# Attachment 2
# Air Quality and Greenhouse Gas Modeling; General Conformity Determination

# Air Quality and Greenhouse Gas Modeling

## USJRBSI Construction Mass Emissions Calculations

| | |
|---|---|
| **Green Tabs G1-G7** | *Green tabs include emissions calculations/summaries* |
| **Orange Tabs O1-O5** | *Orange tabs include emission factor calculations, conversion factors, and other pertinant information used to calculate emissions* |
| **Yellow Tabs Y1-Y8** | *Yellow tabs include construction equipment estimates for Phase 1 of construction* |
| **Red Tabs R1-R3** | *Red tabs include construction equipment estimates for Phase 2 of construction* |
| **Blue Tabs B1-B5** | *Blue tabs include construction equipment estimates for Phase 3 of construction* |

## Emissions Summary

*this sheet summarizes total mass emissions for each alternative by construction phase*

| | Alternative 1-3, 5 | | | | Alternative 4 | | | |
|---|---|---|---|---|---|---|---|---|
| | Average (TPY) | Phase 1 (TPY) | Phase 2 (TPY) | Phase 3 (TPY) | Average (TPY) | Phase 1 (TPY) | Phase 2 (TPY) | Phase 3 (TPY) |
| ***ROG*** | 17 | 21 | 4 | 21 | 18 | 21 | 5 | 21 |
| ***NOX*** | 148 | 189 | 35 | 200 | 150 | 189 | 41 | 200 |
| ***PM10 (exhaust)*** | 5 | 6 | 1 | 7 | 5 | 6 | 1 | 7 |
| ***PM10 (dust)*** | 167 | 133 | 8 | 235 | 167 | 133 | 8 | 235 |
| ***CO2 (MT)*** | 23,539 | 26,210 | 5,993 | 29,004 | 23,908 | 26,210 | 6,932 | 29,004 |

## Off-Road Emissions Summary Alternative 1-3, 5

*this sheet summarizes exhaust and fugitive dust emissions from the use of off-road equipmnet for alternatives 1-3*

| | | Fuel Consumption | | | Fugitive Dust Sources | |
|---|---|---|---|---|---|---|
| **Phase 1 Activities** | **Phase 1 Equipment Use/Fuel Consumption** | **Diesel (gal)** | **Gasoline (gal)** | **Grading/Dozing (hours)** | **Truck Loading (tons)** | **Batch Plant (cy)** |
| | Contractor Use Area | 4,179,640 | 82,329 | 123,716 | | |
| | Transmission | 6,530 | 20,462 | 2,177 | | |
| *Site Access and Staging* | Haul Roads | 923,475 | 31,677 | 24,592 | | |
| | PermRoads | 419,428 | 13,758 | 19,768 | | |
| | USJRB - RM274 - Subgrp A - Fine Gold Crk Brdge - 2013 | 7,957 | 19 | 0 | | |
| | USJRV - RM274 - Subgrp E - Pwrplt Acc Rd Brdg - 2013 | 50,694 | 19 | 0 | | |
| *Cofferdam Material Processing* | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt | 798,930 | 159,777 | 5,277 | | |
| *Marine Cofferdam Work** | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (marine vessels) | 0 | 0 | 0 | | |
| *Diversion Tunnel* | USJRB - Subgrp B - Outlet Works Tunnel - March 2013 | 596,113 | 0 | 3,101 | | |
| **Phase Total** | | 6,982,768 | 308,040 | 178,631 | 26,049,552 | 2,781,276 |
| *Per Day* | | 9,069 | 400 | 232 | 33,831 | 3,612 |
| *Per year* | | 1,995,077 | 88,012 | 51,038 | 7,442,729 | 794,650 |

| **Phase 2 Activities** | **Phase 2 Equipment Use/Fuel Consumption** | **Diesel (gal)** | **Gasoline (gal)** | **Grading/Dozing (hours)** | **Truck Loading (tons)** | **Batch Plant (cy)** |
|---|---|---|---|---|---|---|
| *Powerhouse/Valve house* | PH&Row | 955,313 | 455,560 | 13,484 | | |
| *Intake Structure* | LLIS (Alt1-3) | 226,781 | 100,676 | 2,485 | | |
| *Tunnel Connection* | LLIS (Alt1-3) | 226,781 | 100,676 | 2,485 | | |
| **Phase Total** | | 1,408,875 | 656,911 | 18,453 | 2,145,720 | 162,768 |
| *Per Day* | | 1,601 | 746 | 21 | 2,438 | 185 |
| *Per year* | | 352,219 | 164,228 | 4,613 | 536,430 | 40,692 |

| **Phase 3 Activities** | **Phase 3 Equipment Use/Fuel Consumption** | **Diesel (gal)** | **Gasoline (gal)** | **Grading/Dozing (hours)** | **Truck Loading (tons)** | **Batch Plant (cy)** |
|---|---|---|---|---|---|---|
| *Dam Material Processing* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| *Complete Cofferdams* | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (PDF) + 1/2 marine vessels | 798,930 | 159,777 | 5,277 | | |
| *Foundation Preparation* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| *RCC Arch Dam* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| | USJRB - RM274 - Subgrp C - Spillway Curved Arch Dam - 2013 - 1 (PDF) | 741,605 | 48,910 | 1,408 | | |
| *Reclamation and Demobilization* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| *Affected Existing Facilities* | Kerckhoff Decom (spreadsheet) | 82,240 | 9,922 | 176 | | |
| | Recreation (spreadsheet) | 72,374 | 3,802 | 1,568 | | |
| | Utilities (spreadsheet) | 6,133 | 1,379 | 7 | | |
| | LeGrande Transmission Line (spreadsheet) | 4,925 | 15,431 | 1,642 | | |
| *Reservoir Clearing* | Reservoir Clearning (spreadsheet) | 1,435,060 | 108,263 | 5,670 | | |
| **Phase Total** | | 9,301,746 | 817,377 | 47,051 | 9,880,993 | 7,811,123 |
| *Per Day* | | 8,456 | 743 | 43 | 8,983 | 7,101 |
| *Per year* | | 1,860,349 | 163,475 | 9,410 | 1,976,199 | 1,562,225 |

| Alternative 1-3 Totals | Diesel (gal) | Gasoline (gal) | Grading/Dozing (hours) | Truck Loading (tons) | Batch Plant (cy) |
|---|---|---|---|---|---|
| *EMFAC Input Alt Total* | 17,693,389 | 1,782,328 | 244,136 | 38,076,266 | 10,755,167 |

| **Emissions Summary** | | | | | |
|---|---|---|---|---|---|
| ***Exhaust (Off-Road)*** | | | | | |
| ROG (tons) | 161 | | | | |
| NOX (tons) | 1,283 | | | | |
| PM10 Exhaust (tons) | 47 | | | | |
| CO2 (tons) | 214,723 | | | | |
| CO2 (MT) | 193,251 | | | | |
| ***Exhaust (Marine Vessel)*** | | | | | |
| ROG (tons) | 6 | | | | |
| NOX (tons) | 100 | | | | |
| PM10 Exhaust (tons) | 3 | | | | |
| CO2 (tons) | 7,311 | | | | |
| CO2 (MT) | 6,580 | | | | |
| ***Fugitive Dust Summary*** | | | | | |
| pounds/activity | | | 149,460 | 4,601 | 3,125,451 |
| tons/activity | | | 75 | 2 | 1,563 |
| PM10 Dust Alt Total (tons) | 1,640 | | | | |
| | | | | | |
| ***Alternative Average*** | | | | | |
| ROG (TPY) | 17 | | | | |
| NOX (TPY) | 138 | | | | |
| PM10 (TPY) | 5 | | | | |
| PM10 Dust | 164 | | | | |
| CO2 (MT/YR) | 19,983 | | | | |

* See "Exhaust Emission Factors" sheet for marine vessel exhaust calculations

## On-Road Emissions Summary Alternative 1-3, 5

*this sheet summarizes exhaust and dust emissions from the use of on-road vehicles (worker commute and haul trucks) for alternative 1-3*

| | Exhaust | | Fugitive Dust Sources | | |
|---|---|---|---|---|---|
| **Phase 1 Activities** | **Haul Trip VMT** | **Worker VMT** | **Heavy DutyTravel on Paved Road VMT** | **Heavy DutyTravel on Unpaved Road VMT** | **Worker Commute on Paved Roads VMT** |
| | 49,560 | 2,323,160 | 44,604 | 4,956 | 2,323,160 |
| *Site Access and Staging* | 5,880 | 9,602,040 | 5,292 | 588 | 9,602,040 |
| | 37,520 | 364,280 | 33,768 | 3,752 | 364,280 |
| | 55,840 | 0 | 50,256 | 5,584 | 0 |
| *Cofferdam Material Processing* | 0 | 2,693,600 | 0 | 0 | 2,693,600 |
| *Marine Cofferdam Work* | 0 | 2,693,600 | 0 | 0 | 2,693,600 |
| | 130,480 | 1,759,940 | 117,432 | 13,048 | 1,759,940 |
| *Diversion Tunnel* | 20,860 | 0 | 18,774 | 2,086 | 0 |
| | 52,824 | 0 | 47,542 | 5,282 | 0 |
| **Phase Total** | 352,964 | 19,436,620 | 317,668 | 35,296 | 19,436,620 |
| *Per Day* | 458 | 25,242 | 413 | 46 | 25,242 |
| *Per year* | 100,847 | 5,553,320 | 90,762 | 10,085 | 5,553,320 |

| **Phase 2 Activities** | **Haul Trip VMT** | **Worker VMT** | **Heavy DutyTravel on Paved Road** | **Heavy DutyTravel on Unpaved Road** | **Worker Commute on Paved Roads** |
|---|---|---|---|---|---|
| | 170,660 | 5,275,900 | 153,594 | 17,066 | 5,275,900 |
| *Powerhouse/Valve house* | 96,320 | 0 | 86,688 | 9,632 | 0 |
| | 72,008 | 0 | 64,807 | 7,201 | 0 |
| *Intake Structure* | 122,640 | 941,150 | 110,376 | 12,264 | 941,150 |
| *Tunnel Connection* | 0 | 941,150 | 0 | 0 | 941,150 |
| **Phase Total** | 461,628 | 7,158,200 | 415,465 | 46,163 | 7,158,200 |
| *Per Day* | 525 | 8,134 | 472 | 52 | 8,134 |
| *Per year* | 115,407 | 1,789,550 | 103,866 | 11,541 | 1,789,550 |

