3.2. SURFACE MINING--OPERATING COSTS

3.2.1. PRODUCTION DEVELOPMENT

3.2.1.1. CLEARING

The curve for clearing production is based on costs for medium light growth on terrain with a side slope of 20% to 50%. Estimate one tree, 0.33 m in diameter, per 40 m^2. The rate of clearing is determined by the surface mine production rate.

Total daily operating cost is the sum of three separate cost curves (labor, supplies, and equipment operation) having a clearing rate of (X), in hectares per day. The curves are valid for operations between 0.1 and 10 ha/d, operating one shift per day. The curves include all daily operating and maintenance costs associated with clearing a land surface for further development.

BASE CURVE

(L) Labor Operating Cost $(Y_L) = 1{,}552.120(X)^{0.819}$
The operating labor costs are distributed as follows:

Direct labor...............	84%
Maintenance labor..........	16%

The direct labor costs consist of the following typical range of personnel:

		Av salary per hour (base rate)
Dozer operator.............	21%	$16.33
Truck driver...............	6%	15.89
General laborer............	73%	13.66

The average wage for labor is $14.28 per worker-hour (including burden and average shift differential).

(S) Supply Operating Cost $(Y_S) = 245.963(X)^{0.953}$
The supply cost consists of 78% fuel oil and 22% tools, cables, and chokers for clearing operations of 0.1 to 5 ha/d. For clearing operations of 5 to 10 ha/d, the supply cost consists of 83% fuel oil (for burning trees and scrub) and 17% tools, cables, and chokers.

(E) Equipment Operating Cost $(Y_E) = 549.565(X)^{0.890}$
The equipment operating cost consists of

	Repair parts	Fuel and lube	Tires
Crawler dozers..........	51%	49%	-
Trucks, pickups, and chainsaws..........	14%	80%	6%

Equipment operating costs are based on a spread of 87% for crawler dozers and 13% for trucks, pickups, and chainsaws.

ADJUSTMENT FACTORS

Brush Factor For light clearing conditions where the growth consists mainly of brush and small trees, multiply the curves by the following factor:

Brush factor $(Y_{B\ LIGHT}) = 0.25$

For heavy clearing conditions, defined as when clearing a dense growth of trees (diameter of the trees commonly exceeding 0.33 m), multiply the curves by the following factor:

Brush factor $(Y_{B\ DENSE}) = 1.75$

Side Slope Factor For clearing on terrain level to 20% side slope, multiply the costs obtained from the curves by the following factor:

Side slope factor $(F_{S\ 0\%-20\%}) = 0.8$

For clearing on terrain with side slopes from 50% to 100%, multiply the costs obtained from the curves by the following factor:

Side slope factor $(F_{S\ 50\%-100\%}) = 1.2$

On rocky slopes and slopes over 100%, multiply the costs obtained from the curves by the following factor:

Side slope factor $(F_{S\ +100\%}) = 2.5$

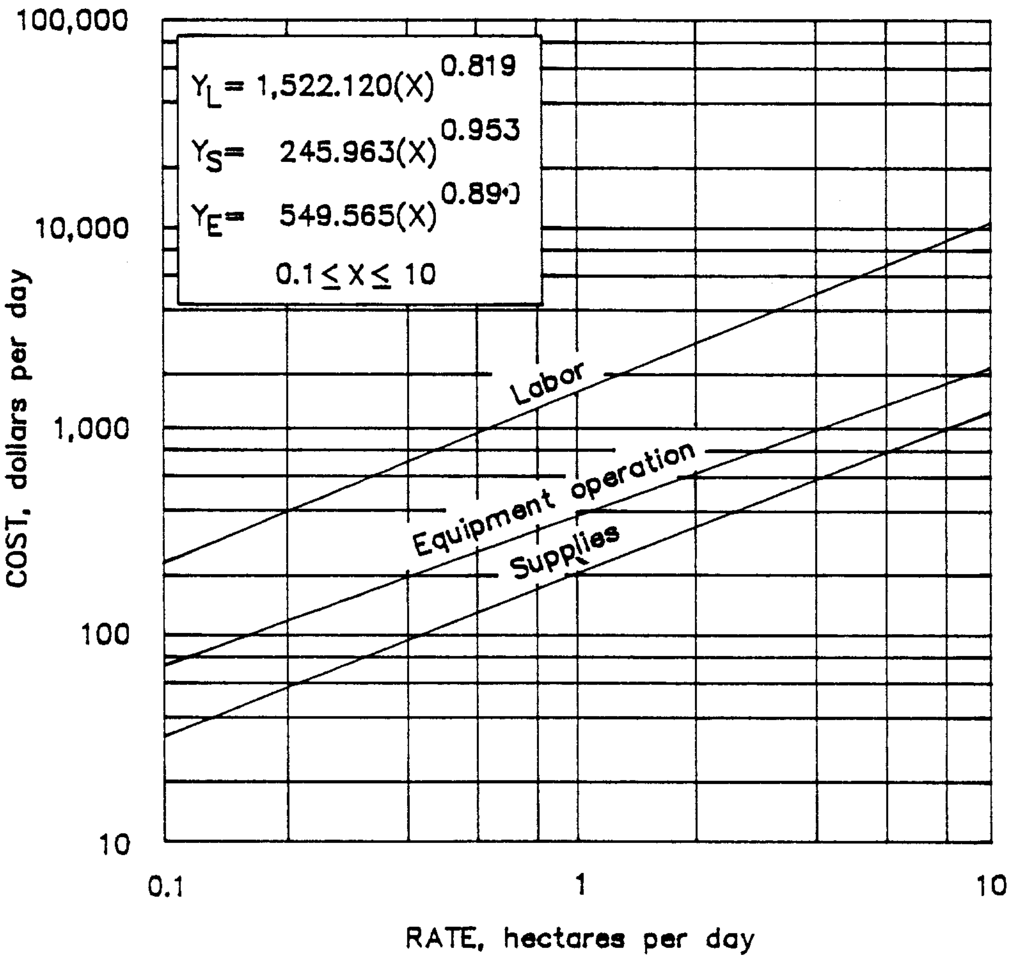
Burning Factor When the burning of cleared brush and trees is prohibited because of environmental regulations, the brush and trees will have to be stacked or buried. If burning is prohibited, multiply the costs obtained from the curves by the following factors:

Labor factor $(F_L) = 1.2$

Supply factor $(F_S) = 0.2$

Equipment operation factor $(F_E) = 1.2$

Surface Mining—Operating Costs



3.2.1.1. Clearing

3.2. SURFACE MINING--OPERATING COSTS

3.2.1. PRODUCTION DEVELOPMENT

3.2.1.2. CORE DRILLING

Core drilling varies from nonexistent to extensive depending on many unknown factors. Core drilling is performed on centers varying from 30 to 245 m and to varying depths. The following tabulation gives the average range of cost for core diameter and depth of hole for drilling medium hard rocks. Costs could be higher or lower depending on hardness, location, access, and weather conditions.

