmd	Equipment Operators, Medium Equipment	42.95	343.60	9.4		14.0		49.7	21.35	64.30	514.40
Eqlt	Equipment Operators, Light Equipment	41.30	330.40	9.4		14.0		49.7	20.55	61.85	494.80
Eqol	Equipment Operators, Oilers	38.30	306.40	9.4		14.0		49.7	19.05	57.35	458.80
Eqmm	Equipment Operators, Master Mechanics	44.60	356.80	9.4		14.0		49.7	22.15	66.75	534.00
Glaz	Glaziers	40.20	321.60	13.3		11.0		50.6	20.35	60.55	484.40
Lath	Lathers	36.95	295.60	9.8		11.0		47.1	17.40	54.35	434.80
Marb	Marble Setters	39.90	319.20	13.5		11.0		50.8	20.25	60.15	481.20
Mill	Millwrights	42.95	343.60	8.7		11.0		46.0	19.75	62.70	501.60
Mstz	Mosaic & Terrazzo Workers	39.00	312.00	8.8		11.0		46.1	18.00	57.00	456.00
Pord	Painters, Ordinary	36.35	290.80	11.5		11.0		48.8	17.75	54.10	432.80
Psst	Painters, Structural Steel	37.40	299.20	41.6		11.0		78.9	29.50	66.90	535.20
Pape	Paper Hangers	36.55	292.40	11.5		11.0		48.8	17.85	54.40	435.20
Pile	Pile Drivers	40.30	322.40	18.5		16.0		60.8	24.50	64.80	518.40
Plas	Plasterers	37.30	298.40	11.9		11.0		49.2	18.35	55.65	445.20
Plah	Plasterer Helpers	33.90	271.20	11.9		11.0		49.2	16.70	50.60	404.80
Plum	Plumbers	52.05	416.40	7.6		16.0		49.9	25.95	78.00	624.00
Rodm	Rodmen (Reinforcing)	46.80	374.40	20.8		14.0		61.1	28.60	75.40	603.20
Rofc	Roofers, Composition	35.40	283.20	28.9		11.0		66.2	23.45	58.85	470.80
Rots	Roofers, Tile & Slate	35.60	284.80	28.9		11.0		66.2	23.55	59.15	473.20
Rohe	Roofers, Helpers (Composition)	26.20	209.60	28.9		11.0		66.2	17.35	43.55	348.40
Shee	Sheet Metal Workers	49.10	392.80	9.1		16.0		51.4	25.25	74.35	594.80
Spri	Sprinkler Installers	50.40	403.20	7.4		16.0		49.7	25.05	75.45	603.60
Stpi	Steamfitters or Pipefitters	51.90	415.20	7.6		16.0		49.9	25.90	77.80	622.40
Ston	Stone Masons	42.15	337.20	13.5		11.0		50.8	21.40	63.55	508.40
Sswk	Structural Steel Workers	46.90	375.20	35.5		14.0		75.8	35.55	82.45	659.60
Tilf	Tile Layers	39.35	314.80	8.8		11.0		46.1	18.15	57.50	460.00
Tilh	Tile Layers Helpers	31.20	249.60	8.8		11.0		46.1	14.40	45.60	364.80
Trlt	Truck Drivers, Light	32.25	258.00	15.2		11.0		52.5	16.95	49.20	393.60
Trhv	Truck Drivers, Heavy	33.15	265.20	15.2		11.0		52.5	17.40	50.55	404.40
Sswl	Welders, Structural Steel	46.90	375.20	35.5		14.0		75.8	35.55	82.45	659.60
Wrck	*Wrecking	33.10	264.80	30.3		11.0		67.6	22.40	55.50	444.00

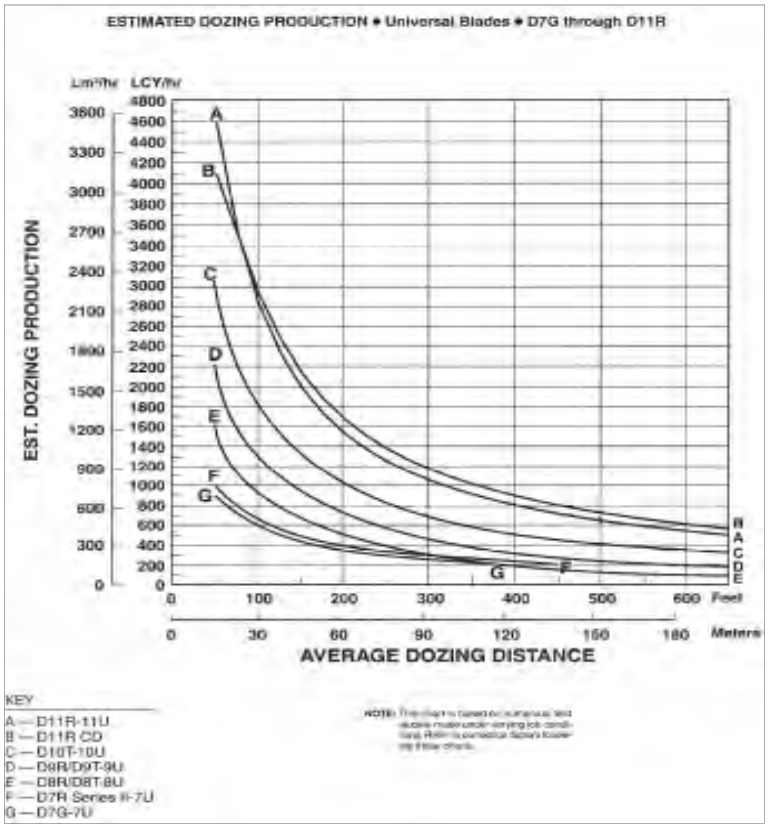
*Not included in averages

Appendix B-4
Equipment Productivity
Curve Fits

D11R

Dozer production data (based on Caterpillar Handbook)

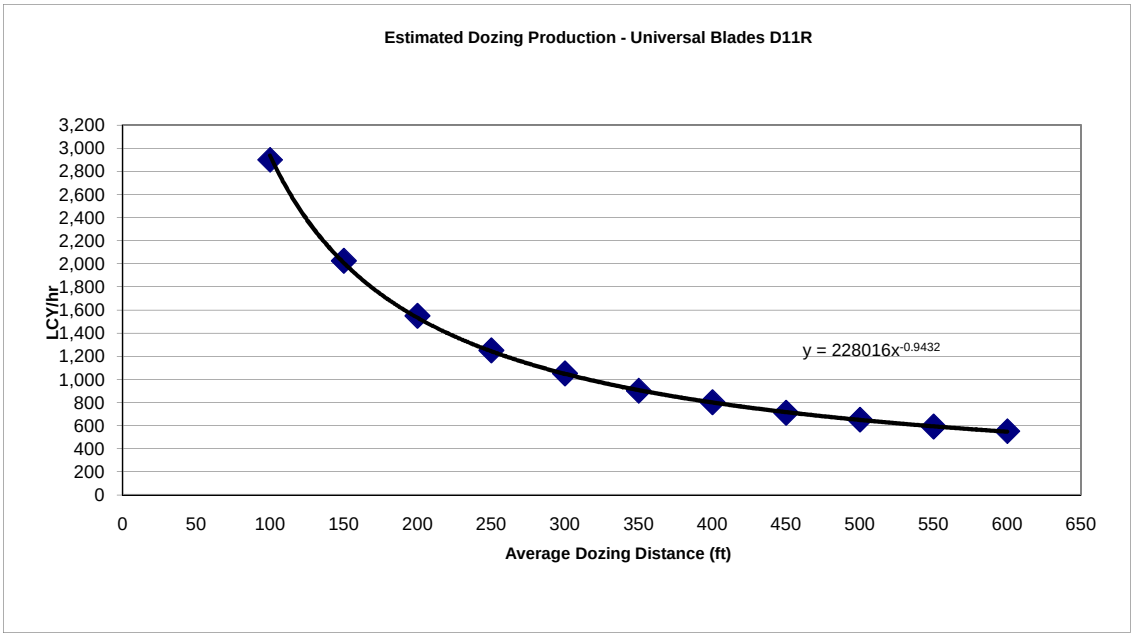
Maximum Push Distance (feet)	Normal Production (cy/hr)
50	4600
100	2,900
150	2,025
200	1,550
250	1,250
300	1,050
350	900
400	800
450	710
500	650
550	590
600	550



Fitted curve - based on data above and additional data points

y = 228016 x ^ (-0.9432)

Maximum Push Distance (feet)	Normal Production (cy/hr)
75	3885
100	2962
125	2400
150	2021
175	1747
200	1540
225	1378
250	1248
275	1141
300	1051
325	974
350	909
375	851
400	801
425	757
450	717
475	681
500	649
525	620
550	593
575	569
600	547

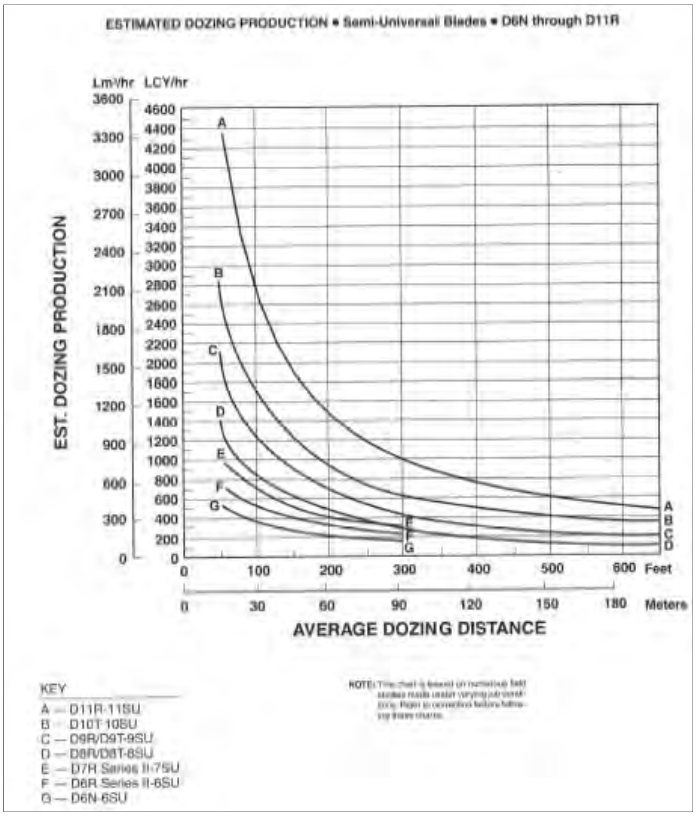


Caterpillar Performance Handbook Edition 38 D11R page1-43

D9R

Dozer production data (based on Caterpillar Handbook)

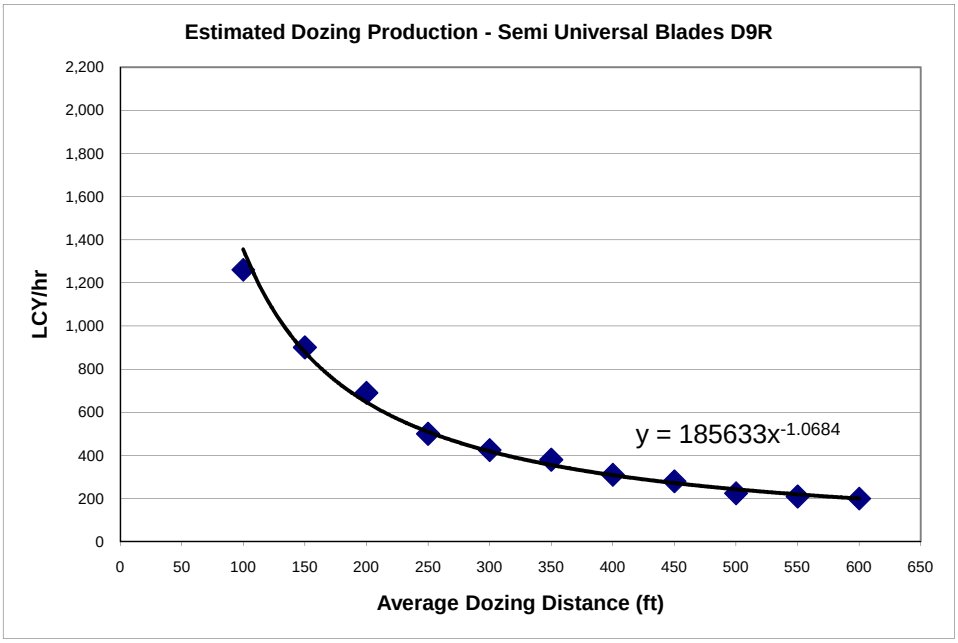
Maximum Push Distance (feet)	Normal Production (cy/hr)
50	2100
100	1,260
150	900
200	690
250	500
300	425
350	380
400	310
450	280
500	225
550	210
600	200



Fitted curve - based on data above and additional data points

y = 185633x ^ (-1.0684)

Maximum Push Distance (feet)	Normal Production (cy/hr)
75	1842
100	1355
125	1067
150	878
175	745
200	646
225	570
250	509
275	460
300	419
325	385
350	355
375	330
400	308
425	289
450	272
475	256
500	243
525	230
550	219
575	209
600	200



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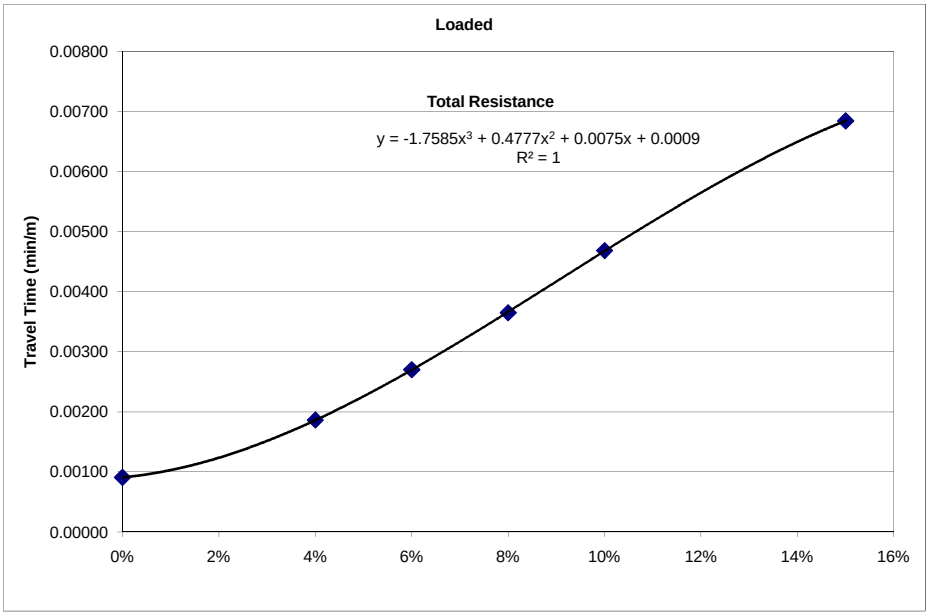
777F

Loaded

%	x (min)	y	Slope (min/m)
0	0	0.0	
	2	2200.0	0.00091
4	0	0.0	
	4.1	2200.0	0.00186
6	0	0.0	
	5.2	1925.0	0.00270
8	0	0.0	
	5.2	1425.0	0.00365
10	0	0.0	
	5.2	1110.0	0.00468
15	0	0.0	
	5.2	760.0	0.00684

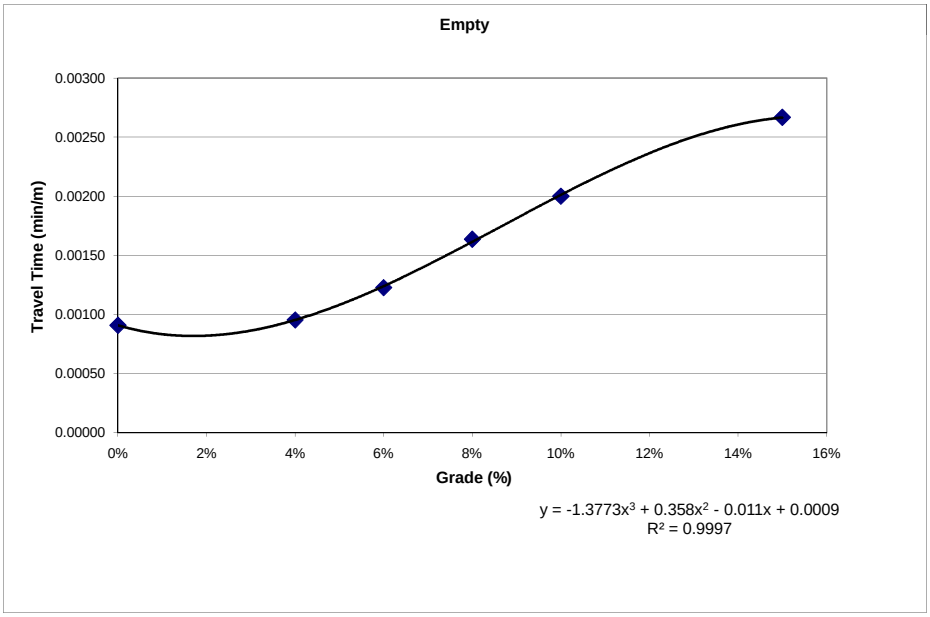
0%	0.00091	0.00090
4%	0.00186	0.00185
6%	0.00270	0.00269
8%	0.00365	0.00366
10%	0.00468	0.00467
15%	0.00684	0.00684



Empty

%	x (min)	y (m)	Slope
0	0	0.0	
	2	2200.0	0.0009
4	0	0.0	
	2.1	2200.0	0.0010
6	0	0.0	
	2.7	2200.0	0.0012
8	0	0.0	
	3.6	2200.0	0.0016
10	0	0.0	
	4.4	2200.0	0.0020
15	0	0.0	
	5.2	1950.0	0.0027