| Phase 3 Activities | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road | Heavy DutyTravel on Unpaved Road | Worker Commute on Paved Roads |
|---|---|---|---|---|---|
| *Dam Material Processing* | 0 | 4,700,920 | 0 | 0 | 4,700,920 |
| *Complete Cofferdams* | 0 | 931,560 | 0 | 0 | 931,560 |
| *Foundation Preparation* | 180,040 | 1,687,000 | 162,036 | 18,004 | 1,687,000 |
| *RCC Arch Dam* | 10,293,080 | 10,373,860 | 9,263,772 | 1,029,308 | 10,373,860 |
| *Reclamation and Demobilzation* | 0 | 137,200 | 0 | 0 | 137,200 |
| | 82,600 | 813,400 | 74,340 | 8,260 | 813,400 |
| | 47,800 | 273,200 | 43,020 | 4,780 | 273,200 |
| | 0 | 15,960 | 0 | 0 | 15,960 |
| *Affected Existing Facilities* | 87,220 | 0 | 78,498 | 8,722 | 0 |
| | 342,800 | 0 | 308,520 | 34,280 | 0 |
| | 1,800 | 0 | 1,620 | 180 | 0 |
| | 7,520 | 0 | 6,768 | 752 | 0 |
| *Reservoir Clearing* | 411,800 | 3,518,600 | 370,620 | 41,180 | 3,518,600 |
| **Phase Total** | 11,454,660 | 22,451,700 | 10,309,194 | 1,145,466 | 22,451,700 |
| *Per Day* | 10,413 | 20,411 | 9,372 | 1,041 | 20,411 |
| *Per year* | 2,290,932 | 4,490,340 | 2,061,839 | 229,093 | 4,490,340 |

| Alternative 1-3 Totals | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road | Heavy DutyTravel on Unpaved Road | Worker Commute on Paved Roads |
|---|---|---|---|---|---|
| *EMFAC Input Alt Total* | 12,269,252 | 49,046,520 | 11,042,327 | 1,226,925 | 49,046,520 |

| Emissions Summary | | | | | |
|---|---|---|---|---|---|
| ***Alternative Total by Source*** | | | | | |
| ROG (tons) | 4 | 2 | | | |
| NOX (tons) | 85 | 7 | | | |
| PM10 Exhaust (tons) | 2 | 0.10 | | | |
| PM10 Dust (tons) | | | 13 | 7 | 9 |
| CO2 (tons) | 23,526 | 20,375 | | | |
| CO2 (MT) | 21,173 | 18,338 | | | |
| ***Alternative Total*** | | | | | |
| ROG (tons) | 6 | | | | |
| NOX (tons) | 92 | | | | |
| PM10 Exhaust (tons) | 2 | | | | |
| PM10 Dust (tons) | 29 | | | | |
| CO2 (tons) | 39,511 | | | | |
| CO2 (MT) | 35,560 | | | | |
| ***Alternative Average*** | | | | | |
| ROG (TPY) | 1 | | | | |
| NOX (TPY) | 9 | | | | |
| PM10 (TPY) | 0 | | | | |
| PM10 Dust | 3 | | | | |
| CO2 (MT/YR) | 3,556 | | | | |

## Emissions Summary by Phase Alternative 1-3, 5

*This sheet summarizes the total mass emissions on a per phase basis for alternatives 1-3*

| | Off-Road Emissions | | | | | | | | On-Road Emissions | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Phase 1** | off road diesel | off road gas | total fuel | grading hours | truck loading tons | batch plant (cy) | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road VMT | Heavy DutyTravel on Unpaved Road VMT | Worker Commute on Paved Roads VMT |
| | 1,995,077 | 88,012 | 2,083,088 | 51,038 | 7,442,729 | 794,650 | 100,847 | 5,553,320 | 90,762 | 10,085 | 5,553,320 |
| **Emissions Summary** | | | | | | | | | | | |
| ***Exhaust*** | | | | | | | | | | | |
| ROG (tons) | | | 17 | | | | 0.03 | 0.25 | | | |
| NOX (tons) | | | 137 | | | | 0.70 | 0.80 | | | |
| PM10 Exhaust (tons) | | | 5 | | | | 0.01 | 0.01 | | | |
| CO2 (tons) | | | 22,966 | | | | 193 | 2,307 | | | |
| CO2 (MT) | | | 20,670 | | | | 174 | 2,076 | | | |
| ***Exhaust (Marine Vessel)*** | | | | | | | | | | | |
| ROG (tons) | 3 | | | | | | | | | | |
| NOX (tons) | 50 | | | | | | | | | | |
| PM10 Exhaust (tons) | 1 | | | | | | | | | | |
| CO2 (tons) | 3,656 | | | | | | | | | | |
| CO2 (MT) | 3,290 | | | | | | | | | | |
| ***Fugitive Dust*** | | | | | | | | | | | |
| Batch Plant/Quarry (lbs) | | | | | | 230,925 | | | | | |
| PM10 Dust (tons) | | | | 16 | 0.45 | 115 | | | 0.11 | 0.06 | 1 |

| Phase 1 Total (TPY) | |
|---|---|
| ROG | 21 |
| NOX | 189 |
| PM10 Exhaust | 6.4 |
| PM2.5 Exhaust | |
| PM10 Dust | 133 |
| PM2.5 Dust | |
| CO2 (MT) | 26,210 |

| **Phase 2** | off road diesel | off road gas | total fuel | grading hours | truck loading tons | batch plant (cy) | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road VMT | Heavy DutyTravel on Unpaved Road VMT | Worker Commute on Paved Roads VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 352,219 | 164,228 | 516,446 | 4,613 | 536,430 | 40,692 | 115,407 | 1,789,550 | 103,866 | 11,541 | 1,789,550 |
| **Emissions Summary** | | | | | | | | | | | |
| ***Exhaust*** | | | | | | | | | | | |
| ROG (tons) | | | 4 | | | | 0.04 | 0.079 | | | |
| NOX (tons) | | | 34 | | | | 0.80 | 0.258 | | | |
| PM10 Exhaust (tons) | | | 1 | | | | 0.01 | 0.004 | | | |
| CO2 (tons) | | | 5,694 | | | | 221.29 | 743.4 | | | |
| CO2 (MT) | | | 5,125 | | | | 199 | 669 | | | |
| ***Fugitive Dust*** | | | | | | | | | | | |
| Batch Plant/Quarry (lbs) | | | | | | 11,825.08 | | | | | |
| PM10 Dust (tons) | | | | 1.41 | 0.03 | 5.91 | | | 0.13 | 0.07 | 0.31 |

| Phase 2 Total (TPY) | |
|---|---|
| ROG | 4.39 |
| NOX | 35.08 |
| PM10 Exhaust | 1.27 |
| PM2.5 Exhaust | |
| PM10 Dust | 7.86 |
| PM2.5 Dust | |
| CO2 (MT) | 5,993 |

| **Phase 3** | off road diesel | off road gas | total fuel | grading hours | truck loading tons | batch plant (cy) | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road VMT | Heavy DutyTravel on Unpaved Road VMT | Worker Commute on Paved Roads VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Emissions Summary** | 1,860,349 | 163,475 | 2,023,825 | 9,410 | 1,976,199 | 1,562,225 | 2,290,932 | 4,490,340 | 2,061,839 | 229,093 | 4,490,340 |
| ***Exhaust*** | | | | | | | | | | | |
| ROG (tons) | | | 17 | | | | 0.70 | 0.20 | | | |
| NOX (tons) | | | 133 | | | | 15.92 | 0.65 | | | |
| PM10 Exhaust (tons) | | | 5 | | | | 0.29 | 0.01 | | | |
| CO2 (tons) | | | 22,313 | | | | 4393 | 1865 | | | |
| CO2 (MT) | | | 20,082 | | | | 3954 | 1679 | | | |
| ***Exhaust (Marine Vessel)*** | | | | | | | | | | | |
| ROG (tons) | 3 | | | | | | | | | | |
| NOX (tons) | 50 | | | | | | | | | | |
| PM10 Exhaust (tons) | 1 | | | | | | | | | | |
| CO2 (tons) | 3,656 | | | | | | | | | | |
| CO2 (MT) | 3,290 | | | | | | | | | | |
| ***Fugitive Dust*** | | | | | | | | | | | |
| Batch Plant/Quarry (lbs) | | | | | | 453982.46 | | | | | |
| PM10 Dust (tons) | | | | 2.88 | 0.12 | 226.9912286 | | | 2.496742562 | 1.35821534 | 0.785256188 |

| **Phase 3 Total (TPY)** | |
|---|---|
| ROG | 21 |
| NOX | 200 |
| PM10 Exhaust | 7 |
| PM2.5 Exhaust | |
| PM10 Dust | 234.63 |
| PM2.5 Dust | |
| CO2 (MT) | 29,004 |