Drilling cost, dollars per meter

Core		Drilling depth range, m			
Size	Diam, cm	0-150	150-300	300-450	450-600
PQ.......	8.49	$100-$115	$125-$138	NAp	NAp
NC.......	6.10	62- 79	69- 85	$90	$100
NX.......	5.40	59- 71	62- 75	80	90
BX.......	4.13	49- 64	52- 69	75	85
AX.......	2.86	43- 57	49- 62	70	80
EX.......	2.22	36- 52	43- 59	NAp	NAp

NAp Not applicable.

ADJUSTMENT FACTORS

Subcontractor Factor If drilling is accomplished by a drilling subcontractor, multiply cost by the following factor to compensate for subcontractor's markup.

Subcontractor factor $(F_S) = 1.1$

For additional details, see section 2.1.1. (Exploration).

3.2. SURFACE MINING--OPERATING COSTS

3.2.1. PRODUCTION DEVELOPMENT

3.2.1.3. DRILL AND BLAST OVERBURDEN AND WASTE

The curves have been developed in two parts. The total crawler-type percussion drill cost is the sum of three separate cost curves (labor, supplies, and equipment operation) based on a production rate (X), in metric tons of overburden and waste per day. The curves are valid for operations between 1,000 and 8,000 mt, operating three shifts per day. The curves reflect costs for drilling 6-m-high benches with crawler-type percussion drills. Spacing of 2.5-in (6.35-cm) holes is on a pattern of 1.5 by 2 m to a depth of 7 m. The powder factor is 0.30 kg/mt.

The total daily rotary drill cost is the sum of three separate cost curves (labor, supplies, and equipment operation) based on a production rate (X), in metric tons of overburden and waste per day. The curves are valid for operations between 8,000 and 300,000 mtpd, operating three shifts per day. Drilling is performed with rotary drills having a downpressure of from 13,600 to 56,700 kg. The powder factor varies from 0.11 to 0.20 kg/mt of waste with an average of 0.14 kg/mt of waste. Holes drilled average 12.25-in (31.12-cm) diameter from a range of 6- to 13.75-in (15.24- to 34.93-cm) diameter. Costs are based on drilling hard rocks with an average compressive strength (30,000 psi or 2,100 kg/cm^2). Bench heights are 12 to 18 m averaging 15 m. Drilling patterns and overdrilling varies with a range of 100 to 300 mt of blasted material per linear meter of drill hole. Secondary drilling and blasting varies from 0% to 10% of blasted material.

The curves include all daily operating and maintenance costs associated with drill and blast.

BASE CURVE

(L) <u>Labor Operating Cost (Percussion Drill)</u> $(Y_{L\ PERCUSSION}) = 1.747(X)^{0.909}$

The operating labor costs are distributed as follows:

Direct labor...............	76%
Maintenance labor..........	24%

The direct labor costs consist of the following typical range of personnel:

	Small (100 to 3,000 mtpd)	Large (3,000 to 8,000 mtpd)	Av salary per hour (base rate)
Drilling crew...........	70%	83%	$15.22
Blasting crew...........	30%	17%	14.79

The average wage for labor is $15.84 per worker-hour (including burden and average shift differential).

(L) Labor Operating Cost (Rotary Drill) $(Y_{L\ ROTARY}) = 0.042(X)^{1.035}$
The operating labor costs are distributed as follows:

Direct labor...............	43%
Maintenance labor..........	57%

The direct labor costs consist of the following typical range of personnel:

		Av salary per hour (base rate)
Rotary and secondary drilling crews............	67%	$15.24
Blasting crew..............	33%	15.00

The average wage for labor is $15.45 per worker-hour (including burden and average shift differential).

(S) Supply Operating Cost (Percussion Drill) $(Y_{S\ PERCUSSION}) = 30.278(X)^{0.504}$

The supply costs for percussion drill curve include drill bits and steel-related items and blasting supplies in the following cost proportions:

	Small (100 to 3,000 mtpd)	Large (3,000 to 8,000 mtpd)
Drill bits and steel-related items.......	10%	25%
Blasting supplies..........	90%	75%

(S) Supply Operating Cost (Rotary Drill) $(Y_{S\ ROTARY}) = 0.147(X)^{0.984}$
The supply costs for rotary drill curve include drill bits and steelrelated items and blasting supplies in the following cost proportions:

	Small (8,000 to 100,000 mtpd)	Large (100,000 to 300,000 mtpd)
Drill bits and steel-related items.......	26%	16%
Blasting supplies..........	74%	84%

(E) Equipment Operating Cost (Percussion Drill) $(Y_{E\ PERCUSSION}) = 1.771(X)^{0.818}$

The equipment operating costs for percussion drill and blast are 86% for drilling equipment and 14% for trucks. The equipment operating cost includes power for the drills, fuel and lubrication for trucks and drill compressors, repair parts for drills and supporting equipment, and tire costs for supporting equipment.

The equipment operating cost distribution is

	Repair parts	Fuel and lube	Tires
Drill equipment.........	58%	42%	-
Trucks..................	8%	87%	5%

(E) Equipment Operating Cost (Rotary Drill) $(Y_{E\ ROTARY}) = 0.0294(X)^{1.057}$

The equipment operating costs for rotary drill and blast are 95% for drilling equipment and 5% for supporting equipment. The equipment operating cost includes power for the drills, fuel and lubrication for trucks and drill compressors, repair parts for drills and supporting equipment, and tire costs for supporting equipment.

The equipment operating cost distribution is

	Repair parts	Fuel and lube	Tires	Power
Drill equipment.......	79%	10%	-	11%
Trucks................	11%	80%	9%	-