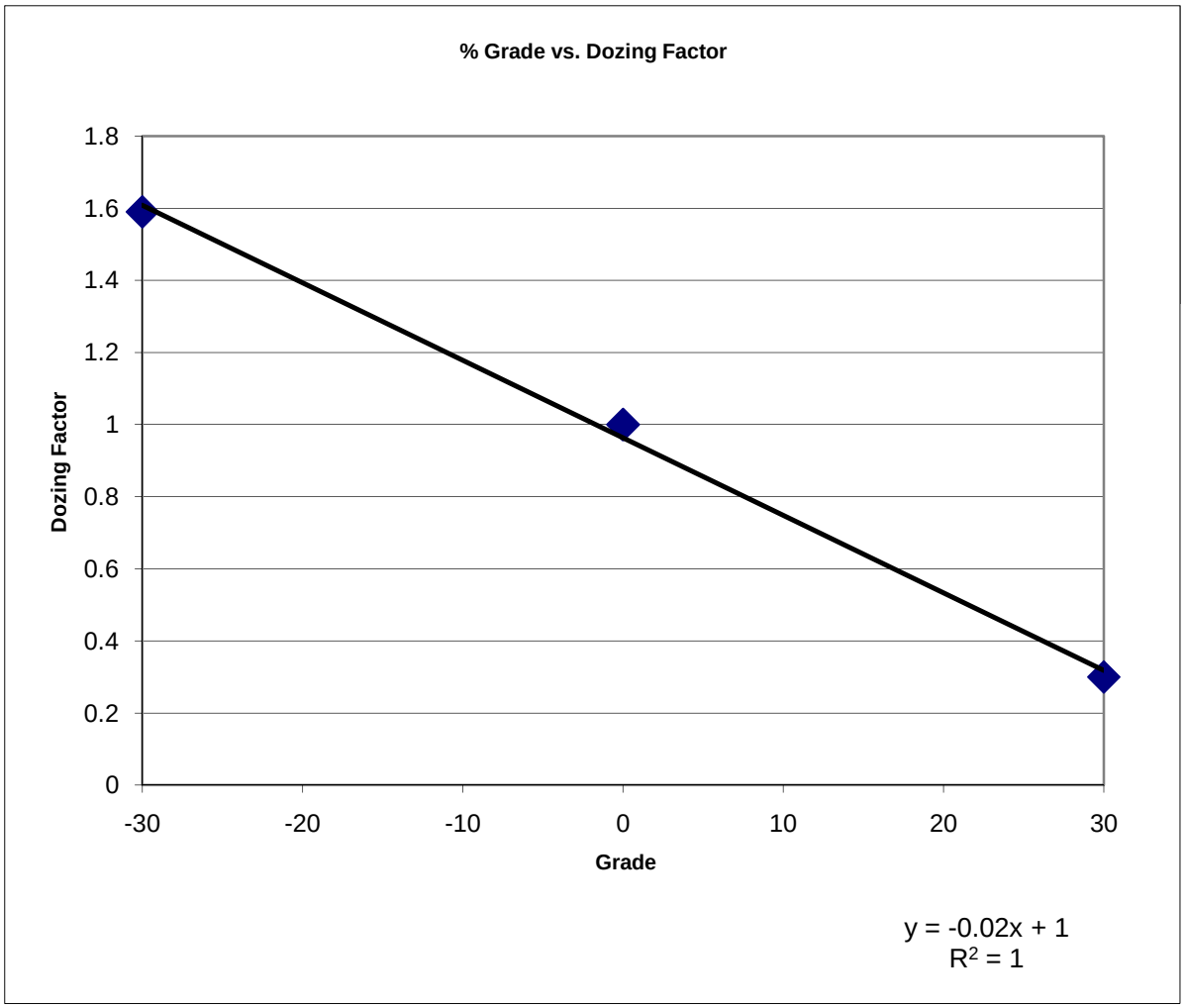
0%	0.00091	0.00090
4%	0.00095	0.00094
6%	0.00123	0.00123
8%	0.00164	0.00161
10%	0.00200	0.00200
15%	0.00267	0.00266



Caterpillar Performance Handbook Edition 38 9-5, 9-33

Grade vs. Dozing Factor

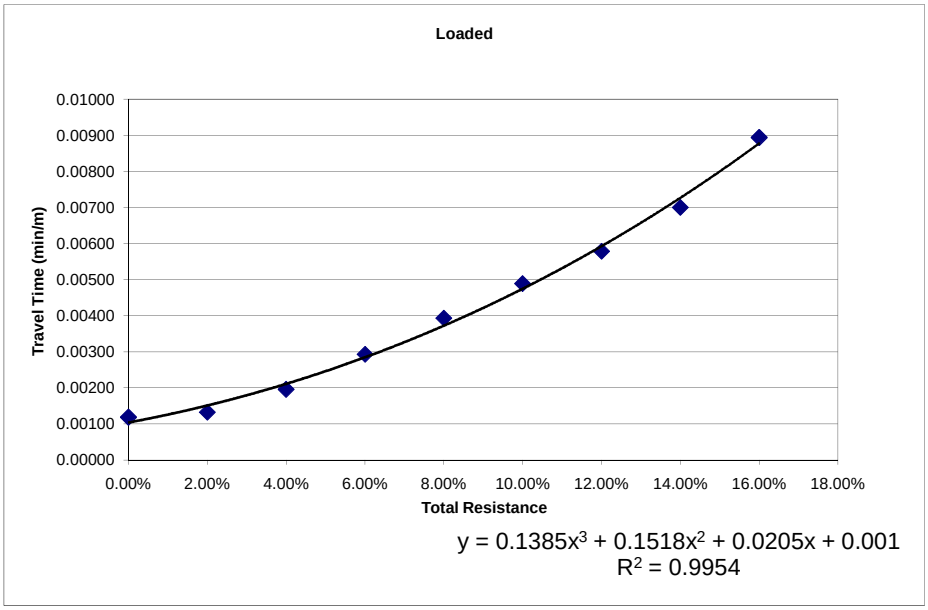
Grade %	Dozing Factor
0	1
-30	1.59
30	0.3



Loaded

%	x (min)	y	Slope (min/m)
0	0	0.0	
	2.6	2200.0	0.0012
2	0	0.0	
	2.9	2200.0	0.0013
4	0	0.0	
	4.3	2200.0	0.0020
6	0	0.0	
	5.5	1880.0	0.0029
8	0	0.0	
	5.5	1400.0	0.0039
10	0	0.0	
	5.5	1125.0	0.0049
12	0	0.0	
	5.5	950.0	0.0058
14	0	0.0	
	5.5	785.0	0.0070
16	0	0	
	5.5	615.0	0.0089

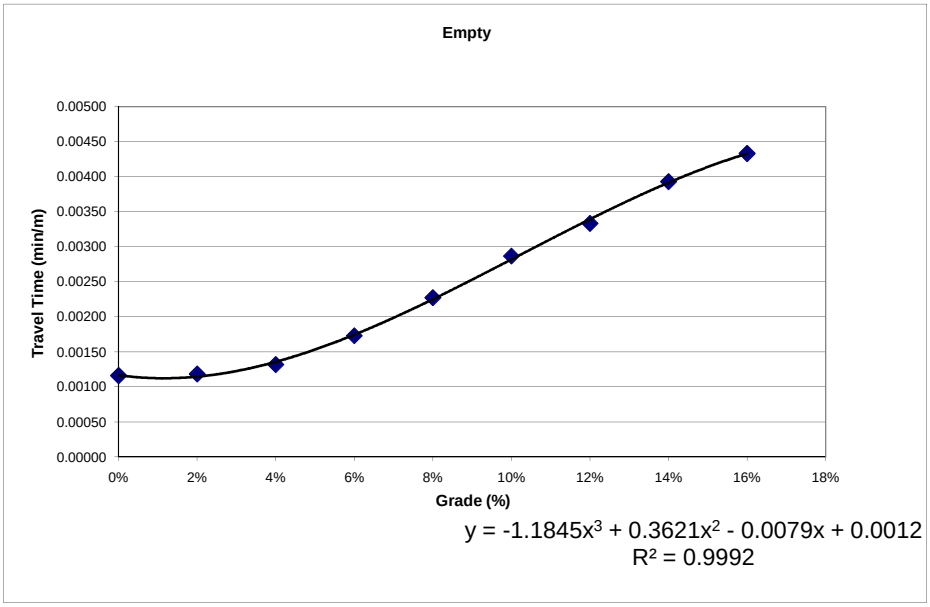
0.00%	0.00118	0.00100
2.00%	0.00132	0.00147
4.00%	0.00195	0.00207
6.00%	0.00293	0.00281
8.00%	0.00393	0.00368
10.00%	0.00489	0.00471
12.00%	0.0058	0.00589
14.00%	0.0070	0.00723
16.00%	0.0089431	0.00873



Empty

%	x (min)	y (m)	Slope
0	0	0.0	
	2.55	2200.0	0.0012
2	0	0.0	
	2.6	2200.0	0.0012
4	0	0.0	
	2.9	2200.0	0.0013
6	0	0.0	
	3.8	2200.0	0.0017
8	0	0.0	
	5	2200.0	0.0023
10	0	0.0	
	5.5	1920.0	0.0029
12	0	0.0	
	5.5	1650.0	0.0033
14	0	0.0	
	5.5	1400.0	0.0039
16	0	0.0	
	5.5	1270.0	0.0043

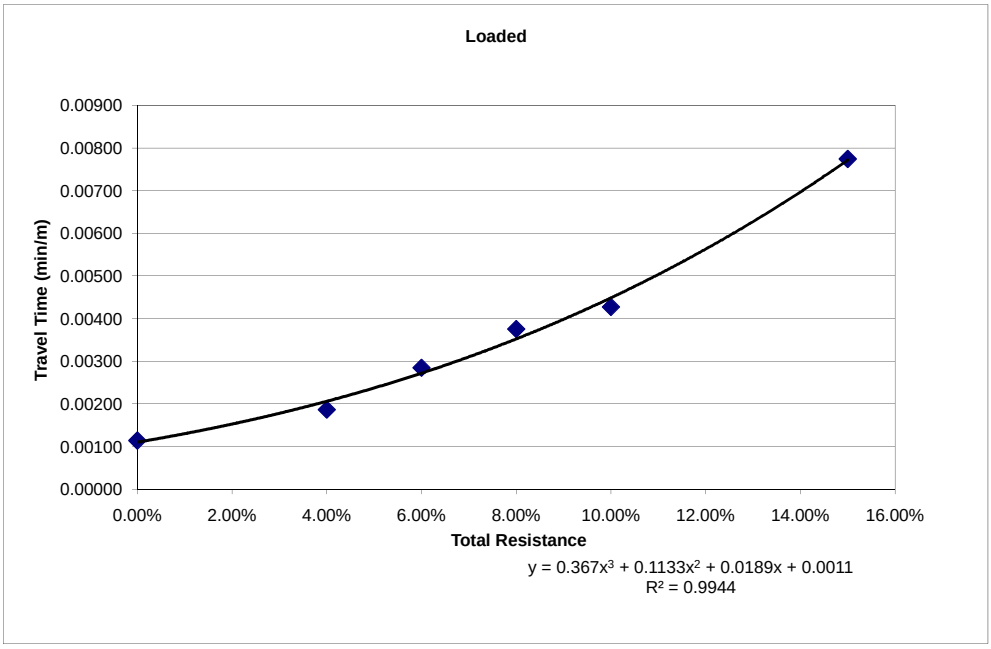
grade	min/m	min/m
0%	0.00116	0.001200
2%	0.00118	0.001177
4%	0.00132	0.001388
6%	0.00173	0.001774
8%	0.00227	0.002279
10%	0.00286	0.002847
12%	0.00333	0.003419
14%	0.00393	0.003941
16%	0.00433	0.004354



Loaded

%	x (min)	y	Slope (min/m)
0	0	0.0	
	2.5	2200.0	0.0011
4	0	0.0	
	4.1	2200.0	0.0019
6	0	0.0	
	6.25	2200.0	0.0028
8	0	0.0	
	8.25	2200.0	0.0038
10	0	0.0	
	9.4	2200.0	0.0043
15	0	0.0	
	12	1550.0	0.0077

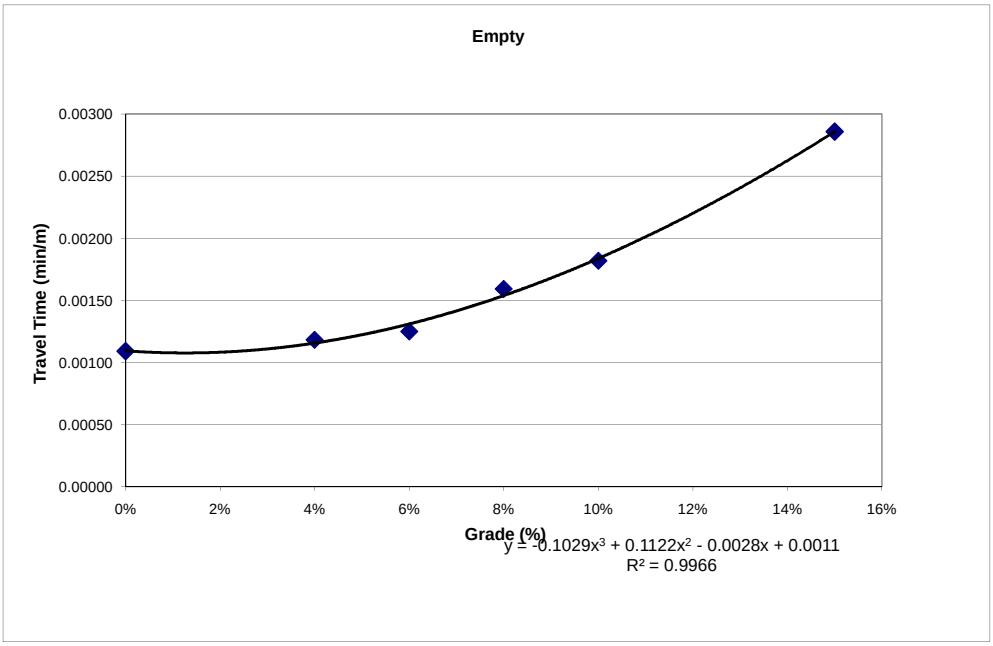
0.00%	0.00114	0.00110
4.00%	0.00186	0.00206
6.00%	0.00284	0.00272
8.00%	0.00375	0.00353
10.00%	0.00427	0.00449
15.00%	0.0077	0.00772



Empty

%	x (min)	y (m)	Slope
0	0	0.0	
	2.4	2200.0	0.0011
4	0	0.0	
	2.6	2200.0	0.0012
6	0	0.0	
	2.75	2200.0	0.0013
8	0	0.0	
	3.5	2200.0	0.0016
10	0	0.0	
	4	2200.0	0.0018
15	0	0.0	
	6	2100.0	0.0029

0%	0.00109	0.00110
4%	0.00118	0.00116
6%	0.00125	0.00131
8%	0.00159	0.00154
10%	0.00182	0.00184
15%	0.00286	0.00286



Appendix B-5
Production Calculation
QA Documentation

EQUATIONS COMMON TO TAILINGS AND STOCKPILES

Sheet #4 Earthwrk:

$$Bank\ Volume\ (bcy) = Area\ (acre) * Cover\ Depth\ (in) * \frac{43560(ft^2/acre)}{12(in/ft) * 27(ft^3/cy)}$$

$$Loose\ Volume\ (lcy) = Bank\ Volume\ (cy) * [1 + Swell\ Factor]$$

Sheet #5 Dozer:

$$Dozer\ Material\ Handling\ Multiplier = Loose\ Volume\ (lcy) * 1.5$$

$$Normal\ Production\ (cy/hr) = 228016 * Maximum\ Push\ Distance\ (ft)^{-.9432}$$
(*Curve Fit Cat Handbook Ed* 37. 1 – 43)

$$Productivity\ (cy) = Normal\ Production\ (cy/hr) * Operator * Material * \frac{Work\ Hour\ (\min/hr)}{60\ (\min/hr)}$$

$$Total\ Task\ Time\ (hr) = \frac{Material\ Handling\ Multiplier\ (cy)}{Productivity\ (cy/hr)}$$

$$Grade\ (Dozing\ Factor) = -0.02 * Cut\ to\ Fill\ Haul\ Grade + 1$$
(*Curve Fit Cat Handbook Ed* 37.1 – 46)

Sheet #13 Earth Sum:

$$Total\ Cost\ (\$) = [Owning\ \&\ Operating\ Cost\ (\$/hr) + Labor\ Cost\ (\$/hr)] * TimeRequired\ (hr)$$

$$Unit\ Cost\ (\$/unit) = \frac{Total\ Cost\ (\$)}{Total\ Production\ (unit)}$$

$$Total\ Cost\ (\$) = \sum Total\ Cost\ (\$)$$

Sheet #14 Reveg:

$$Subtotal\ Cost\ (\$) = Area\ (acres) * Unit\ Cost\ (\$/acre)$$

$$Total\ Reveg\ Cost\ (\$) = \sum\ Subtotal\ Cost\ (\$)$$

$$Tailing\ Pipeline\ Corridor\ Area\ (acres) = \frac{Corridor\ Length\ (ft) * Corridor\ Width\ (ft)}{43560\ (ft^2/acre)}$$

Sheet #15 Other:

$$Unit\ Cost\ (\$/unit) = Unadjusted\ Cost\ (\$/unit) * \frac{Location\ Adjustment\ (\%)}{100}$$

$$Current\ Item\ Cost\ (\$) = Quantity\ (units) * Unit\ Cost\ (\$/unit)$$

$$Total\ (\$) = \sum Current\ Item\ Cost\ (\$)$$

$$Tailings\ Spillway\ Cut\ Volume\ (cy) = \frac{Length\ (ft) * Cross\ Section\ (ft^2)}{27(ft^3/cy)}$$

Sheet #16 & 17 BondSum:

$$SubTotal\ Direct\ Cost\ (\$) = Total\ Earthmoving\ (\$) + Total\ Reveg\ (\$) + Total\ Other\ (\$)$$

$$Indirect\ Costs\ \&\ GrossReceipts\ Tax(\$) = SubTotal\ Direct\ Cost\ (\$) * \frac{Various\ Costs\ (\%)}{100}$$

$$Total\ Bond\ Amount\ (\$) = Sum\ Direct\ Cost\ (\$) + Indirect\ Cost\ (\$) + Gross\ Receipts\ Tax\ (\$)$$

EQUATIONS FOR STOCKPILES:

Sheet #6 Grading:

$$Productivity\ (acre/hr) = Speed\ (mi/hr) * \frac{5280\ (ft/mi) * Effective\ Blade\ Width\ (ft)}{43560\ (ft^2/acre)} * \frac{Work\ Hour\ (\min/hr)}{60\ (\min/hr)}$$
$$* Operator * Material * Grade\ Factor * \frac{2300(lbs/cy)}{Soil\ Weight\ (lbs/cy)} * Prod.\ Method * Visibility * Elev.* Drive\ Trans.$$

$$Normal\ Production\ (cy/hr) = 228016 * Maximum\ Push\ Distance\ (ft)^{-.9432}$$
(*Curve Fit Cat Handbook Ed* 37. 1 – 43)

$$Productivity\ (cy/hr) = Normal\ Production\ (cy/hr) * \frac{Work\ Hour\ (\min/hr)}{60\ (\min/hr)} * Operator * Material * Grade\ Factor$$
$$* \frac{2300\ (lbs/cy)}{Soil\ Weight\ (lbs/cy)} * Production\ Method * Visibility * Elevation * DriveTrans$$

$$Task\ Time(hr) = \frac{Area\ or\ Volume}{Productivity}$$

Sheet #9 Trucks:

$$Total\ Haul\ \text{Distance}\ (ft) = \sum Segment\ Haul\ \text{Distance}\ (ft)$$

$$Haul\ \text{Distance}\ Segment\ (m) = Haul\ \text{Distance}\ (ft) * 0.3048\ (m/ft)$$

$$Haul\ Effective\ Grade\ (\%) = \left(Haul\ Grade\ (\%) + Rolling\text{Resistance}\ (\%)\right)\ (unless < 0\ then\ 0)$$

$$\text{Return}\ Effective\ Grade\ (\%) = \left(Rolling\text{Resistance}\ (\%) - Haul\ Grade\ (\%)\right)\ (unless < 0\ then\ 0)$$

$$777F\ Segment\ Travel\ Time\ Loaded\ (\text{min}/m) =$$
$$-1.7585 * Haul\ Effective\ Grade\ Segment\ (\%)^{3} + 0.4777 * Haul\ Effective\ Grade\ Segement\ (\%)^{2}$$
$$+ 0.0075 * Haul\ Effective\ Grade\ Segment\ (\%) + 0.0009$$

$$777F\ Segment\ Travel\ Time\ Empty\ (\text{min}/m) =$$
$$-1.3773 * \text{Return}\ Effective\ Grade\ Segment\ (\%)^{3} + 0.358 * \text{Return}\ Effective\ Grade\ Segement\ (\%)^{2}$$
$$- 0.011 * \text{Return}\ Effective\ Grade\ Segement\ (\%) + 0.0009$$