## Off-Road Emissions Summary Alternative 4

*this sheet summarizes exhaust and fugitive dust emissions from the use of off-road equipmnet for alternatives 1-3*

| | | Fuel Consumption | | | Fugitive Dust Sources | |
|---|---|---|---|---|---|---|
| **Phase 1 Activities** | **Phase 1 Equipment Use/Fuel Consumption** | **Diesel (gal)** | **Gasoline (gal)** | **Grading/Dozing (hours)** | **Truck Loading (tons)** | **Batch Plant (cy)** |
| | Contractor Use Area | 4,179,640 | 82,329 | 123,716 | | |
| | Transmission | 6,530 | 20,462 | 2,177 | | |
| *Site Access and Staging* | Haul Roads | 923,475 | 31,677 | 24,592 | | |
| | PermRoads | 419,428 | 13,758 | 19,768 | | |
| | USJRB - RM274 - Subgrp A - Fine Gold Crk Bridge - 2013 | 7,957 | 19 | 0 | | |
| | USJRV - RM274 - Subgrp E - Pwrplt Acc Rd Brdg - 2013 | 50,694 | 19 | 0 | | |
| *Cofferdam Material Processing* | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt | 798,930 | 159,777 | 5,277 | | |
| *Marine Cofferdam Work** | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (marine vessels) | 0 | 0 | 0 | | |
| *Diversion Tunnel* | USJRB - Subgrp B - Outlet Works Tunnel - March 2013 | 596,113 | 0 | 3,101 | | |
| **Phase Total** | | 6,982,768 | 308,040 | 178,631 | 26,049,552 | 2,781,276 |
| *Per Day* | | 9,069 | 400 | 232 | 33,831 | 3,612 |
| *Per year* | | 1,995,077 | 88,012 | 51,038 | 7,442,729 | 794,650 |
| **Phase 2 Activities** | **Phase 2 Equipment Use/Fuel Consumption** | **Diesel (gal)** | **Gasoline (gal)** | **Grading/Dozing (hours)** | **Truck Loading (tons)** | **Batch Plant (cy)** |
| *Powerhouse/Valve house* | PH&Row | 955,313 | 455,560 | 13,484 | | |
| *Intake Structure* | SLIS (Alt 4) | 330,961 | 152,909 | 2,485 | | |
| *Tunnel Connection* | SLIS (Alt 4) | 330,961 | 152,909 | 2,485 | | |
| **Phase Total** | | 1,617,235 | 761,378 | 18,453 | 2,145,720 | 162,768 |
| *Per Day* | | 1,838 | 865 | 21 | 2,438 | 185 |
| *Per year* | | 404,309 | 190,344 | 4,613 | 536,430 | 40,692 |
| **Phase 3 Activities** | **Phase 3 Equipment Use/Fuel Consumption** | **Diesel (gal)** | **Gasoline (gal)** | **Grading/Dozing (hours)** | **Truck Loading (tons)** | **Batch Plant (cy)** |
| *Dam Material Processing* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| *Complete Cofferdams* | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (PDF) + 1/2 marine vessels | 798,930 | 159,777 | 5,277 | | |
| *Foundation Preparation* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| *RCC Arch Dam* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| | USJRB - RM274 - Subgrp C - Spillway Curved Arch Dam - 2013 - 1 (PDF) | 741,605 | 48,910 | 1,408 | | |
| *Reclamation and Demobilization* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| | Kerckhoff Decom (spreadsheet) | 82,240 | 9,922 | 176 | | |
| *Affected Existing Facilities* | Recreation (spreadsheet) | 72,374 | 3,802 | 1,568 | | |
| | Utilities (spreadsheet) | 6,133 | 1,379 | 7 | | |
| | LeGrande Transmission Line (spreadsheet) | 4,925 | 15,431 | 1,642 | | |
| *Reservoir Clearing* | Reservoir Clearning (spreadsheet) | 1,435,060 | 108,263 | 5,670 | | |
| **Phase Total** | | 9,301,746 | 817,377 | 47,051 | 9,880,993 | 7,811,123 |
| *Per Day* | | 8,456 | 743 | 43 | 8,983 | 7,101 |
| *Per year* | | 1,860,349 | 163,475 | 9,410 | 1,976,199 | 1,562,225 |

| Alternative 1-3 Totals | Diesel (gal) | Gasoline (gal) | Grading/Dozing (hours) | Truck Loading (tons) | Batch Plant (cy) |
|---|---|---|---|---|---|
| *EMFAC Input Alt Total* | 17,901,749 | 1,886,795 | 244,136 | 38,076,266 | 10,755,167 |

| **Emissions Summary** | | | | | |
|---|---|---|---|---|---|
| ***Exhaust (Off-Road)*** | | | | | |
| ROG (tons) | 164 | | | | |
| NOX (tons) | 1,304 | | | | |
| PM10 Exhaust (tons) | 48 | | | | |
| CO2 (tons) | 218,172 | | | | |
| CO2 (MT) | 196,355 | | | | |
| ***Exhaust (Marine Vessel)*** | | | | | |
| ROG (tons) | 6 | | | | |
| NOX (tons) | 100 | | | | |
| PM10 Exhaust (tons) | 3 | | | | |
| CO2 (tons) | 7,311 | | | | |
| CO2 (MT) | 6,580 | | | | |
| ***Fugitive Dust Summary*** | | | | | |
| pounds/activity | | | 149,460 | 4,601 | 3,125,451 |
| tons/activity | | | 75 | 2 | 1,563 |
| PM10 Dust Alt Total (tons) | 1,640 | | | | |
| | | | | | |
| ***Alternative Average*** | | | | | |
| ROG (TPY) | 17 | | | | |
| NOX (TPY) | 140 | | | | |
| PM10 (TPY) | 5 | | | | |
| PM10 Dust | 164 | | | | |
| CO2 (MT/YR) | 20,293 | | | | |

* See "Exhaust Emission Factors" sheet for marine vessel exhaust calculations

## On-Road Emissions Summary Alternative 4

*this sheet summarizes exhaust and dust emissions from the use of on-road vehicles (worker commute and haul trucks) for alternative 4*

| | Exhaust | | Fugitive Dust Sources | | |
|---|---|---|---|---|---|
| **Phase 1 Activities** | **Haul Trip VMT** | **Worker VMT** | **Heavy DutyTravel on Paved Road VMT** | **Heavy DutyTravel on Unpaved Road VMT** | **Worker Commute on Paved Roads VMT** |
| | 49,560 | 2,323,160 | 44,604 | 4,956 | 2,323,160 |
| *Site Access and Staging* | 5,880 | 9,602,040 | 5,292 | 588 | 9,602,040 |
| | 37,520 | 364,280 | 33,768 | 3,752 | 364,280 |
| | 55,840 | 0 | 50,256 | 5,584 | 0 |
| *Cofferdam Material Processing* | 0 | 2,693,600 | 0 | 0 | 2,693,600 |
| *Marine Cofferdam Work* | 0 | 2,693,600 | 0 | 0 | 2,693,600 |
| | 130,480 | 1,759,940 | 117,432 | 13,048 | 1,759,940 |
| *Diversion Tunnel* | 20,860 | 0 | 18,774 | 2,086 | 0 |
| | 52,824 | 0 | 47,542 | 5,282 | 0 |
| **Phase Total** | 352,964 | 19,436,620 | 317,668 | 35,296 | 19,436,620 |
| *Per Day* | 458 | 25,242 | 413 | 46 | 25,242 |
| *Per year* | 100,847 | 5,553,320 | 90,762 | 10,085 | 5,553,320 |

| **Phase 2 Activities** | **Haul Trip VMT** | **Worker VMT** | **Heavy DutyTravel on Paved Road** | **Heavy DutyTravel on Unpaved Road** | **Worker Commute on Paved Roads** |
|---|---|---|---|---|---|
| | 170,660 | 5,275,900 | 153,594 | 17,066 | 5,275,900 |
| *Powerhouse/Valve house* | 96,320 | 0 | 86,688 | 9,632 | 0 |
| | 72,008 | 0 | 64,807 | 7,201 | 0 |
| *Intake Structure* | 270,620 | 1,473,710 | 243,558 | 27,062 | 1,473,710 |
| *Tunnel Connection* | 0 | 1,473,710 | 0 | 0 | 1,473,710 |
| **Phase Total** | 609,608 | 8,223,320 | 548,647 | 60,961 | 8,223,320 |
| *Per Day* | 693 | 9,345 | 623 | 69 | 9,345 |
| *Per year* | 152,402 | 2,055,830 | 137,162 | 15,240 | 2,055,830 |

| Phase 3 Activities | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road | Heavy DutyTravel on Unpaved Road | Worker Commute on Paved Roads |
|---|---|---|---|---|---|
| *Dam Material Processing* | 0 | 4,700,920 | 0 | 0 | 4,700,920 |
| *Complete Cofferdams* | 0 | 931,560 | 0 | 0 | 931,560 |
| *Foundation Preparation* | 180,040 | 1,687,000 | 162,036 | 18,004 | 1,687,000 |
| *RCC Arch Dam* | 10,293,080 | 10,373,860 | 9,263,772 | 1,029,308 | 10,373,860 |
| *Reclamation and Demobilzation* | 0 | 137,200 | 0 | 0 | 137,200 |
| | 82,600 | 813,400 | 74,340 | 8,260 | 813,400 |
| | 47,800 | 273,200 | 43,020 | 4,780 | 273,200 |
| | 0 | 15,960 | 0 | 0 | 15,960 |
| *Affected Existing Facilities* | 87,220 | 0 | 78,498 | 8,722 | 0 |
| | 342,800 | 0 | 308,520 | 34,280 | 0 |
| | 1,800 | 0 | 1,620 | 180 | 0 |
| | 7,520 | 0 | 6,768 | 752 | 0 |
| *Reservoir Clearing* | 411,800 | 3,518,600 | 370,620 | 41,180 | 3,518,600 |
| **Phase Total** | 11,454,660 | 22,451,700 | 10,309,194 | 1,145,466 | 22,451,700 |
| *Per Day* | 10,413 | 20,411 | 9,372 | 1,041 | 20,411 |
| *Per year* | 2,290,932 | 4,490,340 | 2,061,839 | 229,093 | 4,490,340 |

| Alternative 1-3 Totals | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road | Heavy DutyTravel on Unpaved Road | Worker Commute on Paved Roads |
|---|---|---|---|---|---|
| *EMFAC Input Alt Total* | 12,417,232 | 50,111,640 | 11,175,509 | 1,241,723 | 50,111,640 |

| Emissions Summary | | | | | |
|---|---|---|---|---|---|
| ***Alternative Total by Source*** | | | | | |
| ROG (tons) | 4 | 2 | | | |
| NOX (tons) | 86 | 7 | | | |
| PM10 Exhaust (tons) | 2 | 0.10 | | | |
| PM10 Dust (tons) | | | 14 | 7 | 9 |
| CO2 (tons) | 23,810 | 20,818 | | | |
| CO2 (MT) | 21,429 | 18,736 | | | |
| ***Alternative Total*** | | | | | |
| ROG (tons) | 6 | | | | |
| NOX (tons) | 94 | | | | |
| PM10 Exhaust (tons) | 2 | | | | |
| PM10 Dust (tons) | 30 | | | | |
| CO2 (tons) | 40,165 | | | | |
| CO2 (MT) | 36,148 | | | | |
| ***Alternative Average*** | | | | | |
| ROG (TPY) | 1 | | | | |
| NOX (TPY) | 9 | | | | |
| PM10 (TPY) | 0 | | | | |
| PM10 Dust | 3 | | | | |
| CO2 (MT/YR) | 3,615 | | | | |