ADJUSTMENT FACTOR

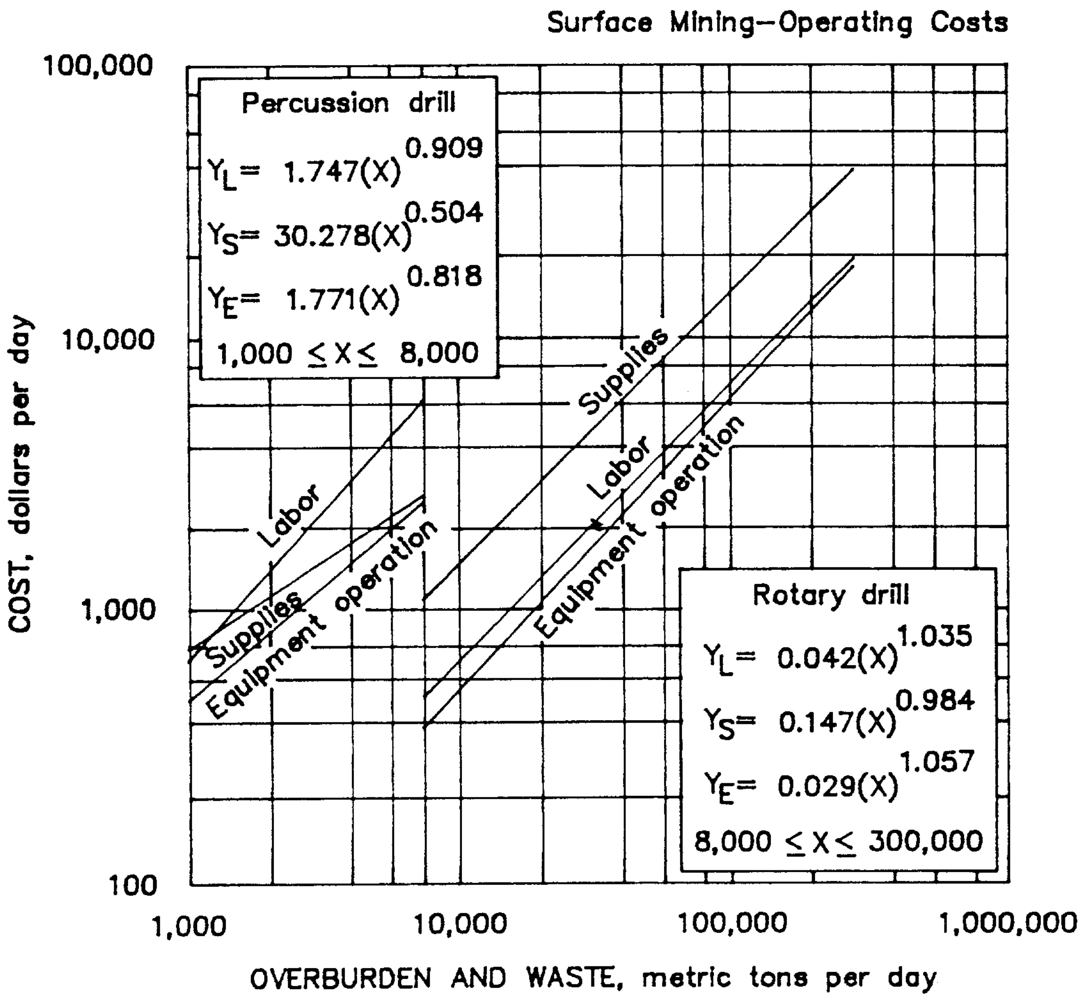
Drill and Blast Factor (D & B Factor) The curves indicate average costs for a wide range of materials as can be noted by drill sizes, bit sizes, powder factors, and drill pattern. To determine drilling and blasting costs, consideration must be given to material hardness, abrasiveness, natural fractures and jointing, and maximum-size fragments that can be loaded, hauled, and processed.

For favorable drilling conditions, multiply the costs obtained from the curves by the following factor:

D & B factor $(F_{D\ GOOD}) = 0.6$

Where the drilling conditions are unfavorable, multiply the costs obtained from the curves by the following factor:

D & B factor $(F_{D\ SEVERE}) = 2.0$



3.2.1.3. Drill and blast
DRILLS

3.2. SURFACE MINING - OPERATING COSTS

3.2.1. PRODUCTION DEVELOPMENT

3.2.1.4.1. EXCAVATION, LOAD AND HAUL OVERBURDEN AND WASTE BUCKET WHEEL EXCAVATION

The total daily cost is the sum of three separate cost curves (labor, supplies, and equipment operation) based on a production rate (X), in metric tons of overburden and waste per day. The curves are valid for operations between 2,200 and 125,000 mtpd, operating three shifts per day. The costs include only the operation of the bucket wheel excavator.

BASE CURVES

The base curve is predicated on excavating overburden or waste material. The daily output of an excavator is based on the operating time and output efficiency of the machine. The base curve assumes an operating time of 50% and an output efficiency of 46%. The operating time is the percent of 24 hours that a machine operates each day. The output efficiency is the percent of theoretical capacity that a machine delivers for a particular overburden.

(L) Labor Operating Curve $(Y_L) = 7.414(X)^{0.556}$
The operating labor costs are distributed as follows:

Direct labor.............	65%
Maintenance labor........	35%

The direct labor costs consist of the following typical range of personnel:

		Av salary per hour (base rate)
Bucket wheel operator....	72%	$16.78
Bucket wheel helper......	3%	13.66
Bucket wheel laborer.....	25%	11.68

The average wage for labor is $15.58 per worker-hour (including burden and average shift differential).

(S) Supply Operating Cost $(Y_S) = 0.058(X)^{0.859}$
The supply cost consists of 100% electric power.

(E) Equipment Operating Cost $(Y_E) = 0.212(X)^{0.681}$
The equipment operating cost consists of 100% for repair parts and materials.

ADJUSTMENT FACTORS

Shift Adjustment The curve is based on a three-shift-per-day operation. Typically bucket wheel excavators are run continuously. For a oneor two-shift operation, decrease the operating costs proportionately.

Operating Time Factor The base case assumes a 50% operating time. Bucket wheel excavators do not have high availabilities. The range of expected operating t-ime is 41% to 60%. To adjust the base case for different operating times, multiply the cost obtained from the labor curve by the following factor:

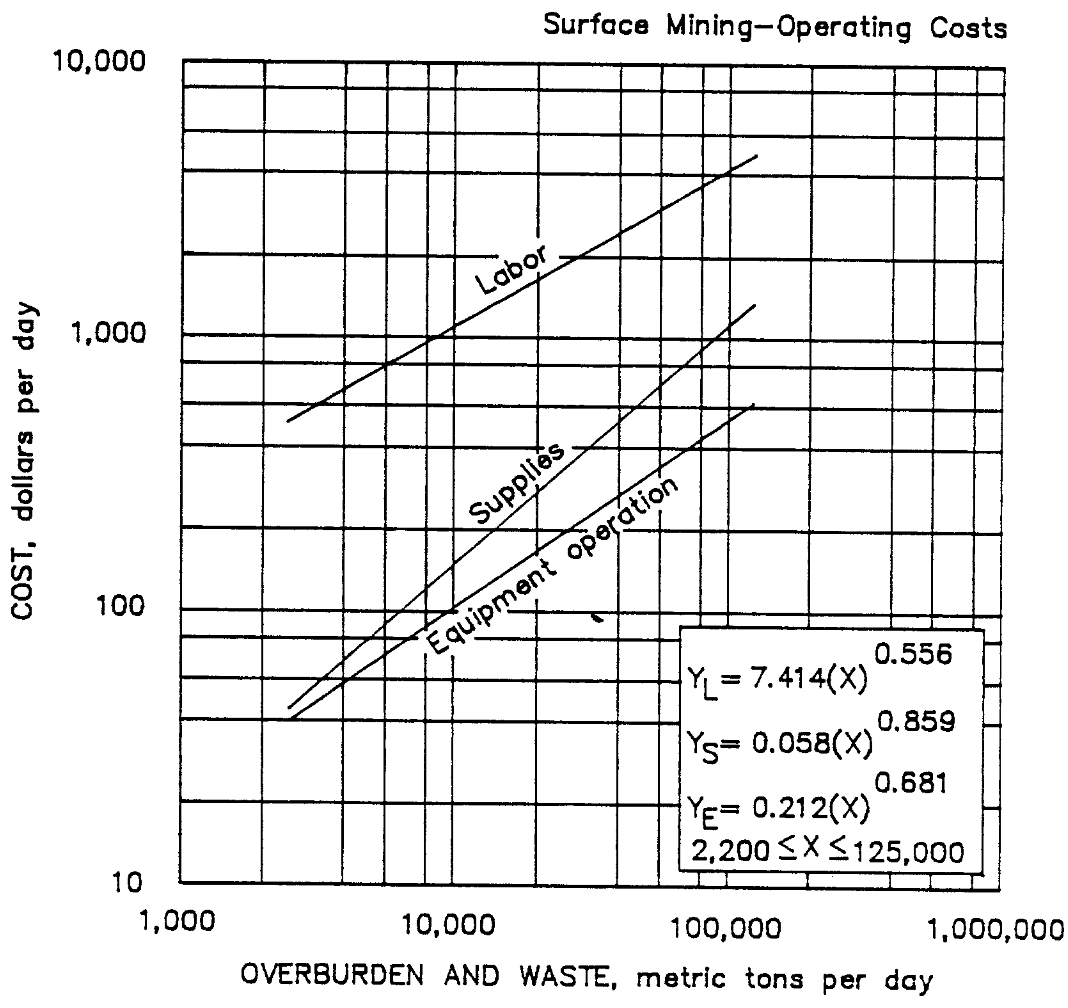
Labor factor $(F_L) = [50/(P)]^{0.554}$
where P = new percent operating time.