(*Curve Fit Cat Handbook Ed* 38. 9 – 5,9 – 33)

$$530M\ Segment\ Travel\ Time\ Loaded\ (\text{min}/m) =$$
$$0.367 * Haul\ Effective\ Grade\ Segment\ (\%)^{3} + 0.1133 * Haul\ Effective\ Grade\ Segement\ (\%)^{2}$$
$$+ 0.0189 * Haul\ Effective\ Grade\ Segment\ (\%) + 0.0011$$

$$530M\ Segment\ Travel\ Time\ Empty\ (\text{min}/m) =$$
$$- 0.1029 * \text{Return}\ Effective\ Grade\ Segment\ (\%)^{3} + 0.1122 * \text{Return}\ Effective\ Grade\ Segment\ (\%)^{2}$$
$$- 0.0028 * \text{Return}\ Effective\ Grade\ Segement\ (\%) + 0.0011$$

(*Curve Fit Cat Handbook Ed* 37. 9 – 38)

$$Loader\ (cycles/truck) = Minimum\left[\frac{Struck\ Capacity\ (cy)}{Loader\ Net\ Bucket\ Capacity\ (cy)}, \frac{Heaped\ Capacity\ (cy)}{Loader\ Net\ Bucket\ Capacity\ (cy)}\right]$$

$$Haul\ Time\ (\text{min}) = \sum\left(Segment\ Travel\ Time\ Loaded\ (\text{min}/m) * Segment\ Haul\ Dist\ (m)\right)$$

$$\text{Return}\ Time\ (\text{min}) = \sum\left(Segment\ Travel\ Time\ Empty\ (\text{min}/m) * Segment\ Haul\ Dist\ (m)\right)$$

$$Loading\ Time\ (\text{min}) = Loader\ Cycle\ Time\ (\text{min}) * Loader\ (cycles/truck)$$

$$Task\ Time\ (hr) = Maximum\left[\frac{Volume\ (cy)}{\text{Productivity}\ (cy/hr)}, Loader\ Task\ Time\ (hr)\right]$$

$$Truck\ Cycle\ Time\ (\text{min}) =$$
$$Haul\ Time\ (\text{min}) + \text{Return}\ Time\ (\text{min}) + Loading\ Time\ (\text{min})$$
$$+ Load\ /\ Manuever\ Time\ (\text{min}) + Dump\ Manumver\ Time\ (\text{min})$$

$$\text{Productivity}\ (cy/hr) =$$
$$Work\ Hour\ (\text{min}/hr) * Loader\ (cycles/truck) * Loader\ Net\ Bucket\ Cap\ (cy) * \frac{Optimum\ Number\ of\ Trucks}{Truck\ Cycle\ Time\ (\text{min})}$$

Sheet #10 Loader:

$$Net\ Bucket\ Capcity\ (cy) = \frac{Rated\ Bucket\ Capcity\ (cy)}{Bucket\ Fill\ Factor}$$

$$\text{Productivity}\ (cy/hr) = \frac{Net\ Bucket\ Capcity\ (cy) * Work\ Hour\ (\text{min}/hr)}{Loader\ Cycle\ Time\ (\text{min})}$$

$$Task\ Time\ (hr) = \frac{Volume\ (cy)}{\text{Productivity}\ (cy/hr)}$$

OPTIMIZATION EQUATIONS:

Productivity Sheet:

$$Productivity\ (cy/hr) =$$
$$Work\ Hour\ (\text{min}/hr) * Loader\ (cycle/truck) * Loader\ Net\ Buckter\ Cap\ (cy) * \frac{Variying\ Number\ of\ Trucks}{Truck\ Cycle\ Time\ (\text{min})}$$

Time Sheet:

$$Time\ (hr) = Maximum\left(\frac{Volume\ (cy)}{Productivity\ (cy/hr)}, Laoder\ Task\ Time\ (hr)\right)$$

Truck Cost Sheet:

$$Truck\ Cost\ (\$) =$$
$$Time\ (hr) * Varying\ Number\ of\ Trucks * \left(Owning\ \&\ Operating\ Cost\ (\$/hr) + Labor\ Cost\ (\$/hr)\right)$$

Loader Cost Sheet:

$$Loader\ Cost\ \ for\ Varying\ Number\ of\ Trucks\ (\$) =$$
$$Time\ (hr) * \left(Owning\ \&\ Operating\ Cost\ (\$/hr) + Labor\ Cost\ (\$/hr)\right)$$

Total Cost Sheet:

$$Total\ Cost\ Varying\ Number\ of\ Trucks\ (\$) = Truck\ Cost\ (\$) + Loader\ Cost\ (\$)$$

$$Minimum\ Cost = Minimum\ (Total\ Cost\ \ for\ Varying\ Number\ of\ Trucks(\$))$$

Optimum Number of Trucks:

$$Number\ of\ Trucks =$$
$$Number\ of\ Trucks$$
$$when\ \left(Minimum\ Cost\ (\$) >= Total\ Cost\ \ for\ Varying\ Number\ of\ Trucks\right)$$
$$else\ 0$$

$$Optimum\ Number\ of\ Trucks = \sum Number\ of\ Trucks$$

Appendix B-6
Caterpillar Performance Handbook
References

CATERPILLAR® PERFORMANCE HANDBOOK

a Cat® publication by Caterpillar Inc., Peoria, Illinois, U.S.A.

JANUARY 2008

Performance information in this booklet is intended for estimating purposes only. Because of the many variables peculiar to individual jobs (including material characteristics, operator efficiency, underfoot conditions, altitude, etc.), neither Caterpillar Inc. nor its dealers warrant that the machines described will perform as estimated.

NOTE: Always refer to the appropriate Operation and Maintenance Manual for specific product information.

Materials and specifications are subject to change without notice.

Printed in U.S.A.

SEBD0348

TRAVEL SPEED

POWER SHIFT MODEL	D3K All Models		D4K All Models		D5K All Models		D5N XL/LGP		D5N LGP* PS DD		D6K All Models		D6N FTC	
FORWARD	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph
1	—	—	—	—	—	—	3.1	**1.9**	2.8	**1.7**	—	—	3.3	**2.0**
2	—	—	—	—	—	—	5.4	**3.3**	5.0	**3.1**	—	—	5.7	**3.5**
3	—	—	—	—	—	—	9.1	**5.6**	8.7	**5.4**	—	—	10.0	**6.2**
REVERSE														
1	—	—	—	—	—	—	3.8	**2.3**			—	—	4.0	**2.5**
2	—	—	—	—	—	—	6.7	**4.1**	**		—	—	7.2	**4.4**
3	—	—	—	—	—	—	11.3	**6.9**			—	—	12.3	**7.6**
HYDROSTATIC														
FORWARD	9.0	**5.6**	9.0	**5.6**	9.0	**5.6**	—	—	—	—	0-10.0	**0-6.2**	—	—
REVERSE	10.0	**6.2**	10.0	**6.2**	10.0	**6.2**	—	—	—	—	0-10.0	**0-6.2**	—	—

POWER SHIFT MODEL	D6N D/S		D6G/ D6G Series II		D6T		D7G/ D7G Series II		D7R Series II (FTC)		Differential Steer D7R Series II	
FORWARD	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph
1	3.4	**2.1**	4.0	**2.5**	3.8	**2.3**	3.7	**2.3**	3.7	**2.3**	3.5	**2.2**
2	5.9	**3.7**	6.9	**4.3**	6.6	**4.1**	6.4	**4.0**	6.4	**4.0**	6.2	**3.8**
3	9.9	**6.2**	10.8	**6.7**	11.4	**7.1**	10.0	**6.2**	11.1	**6.9**	10.7	**6.7**
REVERSE												
1	3.8	**2.4**	4.8	**3.0**	4.8	**3.0**	4.5	**2.8**	4.8	**3.0**	4.6	**2.9**
2	7.2	**4.5**	8.4	**5.2**	8.4	**5.2**	7.9	**4.9**	8.3	**5.1**	8.0	**5.0**
3	11.7	**7.3**	12.9	**8.0**	14.6	**9.0**	11.9	**7.4**	14.3	**8.9**	13.8	**8.6**

POWER SHIFT MODEL	Differential Steer D8R		D8T		D9R		D9T		D10T		D11R/CD		D11R/CD High Altitude	
FORWARD	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph
1	3.5	**2.2**	3.4	**2.1**	3.8	**2.4**	3.9	**2.4**	4.0	**2.5**	3.9	**2.4**	4.0	**2.5**
2	6.2	**3.9**	6.1	**3.8**	6.8	**4.2**	6.8	**4.2**	7.2	**4.5**	6.8	**4.2**	7.0	**4.4**
3	10.8	**6.7**	10.6	**6.6**	11.9	**7.4**	11.7	**7.3**	12.7	**7.9**	11.8	**7.3**	12.0	**7.5**
REVERSE														
1	4.7	**2.9**	4.5	**2.8**	4.7	**2.9**	4.7	**2.9**	5.2	**3.2**	4.7	**2.9**	4.8	**3.0**
2	8.1	**5.0**	8.0	**5.0**	8.4	**5.2**	8.4	**5.2**	9.0	**5.6**	8.2	**5.1**	8.3	**5.2**
3	13.9	**8.6**	14.2	**8.8**	14.7	**9.1**	14.3	**8.9**	15.8	**9.8**	14.0	**8.7**	14.9	**9.0**

*Power Shift direct drive transmission available for Japan domestic market only.
**Not available at time of printing.

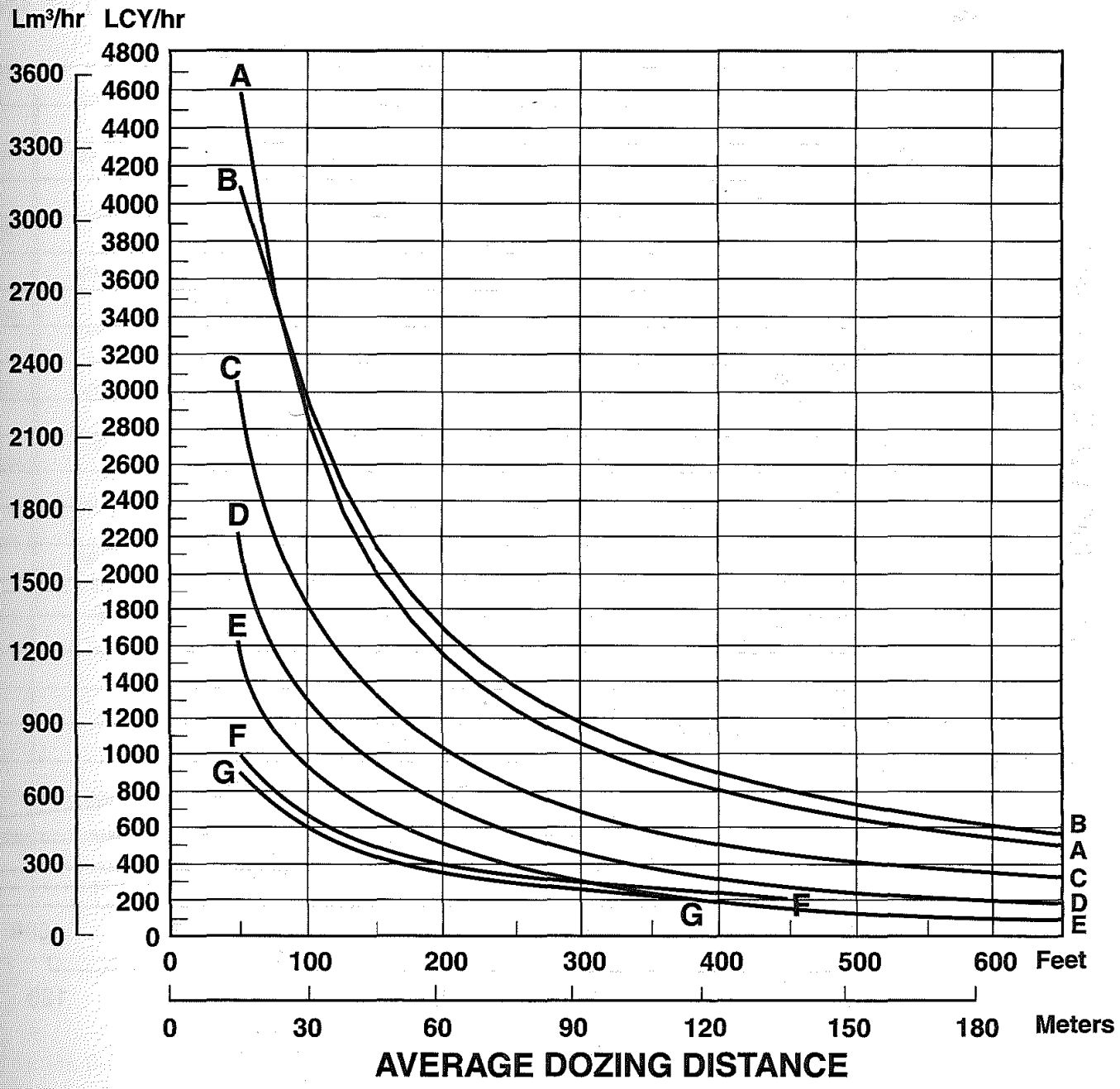
	D8R/D8T						D9R/D9T			
MODEL	**8A**		**8SU**		**8U**		**9SU**		**9U**	
Type	**Angling**		**Semi-U**		**Universal**		**Semi-U**		**Universal**	
Blade Capacities*	4.7 m^3	**6.1 yd^3**	8.7 m^3	**11.4 yd^3**	11.7 m^3	**15.3 yd^3**	13.5 m^3	**17.7 yd^3**	16.4 m^3	**21.4 yd^3**
Weight, Shipping** (Dozer)	5459 kg	**12,009 lb**	4789 kg	**10,557 lb**	5352 kg	**11,800 lb**	6543 kg	**14,425 lb**	7134 kg	**15,727 lb**
Tractor and Dozer Dimensions:										
A Length (Blade Straight)	6.57 m	**21'7"**	6.39 m	**21'0"**	6.79 m	**22'3"**	6.84 m	**22'5"**	7.18 m	**23'7"**
Length (Blade Angled)	7.62 m	**25'0"**	—		—		—		—	
Width (Blade Angled)	4.52 m	**14'10"**	—		—		—		—	
Width (with C-Frame only)	3.38 m	**11'1"**	—		—		—		—	
Blade Dimensions:										
B Width (including std. end bits)	4.99 m	**16'4"**	3.94 m	**12'11"**	4.26 m	**14'0"**	4.31 m	**14'2"**	4.65 m	**15'3"**
C Height	1174 mm	**3'10.2"**	1690 mm	**5'6.5"**	1740 mm	**5'8.5"**	1934 mm	**6'4.1"**	1934 mm	**6'4.1"**
D Max. Digging Depth	628 mm	**2'0.7"**	575 mm	**22.6"**	575 mm	**22.6"**	606 mm	**1'11.9"**	606 mm	**1'11.9"**
E Ground Clearance @ Full Lift	1308 mm	**4'3.5"**	1225 mm	**48.2"**	1225 mm	**48.2"**	1422 mm	**4'8"**	1422 mm	**4'8"**
G Max. Pitch Adjustment	**—**		**+3.0° to 2.9°**		**+3.0° to 2.9°**		**+3.4° to 2.9°**		**+3.4° to 2.9°**	
Blade Angle (either side)	**25°**		—		—		—		—	
H Max. Hydraulic Tilt	729 mm	**2'4.7"◀**	883 mm	**34.8"**	954 mm	**37.5"**	940 mm	**3'1"**	1014 mm	**3'3.9"**
J Hydraulic Tilt (Manual Brace Centered)	**—**		596 mm	**23"**	644 mm	**25"**	570 mm	**1'10.4"**	616 mm	**2'0.3"**
K Push Arm Trunnion Width (to Ball Centers)	2.98 m	**9'9"**	2.98 m	**9'9"**	2.98 m	**9'9"**	3.17 m	**10'3"**	3.17 m	**10'3"**
Maximum Track Width Permitted	712 mm	**2'4"**	711 mm	**2'4"**	711 mm	**2'4"**	762 mm	**2'6"**	762 mm	**2'6"**
Dual Tilt Option										
G Dual Pitch Adj.	**—**		**±4.6°**		**±4.6°**		**+4.8° to 5.2°**		**+4.8° to 4.9°**	
H Dual Max. Hyd. Tilt	**—**		879 mm	**34.5"**	950 mm	**37.3"**	1139 mm	**3'8.8"**	1231 mm	**4'0.5"**

* Blade capacities as determined by SAE J1265.
Notice that the capacity of the U-blade is the volume carried by a straight blade of the same dimensions plus the volume included in the "cup" of the U-blade. It is intended for **relative comparisons of dozer sizes,** and not for predicting capacities or productivities in actual field conditions.
** Shipping Weight — Total Bulldozer Arrangement includes: Blade, push arms or C-frame, braces, cylinders, lines, trunnions and lift cylinder mountings.
◀ Attachment includes two cylinders.

MODEL	D10T				D11R					
	10SU		10U		11SU		11U		11 CD	
Type	Semi-U		Universal		Semi-U		Universal		Universal	
Blade Capacities*	18.5 m^3	**24.2 yd^3**	22.0 m^3	**28.7 yd^3**	27.2 m^3	**35.5 yd^3**	34.4 m^3	**45.0 yd^3**	43.6 m^3	**57.0 yd^3**
Weight, Shipping**										
Standard Dozer	10 229 kg	**22,550 lb**	10 784 kg	**23,775 lb**	14 813 kg	**32,658 lb**	17 296 kg	**38,131 lb**	22 070 kg	**48,660 lb**
Abrasion Dozer	11 069 kg	**24,403 lb**	12 413 kg	**27,366 lb**	16 192 kg	**35,698 lb**	18 823 kg	**41,498 lb**	—	
Tractor and Dozer Dimensions:										
A Length	7.76 m	**25'5"**	8.01 m	**26'3"**	8.38 m	**27'6"**	8.83 m	**28'11"**	8.34 m	**26'8"**
Width	4.86 m	**15'11"**	5.26 m	**17'3"**	5.60 m	**18'4"**	6.35 m	**20'10"**	6.71 m	**22'0"**
Blade Dimensions:										
B Width (including std. end bits)	4.86 m	**15'11"**	5.26 m	**17'3"**	5.60 m	**18'4"**	6.35 m	**20'10"**	6.71 m	**22'0"**
C Height	2.12 m	**6'11"**	2.12 m	**6'11"**	2.37 m	**7'9"**	2.37 m	**7'9"**	3.26 m	**10'8"**
D Max. Digging Depth	674 mm	**2'2.5"**	674 mm	**2'2.5"**	766 mm	**2'6.2"**	766 mm	**2'6.2"**	766 mm	**2'6.2"**
E Ground Clearance @ Full Lift	1497 mm	**4'10.9"**	1497 mm	**4'10.9"**	1533 mm	**5'0.4"**	1533 mm	**5'0.4"**	1533 mm	**5'0.4"**
G Max. Pitch Adjustment	**+1.7° to 2.3°**		**+1.7° to 2.3°**		**+2.1° to 2.2°**		**+2.1° to 2.2°**		—	
H Max. Hydraulic Tilt	993 mm	**3'3.1"**	1074 mm	**3'6.3"**	1184 mm	**3'10.6"**	1344 mm	**4'4.9"**	1344 mm	**4'4.9"**
J Hydraulic Tilt (Manual Brace Centered)	722 mm	**2'4.4"**	782 mm	**2'6.8"**	886 mm	**2'10.9"**	1006 mm	**3'3.6"**	—	
K Push Arm Trunnion Width (to Ball Centers)	3.60 m	**11'10"**	3.60 m	**11'10"**	4.18 m	**13'9"**	4.18 m	**13'9"**	4.18 m	**13'9"**
Maximum Track Width Permitted	762 mm	**2'6"**	762 mm	**2'6"**	914 mm	**3'0"**	914 mm	**3'0"**	914 mm	**3'0"**
Dual Tilt Option					**+7.5° to 7.6° or**		**+7.5° to 7.6° or**			
G Dual Pitch Adj.	**+5.2° to 5.5°**		**+5.2° to 5.5°**		**+0° to 13°**		**+0° to 13°**		**+47.8° to 10.4°**	
H Dual Max. Hyd. Tilt	1441 mm	**4'8.7"**	1560 mm	**5'1.4"**	1706 mm	**5'7.2"**	1938 mm	**6'4.3"**	—	

*Blade capacities as determined by SAE J1265.
Notice that the capacity of the U-blade is the volume carried by a straight blade of the same dimensions plus the volume included in the "cup" of the U-blade. It is intended for **relative comparisons of dozer sizes,** and not for predicting capacities or productivities in actual field conditions.
**Shipping Weight — Total Bulldozer Arrangement includes: Blade, push arms or C-frame, braces, cylinders, lines, trunnions and lift cylinder mountings.