## Emissions Summary by Phase Alternative 4

*This sheet summarizes the total mass emissions on a per phase basis for alternatives 1-3*

| | Off-Road Emissions | | | | | | On-Road Emissions | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Phase 1** | off road diesel | off road gas | total fuel | grading hours | truck loading tons | batch plant (cy) | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road VMT | Heavy DutyTravel on Unpaved Road VMT | Worker Commute on Paved Roads VMT |
| | 1,995,077 | 88,012 | 2,083,088 | 51,038 | 7,442,729 | 794,650 | 100,847 | 5,553,320 | 90,762 | 10,085 | 5,553,320 |
| **Emissions Summary** | | | | | | | | | | | |
| ***Exhaust*** | | | | | | | | | | | |
| ROG (tons) | | | 17 | | | | 0.03 | 0.25 | | | |
| NOX (tons) | | | 137 | | | | 0.70 | 0.80 | | | |
| PM10 Exhaust (tons) | | | 5 | | | | 0.01 | 0.01 | | | |
| CO2 (tons) | | | 22,966 | | | | 193 | 2,307 | | | |
| CO2 (MT) | | | 20,670 | | | | 174 | 2,076 | | | |
| ***Exhaust (Marine Vessel)*** | | | | | | | | | | | |
| ROG (tons) | 3 | | | | | | | | | | |
| NOX (tons) | 50 | | | | | | | | | | |
| PM10 Exhaust (tons) | 1 | | | | | | | | | | |
| CO2 (tons) | 3,656 | | | | | | | | | | |
| CO2 (MT) | 3,290 | | | | | | | | | | |
| ***Fugitive Dust*** | | | | | | | | | | | |
| Batch Plant/Quarry (lbs) | | | | | | 230,925 | | | | | |
| PM10 Dust (tons) | | | | 16 | 0.45 | 115 | | | 0.11 | 0.06 | 1 |

| Phase 1 Total (TPY) | |
|---|---|
| ROG | 21 |
| NOX | 189 |
| PM10 Exhaust | 6.4 |
| PM2.5 Exhaust | |
| PM10 Dust | 133 |
| PM2.5 Dust | |
| CO2 (MT) | 26,210 |

| **Phase 2** | off road diesel | off road gas | total fuel | grading hours | truck loading tons | batch plant (cy) | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road VMT | Heavy DutyTravel on Unpaved Road VMT | Worker Commute on Paved Roads VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 404,309 | 190,344 | 594,653 | 4,613 | 536,430 | 40,692 | 152,402 | 2,055,830 | 137,162 | 15,240 | 2,055,830 |
| **Emissions Summary** | | | | | | | | | | | |
| ***Exhaust*** | | | | | | | | | | | |
| ROG (tons) | | | 5 | | | | 0.05 | 0.091 | | | |
| NOX (tons) | | | 39 | | | | 1.06 | 0.296 | | | |
| PM10 Exhaust (tons) | | | 1 | | | | 0.02 | 0.004 | | | |
| CO2 (tons) | | | 6,556 | | | | 292.23 | 854.1 | | | |
| CO2 (MT) | | | 5,901 | | | | 263 | 769 | | | |
| ***Fugitive Dust*** | | | | | | | | | | | |
| Batch Plant/Quarry (lbs) | | | | | | 11,825.08 | | | | | |
| PM10 Dust (tons) | | | | 1.41 | 0.03 | 5.91 | | | 0.17 | 0.09 | 0.36 |

| Phase 2 Total (TPY) | |
|---|---|
| ROG | 5.06 |
| NOX | 40.53 |
| PM10 Exhaust | 1.47 |
| PM2.5 Exhaust | |
| PM10 Dust | 7.97 |
| PM2.5 Dust | |
| CO2 (MT) | 6,932 |

| Phase 3 | off road diesel | off road gas | total fuel | grading hours | truck loading tons | batch plant (cy) | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road VMT | Heavy DutyTravel on Unpaved Road VMT | Worker Commute on Paved Roads VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Emissions Summary** | 1,860,349 | 163,475 | 2,023,825 | 9,410 | 1,976,199 | 1,562,225 | 2,290,932 | 4,490,340 | 2,061,839 | 229,093 | 4,490,340 |
| ***Exhaust*** | | | | | | | | | | | |
| ROG (tons) | | | 17 | | | | 0.70 | 0.20 | | | |
| NOX (tons) | | | 133 | | | | 15.92 | 0.65 | | | |
| PM10 Exhaust (tons) | | | 5 | | | | 0.29 | 0.01 | | | |
| CO2 (tons) | | | 22,313 | | | | 4393 | 1865 | | | |
| CO2 (MT) | | | 20,082 | | | | 3954 | 1679 | | | |
| ***Exhaust (Marine Vessel)*** | | | | | | | | | | | |
| ROG (tons) | 3 | | | | | | | | | | |
| NOX (tons) | 50 | | | | | | | | | | |
| PM10 Exhaust (tons) | 1 | | | | | | | | | | |
| CO2 (tons) | 3,656 | | | | | | | | | | |
| CO2 (MT) | 3,290 | | | | | | | | | | |
| ***Fugitive Dust*** | | | | | | | | | | | |
| Batch Plant/Quarry (lbs) | | | | | | 453982.46 | | | | | |
| PM10 Dust (tons) | | | | 2.88 | 0.12 | 226.9912286 | | | 2.496742562 | 1.35821534 | 0.785256188 |
| **Phase 3 Total (TPY)** | | | | | | | | | | | |
| ROG | 21 | | | | | | | | | | |
| NOX | 200 | | | | | | | | | | |
| PM10 Exhaust | 7 | | | | | | | | | | |
| PM2.5 Exhaust | | | | | | | | | | | |
| PM10 Dust | 234.63 | | | | | | | | | | |
| PM2.5 Dust | | | | | | | | | | | |
| CO2 (MT) | 29,004 | | | | | | | | | | |

## Phasing Summary

*this sheet summarizes the activities within each phase and the associated sources of construction equipment estimates for each.*

| **Schedule** | |
|---|---|
| ***Phase 1*** | ***Source for fuel consumption and equipment hours*** |
| Site Access and Staging | Contractor Use Area (spreadsheet) |
| | Transmission (spreadsheet) |
| | Haul Roads (spreadsheet) |
| | PermRoads (spreadsheet) |
| | USJRB - RM274 - Subgrp A - Fine Gold Crk Brdge - 2013 (PDF) |
| | USJRV - RM274 - Subgrp E - Pwrplt Acc Rd Brdg - 2013 (PDF) |
| Cofferdam Material Processing | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (PDF) |
| Marine Cofferdam Work | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (PDF) |
| Diversion Tunnel | USJRB - Subgrp B - Outlet Works Tunnel - March 2013 (PDF) |
| ***Phase 2*** | |
| Powerhouse/Valve house | PH&Row (spreadsheet) |
| Intake Structure | LLIS (Alt1-3)/SLIS (Alt. 4) (spreadsheet) |
| Tunnel Connection | LLIS (Alt1-3)/SLIS (Alt. 4) (spreadsheet) |
| ***Phase 3*** | |
| Dam Material Processing | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) |
| Complete Cofferdams | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (PDF) |
| Foundation Preparation | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) |
| RCC Arch Dam | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) |
| | USJRB - RM274 - Subgrp C - Spillway Curved Arch Dam - 2013 - 1 (PDF) |
| Reclamation and Demobilzation | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) |
| Affected Existing Facilities | Kerckhoff Decom (spreadsheet) |
| | Recreation (spreadsheet) |
| | Utilities (spreadsheet) |
| | LeGrande Transmission Line (spreadsheet) |
| Reservoir Clearing | Reservoir Clearning (spreadsheet) |

## Conversion Factors and Dust Emission Factors

*this sheet contains common conversion factors and construction timing assumptions used throughout this entire spreadsheet as well as calculated emission factors for fugitive dust emissions based on EPA's AP-42*

### Construction Timing

| | Years | days |
|---|---|---|
| Phase 1 | 3.5 | 770 |
| Phase 2 | 4 | 880 |
| Phase 3 | 5 | 1100 |
| Alternatives | 10 | |

### Conversions

| | Units | Source |
|---|---|---|
| 220 | days/yr | conversion |
| 8 | hours/day | conversion |
| 2000 | lbs/ton | conversion |
| 0.9 | ton/mt | conversion |
| 1.3 | tons/cubic yard | calEEMod v2013.2 |
| 2.3 | mph= 1m/s | conversion |
| 0.1 | % unpaved roads | assumption |
| 453.6 | g/lb | conversion |
| 1.34 | hp/kW | conversion |

### Fugitive Dust Emissions

*This section provides calculated emission factors for the various sources of fugitive dust emissions using formulas from EPS's AP-42*

1 Bulldozing/Grading/Scraping

*Equation is applied to dozers/scrapers, and graders to estimate fugitive dust from grading activity*