Output Efficiency Factor The output efficiency is the ratio of the actual production to the theoretical capacity of the bucket wheel excavator. The theoretical capacity is based on the number of bucket discharges per minute and the bucket size. The theoretical capacity is normally expressed in loose cubic meters per hour. The factors that determine the output efficiency are the difficulty of digging (required cutting force), the percentage of clay or compact material in the bank, and site-specific details such as climatology. The range of output efficiencies is from 44% to 85%. To adjust the curves for different output efficiency, multiply the costs obtained from the curves by the following factor:

Labor factor $(F_L) = [46/(E)]^{0.555}$

Supply factor $(F_S) = [46/(E)]^{0.858}$

Equipment operation factor $(F_E) = [46/(E)]^{0.680}$
where E = new percent output efficiency.



3.2.1.4.1. Excavation, load and haul
BUCKET WHEEL EXCAVATION

3.2. SURFACE MINING--OPERATING COSTS

3.2.1. PRODUCTION DEVELOPMENT

3.2.1.4.2. EXCAVATION, LOAD AND HAUL OVERBURDEN AND WASTE DRAGLINES

The curve for draglines covers excavating and casting a medium-digging overburden and waste material from a dry pit into a spoil pile. The material is assumed to weigh 2.0 mt/m^3 for crawler (diesel-powered) draglines and 1.5 mt/m^3 for walking (electric-powered) draglines.

Crawler draglines range in size from 2- to 20-yd^3 capacity; walking draglines, from 16- to 50-yd^3 capacity. One dozer is provided for each dragline operation for cleanup and support.

The total daily crawler dragline cost is the sum of two separate cost curves (labor and equipment operation) based on a production rate (X), in metric tons of overburden and waste per day. The curves are valid for operations between 2,000 and 15,000 mtpd, operating one shift per day. The total daily walking dragline cost is the sum of three separate cost curves (labor, supplies, and equipment operation) based on a production rate (X), in metric tons of overburden and waste per day. The curves are valid for operations between 15,000 and 150,000 mt, operating three shifts per day. The curves include all daily operating and maintenance costs associated with dragline excavation.

BASE CURVE

(L) Labor Operating Cost (crawler dragline) $(Y_{L\ CRAWLER}) = 43.884(X)^{0.363}$
The operating labor costs are distributed as follows:

	Small (2,000 to 10,000 mtpd)	Large (10,000 to 15,000 mtpd)
Direct labor...............	59%	56%
Maintenance labor..........	41%	44%

The direct labor costs consist of the following typical range of personnel:

	Small (2,000 to 10,000 mtpd)	Large (10,000 to 15,000 mtpd)	Av salary per hour (base rate)
Crawler dragline operator..	41%	26%	$18.11
Oiler......................	24%	22%	15.89
Dozer operator.............	25%	23%	16.33
Utility operator...........	10%	29%	13.66

The average wage for labor is $16.13 per worker-hour (including burden and average shift differential).

(L) Labor Operating Cost (walking dragline) $(Y_{L\ WALKING}) = 12.249(X)^{0.542}$
The operating labor costs are distributed as follows:

Direct labor...............	62%
Maintenance labor..........	38%

The direct labor costs consist of the following typical range of personnel:

		Av salary per hour (base rate)
Walking dragline operator..	30%	$18.11
Oiler......................	26%	15.89
Dozer operator.............	27%	16.33
Utility operator...........	17%	13.66

The average wage for labor is $16.46 per worker-hour (including burden and average shift differential).

(S) Supply Operating Cost (walking dragline) $(Y_{S\ WALKING}) = 0.0395(X)^{1.003}$
The supply cost consists of 100% electric power for the walking (electric) draglines.

(E) Equipment Operating Cost (crawler dragline) $(Y_{E\ CRAWLER}) = 2.218(X)^{0.688}$
The equipment operating cost for crawler draglines consists of 70% for the dragline and 30% for support equipment consisting of 25% crawler tractors and 5% pickup trucks.

(E) Equipment Operating Cost (walking dragline) $(Y_{E\ WALKING}) = 0.533(X)^{0.834}$
The equipment operating cost for walking draglines consists of 66% for the dragline and 34% for support equipment consisting of 31% crawler tractors and 3% pickup trucks.

The general equipment operating cost distribution for draglines and support equipment is as follows:

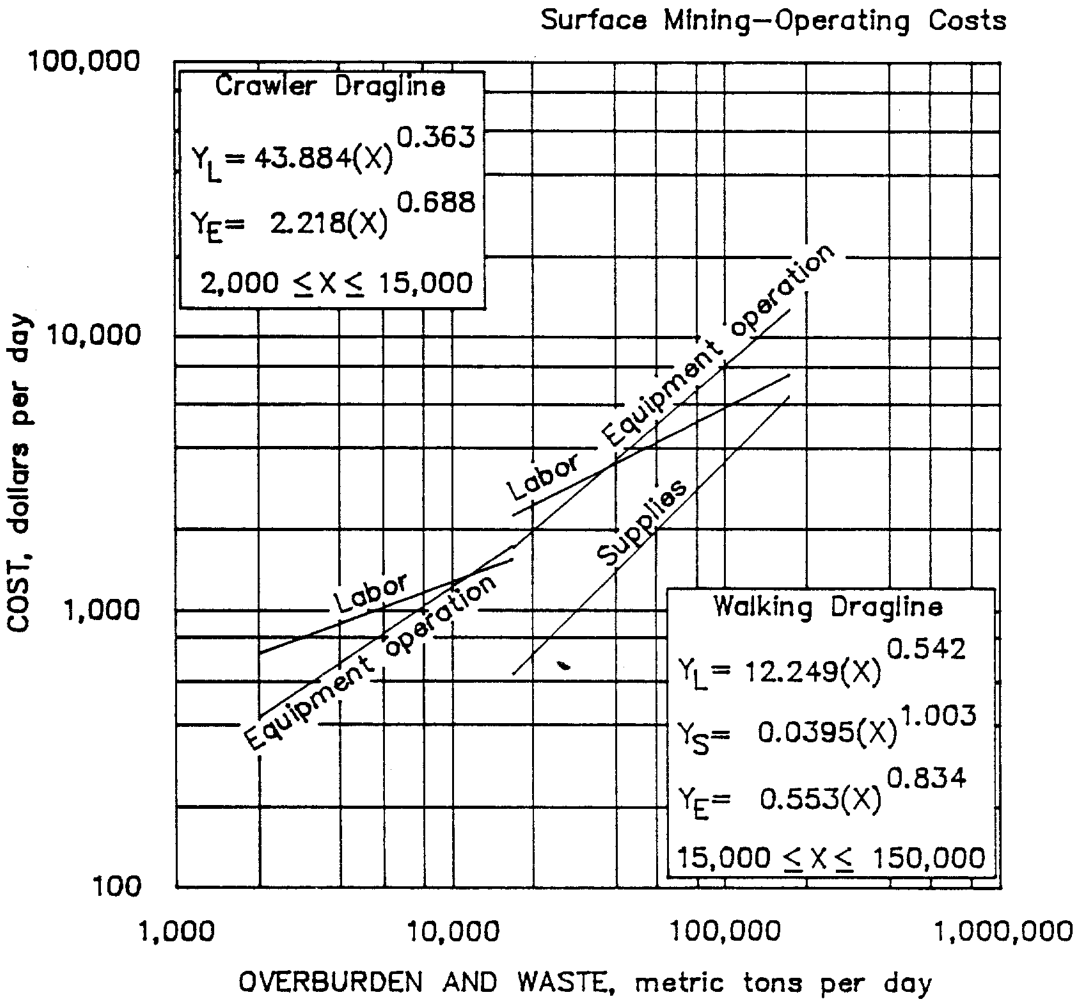
	Repair parts	Fuel and lube	Tires
Walking draglines..........	94%	6%	-
Crawler draglines..........	65%	35%	-
Crawler dozers.............	49%	51%	-
Rubber-tired support.......	8%	90%	2%