ESTIMATED DOZING PRODUCTION ● Universal Blades ● D7G through D11R

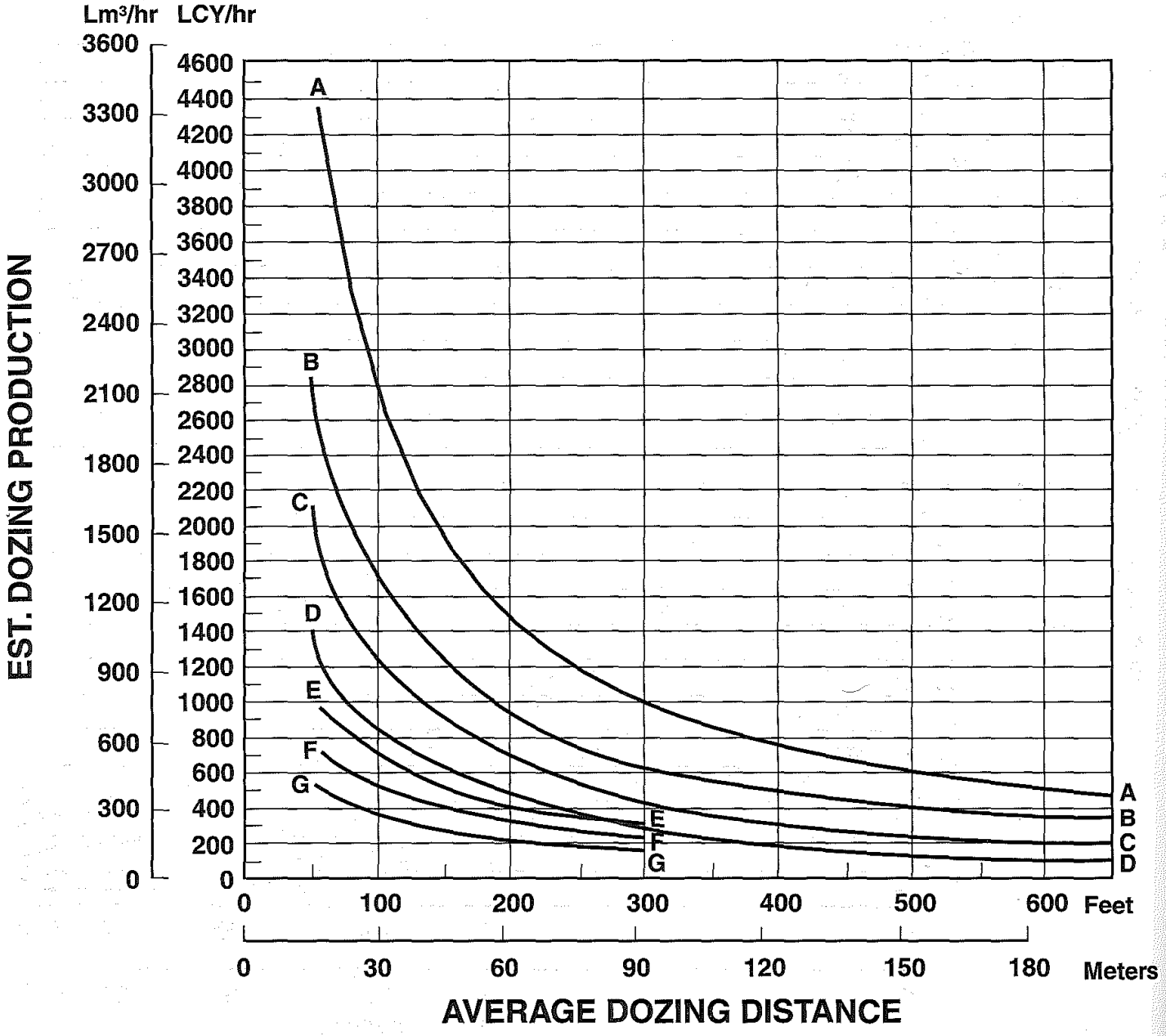


KEY

A — D11R-11U
B — D11R CD
C — D10T-10U
D — D9R/D9T-9U
E — D8R/D8T-8U
F — D7R Series II-7U
G — D7G-7U

NOTE: This chart is based on numerous field studies made under varying job conditions. Refer to correction factors following these charts.

ESTIMATED DOZING PRODUCTION ● Semi-Universal Blades ● D6N through D11R



KEY

A — D11R-11SU
B — D10T-10SU
C — D9R/D9T-9SU
D — D8R/D8T-8SU
E — D7R Series II-7SU
F — D6T

NOTE: This chart is based on numerous field studies made under varying job conditions. Refer to correction factors following these charts.

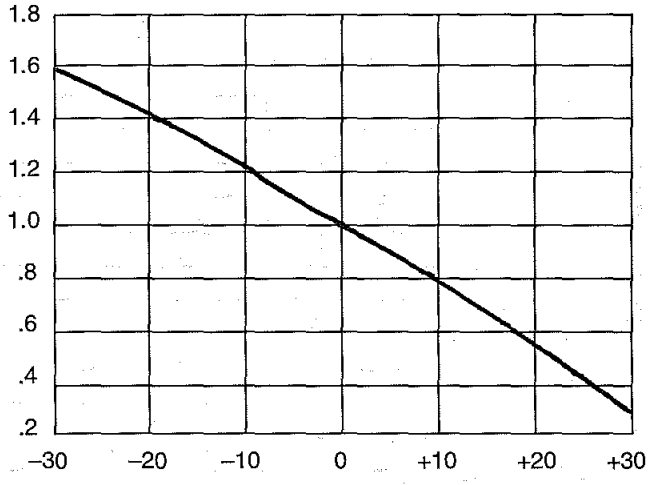
JOB CONDITION CORRECTION FACTORS

	TRACK-TYPE TRACTOR	WHEEL-TYPE TRACTOR
OPERATOR —		
Excellent	1.00	1.00
Average	0.75	0.60
Poor	0.60	0.50
MATERIAL —		
Loose stockpile	1.20	1.20
Hard to cut; frozen —		
with tilt cylinder	0.80	0.75
without tilt cylinder	0.70	—
Hard to drift; "dead" (dry, non-cohesive material) or very sticky material	0.80	0.80
Rock, ripped or blasted	0.60-0.80	—
SLOT DOZING	1.20	1.20
SIDE BY SIDE DOZING	1.15-1.25	1.15-1.25
VISIBILITY —		
Dust, rain, snow, fog or darkness	0.80	0.70
JOB EFFICIENCY —		
50 min/hr	0.83	0.83
40 min/hr	0.67	0.67
BULLDOZER*		
Adjust based on SAE capacity relative to the base blade used in the Estimated Dozing Production graphs.		
GRADES — See following graph.		

***NOTE:** Angling blades and cushion blades are not considered production dozing tools. Depending on job conditions, the A-blade and C-blade will average 50-75% of straight blade production.

% Grade vs. Dozing Factor

(–) Downhill
(+) Uphill



ESTIMATING DOZER PRODUCTION OFF-THE-JOB

Example problem:

Determine average hourly production of a D8T/8SU (with tilt cylinder) moving hard-packed clay an average distance of 45 m (150 feet) down a 15% grade, using a slot dozing technique.

Estimated material weight is 1600 kg/Lm³ (2650 lb/LCY). Operator is average. Job efficiency is estimated at 50 min/hr.

Uncorrected Maximum Production — 458 Lm³/h (600 LCY/hr) (example only)

Applicable Correction Factors:

Hard-packed clay is "hard to cut" material –0.80
Grade correction (from graph) .....–1.30
Slot dozing .....–1.20
Average operator .....–0.75
Job efficiency (50 min/hr) .....–0.83
Weight correction .....(2300/2650)–0.87

Production = Maximum Production × Correction Factors
= (600 LCY/hr) (0.80) (1.30) (1.20) (0.75) (0.83) (0.87)
= 405.5 LCY/hr

To obtain production in metric units, the same procedure is used substituting maximum uncorrected production in Lm³.

= 458 Lm³/h × Factors
= 309.6 Lm³/h

TRACTOR/RIPPER	D11R	D11R	D11R
Ripper Type	**CD Single Shank**	**CD Multishank**	**Multishank**
Dimensions:			
Ripper to Track			
Ripper length behind track, shank vertical, ripper up (A)			
A With Pushblock	**N/A**	**N/A**	**N/A**
B Without Pushblock	2.04 m **6'8"**	1.92 m **6'4"**	1.92 m **6'4"**
Ripper length behind track, shank vertical, ripper down (A)			
C With Pushblock	**N/A**	**N/A**	**N/A**
D Without Pushblock	2.48 m **8'2"**	1.92 m **6'4"**	1.92 m **6'4"**
Tip to track distance, shank vertical (A)			
E Ripper Up	622 mm **2'0.5"**	651 mm **2'1.6"**	651 mm **2'1.6"**
F Ripper Down	1041 mm **3'5"**	1030 mm **3'4.6"**	1030 mm **3'4.6"**
Ripper Shank*			
G Maximum digging depth	1612 mm **5'3.5"**	1070 mm **3'6.1"**	1070 mm **3'6.1"**
H Dig adjustment per hole	280 mm **11"**	280 mm **11"**	280 mm **11"**
I Total dig adjustment	840 mm **2'9.1"**	280 mm **11"**	280 mm **11"**
Pitch Adjustment, ripper down:			
J Forward	**15°**	**15°**	**15°**
K Backward	**18.3°**	**18.5°**	**18.5°**
L Maximum reach at ground line	1.73 m **5'8"**	1.57 m **5'2"**	1.57 m **5'2"**
M Maximum ground clearance under tooth (shank pinned in bottom hole)	1115 mm **3'7.9"**	1137 mm **3'8.8"**	1137 mm **3'8.8"**
N Maximum ramp angle, ripper up (shank pinned in bottom hole)	**33.9°**	**37.1°**	**37.1°**
Shank Section	110 × 450 mm **4.3" × 17.7"**	100 × 400 mm **3.9" × 15.7"**	100 × 400 mm **3.9" × 15.7"**
Ripper Beam			
O Overall width	**N/A**	3.33 m **10'11"**	3.33 m **10'11"**
P Height	**N/A**	560 mm **1'10"**	560 mm **1'10"**
Q Length	**N/A**	560 mm **1'10"**	560 mm **1'10"**
Clearance under beam, shank vertical			
R Ripper Up	**N/A**	2.06 m **6'9"**	2.06 m **6'9"**
S Ripper Down	**N/A**	282 mm **11.1"**	282 mm **11.1"**
Number of Pockets	**1**	**3**	**3**
T Pocket Spacing	**N/A**	1500 mm **5'9"**	1500 mm **5'9"**
U Shank Gauge	**N/A**	2.99 m **9'10"**	2.99 m **9'10"**
V Track Clearance with standard shoe	141 mm **5.6"**	166 mm **5.6"**	166 mm **5.6"**
W Width across widest part of lift cylinders	1.9 m **6'3"**	1.9 m **6'3"**	1.9 m **6'3"**
Installed Weights:			
Ripper with standard shank	12 971 kg **28,536 lb**	12 389 kg **27,256 lb**	9545 kg **21,000 lb**
Each additional tooth group	**N/A**	**N/A**	**N/A**
Ripper Forces:**			
Penetration Force, shank vertical	295 807 N **66,494 lb**	274 917 N **61,804 lb**	225 680 N **50,715 lb**
Pryout Force, shank vertical	625 577 N **140,579 lb**	549 834 N **123,608 lb**	451 360 N **101,430 lb**

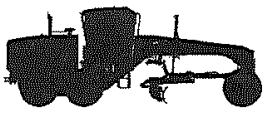
*Hydraulic pin puller is standard with deep ripping shank. Deep Ripping Arrangement maximum digging depth is 2.18 m **(7'2")**.
**Forces are for a ripper on a tractor equipped with an EROPS, U-Dozer and performance track. Forces will vary slightly with other vehicle configurations.

MODEL	140M		160M	
Base Power — Net	136 kW	**183 hp**	159 kW	**213 hp**
VHP Range — Net	136-148 kW	**183-198 hp**	159-170 kW	**213-228 hp**
VHP Plus Range — Net	136-163 kW	**183-218 hp**	159-185 kW	**213-248 hp**
Operating Weight*	15 130 kg	**33,356 lb**	15 903 kg	**35,060 lb**
Engine Model	**C7 ACERT VHP**		**C9 ACERT VHP**	
Rated Engine RPM	**2000**		**2000**	
No. of Cylinders	**6**		**6**	
Displacement	7.2 L	**439 in³**	8.8 L	**537 in³**
Max. Torque Rise	1079 N·m	**796 lb-ft**	1237 N·m	**912 lb-ft**
No. of Speeds Forward/Reverse	**8/6**		**8/6**	
Top Speed: Forward	46.6 km/h	**29 mph**	47.4 km/h	**29.5 mph**
Reverse	36.8 km/h	**22.9 mph**	37.4 km/h	**23.3 mph**
Std. Tires — Front and Rear	**14.00 24 10PR (G-2)**		**14.00 24 10PR (G-2)**	
Front Axle Steering:				
Oscillation Angle	**32°**		**32°**	
Wheel Lean Angle	**18.0°**		**18.0°**	
Steering Angle	**47.5°**		**47.5°**	
Articulation Angle	**20°**		**20°**	
Minimum Turning Radius**	7.75 m	**25'6"**	7.75 m	**25'6"**
No. Circle Support Shoes	**6**		**6**	
Hydraulics:				
Pump Type	**Variable Piston**		**Variable Piston**	
Max. Pump Flow	210 L/min	**55.7 gpm**	210 L/min	**55.7 gpm**
Tank Capacity	60 L	**15.9 U.S. gal**	60 L	**15.9 U.S. gal**
Implement Pressure: Max.	24 150 kPa	**3500 psi**	24 150 kPa	**3500 psi**
Min.	3100 kPa	**450 psi**	3100 kPa	**450 psi**
Interior Sound Level/SAE J919	**70 dB (A)**		**70 dB(A)**	
Electrical:				
System Size	**24V**		**24V**	
Std. Battery CCA @ 0° F	**880**		**880**	
Std. Alternator	**80**		**80**	
GENERAL DIMENSIONS:				
Height (to top of ROPS)	3293 mm	**130"**	3293 mm	**130"**
Overall Length	8713 mm	**343"**	8713 mm	**343"**
With Ripper and Pushplate	10 144 mm	**399"**	10 144 mm	**399"**
Wheelbase	6121 mm	**241"**	6121 mm	**241"**
Blade Base	2552 mm	**101"**	2552 mm	**101"**
Overal Width (at top of front tires)	2493 mm	**98"**	2493 mm	**98"**
Standard Blade: Length	3658 mm	**12'0"**	3658 mm	**12'0"**
Height	610 mm	**24"**	610 mm	**24"**
Thickness	22 mm	**0.87"**	22 mm	**0.87"**
Lift Above Ground	480 mm	**18.9"**	452 mm	**17.8"**
Max. Shoulder Reach:***				
Frame Straight — left	1790 mm	**70.5"**	2090 mm	**82.3"**
Frame Straight — right	1978 mm	**77.9"**	2278 mm	**89.7"**
Fuel Tank Capacity	416 L	**110 U.S. gal**	416 L	**110 U.S. gal**

*Operating Weight — based on standard machine configuration with full fuel tank, coolant, lubricants and operator.
**Minimum Turning Radius — combining the use of articulated frame steering, front wheel steer and unlocked differential.
***Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

Motor Graders Global Versions

Specifications



MODEL	14M		16M		24M	
Base Power — Net	193 kW	**259 hp**	221 kW	**297 hp**	397 kW	**533 hp**
VHP Range — Net	193-204 kW	**259-274 hp**	221-233 kW	**297-312 hp**		—
VHP Plus Range — Net	193-219 kW	**259-294 hp**	221-248 kW	**297-332 hp**		—
Operating Weight*	21 379 kg	**47,133 lb**	26 060 kg	**57,452 lb**	62 456 kg	**137,692 lb**
Engine Model	**C11**		**C13 ACERT VHP**		**C18 ACERT**	
Rated Engine RPM	**1800**		**2000**		**1800**	
No. of Cylinders	**6**		**6**		**6**	
Displacement	11.1 L	**677 in³**	12.5 L	**763 in³**	18.1 L	**1104.5 in³**
Max. Torque Rise	1422 N·m	**1049 lb-ft**	1710 N·m	**1261 lb-ft**	2389 N·m	**1762 lb-ft**
No. of Speeds Forward/Reverse	**8/6**		**8/6**		**6/3**	
Top Speed: Forward	49.8 km/h	**31 mph**	53.9 km/h	**33.5 mph**	43 km/h	**26.7 mph**
Reverse	39.4 km/h	**24.5 mph**	42.6 km/h	**26.5 mph**	41.2 km/h	**25.6 mph**
Std. Tires — Front and Rear	**16.00-24 (16 PR) (G-2)**		**18.00-25 12PR (G-2)**		—	
Front Axle Steering:						
Oscillation Angle	**32°**		**32°**		**32°**	
Wheel Lean Angle	**17.1°**		**18.2°**		**18.0°**	
Steering Angle	**47.5°**		**47.5°**		**47.5°**	
Articulation Angle	**20°**		**20°**		**20°**	
Minimum Turning Radius**	7.9 m	**25'11"**	8.9 m	**29'3"**	12.4 m	**40'9"**
No. Circle Support Shoes	**6**		**6**		**6**	
Hydraulics:						
Pump Type	**Variable Piston**		**Variable Piston**		**Variable Piston**	
Max. Pump Flow	280 L/min	**74 gpm**	280 L/min	**74 gpm**	550 L/min	**145 gpm**
Tank Capacity	60 L	**15.9 U.S. gal**	60 L	**15.9 U.S. gal**	264 L	**70 U.S. gal**
Implement Pressure: Max.	24 150 kPa	**3500 psi**	24 150 kPa	**3500 psi**	24 150 kPa	**3500 psi**
Min.	3100 kPa	**450 psi**	3100 kPa	**450 psi**	3100 kPa	**450 psi**
Interior Sound Level/SAE J919	**70 dB(A)**		**72 dB(A)**		**74 dB(A)**	
Electrical:						
System Size	**24V**		**24V**		**24V**	
Std. Battery CCA @ 0° F	**1125**		**1400**		**1500**	
Std. Alternator	**80**		**150**		**150**	
GENERAL DIMENSIONS:						
Height (to top of ROPS)	3535 mm	**139.2"**	3703 mm	**145.8"**	4352 mm	**171.3"**
Overall Length	9412 mm	**370.6"**	9963 mm	**392.2"**	14 194 mm	**558.8"**
With Ripper and Pushplate	10 896 mm	**429"**	11 672 mm	**459.5"**	16 102 mm	**633.9"**
Wheelbase	6559 mm	**258"**	6985 mm	**275"**	10 278 mm	**404.6"**
Blade Base	2842 mm	**112"**	3069 mm	**120.8"**	4048 mm	**159.4"**
Overal Width (at top of front tires)	2791 mm	**109.9"**	3096 mm	**121.9"**	4280 mm	**168.5"**
Standard Blade: Length	4287 mm	**14'0"**	4877 mm	**16'0"**	7315 mm	**24'0"**
Height	686 mm	**27"**	787 mm	**31"**	1076 mm	**42"**
Thickness	25 mm	**1"**	25 mm	**1"**	50 mm	**2"**
Lift Above Ground	419 mm	**16.5"**	395 mm	**15.6"**	634 mm	**25"**
Max. Shoulder Reach:***						
Frame Straight — left	2169 mm	**85.4"**	2282 mm	**90"**	3222 mm	**126.9"**
Frame Straight — right	2279 mm	**89.7"**	2587 mm	**101.9"**	3228 mm	**127.1"**
Fuel Tank Capacity	492 L	**130 U.S. gal**	511 L	**135 U.S. gal**	1326 L	**350 U.S. gal**

*Operating Weight — based on standard machine configuration with full fuel tank, coolant, lubricants and operator. 24M includes ripper.
**Minimum Turning Radius — combining the use of articulated frame steering, front wheel steer and unlocked differential.
***Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

PRODUCTION

The motor grader is used in a variety of applications in a variety of industries. Therefore, there are many ways to measure its operating capacity, or production. One method expresses a motor grader's production in relation to the area covered by the moldboard.