*Emissions factors for P10 from bulldozing are scaled from those of PM15*

**E(lbs/hr)=C(PM15)*s^1.5/M^1.5** **Where** **E(PM10)=E(PM15)*F(PM10)**

**PM15**

| Where: | | Unit | Source |
|---|---|---|---|
| C= coeffiecient | 1 | constant | AP-42 Table 11.9-1, PM15,overburden |
| M= material moisture content | 7.9 | % | AP-42 Table 11.9-3,Overburden |
| s= material silt content | 6.9 | % | AP-42 Table 11.9-3,Overburden |
| F= scaling factor | 0.75 | constant | AP-42 Table 11.9-1, PM10 Bulldozing |

| Emission Factors | | | |
|---|---|---|---|
| | **PM15** | **0.82** | lbs/hr |
| | **PM10** | **0.61** | lbs/hr |
| | **PM10** | **0.00031** | tons/hr |

*Source: EPA 1998. AP-42 Chapter 11.9 Mineral Products Industry, Western Surface Coal Mining, Equation 11.9-1 Bulldozing*

2 Batch Plant

| Batching Operations | Emission Factor PM10 (lbs/cy) | Emission Factor PM2.5 (lbs/cy) |
|---|---|---|
| Aggregate Transfer | 0.0031 | 0.00047 |
| Sand Transfer | 0.0007 | 0.00011 |
| Cement unloading | 0.113 | 0.0152 |
| Cement supplement unloading | 0.04 | 0.0054 |
| weigh hopper loading | 0.13 | 0.0175 |
| Mixer loading (central mix) | 0.0038 | 0.00058 |

*Source: SMAQMD 2010 (June 28). Concrete Batching Operations Policy Manual. Last updated March 31, 2011.*

3 Truck Loading

*Emissions result from several distinct processes within the stockpiling/loading cycle: 1. loading in of materials through batch or drop operations, 2. equipment traffic in storage areas, 3. wind erosion of piles, 4. loadout of material through batch or drop operations*

**E(lb/ton)=(k)(0.0032)(U/5)^1.3/(M/2)^1.4**

| Where: | PM10 | Unit | Source |
|---|---|---|---|
| k= Particle Size Multiplier: | 0.35 | lbs/ton | AP-42 Chapter 13.2.4-3, PM10 emissions |
| U=mean wind speed | 2.7 | m/s | CalEEMod wind speed for San Joquin County |
| U=mean wind speed | 6.2 | mph | Calculation based on wind speed for San Joaquin County from CalEEMod |
| M=moisture content (%) | 12.0 | constant | AP-42 Chapter 13.2.4-3, Table 13.2.4-1, as used by CalEEMod |
| Emission Factor | **0.000120827** | **lbs/ton** | |
| | **0.0000000604** | **tons pm10/ton** | |

*Source: EPA 1998. AP-42 Chapter 13.2 Miscelaneous Sources, Aggregate Handling and Storage Piles*

4 Travel on Unpaved Roads (Heavy Duty Trucks)

**E(lbs/VMT)=(k)(s/12)^a (W/3)^b**

| Where: | PM10 | Unit | Source |
|---|---|---|---|
| k= Particle Size Multiplier: | 1.5 | lbs/VMT | AP-42 Chapter 13.2.2-2, PM10 emissions; industrial roads |
| s= Silt Content | 0.043 | constant | AP-42 Chapter 13.2.2-2, service roads |
| a= constant | 0.9 | constant | AP-42 Chapter 13.2.2-2, industrial roads |
| b= constant | 0.45 | constant | AP-42 Chapter 13.2.2-2, industrial roads |
| W=Vehicle Weight | 14 | tons | Average weight of loaded and unloaded truck: assumed empty truck weights 2 tons, 20 CY truck capacity and 1 CY of fill equals 1.3 tons ((2+(20cy*1.3 tons+2))/2) |
| | 0.01 | lbs/VMT | |
| | 0.0000069 | tons/VMT | |

Correction for Natural Precipitation

**E(ext)=E[(365-P)/365]**

| Where: | | Unit | Source |
|---|---|---|---|
| P=#days/yr with>=0.01 precip | 51 | inches | CalEEMod for San Joaquin County |
| Emission Factors | **0.012** | **lbs/VMT** | |
| | **0.0000059** | **tons/VMT** | |

*Source: EPA 1998. AP-42 Chapter 13.2 Miscelaneous Sources, Unpaved Roads*

5 Travel on Paved Roads (Heavy Duty Trucks and Worker Commute)

**E(lbs/VMT)=(k)(sL)^.91 (W)^1.02**

| Where: | PM10 | Unit | Source |
|---|---|---|---|
| k= Particle Size Multiplier: | 0.0022 | lbs/VMT | AP-42 Chapter 13.2.1, Table 13.2.1-1, PM10 emissions |
| sL= road surface silt loading | 0.06 | g/m^2 | AP-42 Chapter 13.2.1, Table 13.2.1-2 |
| W=Vehicle Weight | 2.1 | tons | Worker Commute Vehicle Weight Calculation shown below |
| W=Vehicle Weight | 14 | tons | Heavy Duty Average weight of loaded and unloaded truck: assumed empty truck weights 2 tons, 20 CY truck capacity and 1 CY of fill equals 1.3 tons ((2+(20cy*1.3 tons+2))/2) |
| | 0.000362413 | lbs/vmt | Worker Vehicle |
| | 0.002509521 | lbs/vmt | Heav Duty Vehicle |

Correction for Natural Precipitation

E(ext)=E[(1-P/4N)]

| Where: | | Unit | Source |
|---|---|---|---|
| P=#days/yr with>=0.01 precip | 51 | days | CalEEMod for San Joaquin County |
| N=# days in averaging period | 365 | days | NA |

| | | | |
|---|---|---|---|
| Emission Factors | **0.000349754** | **lbs/vmt** | Worker Vehicle |
| | **0.000000175** | **tons/vmt** | Worker Vehicle |
| | **0.002421860** | **lbs/vmt** | Heavy Duty Vehicle |
| | **0.000001211** | **tons/vmt** | Heavy Duty Vehicle |

| ***Worker Commute Vehicle Weight Calculation*** | | Units | Source |
|---|---|---|---|
| Vehicle class for worker trips | LDA, LDT1, LDT2 | NA | default value in CalEEMod's for Trips/VMT in the Construction module |
| Weight | 4230 | lb | average of vehicle categoriy weight (LDA-3,190 lbs, LDT1-3,750 lbs, LDT2-5,750 lbs) from EMFAC2011 |
| Mass conversion | 2000 | lb/ton | conversion |
| Weight | 2.12 | ton | calculation |

*Source: EPA 1998. AP-42 Chapter 13.2 Miscelaneous Sources, Paved Roads*

## Exhaust Emissions (Off-Road and On-Road Vehicles)

*this sheet provides calculations of emission factors from off-road fuel consumption based on OFFROAD 2007, on-road exhaust emissions from haul trucks and worker commute based on EMFAC 2011 and AP-42, and exhaust emissions from marine vessels, and is used to estimate exhaust emissions from construction activities.*

### Fuel Consumption/Emissions (off-road equipment)

OFFROAD 2007: San Joaquin County, 2015

| Equipment | MaxHP | Population | Activity (hr/day) | Consumption (gal/day) | ROG Exhaust (tons/day) | NOX Exhaust (tons/day) | CO2 (tons/day) | PM Exhaust (tons/day) |
|---|---|---|---|---|---|---|---|---|
| Pavers | 500 | 102 | 233 | 2470 | 0.02 | 0.21 | 27.18 | 0.01 |
| Rollers | 500 | 219 | 420 | 4172 | 0.03 | 0.29 | 46.02 | 0.01 |
| Scrapers | 500 | 1239 | 3773 | 55045 | 0.54 | 4.54 | 605.85 | 0.18 |
| Surfacing Equipment | 500 | 65 | 80 | 804 | 0.01 | 0.06 | 8.87 | 0.00 |
| Trenchers | 500 | 66 | 114 | 1610 | 0.02 | 0.14 | 17.71 | 0.01 |
| Bore/Drill Rigs | 500 | 230 | 531 | 7474 | 0.03 | 0.20 | 82.65 | 0.01 |
| Excavators | 500 | 2770 | 10786 | 114105 | 0.85 | 6.26 | 1259.39 | 0.22 |
| Cranes | 500 | 343 | 1203 | 9821 | 0.08 | 0.71 | 108.28 | 0.03 |
| Graders | 500 | 72 | 189 | 1962 | 0.02 | 0.13 | 21.63 | 0.00 |
| Off-Highway Trucks | 500 | 875 | 4763 | 58730 | 0.47 | 3.37 | 648.03 | 0.12 |
| Crushing/Proc. Equipment | 500 | 138 | 362 | 6129 | 0.04 | 0.39 | 67.66 | 0.01 |
| Rough Terrain Forklifts | 500 | 32 | 100 | 1165 | 0.01 | 0.07 | 12.86 | 0.00 |
| Rubber Tired Loaders | 500 | 2232 | 5963 | 64012 | 0.50 | 4.17 | 706.05 | 0.15 |
| Rubber Tired Dozers | 500 | 488 | 2172 | 26196 | 0.32 | 2.60 | 287.46 | 0.11 |
| Tractors/Loaders/Backhoes | 500 | 1136 | 3005 | 46887 | 0.31 | 2.41 | 517.70 | 0.08 |
| Crawler Tractors | 500 | 2048 | 5859 | 68924 | 0.67 | 5.56 | 758.75 | 0.21 |
| Other Construction Equipment | 500 | 589 | 1131 | 13007 | 0.07 | 0.67 | 143.69 | 0.02 |
| Totals | | | | 482513 | 3.9930186 | 31.7854338 | 5319.7855180 | 1.1715923 |
| Tons/gal | | | | | 0.0000082755 | 0.0000658748 | 0.0110251616 | 0.0000024281 |

| Emission Factor | ROG | NOX | PM Exh | CO2 |
|---|---|---|---|---|
| Tons/gal | 0.0000083 | 0.0000659 | 0.0000024 | 0.0110252 |
| lbs/gal | 0.016550921 | 0.131749502 | 0.004856209 | 22.05032328 |

### On-Road (Commute and Haul Trip) Exhaust Emission Factors

*EMFAC2011 Emission Rates* *Region Type: County* *Region: San Joaquin* *Calendar Year: 2015* *Season: Summer* *Vehicle Classification: EMFAC2007 Categories*