ADJUSTMENT FACTORS

To determine the cost of a crawler dragline operation loading to trucks, use the values obtained from the electric shovels and trucks curve. Adjust the values by increasing each curve component 25% and combine equipment operation and supplies curve to account for the substitution of diesel fuel for electric power. (NOTE--Supplies values for the electric shovels and trucks curve include only electric power.)

LIMITATIONS OF DRAGLINE EXCAVATION CURVES

The cost curves for draglines are very general and are meant to represent a typical excavating operation. Factors that greatly affect dragline excavation costs include the swing angle of boom and hoisting height.



3.2.1.4.2. Excavation, load and haul
DRAGLINES

3.2. SURFACE MINING--OPERATING COSTS

3.2.1. PRODUCTION DEVELOPMENT

3.2.1.4.3. EXCAVATION, LOAD AND HAUL OVERBURDEN AND WASTE ELECTRIC SHOVEL AND TRUCKS

The curves show the cost per day for excavating, loading, and hauling both common and shot rock. For common earth excavation, 1 bank m^3 equals 2.08 mt; for shot rock, 1 bank m^3 equals 2.61 mt.

The loading units are electric shovels and diesel front-end loaders ranging in size from 5 to 30 yd^3, with an average of 15 yd^3. Rear-dump trucks from 35 to 170 st are the main hauling units, with the average size of all trucks at 100 st. The ratio of trucks to loading units averages 6:1. The curves reflect an average haul of 2,000 m one-way on an 8% grade from a pit 120 m in depth on wide, well-maintained roads.

The total daily cost is the sum of three separate cost curves (labor, supplies, and equipment operation) based on a production rate (X), in metric tons of overburden and waste per day. The curves are valid for operations between 8,000 and 300,000 mtpd, operating three shifts per day. The curves include all daily operations and maintenance costs associated with load and haul.

BASE CURVE

(L) Labor Operating Cost $(Y_L) = 2.694(X)^{0.790}$
The operating labor costs are distributed as follows:

	Small (8,000 to 50,000 mtpd)	Large (50,000 to 300,000 mtpd)
Direct labor...............	61%	53%
Maintenance labor..........	39%	47%

The direct labor costs consist of the following typical range of personnel:

	Small (8000 to 50,000 mtpd)	Large (50,000 to 300,000 mtpd)	Av salary per hour (base rate)
Shovel operator............	14%	8%	$18.11
Oiler......................	6%	4%	15.89
Dozer operator.............	17%	23%	16.33
Grader operator............	5%	7%	16.33
Front-end loader operator..	3%	1%	16.33
Truck driver...............	52%	57%	15.89
General laborer............	3%	-	13.66

The average wage for labor is $16.54 per worker-hour (including burden and average shift differential).

(S) Supply Operating Cost $(Y_S) = 0.188(X)^{0.780}$
The supply cost consists of 100% electric power for the walking (electric) draglines.

(E) Equipment Operating Cost $(Y_E) = 1.850(X)^{0.867}$
The equipment operating cost covers the daily operating cost for all excavation, loading, and hauling equipment and includes allowances for repair parts, tires, lubrication, and fuel consumption.

The equipment operating cost distribution for a shovel and truck operation is

Shovels....................	7.0%
Rear-dump trucks...........	70.0%
Crawler dozers.............	12.0%
Rubber-tired support.......	11.0%

The general equipment operating cost component distribution is as follows:

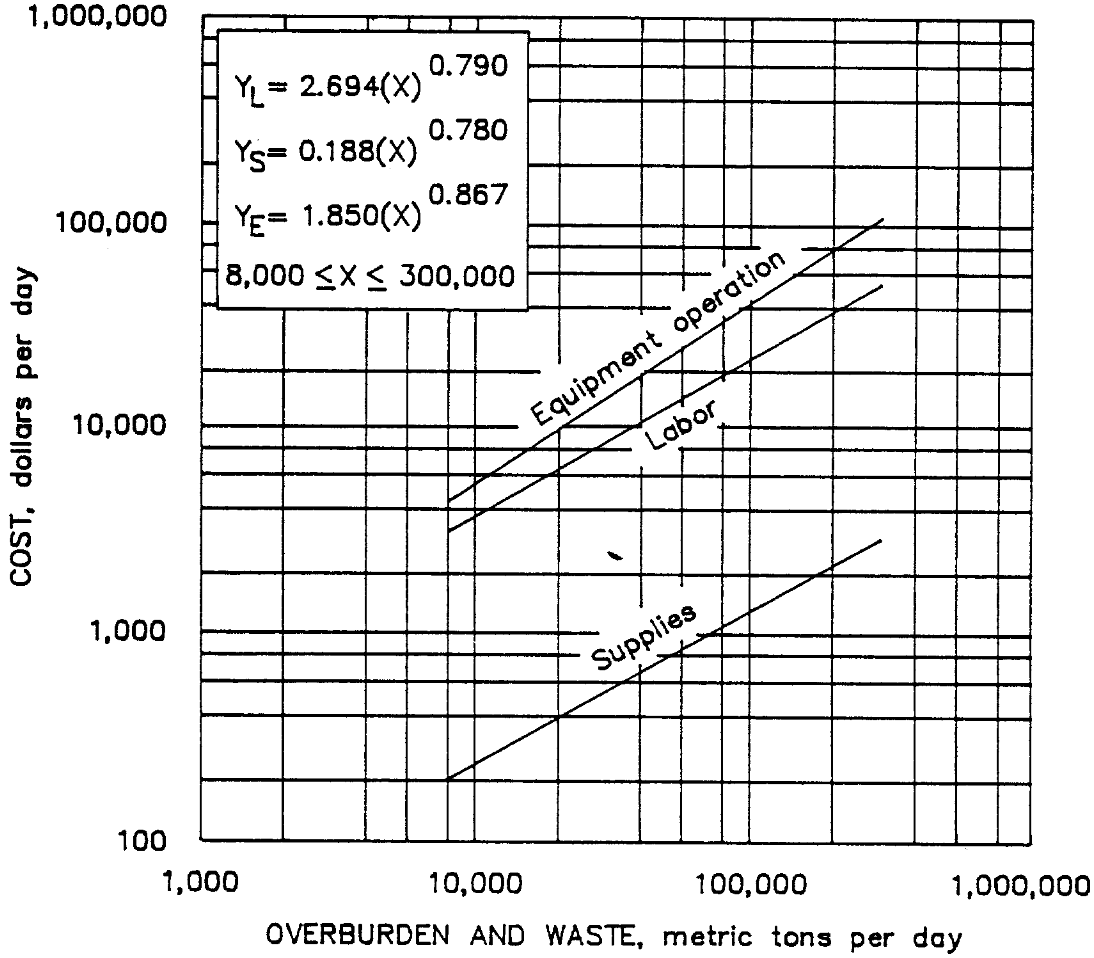
	Repair parts	Fuel and lube	Tires
Shovels, electric..........	96%	4%	-
Rear-dump trucks...........	25%	48%	27%
Crawler dozers.............	50%	50%	
Rubber-tired support.......	35%	47%	18%