Formula:

$$A = S \times (L_e - L_o) \times 1000 \times E \quad \text{(Metric)}$$
$$A = S \times (L_e - L_o) \times 5280 \times E \quad \text{(English)}$$

where A: Hourly operating area (m^2/h or ft^2/h)
S: Operating speed (km/h or mph)
L_e: Effective blade length (m or ft)
L_o: Width of overlap (m or ft)
E: Job efficiency

Operating Speeds:

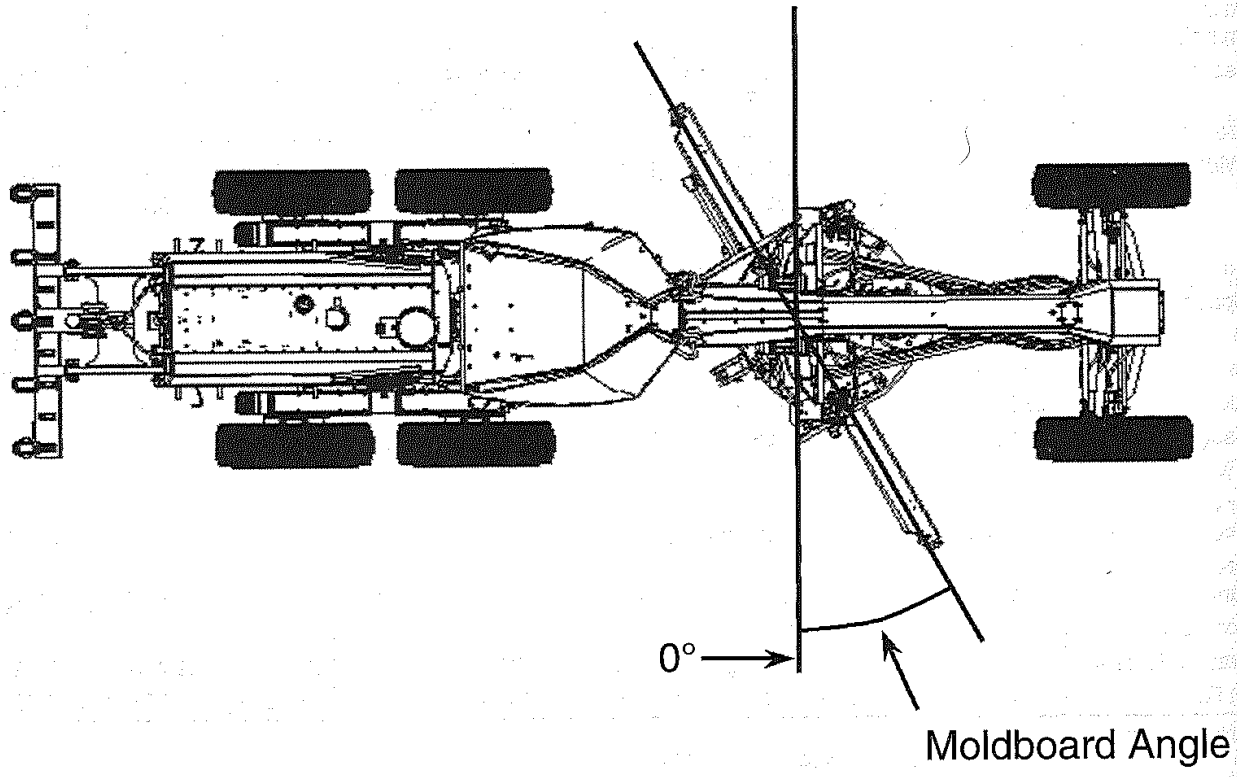
Typical operating speeds by application

Finish Grading:	0-4 km/h	(0-2.5 mph)
Heavy Blading:	0-9 km/h	(0-6 mph)
Ditch Repair:	0-5 km/h	(0-3 mph)
Ripping:	0-5 km/h	(0-3 mph)
Road Maintenance:	5-16 km/h	(3-9.5 mph)
Haul Road Maintenance:	5-16 km/h	(3-9.5 mph)
Snow Plowing:	7-21 km/h	(4-13 mph)
Snow Winging:	15-28 km/h	(9-17 mph)

Effective Blade Length:

Since the moldboard is usually angled when moving material, an effective blade length must be computed to account for this angle. This is the actual width of material swept by the moldboard.

NOTE: Angles are measured as shown below. The effective length becomes shorter as the angle increases.



Moldboard Length, m (ft)	Effective Length, m (ft) 30 degree blade angle	Effective Length, m (ft) 45 degree blade angle
3.658 (12)	3.17 **(10.4)**	2.59 **(8.5)**
3.962 (13)	3.43 **(11.3)**	2.80 **(9.2)**
4.267 (14)	3.70 **(12.1)**	3.02 **(9.9)**
4.877 (16)	4.22 **(13.9)**	3.45 **(11.3)**
7.315 (24)	6.33 **(20.8)**	5.17 **(17.0)**

For other blade lengths and carry angles:
Effective length = COS [Radians (Blade L)] × Blade Length

Width of Overlap:

The width of overlap is generally 0.6 m (2.0 ft). This overlap accounts for the need to keep the tires out of the windrow on the return pass.

Job Efficiency:

Job efficiencies vary based on job conditions, operator skill, etc.

A good estimation for efficiency is approximately 0.70 to 0.85, but actual operating conditions should be used to determine the best value.

Example problem:

A 140M motor grader with a 3.66 m (12 ft) moldboard is performing road maintenance on a township road. The machine is working at an average speed of 13 km/h (8 mph) with a moldboard carry angle of 60 degrees. What is the motor grader's production based on coverage area?

Note: Due to the long passes involved in road maintenance — fewer turnarounds — a higher job efficiency of 0.90 is chosen.

Solution:

From the table, the effective blade length is 3.17 m (10.4 ft).

Metric

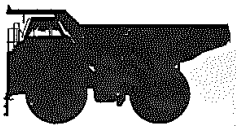
Production, A = 13 km/h × (3.17 m − 0.6 m) × 1000 × 0.90
= **30 069 m²/hr (3.07 hectares/hr)**

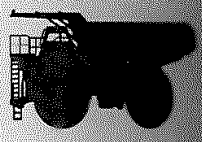
English

Production, A = 8 mph × (10.4 ft − 2.0 ft) × 5280 × 0.90
= **319,334 ft²/hr (7.33 acres/hr)**

MODEL	777F	
Body Type	Dual Slope Lined	
Gross Machine Weight	163 293 kg	**360,000 lb**
Chassis Weight*	50 790 kg	**111,971 lb**
Body System Weight	22 187 kg	**48,914 lb**
Target Payload**	90 316 kg	**199,115 lb**
Capacity:		
Struck (SAE)	41.9 m^3	**54.8 yd^3**
Heaped (2:1) (SAE)	60.2 m^3	**78.8 yd^3**
Distribution Empty:		
Front	**45%**	
Rear	**55%**	
Distribution Loaded:		
Front	**33%**	
Rear	**67%**	
Engine Model	**C32 ACERT**	
Number of Cylinders	**12**	
Bore	145 mm	**5.7"**
Stroke	162 mm	**6.4"**
Displacement	32.1 L	**1959 in^3**
Net Power	700 kW	**938 hp**
Gross Power	758 kW	**1016 hp**
Standard Tires	**27.00R49 (E4)**	
Machine Clearance Turning Circle	28.4 m	**83'0"**
Fuel Tank Refill Capacity	1137 L	**300 U.S. gal**
Top Speed (Loaded)	64.5 km/h	**40.1 mph**
GENERAL DIMENSIONS (Empty):		
Height to Canopy Rock Guard Rail	5.19 m	**17'0"**
Wheelbase	4.56 m	**15'0"**
Overall Length (Operating)	10.53 m	**34'6"**
Overall Length (Shipping)	9.78 m	**32'1"**
Loading Height (Empty)	4.43 m	**14'7"**
Height at Full Dump	10.36 m	**34'0"**
Body Length (Target Length)	6.39 m	**20'11"**
Width (Operating)	6.49 m	**21'4"**
Width (Shipping)***	3.51 m	**11'5"**
Front Tire Tread	4.05 m	**13'3"**

*Weights include lubricants, coolants, 100% fuel and a debris allowance (4% of chassis).
**Refer to Caterpillar's 10/10/20 Payload Policy for Quarry & Construction Trucks.
***Disassembled.





MODEL	785C		789C		793D Standard (MA1)	
Body Type	Dual Slope		Dual Slope		MSD II	
Target Gross Machine Weight §	249 433 kg	**550,000 lb**	317 460 kg	**700,000 lb**	383 673 kg	846,000 lb
Basic Machine Weight*	57 176 kg	**126,074 lb**	67 344 kg	**148,425 lb**	51 934 kg	114,522 lb
Attachments**	22 955 kg	**50,616 lb**	30 668 kg	**67,592 lb**	68 528 kg	151,076 lb
Body Weight without Liners***	22 181 kg	**48,887 lb**	27 094 kg	**59,715 lb**	32 650 kg	71,981 lb
Full Liner	7433 kg	**16,382 lb**	9392 kg	**20,701 lb**	—	
Standard Sideboard	1263 kg	**2785 lb**	1292 kg	**2848 lb**	—	
Operating Machine Weight	111 008 kg	**244,744 lb**	135 790 kg	**299,281 lb**	153 112 kg	337,550 lb
Debris (2% of Operating Machine Weight)	1569 kg	**3461 lb**	1905 kg	**4198 lb**	2334 kg	5145 lb
Empty Operating Weight	112 577 kg	**248,205 lb**	137 695 kg	**303,479 lb**	155 446 kg	342,695 lb
Target Payload §	137 m tons	**151 tons**	180 m tons	**198 tons**	228 m tons	252 tons
Capacity:						
Heaped (2:1) (SAE) Base Body	78 m^3	**102 yd^3**	105 m^3	**137 yd^3**	140 m^3	196 yd^3
Heaped (2:1) (SAE) with Std. Sideboards	91 m^3	**119 yd^3**	120 m^3	**157 yd^3**	—	
Distribution Empty:						
Front	**47%**		**46.9%**		**46.9%**	
Rear	**53%**		**53.1%**		**53.1%**	
Distribution Loaded:						
Front	**33%**		**33.6%**		**33.3%**	
Rear	**67%**		**66.4%**		**66.7%**	
Engine Model	**3512B EUI**		**3516B EUI**		**3516B HD EUI**	
Number of Cylinders	**12**		**16**		**16**	
Bore	170 mm	**6.7"**	170 mm	**6.7"**	170 mm	6.7"
Stroke	190 mm	**7.5"**	190 mm	**7.5"**	215 mm	8.5"
Displacement	51.8 L	**3158 in^3**	69 L	**4210 in^3**	78 L	4760 in^3
Net Power	1005 kW	**1348 hp**	1320 kW	**1771 hp**	1743 kW	2337 hp
Gross Power	1082 kW	**1450 hp**	1417 kW	**1900 hp**	1801 kW	2415 hp
Standard Tires	**33.00R51**		**37.00R57**		**40.00R57**	
Machine Clearance Turning Circle	30.6 m	**100'5"**	30.2 m	**99'2"**	32.7 m	107'3"
Fuel Tank Refill Capacity	1893 L	**500 U.S. gal**	3222 L	**851 U.S. gal**	4353 L	1150 U.S. gal
Top Speed (Loaded)	54.1 km/h	**33.6 mph**	52.6 km/h	**32.7 mph**	54.2 km/h	33.7 mph
GENERAL DIMENSIONS (Empty):						
Height to Canopy Rock Guard Rail	5.77 m	**18'11"**	6.15 m	**20'2"**	6.60 m	21'8"
Wheelbase	5.18 m	**17'0"**	5.70 m	**18'8"**	5.91 m	19'5"
Overall Length (Base Body)	10.62 m	**34'10"**	11.63 m	**38'2"**	13.05 m	42'9"
Loading Height (Base Body)	4.97 m	**16'4"**	5.21 m	**17'1"**	5.87 m	19'4"
Height at Full Dump	11.21 m	**36'9"**	11.90 m	**39'1"**	13.25 m	43'6"
Body Length (Target Length)	7.65 m	**25'1"**	8.15 m	**26'9"**	8.99 m	29'6"
Width (Operating)	6.64 m	**21'4"**	7.67 m	**25'2"**	8.28 m	27'2"
Width (Shipping)***	3.91 m	**12'10"**	3.84 m	**12'7"**	4.09 m	13'5"
Front Tire Tread	4.85 m	**15'11"**	5.43 m	**17'10"**	5.61 m	18'5"

*See Weight Definitions and Relations on 9-9. Note: No mandatory or optional attachments or fuel.

**Typical selection of mandatory and optional attachments.

***Data provided is for a representative body and liner package. Several dual slope, flat floor, and mine specific design (MSD) bodies and liner packages are available. All weights, capacities, and dimensions are dependent on the machine configuration (body type, attachments, tires, and optional equipment selected).

§ Reference Caterpillar's latest 10/10/20 Payload Policy for information on gross machine operating weight and target payload.

USE OF BRAKE PERFORMANCE CURVES

The speed that can be maintained when the machine is descending a grade with retarder applied can be determined from the retarder curves in this section when gross machine weight and total effective grade are known.

Select appropriate grade distance chart that covers total downhill haul; don't break haul into individual segments.

To determine brake performance: Read from gross weight down to the percent effective grade. (Effective grade equals actual % grade *minus* 1% for each 10 kg/metric ton (20 lb./U.S. ton) of rolling resistance.) From this weight-effective grade point, read horizontally to the curve with the highest obtainable speed range, then down to maximum descent speed brakes can safely handle without exceeding cooling capacity. When braking, engine RPM should be maintained at the highest possible level without overspeeding. If cooling oil overheats, reduce ground speed to allow transmission to shift to next lower speed range.

USE OF RIMPULL-SPEED-GRADEABILITY CURVES

(See Wheel Tractor Scraper Section)

Total Effective Grade (or Total Resistance) is grade assistance *minus* rolling resistance.

10 kg/metric ton (20 lb/U.S. ton) = 1% adverse grade.

Example —

With a favorable grade of 20% and rolling resistance of 50 kg/metric ton (100 lb/U.S. ton), find Total Effective Grade.

(50 kg/metric ton) = 50 ÷ 10 = 5% Effective Grade
(from Rolling Resistance)
100 lb/ton = 100 ÷ 20 = 5% Effective Grade
20% (grade) – 5% (resistance) =
15% Total Effective Grade

TYPICAL FIXED TIMES FOR HAULING UNITS

Wait time, delays and operator efficiency all impact cycle time. Minimizing truck exchange time can have a significant effect on productivity.

Fixed time for hauling units include:
1. Truck load time (various with loading tool)
2. Truck maneuver in load area (Truck exchange) (Typically 0.6-0.8 min.)
3. Maneuver and dump time at dump point (Typically 1.0-1.2 min.)