**Raw Emission Factors from EMFAC2011**

| Veh_Class | Fuel | MdlYr | Speed (miles/hr) | Population (vehicles) | VMT (miles/day) | Trips (trips/day) | ROG_RUNEX (gms/mile) | NOX_RUNEX (gms/mile) | CO2_RUNEX (gms/mile) | PM10_RUNEX (gms/mile) | PM2_5_RUNEX (gms/mile) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LDA | GAS | Aggregated | Aggregated | 221,452 | 8,373,837 | 1,395,737 | 0.035 | 0.104 | 374.205 | 0.002 | 0.002 |
| LDA | DSL | Aggregated | Aggregated | 711 | 24,969 | 4,237 | 0.034 | 0.589 | 386.822 | 0.024 | 0.022 |
| LDT1 | GAS | Aggregated | Aggregated | 32,747 | 1,170,489 | 198,959 | 0.091 | 0.276 | 428.735 | 0.004 | 0.003 |
| LDT1 | DSL | Aggregated | Aggregated | 43 | 1,417 | 230 | 0.055 | 0.642 | 391.012 | 0.045 | 0.041 |
| LDT2 | GAS | Aggregated | Aggregated | 74,971 | 2,892,650 | 470,876 | 0.049 | 0.196 | 508.491 | 0.002 | 0.002 |
| LDT2 | DSL | Aggregated | Aggregated | 39 | 1,453 | 227 | 0.039 | 0.653 | 387.562 | 0.030 | 0.028 |
| T7 | GAS | Aggregated | Aggregated | 57 | 8,199 | 1,131 | 0.719 | 4.428 | 580.568 | 0.001 | 0.001 |
| T7 | DSL | Aggregated | Aggregated | 6,429 | 1,104,570 | 0 | 0.279 | 6.306 | 1739.505 | 0.113 | 0.104 |
| **Total** | | | | | **13,577,584** | | | | | | |

**Ratio of Vehicle/Fuel Type to Total VMT**

| Veh | Fuel | Ratio |
|---|---|---|
| LDA | GAS | 61.7% |
| LDA | DSL | 0.2% |
| LDT1 | GAS | 8.6% |

**On-Road Emission Factor Calculations**

| | Worker (light duty)[1] | | | Haul Truck (heavy duty)[2] | | |
|---|---|---|---|---|---|---|
| Pollutant | g/mile | lbs/mile | tons/mile | g/mile | lbs/mile | tons/mile |
| ROG | 0.0400233 | 8.82364E-05 | 0.00000004 | 0.279 | 0.00061444 | 0.00000031 |
| NOX | 0.1305610 | 0.000287838 | 0.00000014 | 6.306 | 0.013902 | 0.00000695 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LDT1 | DSL | 0.0% | PM10 | 0.0018070 | 3.98378E-06 | 0.00000000 | 0.113 | 0.0002495 | 0.00000012 |
| LDT2 | GAS | 21.3% | PM2.5 | 0.0016487 | 3.63482E-06 | 0.00000000 | 0.104 | 0.00022954 | 0.00000011 |
| LDT2 | DSL | 0.0% | CO2 | 376.87 | 0.830862056 | 0.00041543 | 1,740 | 3.83495297 | 0.00191748 |

1. Emission factors calculated based on the composite mix light duty vehicles (LDA, LDT1, LDT2) and the ratio of vehicle/fuel type to total VMT
2. CalEEMod assumes that Heavy-Heavy Diesel Trucks (HHDT) are used to haul materials and equipment during construction. Therefore, haul truck emissions are estimated using EMFAC2011 emission factors for a Heavy-Heavy Duty Diesel CA International Registration Plan Construction Truck (T7 CAIRP construction).

## Marine Vessels

Emission Factor Algorithm

**E= a*(fractional Load)^(x)+b**

| | a | Fractional Load | x | b |
|---|---|---|---|---|
| ROG | 0.0667 | 20% | -1.5 | 0 |
| NOx | 0.1255 | 20% | -1.5 | 10.4496 |
| PM | 0.0059 | 20% | -1.5 | 0.2551 |
| CO2 | 44.1 | 20% | -1 | 648.6 |

| Emission Factors | g/kWh | g/bhp-hr | Adjusted g/bhp-hr |
|---|---|---|---|
| ROG | 0.75 | 1.0 | 0.20 |
| NOx | 11.85 | 15.9 | 3.18 |
| PM | 0.32 | 0.4 | 0.09 |
| CO2 | 869.10 | 1165.5 | 233.10 |

Load Factor 0.2

*Source:EPA 2000. p. 5-2. Emission factors are calculated using the Emission Factor Algorithm and pollutant factors. 20% is the fractional load for many harborcraft when maneuvering. See Table 4-2 on p. 4-13. It is assumed that all of the PM emissions are PM10.*

## Project Boat Emissions

*boats would be used during the marine cofferdam work during phase 1 and to complete the cofferdam in phase 3. Thus, boat hours and emissions are divided evenly between these two activities.*

| Boats | HP | source | Total Work | phase 1 / 2 hrs |
|---|---|---|---|---|
| Speed Boat | 250 | assumed | 82 | 41 |
| Tug Boat | 900 | applicant | 31,593 | 15,797 |

**Speed Boat Emissions (Phase 1/ Phase 2)**

| pollutant | g/phase | lbs/phase | tons/phase |
|---|---|---|---|
| ROG | 2,050 | 5 | 0.0023 |
| NOX | 32,584 | 72 | 0.0359 |
| PM10 | 883 | 2 | 0.0010 |
| CO2 | 2,389,239 | 5,267 | 2.6 |

**Tug Boat Emissions (Phase 1/ Phase 2)**

| pollutant | g/phase | lbs/phase | tons/phase |
|---|---|---|---|
| ROG | 2,843,480 | 6,269 | 3 |
| NOX | 45,194,730 | 99,637 | 50 |
| PM10 | 1,224,224 | 2,699 | 1 |
| CO2 | 3,313,897,409 | 7,305,893 | 3,653 |

## On-Road Vehicle Miles Traveled

*This sheet includes trip numbers provided by the project applicant for each phase/alternative as well as VMT calculation used to estimate exhaust dust emissions from material hauling and travel on paved/unpaved roads*

### Material Haul VMT

| Construction Activity | Route Number | one way (miles) | round trip length (miles) | Alternative 1 Trips | Alternative 1 VMT | Alternative 2 Trips | Alternative 2 VMT | Alternative 3 Trips | Alternative 3 VMT | Alternative 4 Trips | Alternative 4 VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 35 | 70 | 708 | 49,560 | 708 | 49,560 | 708 | 49,560 | 708 | 49,560 |
| *Site Access and Staging* | 2 | 70 | 140 | 42 | 5,880 | 42 | 5,880 | 42 | 5,880 | 42 | 5,880 |
| | 3 | 35 | 70 | 536 | 37,520 | 536 | 37,520 | 536 | 37,520 | 536 | 37,520 |
| | 11 | 20 | 40 | 1,396 | 55,840 | 1,396 | 55,840 | 1,396 | 55,840 | 1,396 | 55,840 |
| *Cofferdam Material Processing* | 2 | 70 | 140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Marine Cofferdam Work* | 2 | 70 | 140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 35 | 70 | 1,864 | 130,480 | 1,864 | 130,480 | 1,864 | 130,480 | 1,864 | 130,480 |
| *Diversion Tunnel* | 3 | 35 | 70 | 298 | 20,860 | 298 | 20,860 | 298 | 20,860 | 298 | 20,860 |
| | 10 | 2 | 4 | 13,206 | 52,824 | 13,206 | 52,824 | 13,206 | 52,824 | 13,206 | 52,824 |
| | 1 | 35 | 70 | 2,438 | 170,660 | 2,438 | 170,660 | 2,438 | 170,660 | 2,438 | 170,660 |
| *Powerhouse/Valve House* | 3 | 35 | 70 | 1,376 | 96,320 | 1,376 | 96,320 | 1,376 | 96,320 | 1,376 | 96,320 |
| | 10 | 2 | 4 | 18,002 | 72,008 | 18,002 | 72,008 | 18,002 | 72,008 | 18,002 | 72,008 |
| *Intake Structure* | 1 | 35 | 70 | 1,752 | 122,640 | 1,752 | 122,640 | 1,752 | 122,640 | 3,866 | 270,620 |
| *Tunnel Connection* | 1 | 35 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Dam Material Processing* | 2 | 70 | 140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Complete Cofferdams* | 2 | 70 | 140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Foundation Preparation* | 2 | 70 | 140 | 1,286 | 180,040 | 1,286 | 180,040 | 1,286 | 180,040 | 1,286 | 180,040 |
| *RCC Arch Dam* | 2 | 70 | 140 | 73,522 | 10,293,080 | 73,522 | 10,293,080 | 73,522 | 10,293,080 | 73,522 | 10,293,080 |
| *Reclamation and Demobilization* | 2 | 70 | 140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 4 | 50 | 100 | 826 | 82,600 | 826 | 82,600 | 826 | 82,600 | 826 | 82,600 |
| | 5 | 50 | 100 | 478 | 47,800 | 478 | 47,800 | 478 | 47,800 | 478 | 47,800 |
| | 2 | 70 | 140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Affected Existing Facilities* | 6 | 35 | 70 | 1,246 | 87,220 | 1,246 | 87,220 | 1,246 | 87,220 | 1,246 | 87,220 |
| | 7 | 25 | 50 | 6,856 | 342,800 | 6,856 | 342,800 | 6,856 | 342,800 | 6,856 | 342,800 |
| | 8 | 30 | 60 | 30 | 1,800 | 30 | 1,800 | 30 | 1,800 | 30 | 1,800 |
| | 9 | 20 | 40 | 188 | 7,520 | 188 | 7,520 | 188 | 7,520 | 188 | 7,520 |
| *Reservoir Clearing* | 7 | 25 | 50 | 8,236 | 411,800 | 8,236 | 411,800 | 8,236 | 411,800 | 8,236 | 411,800 |