ADJUSTMENT FACTOR

Haulage Factor To determine costs for hauls of varying length or depth of pit, multiply the costs obtained from the curves by the following factors:

Labor factor $(F_L) = 0.117(R)^{0.030}(L)^{0.263}$

Equipment operating factor $(F_E) = 0.0546(R)^{0.047}(L)^{0.353}$
where R = depth of pit, in meters (R = 1.0 for negative or 0% grade from loading point),
and L = length of haul, in meters.



3.2.1.4.3. Excavation, load and haul
ELECTRIC SHOVEL AND TRUCKS

3.2. SURFACE MINING--OPERATING COSTS

3.2.1. PRODUCTION DEVELOPMENT

3.2.1.4.4. EXCAVATION, LOAD AND HAUL OVERBURDEN AND WASTE FRONT-END LOADER OR DIESEL SHOVEL AND TRUCKS

The curve shows the cost per day for loading and hauling both common and shot rock. For common earth excavation, 1 bank m^3 equals 2.08 mt; for shot rock, 1 bank m^3 equals 2.61 mt.

The costs are based on mines using front-end loaders or diesel shovels for loading and trucks for haulage. The loaders and shovels range in size from 1 to 6 yd^3 and the trucks range from 10 to 35 st. The curves reflect an average haul of 750 m one way on an 8% grade from a pit 60 m deep.

The total daily cost is the sum of two separate cost curves (labor and equipment operation) based on a production rate (X), in metric tons of overburden and waste per day. The curves are valid for operations between 1,000 and 10,000 mtpd, operating two shifts per day. The curves include all daily operating and maintenance costs associated with excavation, loading, and haulage.

BASE CURVE

(L) Labor Operating Cost $(Y_L) = 37.003(X)^{0.529}$

The operating labor costs are distributed as follows:

Direct labor...............	70%
Maintenance labor..........	30%

The direct labor costs consist of the following typical range of personnel:

	Small (1,000 to 3,000 mtpd)	Large (3,000 to 10,000 mtpd)	Av salary per hour (base rate)
Loader-shovel crew.........	30%	21%	$16.24
Truck haulage crew.........	46%	37%	15.89
Dozer operator.............	24%	17%	16.33
Rubber-tired support crew......................	-	25%	16.11

The average wage for labor for small operations is $16.20 per worker-hour (including burden and average shift differential).

The average wage for labor for large operations is $16.42 per worker-hour (including burden and average shift differential).

(E) Equipment Operating Cost $(Y_E) = 24.620(X)^{0.576}$

The equipment operating cost distribution for front-end loader-diesel shovel and truck operation is

Front-end loader-shovel....	18%
Rear-dump truck............	43%
Crawler dozer..............	23%
Rubber-tired support.......	16%

The general equipment cost component distribution is as follows:

	Repair parts	Fuel and lube	Tires
Shovel, diesel.............	70%	30%	-
Front-end loader...........	33%	44%	23%
Rear-dump truck............	28%	52%	20%
Crawler dozer..............	51%	49%	-
Rubber-tired support.......	28%	63%	9%

ADJUSTMENT FACTOR

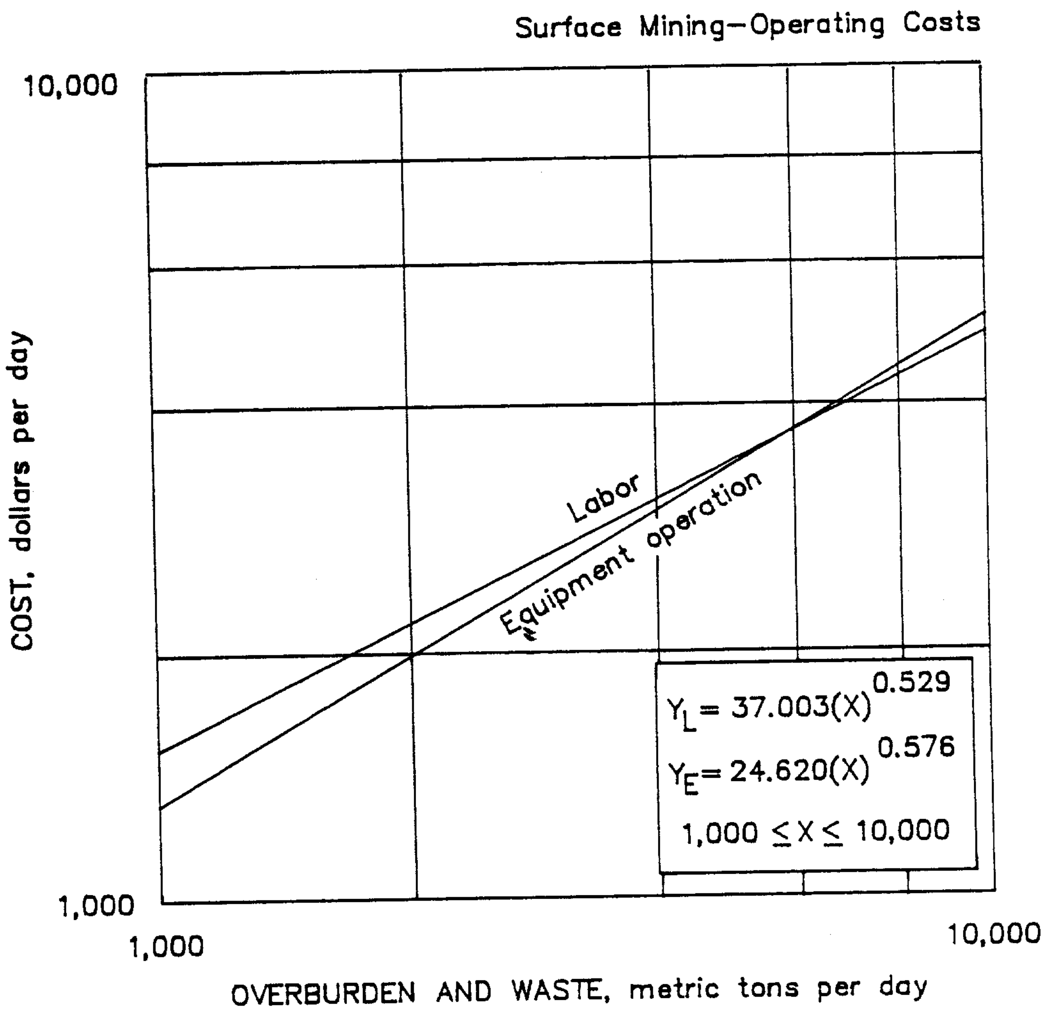
Haulage Factor To determine costs for hauls of varying haul length or depth of pit multiply the costs obtained from the curves by the following factors:

Labor factor $(F_L) = 0.155(R)^{0.030}(L)^{0.263}$

Equipment operation factor $(F_E) = 0.080(R)^{0.047}(L)^{0.353}$

where R = depth of pit, in meters (R = 1.0 for negative or 0% grade from loading point),

and L = length of haul, in meters.



3.2.1.4.4. Excavation, load and haul
FRONT–END LOADER OR DIESEL SHOVEL AND TRUCKS

3.2. SURFACE MINING--OPERATING COSTS

3.2.1. PRODUCTION DEVELOPMENT

3.2.1.4.5. EXCAVATION, LOAD AND HAUL OVERBURDEN AND WASTE HYDRAULIC MINING

The total daily cost is the sum of three separate cost curves (labor, supplies, and equipment operation) based on a production rate (X), in metric tons of material slurried per day. The curves are valid for operations between 9,500 and 58,000 mtpd, operating three shifts per day. The costs include the operation of the monitors and high pressure water pumps. Not included in the estimates is the cost for pumping the slurry.

BASE CURVES

The base curve is for the hydraulic mining of phosphate matrix. The matrix is excavated by draglines and deposited in "pits" where hydraulicing occurs. The hydraulic monitors (also called guns, giants, or water cannons) break down the matrix for pumping to the processing plant. The monitors are mounted on a pit gun car that advances with the dragline. The base case assumes an 85% operating time and a water ratio of 0.67 mt of slurried ore per metric ton of water used.

(L) Labor Operating Curve $(Y_L) = 0.406(X)^{0.771}$
The operating labor costs are distributed as follows:

Direct labor...............	83%
Maintenance labor..........	17%

The direct labor costs consist of the following typical range of personnel:

		Av salary per hour (base rate)
Monitor operator...........	59%	$16.78
Monitor helper.............	33%	13.66
Laborer....................	8%	11.68

The average wage for labor is $15.65 per worker-hour (including burden and average shift differential).

(S) Supply Operating Cost $(Y_S) = 0.883(X)^{0.685}$
The supply cost consists of 100% electric power.

(E) Equipment Operating Cost $(Y_E) = 0.019(X)^{0.748}$
The equipment operating cost consists of 100% for monitor repair parts and materials. The repair costs are divided 30% for water pumps and 70% for the monitor systems (hydraulic pumps, controls, and monitors).

ADJUSTMENT FACTORS

Water Ratio Each deposit to be hydraulically mined will require different quantities of water, and therefore, different sizes or numbers of monitors. The more competent (tougher) the deposit, the more water that will be required. The measure of difficulty in slurrying the deposit is the mass ratio of ore excavated to water used. To adjust the base curves for different water requirements, multiply the costs obtained from the curves by the following factors:

Labor factor $(F_L) = [0.67/(R)]^{0.050}$

Supply factor $(F_S) = [0.67/(R)]^{1.285}$

Equipment operation factor $(F_E) = [0.67/(R)]^{0.327}$
where R = new water ratio, defined as metric ton of ore slurried per metric ton of water used.

For phosphate, the water ratio can vary from 0.7 to 0.3. For other applications it can vary from 1.5 to 0.2.

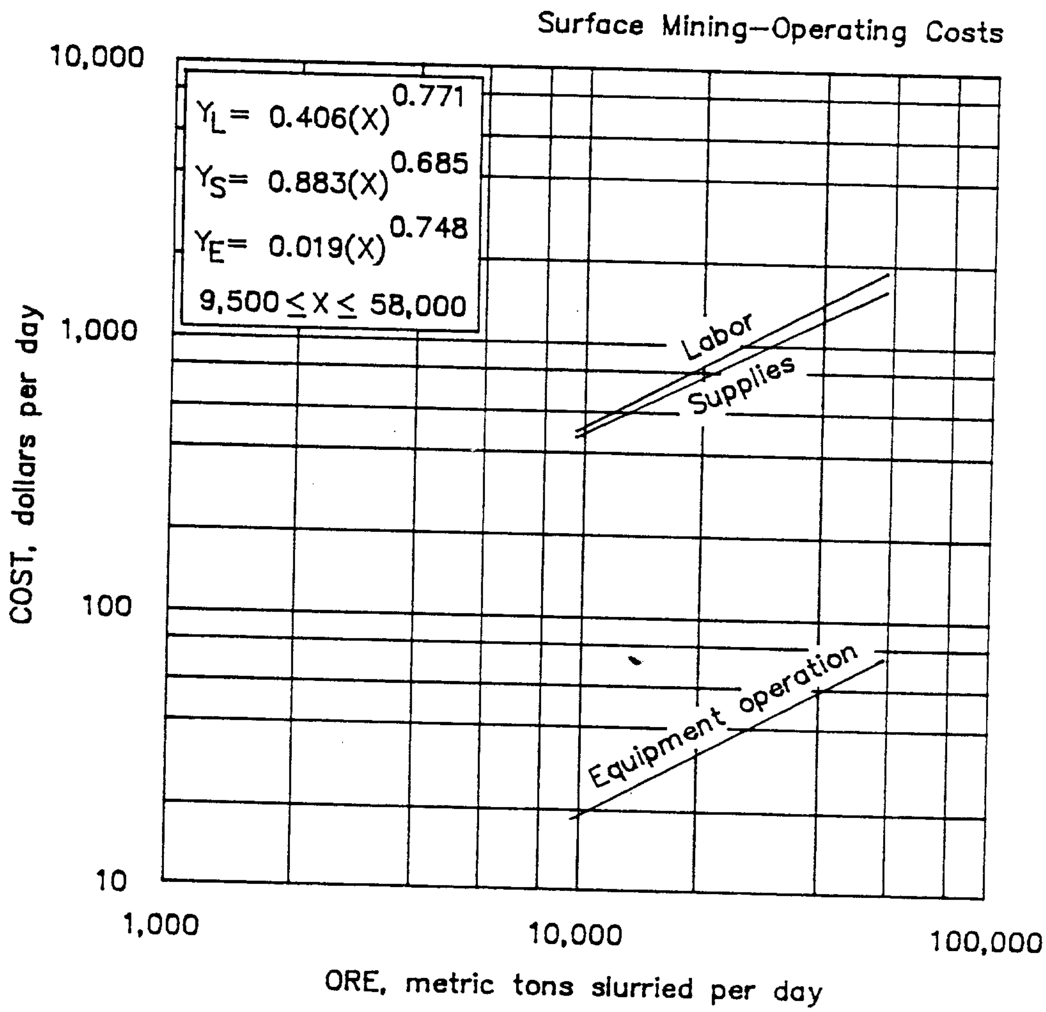
Tailings Factor Hydraulic mining can be used to excavate old tailings ponds for the reprocessing of the tailings. This application normally requires higher water pressure and larger monitors. To adjust the base curves for the hydraulic mining of tailings, multiply the costs obtained from the curves by the following factors:

Labor factor $(F_L) = 3.32$

Supply factor $(F_S) = 1.51$

Equipment operation factor $(F_E) = 1.12$

The tailings adjustment is based on a water ratio of 1.22 mt of tailings slurried per metric ton of water applied.