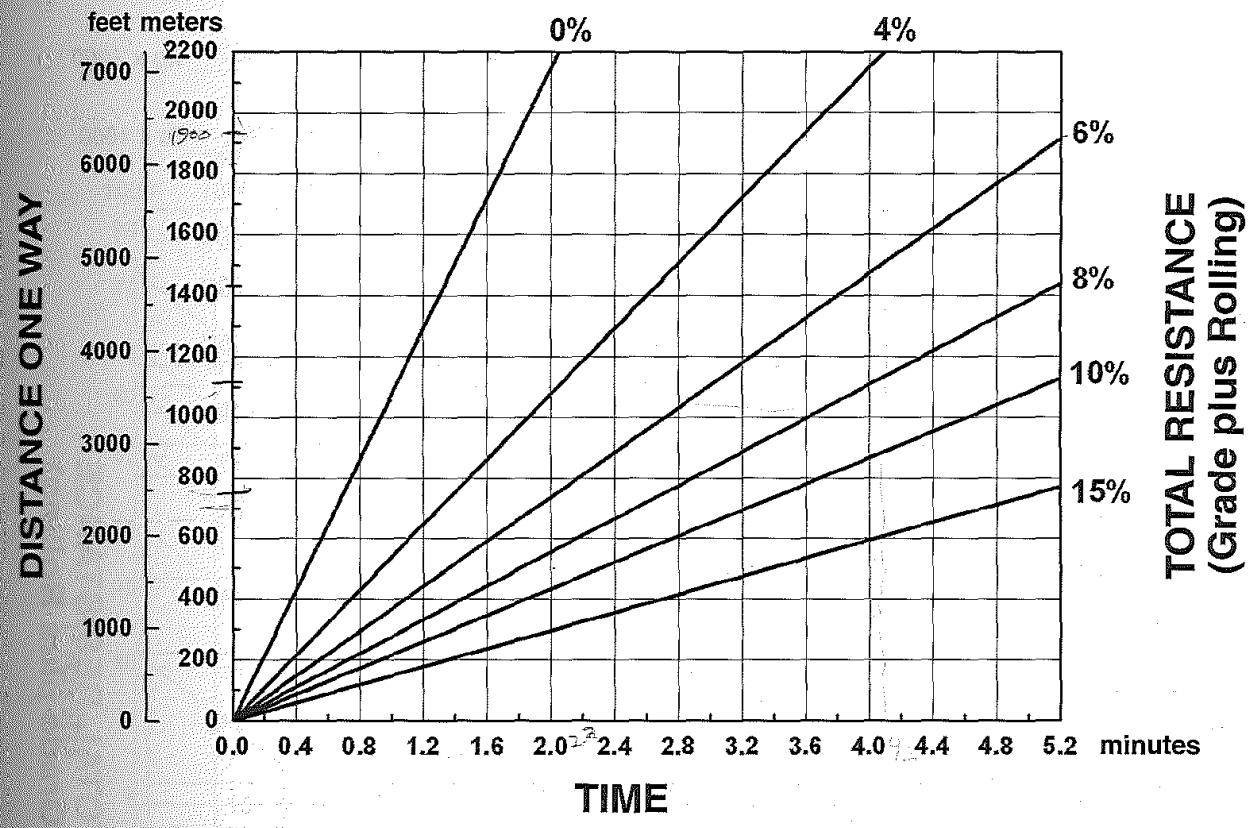
Total cycle time is the combination of:
1. The above fixed time
2. Hauling time (Loaded)
3. Return time (Empty)

Example — assume load tool spots hauler with full bucket

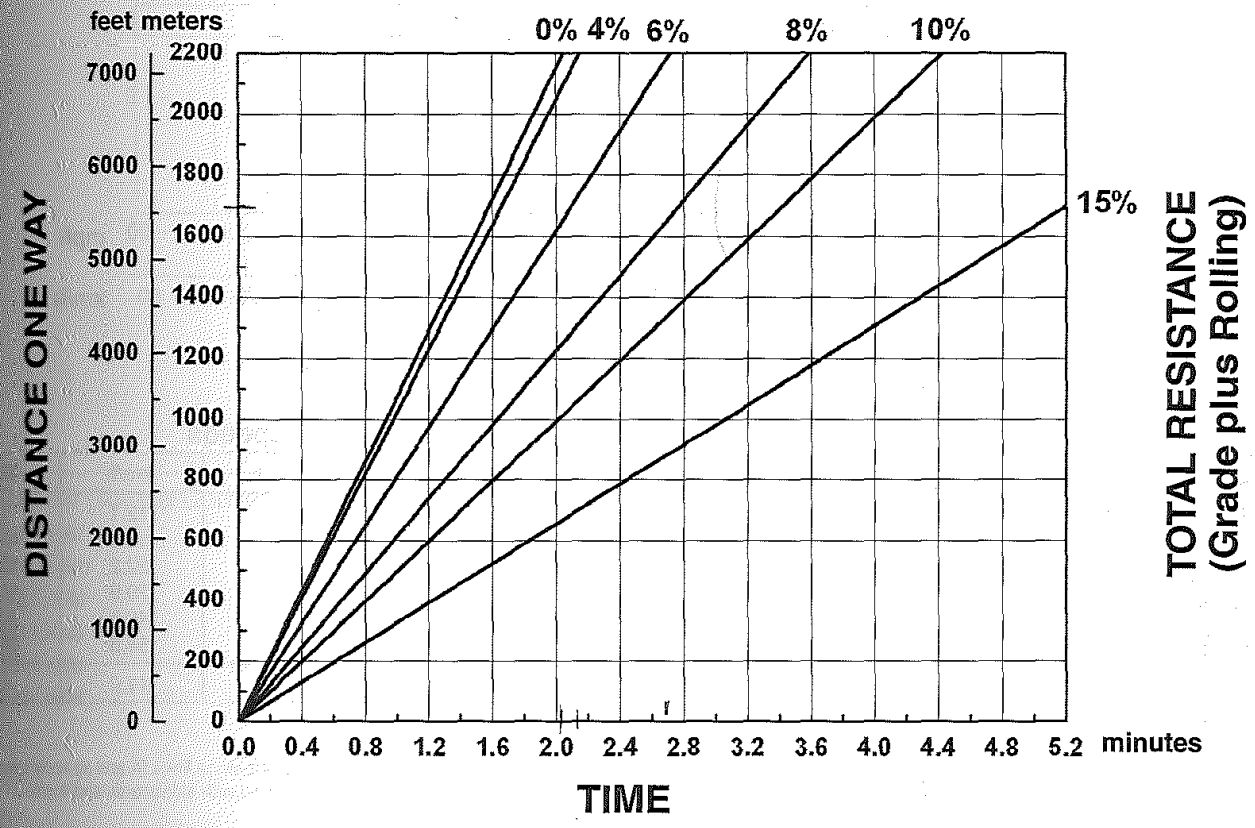
		988F	5130B
cycle times		.60	.45
First pass	(dump time)	.10 min.	.05 min.
2 passes	(full cycle)	.70	.50
3 passes	"	1.30	.95
4 passes	"	1.90	1.40
5 passes	"	2.50	1.85
6 passes	"	3.10	2.30
7 passes	"	3.70	2.75
8 passes	"	4.30	3.20
9 passes	"	4.90	3.65
10 passes	"	5.40	4.10

NOTE: Other sizes of loading tools will have different cycle times. See Wheel Loader section for **average** cycle times for truck loading.

LOADED



EMPTY



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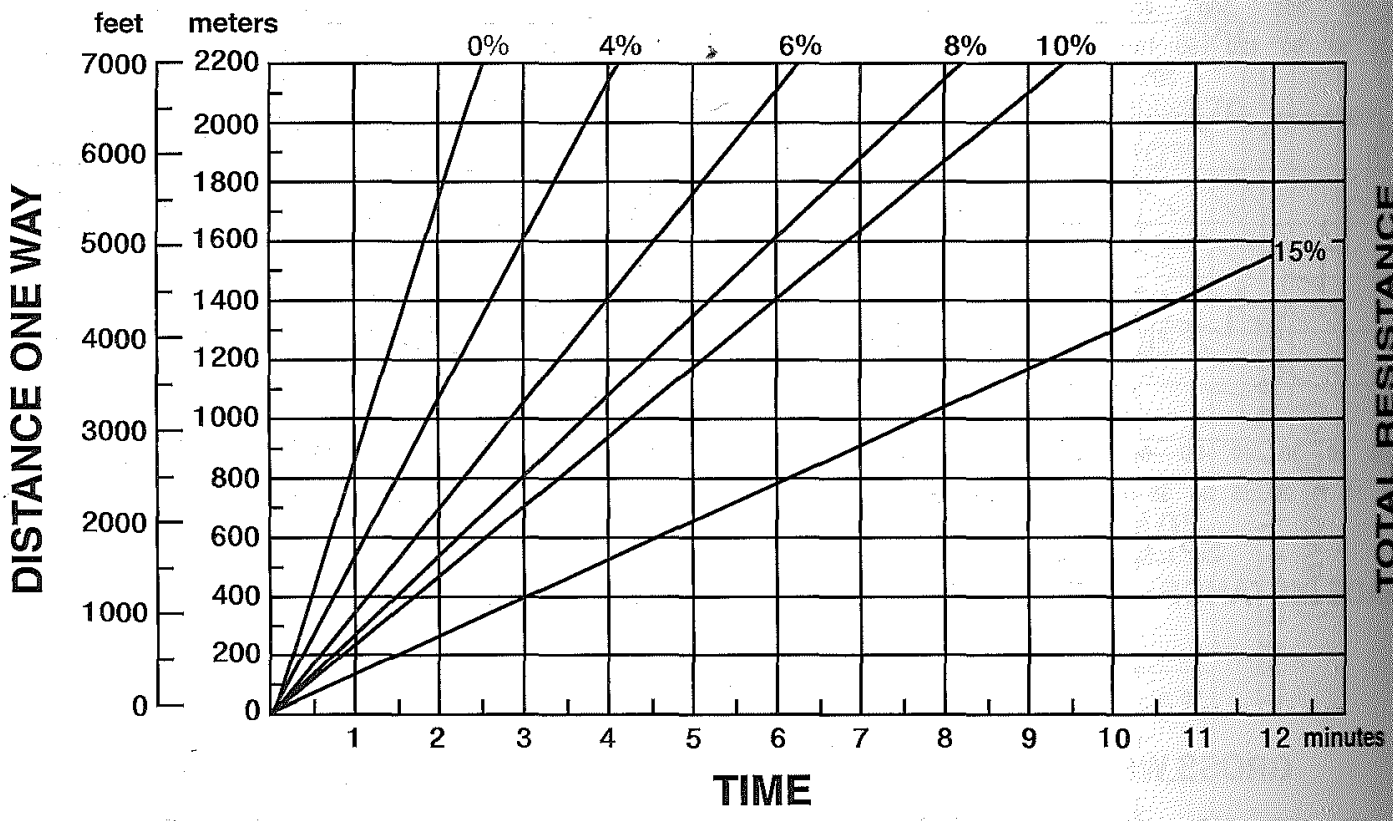

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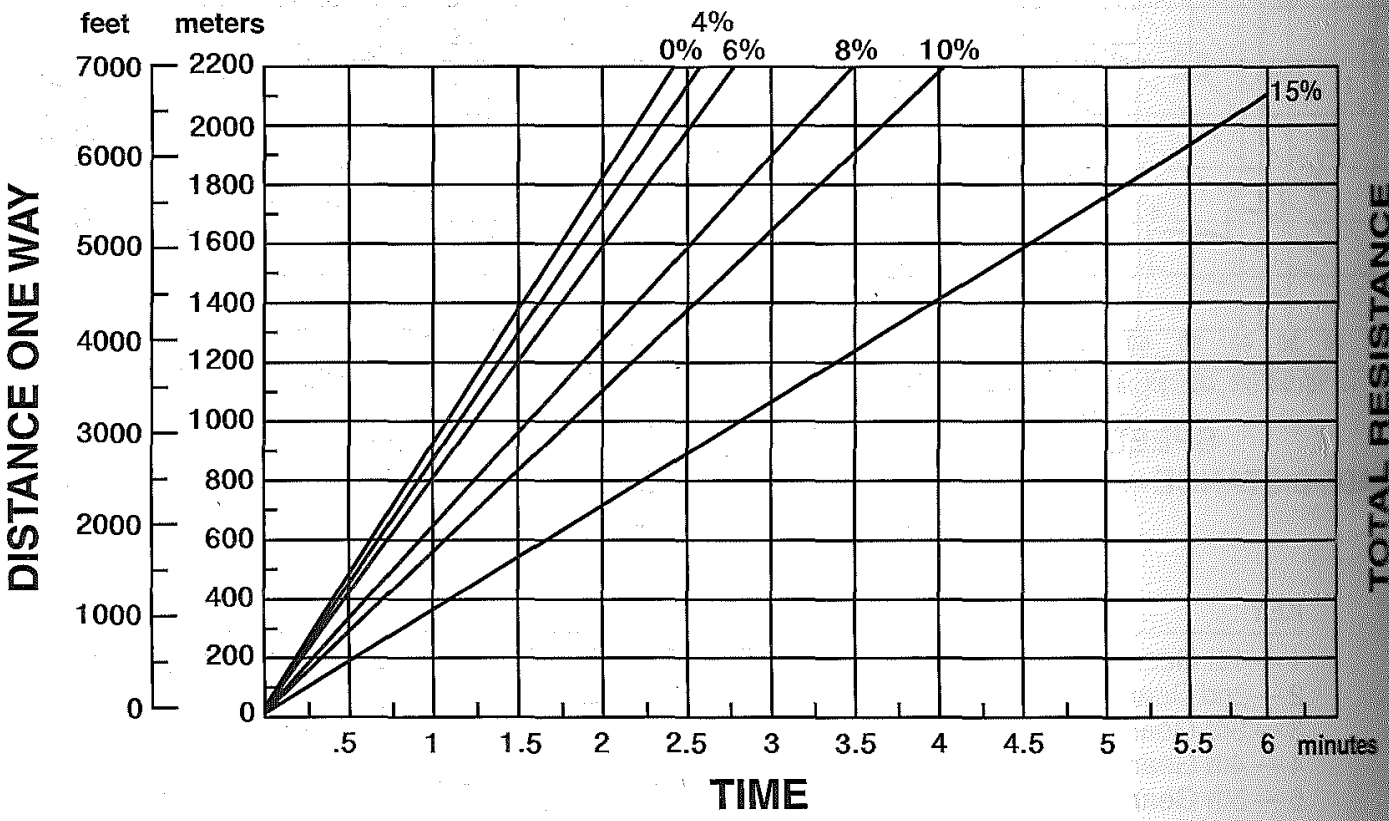


Rock Buckets			Standard Spade Edge		Large Standard Spade Edge		Heavy Duty Quarry		High Abrasion	
			Teeth & Segments		Teeth & Segments		Teeth & Segments		Teeth	
			Std.	Hi-Lift	Std.	Hi-Lift	Std.	Hi-Lift	Std.	Hi-Lift
Rated bucket capacity (§)		m^3	11.5	11.5	12.2	12.2	11.5	11.5	11.5	11.5
		yd^3	**15.0**	**15.0**	**16.0**	**16.0**	**15.0**	**15.0**	**15.0**	**15.0**
Struck capacity (§)		m^3	9.45	9.45	10.1	10.1	9.45	9.45	9.45	9.45
		yd^3	**12.36**	**12.36**	**13.2**	**13.2**	**12.4**	**12.4**	**12.36**	**12.36**
Bucket width (§)		mm	4824	4824	4824	4824	4824	4824	4840	4840
		ft/in	**15'10"**	**15'10"**	**15'10"**	**15'10"**	**15'10"**	**15'10"**	**15'11"**	**15'11"**
Dump clearance at full lift and 45° discharge (§)	With teeth	mm	4626	5250	4626	5250	4557	5182	4602	5227
		ft/in	**15'2"**	**17'3"**	**15'2"**	**17'3"**	**14'11"**	**17'0"**	**15'1"**	**17'2"**
	Bare	mm	4993	5607	4993	5607	4993	5607	4993	5607
		ft/in	**16'5"**	**18'5"**	**16'5"**	**18'5"**	**16'5"**	**18'5"**	**16'5"**	**18'5"**
Reach at full lift and 45° discharge (§)	With teeth	mm	2315	2304	2315	2304	2364	2354	2391	2381
		ft/in	**7'7"**	**7'7"**	**7'7"**	**7'7"**	**7'9"**	**7'9"**	**7'10"**	**7'10"**
	Bare	mm	1732	1720	1732	1720	1732	1720	1732	1720
		ft/in	**5'8"**	**5'8"**	**5'8"**	**5'8"**	**5'8"**	**5'8"**	**5'8"**	**5'8"**
Reach with boom – horizontal and bucket level	With teeth	mm	5110	5590	5110	5590	5192	5673	5181	5661
		ft/in	**16'9"**	**18'4"**	**16'9"**	**18'4"**	**17'0"**	**18'7"**	**17'0"**	**18'7"**
	Bare	mm	4177	4657	4177	4657	4177	4657	4177	4657
		ft/in	**13'8"**	**15'3"**	**13'8"**	**15'3"**	**13'8"**	**15'3"**	**13'8"**	**15'3"**
Digging depth (§)		mm	165	161	165	161	180	177	155	152
		in	**6**	**6**	**6**	**6**	**7**	**7**	**6**	**6**
Overall length (§)	With teeth	mm	15 585	16 175	15 585	16 175	15 604	16 194	15 636	16 226
		ft/in	**51'2"**	**53'1"**	**51'2"**	**53'1"**	**51'2"**	**53'2"**	**51'4"**	**53'3"**
	Bare	mm	15 143	15 733	15 143	15 733	15 143	15 733	15 143	15 733
		ft/in	**49'8"**	**51'7"**	**49'8"**	**51'7"**	**49'8"**	**51'7"**	**49'8"**	**51'7"**
Overall height with bucket at full raise (§)		mm	9415	10 035	9415	10 035	9415	10 035	9415	10 035
		ft/in	**30'11"**	**32'11"**	**30'11"**	**32'11"**	**30'11"**	**32'11"**	**30'11"**	**32'11"**
Loader clearance circle with bucket in carry position (§)	With teeth	m	22.27	22.88	22.27	22.88	22.27	22.88	22.31	22.92
		ft/in	**73'1"**	**75'1"**	**73'1"**	**75'1"**	**73'1"**	**75'1"**	**73'2"**	**75'2"**
	Bare	m	21.88	22.46	21.88	22.46	21.88	22.46	21.94	22.51
		ft/in	**71'9"**	**73'8"**	**71'9"**	**73'8"**	**71'9"**	**73'8"**	**72'**	**73'10"**
Static tipping load, straight†		kg	60 292	58 693	60 091	58 488	59 226	57 552	58 164	56 620
		lb	**132,921**	**129,396**	**132,478**	**128,944**	**130,571**	**126,880**	**128,230**	**124,826**
Static tipping load, full 40° turn†		kg	52 541	50 720	52 303	50 477	51 424	49 534	50 442	48 673
		lb	**115,833**	**111,818**	**115,308**	**111,283**	**113,370**	**109,204**	**111,205**	**107,306**
Static tipping load, full 43° turn†		kg	51 392	49 538	51 149	49 289	50 267	48 346	49 297	47 494
		lb	**113,300**	**109,213**	**112,764**	**108,664**	**110,820**	**106,585**	**108,681**	**104,706**
Breakout force†† (§)		kN	615	602	612	599	595	583	591	578
		lb	**138,360**	**135,421**	**137,692**	**134,753**	**133,783**	**130,957**	**132,804**	**129,921**
Operating weight† (§)		kg	94 927	98 596	95 447	99 116	96 304	99 973	96 607	100 277
		lb	**209,278**	**217,367**	**210,424**	**218,513**	**212,314**	**220,403**	**212,982**	**221,073**

†Static tipping load and operating weight shown are based on standard machine configuration with 45/65-45, 46 PR (L-5) tires, full fuel tank, cooolant, lubricants and operator.

††Measured 102 mm **(4")** behind tip of cutting edge with bucket hinge pin as pivot point in accordance with SAE J732 JUN92.

NOTE: Specifications and ratings conform to all applicable standards recommended by the Society of Automotive Engineers (SAE). SAE Standards J732 JUN92 and J742 FEB85 govern loader ratings, denoted in the text by (§). Dimensions are also measured to the tip of the bucket teeth to provide accurate clearance data. SAE Standards specifies the cutting edge.