### Worker Commute VMT

| Construction Activity | Route Number | one way (miles) | round trip length (miles) | Alternative 1 Trips | Alternative 1 VMT | Alternative 2 Trips | Alternative 2 VMT | Alternative 3 Trips | Alternative 3 VMT | Alternative 4 Trips | Alternative 4 VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 35 | 70 | 33,188 | 2,323,160 | 33,188 | 2,323,160 | 33,188 | 2,323,160 | 33,188 | 2,323,160 |
| *Site Access and Staging* | 2 | 70 | 140 | 68,586 | 9,602,040 | 68,586 | 9,602,040 | 68,586 | 9,602,040 | 68,586 | 9,602,040 |
| | 3 | 35 | 70 | 5,204 | 364,280 | 5,204 | 364,280 | 5,204 | 364,280 | 5,204 | 364,280 |
| *Cofferdam Material Process and Marine Cofferdam Work* | 2 | 70 | 140 | 38,480 | 5,387,200 | 38,480 | 5,387,200 | 38,480 | 5,387,200 | 38,480 | 5,387,200 |
| *Diversion Tunnel* | 3 | 35 | 70 | 25,142 | 1,759,940 | 25,142 | 1,759,940 | 25,142 | 1,759,940 | 25,142 | 1,759,940 |
| *Powerhouse/Valve House* | 3 | 35 | 70 | 75,370 | 5,275,900 | 75,370 | 5,275,900 | 75,370 | 5,275,900 | 75,370 | 5,275,900 |
| *Intake Structure and Tunnel Connection* | 1 | 35 | 70 | 26,890 | 1,882,300 | 26,890 | 1,882,300 | 26,890 | 1,882,300 | 42,106 | 2,947,420 |
| *Dam Material Processing* | 2 | 70 | 140 | 33,578 | 4,700,920 | 33,578 | 4,700,920 | 33,578 | 4,700,920 | 33,578 | 4,700,920 |
| *Complete Cofferdams* | 1 | 35 | 70 | 13,308 | 931,560 | 13,308 | 931,560 | 13,308 | 931,560 | 13,308 | 931,560 |
| *Foundation Preparation* | 1 | 35 | 70 | 24,100 | 1,687,000 | 24,100 | 1,687,000 | 24,100 | 1,687,000 | 24,100 | 1,687,000 |
| *RCC Arch Dam* | 1 | 35 | 70 | 148,198 | 10,373,860 | 148,198 | 10,373,860 | 148,198 | 10,373,860 | 148,198 | 10,373,860 |
| *Reclamation and Demobilization* | 1 | 35 | 70 | 1,960 | 137,200 | 1,960 | 137,200 | 1,960 | 137,200 | 1,960 | 137,200 |
| | 4 | 50 | 100 | 8,134 | 813,400 | 8,134 | 813,400 | 8,134 | 813,400 | 8,134 | 813,400 |
| *Affected Existing Facilities* | 5 | 50 | 100 | 2,732 | 273,200 | 2,732 | 273,200 | 2,732 | 273,200 | 2,732 | 273,200 |
| | 2 | 70 | 140 | 114 | 15,960 | 114 | 15,960 | 114 | 15,960 | 114 | 15,960 |
| *Reservoir Clearing* | 5 | 50 | 100 | 35,186 | 3,518,600 | 35,186 | 3,518,600 | 35,186 | 3,518,600 | 35,186 | 3,518,600 |

# Material Quantities

*This sheet contains project data provided by the client on total aggegate/material quantities and is used to calculate fugitive dust emissions from truck loading/movement during constructionas well as batch plant throughput*

| | Alt 1 | | Alt 2 | | Alt 3 | | Alt 4 | |
|---|---|---|---|---|---|---|---|---|
| **Phase 1** | **cy** | **tons** | **cy** | **tons** | **cy** | **tons** | **cy** | **tons** |
| Excavation | 15,625,574 | 20,313,246 | 15,625,574 | 20,313,246 | 15,625,574 | 20,313,246 | 15,625,574 | 20,313,246 |
| Embanckment/Fill | 2,273,100 | 2,955,030 | 2,273,100 | 2,955,030 | 2,273,100 | 2,955,030 | 2,273,100 | 2,955,030 |
| Aggregate* | 2,139,443 | 2,781,276 | 2,139,443 | 2,781,276 | 2,139,443 | 2,781,276 | 2,139,443 | 2,781,276 |
| **Phase total** | **20,038,117** | **26,049,552** | **20,038,117** | **26,049,552** | **20,038,117** | **26,049,552** | **20,038,117** | **26,049,552** |
| **Phase 2** | | | | | | | | |
| Excavation | 898,848 | 1,168,502 | 898,848 | 1,168,502 | 898,848 | 1,168,502 | 946,848 | 1,230,902 |
| Embanckment/Fill | 626,500 | 814,450 | 626,500 | 814,450 | 626,500 | 814,450 | 626,500 | 814,450 |
| Aggregate* | 125,206 | 162,768 | 125,206 | 162,768 | 125,206 | 162,768 | 176,901 | 229,971 |
| **Phase total** | **1,650,554** | **2,145,720** | **1,650,554** | **2,145,720** | **1,650,554** | **2,145,720** | **1,750,249** | **2,275,324** |
| **Phase 3** | | | | | | | | |
| Excavation | 1,547,158 | 2,011,305 | 1,547,158 | 2,011,305 | 1,547,158 | 2,011,305 | 1,547,158 | 2,011,305 |
| Embanckment/Fill | 45,050 | 58,565 | 45,050 | 58,565 | 45,050 | 58,565 | 45,050 | 58,565 |
| Aggregate* | 6,008,556 | 7,811,123 | 6,008,556 | 7,811,123 | 6,008,556 | 7,811,123 | 6,008,556 | 7,811,123 |
| **Phase total** | **7,600,764** | **9,880,993** | **7,600,764** | **9,880,993** | **7,600,764** | **9,880,993** | **7,600,764** | **9,880,993** |
| Alternative total | 29,289,435 | 38,076,266 | 29,289,435 | 38,076,266 | 29,289,435 | 38,076,266 | 29,389,130 | 38,205,869 |

*aggregate would come from onsite batch plants and therefore aggregate quantities were used to estimate daily throughput of the batch plant to calculate fugitive dust emissions

**Temperance Flat Transmission Line Appraisal Level Equipment and Fuel Consumption Estima**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Service & Maintenance Equiptment** | | | |
| 3/4 Ton Pickup Truck 2x2 | 2,177 | 3,265 | - |
| 3/4 Ton Crew Cab Truck 4x4 | 2,177 | 3,265 | - |
| 40 Ton Hydraulic Crane (Grove700) | 2,177 | - | 5,224 |
| Drill Rig Truck Mount | 2,177 | - | 4,354 |
| 170 Hsp Bulldozer (Cat D6) | 2,177 | - | 10,884 |
| Subtotal: | 10,884 | 6,530 | 20,462 |
| | | | |
| **Total:** | **10,884** | **6,530** | **20,462** |
| Grading/Dozing/Scraper | **2,177** | | |

**Haul Roads Area A: Appraisal Level Equipment and Fuel Consumption Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthwork Equipment** | | | |
| 1.5 CY Backhoe (Cat 225) | 16 | 69 | 0 |
| 1.5 CY Backhoe (Cat 325) | 643 | 3,952 | 0 |
| 2.3 CY Backhoe (Cat 235) | 4,192 | 30,233 | 0 |
| 3.5 CY Loader (Cat 950) | 643 | 2,495 | 0 |
| 11.2 CY Loader (Cat 990) | 1,194 | 16,298 | 0 |
| 140 Hsp Grader (Cat 140) | 9,505 | 69,081 | 0 |
| 150 Hsp Grapple (Cat 527) | 642 | 3,883 | 0 |
| 275 Hsp Grader (Cat 16G) | 1,345 | 10,449 | 0 |
| 170 Hsp Bulldozer (Cat D6) | 13,068 | 72,503 | 0 |
| 305 Hsp Bulldozer (Cat D8) | 2,539 | 27,472 | 0 |
| 850 Hsp Bulldozer (Cat D11) | 1,791 | 49,689 | 0 |
| 6 Ton Compactor 48"(Cat 323) | 16 | 40 | 0 |
| 10 Ton Compactor 120 hsp (Dyn CA25) | 1,946 | 7,786 | 0 |
| 23 Ton Compactor 220 hsp (Cat 815) | 7,558 | 65,221 | 0 |
| 18 CY Tandem Scraper (Cat 627) | 604 | 9,219 | 0 |
| 90 Kg Plate Tamper | 643 | 0 | 216 |
| Cat TK723 Feller Buncher | 642 | 6,558 | 0 |
| DT-320 Tree Mulcher | 642 | 13,664 | 0 |
| Tree Stumper | 1,284 | 3,920 | 0 |
| Subtotal: | 48,916 | 392,533 | 216 |
| **Drilling & Tunneling Equipment** | | | |
| Hydraulic Drill 3" (AC1238/Tam400) | 2,043 | 16,439 | 0 |
| Subtotal: | 2,043 | 16,439 | 0 |
| **Service & Maintenance Equipment** | | | |
| 3/4 Ton Pickup Truck 2x2 | 11,149 | 0 | 20,620 |
| 5 Ton Flat Bed Truck | 681 | 2,078 | 0 |
| 16 Ton (8 CY) Tandem Truck | 12,968 | 88,726 | 0 |
| 20 Ton (10 CY) Tandem Truck | 2,963 | 20,277 | 0 |
| 50 Ton Off Hwy Truck 680 Hsp (Cat 773) | 4,776 | 53,001 | 0 |
| 3000 Gallon Watertruck | 7,558 | 33,548 | 0 |
| 5000 Gallon Watertanker | 1,194 | 5,963 | 0 |
| 10000 Gallon Cat 631 Waterwagon | 151 | 998 | 0 |
| Subtotal: | 41,441 | 204,591 | 20,620 |
| **Utilities** | | | |
| 2" Gas Water Pump 8,000 gph | 624 | 0 | 231 |
| Subtotal: | 624 | 0 | 231 |
| | | | |
| **Total:** | **93,025** | **613,562** | **21,066** |
| Grading/Dozing/Scraper | 11,454 | | |