3.2.1.4.5. Excavation, load and haul
HYDRAULIC MINING

3.2. SURFACE MINING--OPERATING COSTS

3.2.1. PRODUCTION DEVELOPMENT

3.2.1.4.6. EXCAVATION, LOAD AND HAUL OVERBURDEN AND WASTE SCRAPERS

The curves show the cost per day for loading and hauling unconsolidated overburden. Scraper production in metric tons per day is based on an assumed material having a weight of 2.2 mt/m^3 and requiring ripping.

The costs cover wheel tractor scrapers ranging in size and type from 150-hp self-loading elevating scrapers to 550-hp twin-engine scrapers. The curves are based on a one-way haul of 900 m on a level grade and include a 6% rolling resistance in the pit area.

The total daily cost is the sum of two separate cost curves (labor and equipment o eration) based on a production rate (X), in metric tons of overburden and waste per day. The curves are valid for operations between 2,000 and 300,000 mtpd, operating three shifts per day. The curves include all daily operating and maintenance costs associated with load and haul.

BASE CURVE

(L) Labor Operating Cost $(Y_L) = 3.825(X)^{0.735}$
The operating labor costs are distributed as follows:

Direct labor...............	53%
Maintenance labor..........	47%

The direct labor costs consist of the following typical range of personnel:

		Av salary per hour (base rate)
Scraper operator...............	58%	$16.33
Crawler operator...............	32%	16.33
Rubber-tired support operator..	10%	16.11

The average wage for labor is $16.64 per worker-hour (including burden and average shift differential).

(E) Equipment Operating Cost $(Y_E) = 0.602(X)^{0.925}$
The equipment operating cost distribution for a scraper operation is

Scraper....................	71%
Crawler-dozer..............	24%
Rubber-tired support.......	5%

The general equipment cost component distribution is as follows:

	Repair parts	Fuel and lube	Tires
Scraper....................	38%	47%	15%
Crawler-dozer..............	53%	47%	-
Rubber-tired support.......	36%	52%	12%

ADJUSTMENT FACTORS

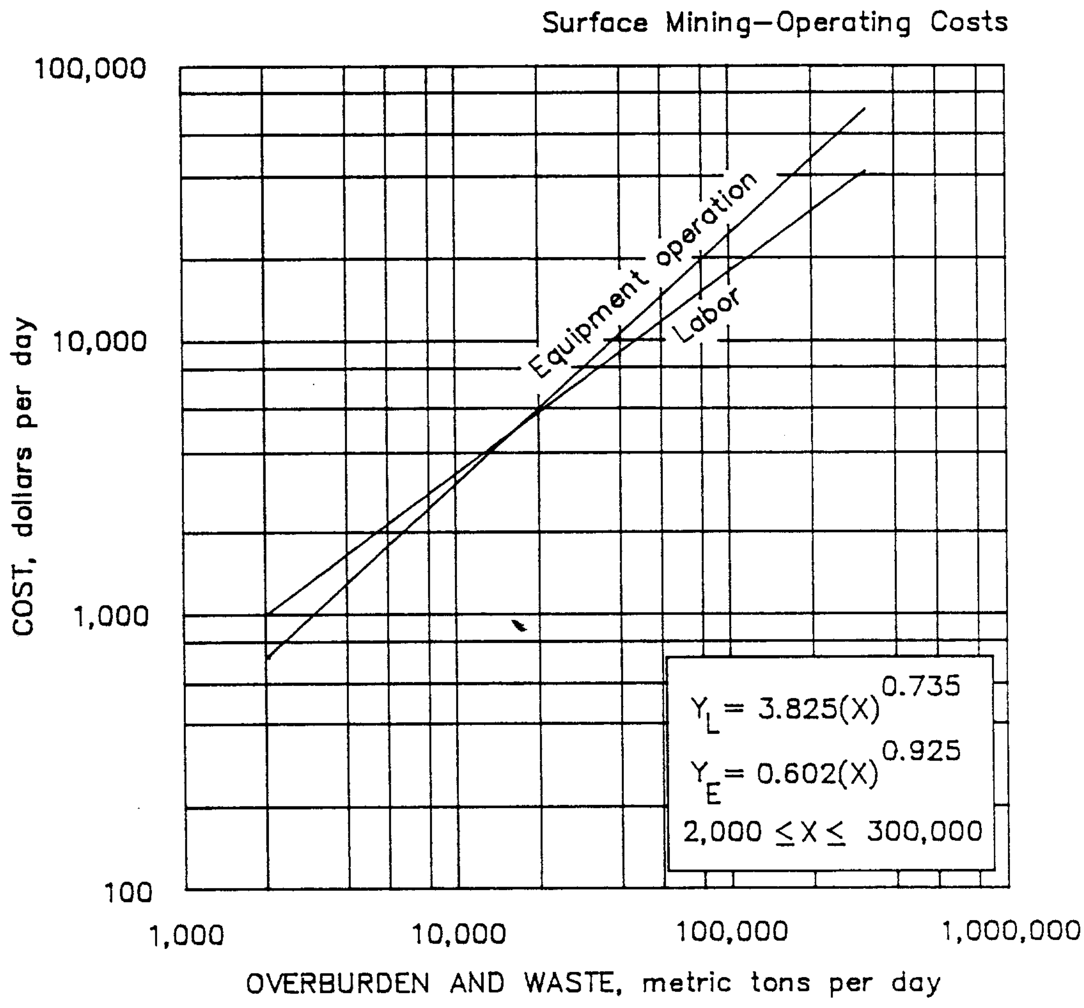
Haulage Factor To determine costs for varying haul lengths and grades, multiply the costs obtained from the curves by the following factors:

Labor factor $(F_L) = 0.087(L)^{0.359}(G)^{1.530}$

Equipment operation factor $(F_E) = 0.064(L)^{0.403}(G)^{1.620}$
where L = length of haul, in meters,
and G = grade [defined as 1.0 plus or minus (percent grade/100)].

Ripping Factor If no ripping is required, multiply the costs obtained from the curves by the following factor:

Ripping factor $(F_R) = 0.85$



3.2.1.4.6. Excavation, load and haul
SCRAPERS