	Change in Operating Weight		Change in Articulated Static Tipping Load			
	Standard (for four tires)		Standard		High Lift	
	kg	lb	kg	lb	kg	lb
45/65-45, 46 ply L-5 Firestone	0	**0**	0	**0**	0	**0**
45/65-45, 46 ply L-5 General	+ 427	**+ 940**	+ 284	**+ 625**	+256	**+ 564**
45/65-45, 46 ply L-5 Goodyear	– 162	**– 356**	– 108	**– 238**	– 97	**– 214**
45/65 R45 1-Star L-4 (XLDD1) Michelin	–1942	**–4272**	–1290	**–2838**	–882	**–1942**
45/65 R45 1-Star L-5 (XLDD2) Michelin	– 681	**–1500**	– 452	**– 994**	–409	**– 900**
45/65 R45 1-Star L-5 (XMINED2) Michelin	+ 752	**+1656**	+ 523	**+1151**	+451	**+ 994**
45/65-45, 50PR L-5 Firestone	– 278	**– 612**	– 167	**– 367**	–167	**– 367**
45/65-45, 50PR L-5 Firestone	+ 441	**+ 972**	+ 265	**+ 583**	+265	**+ 583**

	Minutes added (+) or Subtracted (–) From Basic Cycle
Machine	
— Material handler	–.05
Materials	
— Mixed	+.02
— Up to 3 mm (1/8 in)	+.02
— 3 mm (1/8 in) to 20 mm (3/4 in)	–.02
— 20 mm (3/4 in) to 150 mm (6 in)	.00
— 150 mm (6 in) and over	+.03 and Up
— Bank or broken	+.04 and Up
Pile	
— Conveyor or Dozer piled 3 m (10 ft) and up	.00
— Conveyor or Dozer piled 3 m (10 ft) or less	+.01
— Dumped by truck	+.02
Miscellaneous	
— Common ownership of trucks and loaders	Up to –.04
— Independently owned trucks	Up to +.04
— Constant operation	Up to –.04
— Inconsistent operation	Up to +.04
— Small target	Up to +.04
— Fragile target	Up to +.05

Using actual job conditions and the above factors, total cycle time can be estimated. Convert total cycle time to cycles per hour.

$$\textit{Cycles per hour at 100\% Efficiency} = \frac{\textit{60 min}}{\textit{Total Cycle Time in Minutes}}$$

Job efficiency is an important factor in machine selection. Efficiency is the actual number of minutes worked during an hour. Job efficiency accounts for bathroom breaks and other work interruptions.

$$\text{Cycles per hour at 50 minutes per hour (83\% efficiency)} = \text{Cycles per hour at 100\% efficiency} \times \frac{\text{50 min actual work time}}{\text{60 min hour}}$$

TRUCK LOADING

Average loader cycle times

914G-962H	0.45-0.5 min
966H-980H	0.50-0.55 min
988H-990H	0.55-0.6 min
992G-994F	0.60-0.7 min

3. Required Payload Per Cycle

Required payload per cycle is determined by dividing required hourly production by the number of cycles per hour.

4. Bucket Selection

After required payload per cycle has been calculated, the payload should be divided by the loose cubic yard (meter) material weight to determine number of loose cubic yards (meters) required per cycle.

The bulk of material handled does not weigh 1800 kg/m³ (3000 lb/yd³), so a reasonable knowledge of material weight is necessary for accurate production estimates. The Tables Section has average weight for certain materials when actual weights are not known.

The percentage of rated capacity a bucket will carry in various materials is estimated below. The bucket size required to handle the required volume per cycle is found with the aid of the percentage of rated bucket capacity called "Bucket Fill Factor."

The bucket size needed is determined by dividing loose cubic meters (or yards) required per cycle by the bucket fill factor.

$$\textit{Bucket size} = \frac{\textit{Volume Required/Cycle}}{\textit{Bucket Fill Factor}}$$

BUCKET FILL FACTORS

The following indicates the approximate amount of material as a percent of rated bucket capacity which will actually be delivered per bucket per cycle. This is known as "Bucket Fill Factor."

Loose Material	Fill Factor
Mixed moist aggregates	95-100%
Uniform aggregates up to 3 mm (1/8 in)	95-100%
3 mm (1/8 in) to 9 mm (3/8 in)	90-95%
12 mm (1/2 in) to 20 mm (3/4 in)	85-90%
24 mm (1.0 in) and over	85-90%

Blasted Rock

Well blasted	80-95%
Average	75-90
Poor	60-75

Other

Rock dirt mixtures	100-120%
Moist loam	100-110
Soil, boulders, roots	80-100
Cemented materials	85-95

NOTE: Fill factors on wheel loaders are affected by bucket penetration, breakout force, rackback angle, bucket profile and ground engaging tools such as bucket teeth or bolt-on replaceable cutting edges.

Example:

12 mm (1/2 in) material and 3 m^3 (4 yd^3) bucket.
.90 × 3 m^3 = 2.75 Loose m^3 delivered per cycle.
.90 × 4 yd^3 = 3.6 Loose yd^3 delivered per cycle.

NOTE: Check the static tipping load on the specific machine to determine if bucket load is in fact a safe operating load.

Bucket Selection

$$\textit{Tons Required/Cycle} = \frac{\textit{Tons Required/Hour}}{\textit{CyclesHour}}$$

$$\textit{Kg (Pounds) Required/Cycle} = \textit{Tons Required/Cycle} \times \textit{907 kg (2000 lb)}$$

$$\textit{Volume Required/Cycle} = \frac{\textit{kg (Pounds) Cycle}}{\textit{Material Weight kg/m}^3\textit{ (lb/yd}^3\textit{)}}$$

Always select a machine with a greater capacity than the calculated required operating capacity. For most applications, payload above recommended and excessive counterweight can hinder machine performance and reduce dynamic stability and machine life.

For optimum performance in fast cycling situations such as truck loading, operating loads should not exceed the recommended capacity. To provide extra stability, calcium chloride ($CaCl_2$) ballast may be desired when operating at recommended operating load, see SAE Loader rating pages in this section. For specific stability data and optional tire sizes, see the "Performance Data" pages in this section.

When selecting special application buckets, such as multi-purpose and side dump the additional bucket weight must be deducted from recommended capacity.

Specific circumstances may involve other conditions which would also affect loader capacity. Because of the greatly varied applications and conditions, your Caterpillar dealer should be contacted for guidance.

Example problem:

JOB CONDITIONS

Application	Truck loading
Production Required	450 metric ton (496 Tons) per hour
Material	9 mm (3/8") gravel in 6 m (20 ft) high stockpile
Density	1660 kg/m^3 (2800 lb/yd^3)

Trucks are 6-9 m^3 (8-12 yd^3) capacity and are owned by three contractors. Loading is constant. Hard level surface for loader maneuvering.

1. *PRODUCTION REQUIRED:* Given

2. *CYCLE TIME:* Assume loader size between 914G and 962H for initial choice of basic cycle.
(Refer to Cycle Time Factors in this section)

Independent trucks	.04 min
Basic Cycle	.50 min
Material	–.02 min
Independent trucks	+.04 min
Constant operation	–.02 min
Total Cycle	.50 min

NOTE: Load and carry times not required in total cycle.

$$\text{Cycles/hr at 83\% efficiency} = 120 \text{ cycles/hr} \times \frac{\text{50 min actual work time}}{\text{60 min per hr}}$$

$$= 100 \text{ cycles/hr}$$

3. *VOLUME REQUIRED PER CYCLE*
(Density in tons)
Density in this example was given. When not given, refer to Tables Section to obtain an estimated density for the material being handled.

$$\textit{Metric:}\ \frac{1660 \text{ kg/m}^3}{1000 \text{ kg/ton}} = 1.66 \text{ ton/m}^3$$

$$\textit{English:}\ \frac{2800 \text{ lb/yd}^3}{2000 \text{ lb/ton}} = 1.4 \text{ tons/yd}^3$$

12

SWELL — VOIDS — LOAD FACTORS

SWELL (%)	VOIDS (%)	LOAD FACTOR
5	4.8	.952
10	9.1	.909
15	13.0	.870
20	16.7	.833
25	20.0	.800
30	23.1	.769
35	25.9	.741
40	28.6	.714
45	31.0	.690
50	33.3	.667
55	35.5	.645
60	37.5	.625
65	39.4	.606
70	41.2	.588
75	42.9	.571
80	44.4	.556
85	45.9	.541
90	47.4	.526
95	48.7	.513
100	50.0	.500

BUCKET FILL FACTORS

Loose Material	Fill Factor
Mixed Moist Aggregates	95-100%
Uniform Aggregates up to 3 mm (1/8")	95-100
3 mm-9 mm (1/8"-3/8")	90-95
12 mm-20 mm (1/2"-3/4")	85-90
24 mm (1") and over	85-90
Blasted Rock	
Well Blasted	80-95%
Average Blasted	75-90
Poorly Blasted	60-75
Other	
Rock Dirt Mixtures	100-120%
Moist Loam	100-110
Soil, Boulders, Roots	80-100
Cemented Materials	85-95

NOTE: Loader bucket fill factors are affected by bucket penetration, breakout force, rackback angle, bucket profile and ground engaging tools such as bucket teeth or bolt-on replaceable cutting edges.

NOTE: For bucket fill factors for hydraulic excavators, see bucket payloads in the hydraulic excavator section.

TYPICAL ROLLING RESISTANCE FACTORS

Various tire sizes and inflation pressures will greatly reduce or increase the rolling resistance. The values in this table are approximate, particularly for the track and track + tire machines. These values can be used for estimating purposes when specific performance information on particular equipment and given soil conditions is not available. See Mining and Earthmoving Section for more detail.

UNDERFOOTING	ROLLING RESISTANCE, PERCENT*			
	Tires		Track	Track
	Bias	Radial	**	+Tires
A very hard, smooth roadway, concrete, cold asphalt or dirt surface, no penetration or flexing	1.5%*	1.2%	0%	1.0%
A hard, smooth, stabilized surfaced roadway without penetration under load, watered, maintained	2.0%	1.7%	0%	1.2%
A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under load or undulating, maintained fairly regularly, watered	3.0%	2.5%	0%	1.8%
A dirt roadway, rutted or flexing under load, little maintenance, no water, 25 mm (1") tire penetration or flexing	4.0%	4.0%	0%	2.4%
A dirt roadway, rutted or flexing under load, little maintenance, no water, 50 mm (2") tire penetration or flexing	5.0%	5.0%	0%	3.0%
Rutted dirt roadway, soft under travel, no maintenance, no stabilization, 100 mm (4") tire penetration or flexing	8.0%	8.0%	0%	4.8%
Loose sand or gravel	10.0%	10.0%	2%	7.0%
Rutted dirt roadway, soft under travel, no maintenance, no stabilization, 200 mm (8") tire penetration and flexing	14.0%	14.0%	5%	10.0%
Very soft, muddy, rutted roadway, 300 mm (12") tire penetration, no flexing	20.0%	20.0%	8%	15.0%

*Percent of combined machine weight.

**Assumes drag load has been subtracted to give Drawbar Pull for good to moderate conditions. Some resistance added for very soft conditions.

ANGLE OF REPOSE OF VARIOUS MATERIALS

MATERIAL	ANGLE BETWEEN HORIZONTAL AND SLOPE OF HEAPED PILE	
	Ratio	Degrees
Coal, industrial	1.4:1—1.3:1	35-38
Common earth, Dry	2.8:1—1.0:1	20-45
Moist	2.1:1—1.0:1	25-45
Wet	2.1:1—1.7:1	25-30
Gravel, Round to angular	1.7:1—0.9:1	30-50
Sand & clay	2.8:1—1.4:1	20-35
Sand, Dry	2.8:1—1.7:1	20-30
Moist	1.8:1—1.0:1	30-45
Wet	2.8:1—1.0:1	20-45

ALTITUDE DERATION

PERCENT FLYWHEEL HORSEPOWER AVAILABLE AT SPECIFIED ALTITUDES

MODEL	0-760 m (0-2500')	760-1500 m (2500-5000')	1500-2300 m (5000-7500')	2300-3000 m (7500-10,000')	3000-3800 m (10,000-12,500')	3800-4600 m (12,500-15,000')
D3K XL	100	100	100	100	88	85
D3K LGP	100	100	100	100	88	85
D4K XL	100	100	100	100	88	85
D4K LGP	100	100	100	100	88	85
D5K XL	100	100	100	100	88	85
D5K LGP	100	100	100	100	88	85
D5N XL & LGP	100	100	100	100	100	100
D6K XL & LGP	100	100	100	100	N/A	N/A
D6N XL & LGP	100	100	100	100	N/A	N/A
D6N XL & LGP**	100	100	100	100	100	100
D6G	100	100	100	100	94	87
D6R Series III (All)	100	100	100	100	92	84
D7G	100*	100*	100*	94	86	80
D7R Series II (All)	100	100	100	100	100	96
D8R	100	100	100	93	85	77
D8T	100	100	100	100	100	93
D9R	100	100	100	93	85	77
D9T	100	100	100	100	100	93
D10T	100	100	100	100	97	89
D11R/D11R CD	100	100	100	93	85	77
120H STD	100	100	100	100	100	100
120M	100	100	100	100	95	88
135H STD	100	100	100	100	100	98
12H STD	100	89	83	77	71	65
12M	100	100	100	100	95	88
140H STD	100	100	100	100	97	89
140M	100	100	100	100	**	**
160H STD	100	100	100	97	89	82
160M	100	100	100	100	**	**
14M	100	100	100	100	100	**
16M	100	100	100	100	100	100
24M	100	100	100	100	**	**

*Refer to "Captive Vehicle Engine Fuel Specifications" microfiche at your local dealer.
**Information not available at time of printing.

CATERPILLAR® PERFORMANCE HANDBOOK

a CAT® publication by Caterpillar Inc., Peoria, Illinois, U.S.A.

OCTOBER 2004

Performance information in this booklet is intended for estimating purposes only. Because of the many variables peculiar to individual jobs (including material characteristics, operator efficiency, underfoot conditions, altitude, etc.), neither Caterpillar Inc. nor its dealers warrant that the machines described will perform as estimated.

Materials and specifications are subject to change without notice.

Printed in U.S.A.

SEBD0345

Working Weights Bucket & Payload

Model	Boom		Stick Length		Working Weights Buckets & Payload	
5110B ME	7.6 m	**24'11"**	3.4 m	**11'1"**	21 940 kg	**48,350 lb**
			4.1 m	**13'5"**	19 920 kg	**43,900 lb**
5110B L	9.2 m	**30'2"**	3.6 m	**11'10"**	17 995 kg	**39,660 lb**
			4.5 m	**14'9"**	16 030 kg	**35,320 lb**
			5.5 m	**18'1"**	13 710 kg	**30,220 lb**
5130B ME	8.0 m	**26'3"**	3.8 m	**12'6"**	30 540 kg	**67,310 lb**
			5.2 m	**17'1"**	25 850 kg	**56,970 lb**
5230B ME	9.5 m	**31'2"**	4.5 m	**14'9"**	51 000 kg	**112,450 lb**

Bucket Selection — ME

Model	Bucket Type	Bucket Bite Width		Bucket Tip Radius		Heaped Capacity		Bucket Weight With Teeth	
		mm	in	mm	in	m^3	yd^3	kg	lb
5110B ME	Rock	2682	**105.0"**	2812	**110.0"**	7.6	**9.9**	7450	**16,420**
	Rock	2356	**93.0"**	2797	**110.0"**	6.2	**8.1**	6680	**14,730**
	Coal	3128	**123.0"**	2803	**110.0"**	10.4	**13.6**	7010	**15,450**
5110B L	Rock	2356	**93.0"**	2474	**98.0"**	4.6	**6.0**	5730	**12,630**
	Medium Duty	2540	**100.0"**	2550	**100.0"**	6.0	**7.8**	5280	**11,640**
	Medium Duty	2210	**87.0"**	2550	**100.0"**	5.0	**6.5**	4750	**10,470**
	Medium Duty	1905	**75.0"**	2550	**100.0"**	4.2	**5.5**	4350	**9590**
5130B ME	High Density	2840	**111.8"**	3065	**120.0"**	8.6	**11.2**	9750	**21,500**
	Rock	2840	**111.8"**	3053	**120.0"**	10.6	**13.9**	10 630	**23,440**
	Excavation	3290	**129.4"**	3074	**121.0"**	10.2	**13.3**	8740	**19,260**
	Coal	3500	**138.0"**	3244	**127.0"**	13.8	**18.0**	8920	**19,670**
	Coal	3680	**145.0"**	3225	**127.0"**	18.6	**24.0**	9360	**20,630**
5230B ME	Rock	3940	**156.0"**	3350	**132.0"**	16.0	**20.9**	17 085	**37,665**
	Light Material	3940	**156.0"**	3250	**128.0"**	18.0	**23.5**	18 810	**41,465**
	Coal	4350	**171.0"**	3664	**144.0"**	27.6	**36.1**	16 700	**36,815**

ESTIMATING FRONT SHOVEL CYCLE TIME

The loading cycle of the front shovel is composed of four segments:

1. Load bucket
2. Swing loaded
3. Dump bucket
4. Swing empty

Total shovel cycle time is dependent on machine size and job conditions. As conditions become more severe (tougher loading, more obstacles, etc.), the shovel slows down accordingly.

The following table breaks down what experience has shown to be typical Caterpillar Front Shovel cycle times with above average job conditions and an operator of average ability.

These times would decrease as job conditions or operator ability improved and would become slower as conditions become less favorable. For example:

Tough material . . . . . .Longer bucket fill and dump time.
Greater swing angle . . . . . .Longer swing times.
Operator ability . . . . . .Affects total cycle time.
Loading from the top down . . . . . .May improve swing time.

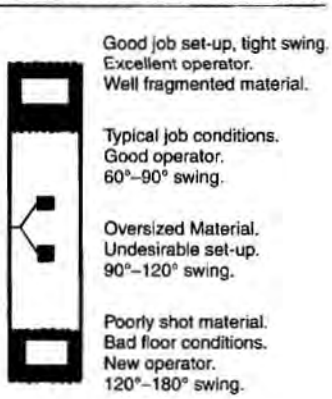
Cycle Time Estimating

MODEL		5110B ME	5130B ME	5230B ME
Bucket Size	(m^3) (yd^3)	7.6 **9.9**	10.6 **13.9**	16.0 **20.9**
Soil Type		←	Hard Clay	→
Digging Depth	(m) (ft)	—	4.0 **13**	5.0 **16**
Load Bucket	(min)	0.11	0.12	0.12
Swing Loaded	(min)	0.10	0.13	0.14
Dump Bucket	(min)	0.04	0.04	0.04
Swing Empty	(min)	0.10	0.13	0.14
Total Cycle Time	(min)	0.35	0.42	0.44

MODEL		5090B FS	5130B FS	5230B FS
Bucket Size	(m^3) (yd^3)	5.2 **6.8**	11.0 **14.4**	17.0 **22.2**
Soil Type		←	Shot Rock	→
Swing Angle		←	90°	→
Load Area		←	No Obstructions	→
Operator Ability		←	Average	→
Load Bucket	(min)	0.18	0.18	0.20
Swing Loaded	(min)	0.08	0.13	0.14
Dump Bucket	(min)	0.05	0.04	0.05
Swing Empty	(min)	0.10	0.10	0.10
Total Cycle Time	(min)	0.41	0.45	0.49

CYCLE TIME ESTIMATING CHART				
CYCLE TIME (Min)	MACHINE AND BUCKET			CYCLE TIME (Sec)
	5090B FS	5130B FS	5230B FS	
				10
0.25				15
0.30				20
0.35				
0.40				25
0.45				
0.50				30
0.60				35
				40
0.75				45
				50
				55
1.00				60

CYCLE TIME vs JOB CONDITION DESCRIPTION



BOTTOM DUMP BUCKET FILL FACTORS

Material	Fill Factor*
Bank Clay; Earth	100%-105%
Rock-Earth Mixture	100%-105%
Rock — Poorly Blasted	85%-95%
Rock — Well Blasted	95%-105%
Shale, Sandstone — Standing Bank	85%-100%

*Percent of heaped bucket capacity.

CYCLE TIME ESTIMATING CHART				
CYCLE TIME (Min)	MACHINE SIZE CLASS			CYCLE TIME (Sec)
	5110B ME	5130B ME	5230B ME	
0.17				10
0.25				15
0.33				20
0.42				25
0.50				30
0.58				35
0.67				40
0.75				45
0.83				50
0.92				55
1.00				60

Appendix B-7
Third Party On-site Rip-Rap Production

M3 Engineering & Technology Corp.

To: Chuck Johnson

Cc: Tom Shelley, Daniel Roth

From: Frank Van de Wille

Date: September 21, 2007

Subject: August Production – McCain Springs Quarry

M3 Engineering & Technologies is hereby transmitting the August 2007 production numbers for the McCain Springs Quarry.

The plant was approved for production on August 14th, 2007. T.G. McCauley operated the plant 7 days per week during this period. The plant was shutdown due to a belt on August 19th.

A total of 17,497 CY was pushed through the plant during this period. Output of the plant was as follows:

Size/Product	Quantity (CY)	Percent of Throughput
1" minus	7,305	42%
1"-3"	2,781	16%
3"-6"	2,753	16%
6"-12"	2,358	14%
+12"	1,745	10%

Cost per Cubic Yard of rock produced excluding drill & blast was $14.32/CY. Estimated drill & blast cost are $1.00/CY.

If you have any comments or questions, please feel free to contact me.

Encl. August Riprap Costs
Drill & Blast Cost

Frank Van de Wille
M3 Engineering
602-909-2205
fvandewille@cox.net

M3 Engineering & Technology

PROJECT NO. _____

PROJECT _____

SHEET NO. _____ OF _____ BY _____

DRAWING NO. _____

SUBJECT: August Riprap Cost DATE: 9/2017

TOTAL PLANT THROUGHPUT: 17,497 CY (Aug. 15-Aug 31)

TOTAL PRODUCTION:

1" minus	7305	+2 %
1"-3"	3781	16 %
3"-6"	2,753	16 %
6"-12"	2,358	14 %
+12"	1745	10%

TOTAL COST FOR MONTH: 137,981$

TOTAL ROCK (RIPRAP) PRODUCED: 9,637 CY

COST FOR CY: $\frac{137,981\$}{9,637\ CY} = 14.32\ \$/CY$

COST EXCLUDE DRILL & BLAST

PROJECT NO. _____

M3 Engineering & Technology

PROJECT _____
SHEET NO. _____ OF _____ BY _____
DRAWING NO. _____

SUBJECT: DRILL BLAST COST DATE: 9/5/7.

46,222 CY/BLAST (BASED ON 13X15 SPACING W/ 50' DEPTH)

BLAST COST : 15,127 17 ON 7/10/7.

DRILL COST : 177 hr @ 178 $/hr = 31,506.

TOTAL COST: 46,633 17 $

DRILL BLAST COST ≅ 1$/CY.

U.S. Bureau of Labor Statistics

Databases, Tables & Calculators by Subject

CPI Inflation Calculator

Inflation Calculator

$ 15.32

in 2007

has the same buying power as

$15.98

in 2009

Calculate

About this calculator

About the CPI Inflation Calculator

The CPI inflation calculator uses the average Consumer Price Index for a given calendar year. This data represents changes in prices of all goods and services purchased for consumption by urban households. This index value has been calculated every year since 1913. For the current year, the latest monthly index value is used.

U.S. Bureau of Labor Statistics 2 Massachusetts Avenue, NE Washington, DC 20212-0001

www.bls.gov | Telephone: (202) 691-5200 | Do you have a Data question?

Appendix B-8
Spillway, Channel, and Bench
Linear Foot Cost

Spillways

Task Description	Equipment	Productivity (cy/hr)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.
Excavate	D11R	1,973	1.2	1.80	3,300	1.20	175	1747	0.75	50	1.00	1.00	1.00
Waste	D11R	805	1.2	1.00	3,300	1.00	200	1540	0.75	50	1.00	1.00	1.00
Finish Grade	D6R	165	1.2	1.80	3,300	1.00	175	175	0.75	50	1.00	1.00	1.00

Spillway Volume:				Dozer Cost		Spillway Cost	
	Excavate	7.3	CY/LF				
	Waste	7.3	CY/LF				
	Finish	2.9	CY/LF				
	Excavate	0.0037005	HRS/LF	447.48	$/HR	1.66	$/LF
	Waste	0.009066	HRS/LF	447.48	$/HR	4.06	$/LF
	Finish Grade	0.01743	HRS/LF	104.1	$/HR	1.81	$/LF
						7.53	**$/LF**

Volumes based on cross-section area for excavation and waste
Volume assumes unit volume/linear foot of spillway perimeter (39 Feet * 1 Foot/27)

Outslope Bench Grading Unit Cost Development

Task Description	Equipment	Productivity (cy/hr)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.
Excavate	D11R	1552.6	1.2	1.7	3300.0	1.0	175.0	1747	0.75	50.0	1.0	1.0	1.0

		Productivity (lf/hr)	Time (hrs/lf)	# passes	Material	Grade	Task Weight (lb/cy)	Blade	Width (feet)	Soil Speed (miles/hr)	Method/ Operator	Blade Hour (min/hr)	Visibility	Elevation
Finish Grade	D9R	920.0	0.0011	3	1.2	1.0	3300.0	1.0	15.25	1.0	0.75	50.0	1.0	1.0

Notes:
1. Bench width: Stockpiles 15 ft

Bench Volume (excavate):	4.22 cy/lf	Dozer Cost ($/hr)	Bench Cost ($/lf)
Excavate	0.0027 hrs/lf	447.48	1.22
Finish Grade	0.0011 hrs/lf	$209.96	0.23
Excavate + Finish Grade			**1.44**
Finish Grade Only			**0.23**

Terrace Channels

Task Description	Equipment	Productivity (cy/hr)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.
Excavate	D11R	1,754	1.2	1.60	3,300	1.20	175	1747	0.75	50	1.00	1.00	1.00
Waste	D11R	805	1.2	1.00	3,300	1.00	200	1540	0.75	50	1.00	1.00	1.00
Finish Grade	D6R	146	1.2	1.60	3,300	1.00	175	175	0.75	50	1.00	1.00	1.00

Volume: Excavate 1.0 CY/LF
Waste 1.0 CY/LF
Finish 1.0 CY/LF

			Dozer Cost		Outslope Channel Cost	
Excavate	0.0005931	HRS/LF	447.48	$/HR	0.27	$/LF
Waste	0.0012916	HRS/LF	447.48	$/HR	0.58	$/LF
Finish Grade	0.0071056	HRS/LF	104.1	$/HR	0.74	$/LF
					1.58	**$/LF**

Volumes based on cross-section area for excavation and waste
Volume assumes unit volume/linear foot of perimeter (39 Feet * 1 Foot/27)
Finish grading based on 1mph at 3 passes

Channels

Task Description	Equipment	Productivity (cy/hr)	Material	Grade	Soil Weight (lb/cy)	Production Method/ Blade	Maximum Push Distance (feet)	Normal Production (cy/hr)	Operator	Work Hour (min/hr)	Visibility	Elevation	Direct Drive Trans.
Excavate	D11R	1,096	1.2	1.00	3,300	1.20	175	1747	0.75	50	1.00	1.00	1.00
Waste	D11R	805	1.2	1.00	3,300	1.00	200	1540	0.75	50	1.00	1.00	1.00
Finish Grade	D6R	91	1.2	1.00	3,300	1.00	175	175	0.75	50	1.00	1.00	1.00

Volume: Excavate 5.5 CY/LF
Waste 5.5 CY/LF
Finish 2.9 CY/LF

			Dozer Cost		Top Channel Cost	
Excavate	0.0050368	HRS/LF	447.48	$/HR	2.25	$/LF
Waste	0.0068554	HRS/LF	447.48	$/HR	3.07	$/LF
Finish Grade	0.0313739	HRS/LF	104.1	$/HR	3.27	$/LF
					8.59	**$/LF**

Volumes based on cross-section area for excavation and waste
Volume assumes unit volume/linear foot of perimeter (39 Feet * 1 Foot/27)
Finish grading based on 1mph at 3 passes

Appendix B-9
Pit Dewatering Wells
Unit Cost

3 Production Wells Drilled with air rotary/foam; super jaw

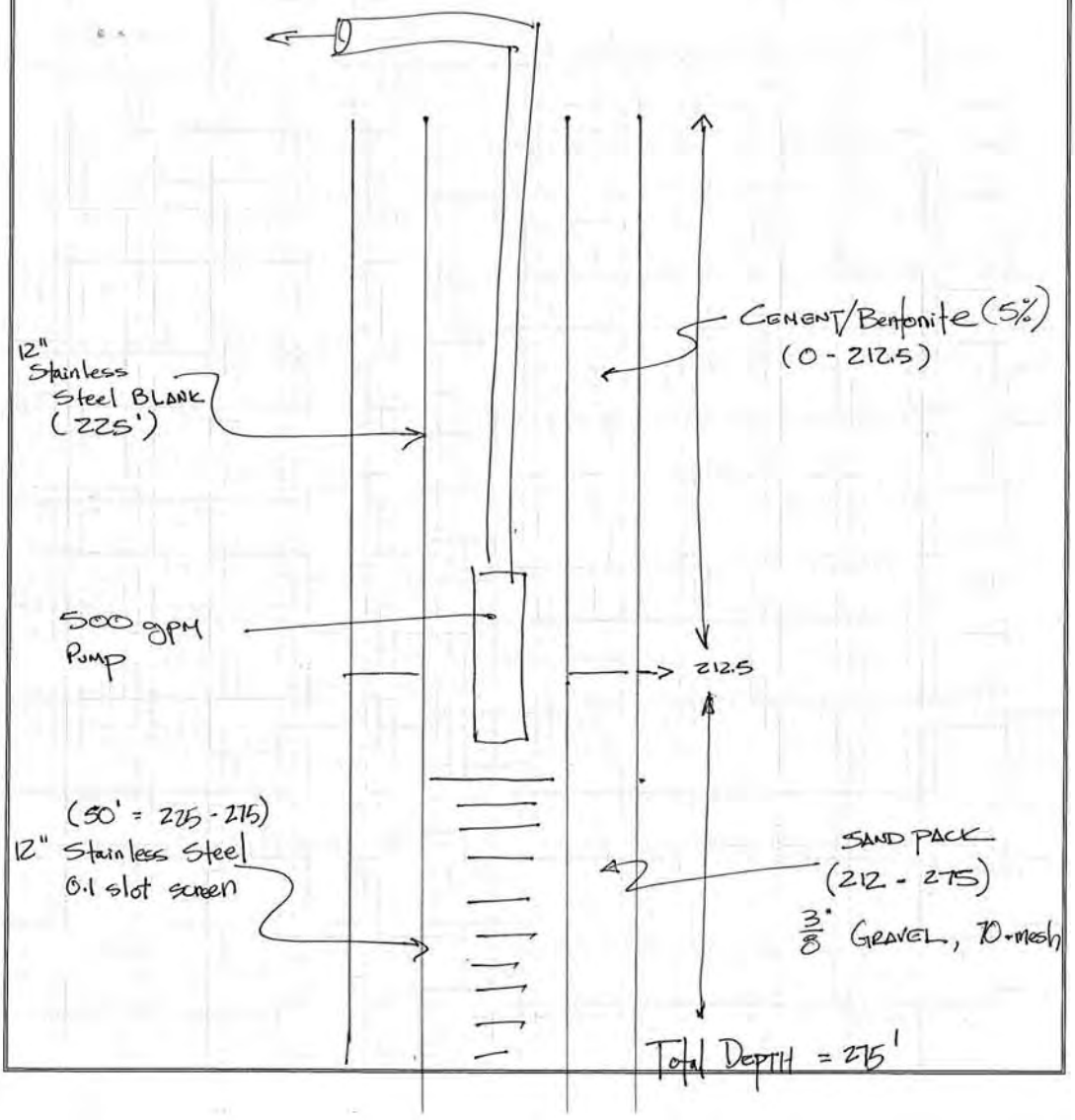
Item	Unit	Unit Cost		Total	
Mobe/Demobe	1	$40,000	$	40,000	
Drilling 24" with casing advance	825	$1,515	$	1,249,875	(per foot)
Drilling 24" open hole	825	$0	$	-	per foot
Construction of Wells	825	$1,070	$	882,750	per foot
Pump- 500gpm at 250 nph; Includes associated install, wiring, etc.	3	$12,500	$	37,500	
Well-head completion	3	$4,500	$	13,500	each
Well development	72	$385	$	27,720	24 hours/well
Pumping Test Support	72	$250	$	18,000	10 hours well
Non-drill time	30	$625	$	18,750	
			$	**2,288,095**	**3-Production well total**
			$	326,870.71	unit cost

TELESTO
SOLUTIONS • INCORPORATED

Job No.: _____ Client: _____ Page ___ of ___

Task: _____ Computed By: _____ Date: _____

_____ Checked By: _____ Date: _____



APPENDIX C
ENGINEERING TAKE-OFFS
By MWH

TYRONE MINE STOCKPILE CONCEPTUAL RECLAMATION PLAN
Quantities

COMPLETE BACKFILL

Area		Task	Length (ft)	Volume (cy)	Area (ac)	Dozer Work		Haul Leg 1	
						Distance (ft)	Slope (%)	Distance (ft)	Grade (%)
Main Pit		Truck/Shovel		427,100,000				4,000	(10)
		Dozer Rough Grade							
		Truck/Shovel Bench Regrade		-					
		Terrace Bench Construction							
		Cover Placement (Haul)		3,915,600	809			6,000	2
		Cover Placement (Placement)		3,915,600	809	100	1		
		Terrace Channel Construction							
		Terrace Gravel Placement		-					
		Down Drain Construction							
		Down Drain Riprap Placement		-					
		Down Drain Bedding Layer		-					
		Drainage Construction	7,000						
		Drainage Riprap Placement		10,400					
		Drainage Bedding Layer		5,300					
		Revegetation			809				
		Backfill Depth	950						
Savanna		Truck/Shovel		57,700,000				2,600	(10)
		Dozer Rough Grade							
		Truck/Shovel Bench Regrade		-					
		Terrace Bench Construction							
		Cover Placement (Haul)		808,300	167			4,000	2
		Cover Placement (Placement)		808,300	167	100	1		
		Terrace Channel Construction							
		Terrace Gravel Placement		-					
		Down Drain Construction							
		Down Drain Riprap Placement		-					
		Down Drain Bedding Layer		-					
		Drainage Construction	6,000						
		Drainage Riprap Placement		8,900					
		Drainage Bedding Layer		4,500					
		Revegetation			167				
		Backfill Depth	570						
Gettysburg		Truck/Shovel		76,400,000				3,000	(10)
		Dozer Rough Grade							
		Truck/Shovel Bench Regrade		-					
		Terrace Bench Construction							
		Cover Placement (Haul)		1,118,000	231			6,000	2
		Cover Placement (Placement)		1,118,000	231	100	1		
		Terrace Channel Construction							
		Terrace Gravel Placement		-					
		Down Drain Construction							
		Down Drain Riprap Placement		-					
		Down Drain Bedding Layer		-					
		Drainage Construction	5,000						
		Drainage Riprap Placement		7,400					
		Drainage Bedding Layer		3,800					
		Revegetation			231				
		Backfill Depth	570						
Copper Mtn		Truck/Shovel		48,400,000				3,000	(10)
		Dozer Rough Grade							
		Truck/Shovel Bench Regrade		-					
		Terrace Bench Construction							
		Cover Placement (Haul)		793,800	164			12,000	2
		Cover Placement (Placement)		793,800	164	100	1		
		Terrace Channel Construction							
		Terrace Gravel Placement		-					
		Down Drain Construction							
		Down Drain Riprap Placement		-					
		Down Drain Bedding Layer		-					
		Drainage Construction	4,500						
		Drainage Riprap Placement		6,700					
		Drainage Bedding Layer		3,400					
		Revegetation			164				
		Backfill Depth	375						

TYRONE MINE STOCKPILE CONCEPTUAL RECLAMATION PLAN
Quantities

PARTIAL BACKFILL

Area		Task	Length (ft)	Volume (cy)	Area (ac)	Dozer Work		Haul Leg 1	
						Distance (ft)	Slope (%)	Distance (ft)	Grade (%)
Main Pit		Truck/Shovel		213,300,000				5,000	(10)
		Dozer Rough Grade							
		Truck/Shovel Bench Regrade		-					
		Terrace Bench Construction							
		Cover Placement (Haul)		3,915,600	809			6,000	2
		Cover Placement (Placement)		3,915,600	809	100	1		
		Terrace Channel Construction	187,000						
		Terrace Gravel Placement		74,800					
		Down Drain Construction	6,800						
		Down Drain Riprap Placement		27,800					
		Down Drain Bedding Layer		4,800					
		Drainage Construction	3,200						
		Drainage Riprap Placement		4,700					
		Drainage Bedding Layer		2,400					
		Revegetation			809				
		Pipe/head	2600 / 360						
Savanna		Truck/Shovel		23,900,000				3,000	(10)
		Dozer Rough Grade							
		Truck/Shovel Bench Regrade		-					
		Terrace Bench Construction							
		Cover Placement (Haul)		808,300	167			4,000	2
		Cover Placement (Placement)		808,300	167	100	1		
		Terrace Channel Construction	48,000						
		Terrace Gravel Placement		19,200					
		Down Drain Construction	3,900						
		Down Drain Riprap Placement		16,000					
		Down Drain Bedding Layer		2,700					
		Drainage Construction							
		Drainage Riprap Placement		-					
		Drainage Bedding Layer		-					
		Revegetation			167				
		Pipe/head	3100 / 400						
Gettysburg		Truck/Shovel		22,500,000				4,000	(10)
		Dozer Rough Grade							
		Truck/Shovel Bench Regrade		-					
		Terrace Bench Construction							
		Cover Placement (Haul)		1,118,000	231			6,000	2
		Cover Placement (Placement)		1,118,000	231	100	1		
		Terrace Channel Construction	59,000						
		Terrace Gravel Placement		23,600					
		Down Drain Construction	3,500						
		Down Drain Riprap Placement		14,300					
		Down Drain Bedding Layer		2,500					
		Drainage Construction	-						
		Drainage Riprap Placement		-					
		Drainage Bedding Layer		-					
		Revegetation			231				
		Pipe/head	1900 / 490						
Copper Mtn		Truck/Shovel		18,900,000				3,500	(10)
		Dozer Rough Grade							
		Truck/Shovel Bench Regrade		-					
		Terrace Bench Construction							
		Cover Placement (Haul)		793,800	164			12,000	2
		Cover Placement (Placement)		793,800	164	100	1		
		Terrace Channel Construction	30,000						
		Terrace Gravel Placement		12,000					
		Down Drain Construction	1,300						
		Down Drain Riprap Placement		5,300					
		Down Drain Bedding Layer		900					
		Drainage Construction	5,000						
		Drainage Riprap Placement		7,400					
		Drainage Bedding Layer		3,800					
		Revegetation			164				
		Pipe/head	900 / 45						

APPENDIX D
COST ESTIMATE (ELECTRONIC)