**Haul Roads Area D: Appraisal Level Equipment and Fuel Consumption Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthwork Equipment** | | | |
| 1.5 CY Backhoe (Cat 225) | 5 | 23 | 0 |
| 1.5 CY Backhoe (Cat 325) | 144 | 885 | 0 |
| 2.3 CY Backhoe (Cat 235) | 972 | 7,011 | 0 |
| 3.5 CY Loader (Cat 950) | 144 | 559 | 0 |
| 11.2 CY Loader (Cat 990) | 505 | 6,896 | 0 |
| 140 Hsp Grader (Cat 140) | 2,408 | 17,500 | 0 |
| 150 Hsp Grapple (Cat 527) | 154 | 929 | 0 |
| 275 Hsp Grader (Cat 16G) | 542 | 4,210 | 0 |
| 170 Hsp Bulldozer (Cat D6) | 3,403 | 18,883 | 0 |
| 305 Hsp Bulldozer (Cat D8) | 1,047 | 11,330 | 0 |
| 850 Hsp Bulldozer (Cat D11) | 758 | 21,025 | 0 |
| 6 Ton Compactor 48"(Cat 323) | 5 | 13 | 0 |
| 10 Ton Compactor 120 hsp (Dyn CA25) | 329 | 1,317 | 0 |
| 23 Ton Compactor 220 hsp (Cat 815) | 2,079 | 17,937 | 0 |
| 18 CY Tandem Scraper (Cat 627) | 147 | 2,240 | 0 |
| 90 Kg Plate Tamper | 144 | 0 | 48 |
| Cat TK723 Feller Buncher | 154 | 1,568 | 0 |
| DT-320 Tree Mulcher | 154 | 3,268 | 0 |
| Tree Stumper | 307 | 937 | 0 |
| Subtotal: | 13,401 | 116,531 | 48 |
| **Drilling & Tunneling Equipment** | | | |
| Hydraulic Drill 3" (AC1238/Tam400) | 865 | 6,956 | 0 |
| Subtotal: | 865 | 6,956 | 0 |
| **Service & Maintenance Equipment** | | | |
| 3/4 Ton Pickup Truck 2x2 | 2,988 | 0 | 5,525 |
| 5 Ton Flat Bed Truck | 288 | 879 | 0 |
| 16 Ton (8 CY) Tandem Truck | 2,982 | 20,406 | 0 |
| 20 Ton (10 CY) Tandem Truck | 634 | 4,340 | 0 |
| 50 Ton Off Hwy Truck 680 Hsp (Cat 773) | 2,021 | 22,426 | 0 |
| 3000 Gallon Watertruck | 2,079 | 9,226 | 0 |
| 5000 Gallon Watertanker | 505 | 2,523 | 0 |
| 10000 Gallon Cat 631 Waterwagon | 37 | 242 | 0 |
| Subtotal: | 11,534 | 60,044 | 5,525 |
| **Utilities** | | | |
| 2" Gas Water Pump 8,000 gph | 144 | 0 | 53 |
| Subtotal: | 144 | 0 | 53 |
| | | | |
| **Total:** | **25,944** | **183,531** | **5,627** |
| Grading/Dozing/Scraper | 8,305 | | |

**Haul Roads Area E: Appraisal Level Equipment and Fuel Consumption Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthwork Equipment** | | | |
| 1.5 CY Backhoe (Cat 225) | 19 | 82 | 0 |
| 1.5 CY Backhoe (Cat 325) | 144 | 885 | 0 |
| 2.3 CY Backhoe (Cat 235) | 38 | 277 | 0 |
| 3.5 CY Loader (Cat 950) | 144 | 559 | 0 |
| 140 Hsp Grader (Cat 140) | 4,324 | 31,425 | 0 |
| 150 Hsp Grapple (Cat 527) | 125 | 755 | 0 |
| 275 Hsp Grader (Cat 16G) | 28 | 219 | 0 |
| 170 Hsp Bulldozer (Cat D6) | 4,663 | 25,873 | 0 |
| 305 Hsp Bulldozer (Cat D8) | 28 | 305 | 0 |
| 6 Ton Compactor 48"(Cat 323) | 19 | 48 | 0 |
| 10 Ton Compactor 120 hsp (Dyn CA25) | 285 | 1,141 | 0 |
| 23 Ton Compactor 220 hsp (Cat 815) | 4,038 | 34,848 | 0 |
| 18 CY Tandem Scraper (Cat 627) | 113 | 1,723 | 0 |
| 90 Kg Plate Tamper | 144 | 0 | 48 |
| Cat TK723 Feller Buncher | 125 | 1,274 | 0 |
| DT-320 Tree Mulcher | 125 | 2,655 | 0 |
| Tree Stumper | 250 | 762 | 0 |
| Subtotal: | 14,613 | 102,831 | 48 |
| **Service & Maintenance Equipment** | | | |
| 3/4 Ton Pickup Truck 2x2 | 2,640 | 0 | 4,882 |
| 16 Ton (8 CY) Tandem Truck | 173 | 1,182 | 0 |
| 20 Ton (10 CY) Tandem Truck | 622 | 4,258 | 0 |
| 3000 Gallon Watertruck | 4,038 | 17,925 | 0 |
| 10000 Gallon Cat 631 Waterwagon | 28 | 186 | 0 |
| Subtotal: | 7,502 | 23,551 | 4,882 |
| **Utilities** | | | |
| 2" Gas Water Pump 8,000 gph | 144 | 0 | 53 |
| Subtotal: | 144 | 0 | 53 |
| | | | |
| **Total:** | **22,259** | **126,382** | **4,984** |

Grading/Dozing/Scraper 4,833

Table X-X. Permanent Roads Area A: Appraisal Level Equipment and Fuel Consumption Est

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthwork Equipment** | | | |
| 1.5 CY Backhoe (Cat 225) | 2 | 10 | 0 |
| 1.5 CY Backhoe (Cat 325) | 120 | 737 | 0 |
| 2.3 CY Backhoe (Cat 235) | 3,840 | 27,697 | 0 |
| 3.5 CY Loader (Cat 950) | 120 | 466 | 0 |
| 11.2 CY Loader (Cat 990) | 162 | 2,213 | 0 |
| 140 Hsp Grader (Cat 140) | 4,662 | 33,888 | 0 |
| 150 Hsp Grapple (Cat 527) | 230 | 1,393 | 0 |
| 275 Hsp Grader (Cat 16G) | 216 | 1,676 | 0 |
| 170 Hsp Bulldozer (Cat D6) | 9,006 | 49,966 | 0 |
| 305 Hsp Bulldozer (Cat D8) | 378 | 4,088 | 0 |
| 850 Hsp Bulldozer (Cat D11) | 243 | 6,745 | 0 |
| 6 Ton Compactor 48"(Cat 323) | 2 | 6 | 0 |
| 10 Ton Compactor 120 hsp (Dyn CA25) | 329 | 1,317 | 0 |
| 23 Ton Compactor 220 hsp (Cat 815) | 4,333 | 37,393 | 0 |
| 18 CY Tandem Scraper (Cat 627) | 215 | 3,274 | 0 |
| 90 Kg Plate Tamper | 120 | 0 | 40 |
| Cat TK723 Feller Buncher | 230 | 2,353 | 0 |
| DT-320 Tree Mulcher | 230 | 4,902 | 0 |
| Tree Stumper | 461 | 1,406 | 0 |
| Subtotal: | 24,901 | 179,529 | 40 |
| **Pavement Equiptment** | | | |
| Asphalt Spreader Rubber (AP 1000) | 143 | 786 | 0 |
| Asphalt Steel Roller (Ferguson) | 143 | 286 | 0 |
| Asphalt 7 Ton Roller (Cat CB434) | 143 | 2,002 | 0 |
| Asphalt Broom -Ride On (Ten215) | 143 | 241 | 0 |
| Subtotal: | 572 | 3,315 | 0 |
| **Drilling & Tunneling Equipment** | | | |
| Hydraulic Drill 3" (AC1238/Tam400) | 277 | 2,232 | 0 |
| Truck Mounted Post Hole Auger | 696 | 772 | 0 |
| Subtotal: | 973 | 3,004 | 0 |
| **Service & Maintenance Equiptment** | | | |
| 3/4 Ton Pickup Truck 2x2 | 5,220 | 0 | 9,653 |
| 5 Ton Flat Bed Truck | 788 | 2,406 | 0 |
| General Service Truck | 143 | 0 | 143 |
| 16 Ton (8 CY) Tandem Truck | 11,586 | 79,276 | 0 |
| 20 Ton (10 CY) Tandem Truck | 1,645 | 11,257 | 0 |
| 50 Ton Off Hwy Truck 680 Hsp (Cat 773) | 648 | 7,195 | 0 |
| 3000 Gallon Watertruck | 4,333 | 19,234 | 0 |
| 5000 Gallon Watertanker | 162 | 809 | 0 |
| 10000 Gallon Cat 631 Waterwagon | 54 | 354 | 0 |
| Subtotal: | 24,580 | 120,531 | 9,796 |
| **Utilities** | | | |
| 2" Gas Water Pump 8,000 gph | 120 | 0 | 37 |
| Subtotal: | 120 | 0 | 37 |
| | | | |

| | | | | |
|---|---|---|---|---|
| | **Total:** | **51,147** | **306,379** | **9,874** |
| Grading/Dozing/Scraper | | 14,950 | | |

**Table X-X. Permanent Roads Area D: Appraisal Level Equipment and Fuel Consumption Estin**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthwork Equipment** | | | |
| 1.5 CY Backhoe (Cat 225) | 1 | 6 | 0 |
| 1.5 CY Backhoe (Cat 325) | 23 | 140 | 0 |
| 2.3 CY Backhoe (Cat 235) | 588 | 4,241 | 0 |
| 3.5 CY Loader (Cat 950) | 23 | 88 | 0 |
| 11.2 CY Loader (Cat 990) | 12 | 158 | 0 |
| 140 Hsp Grader (Cat 140) | 936 | 6,804 | 0 |
| 150 Hsp Grapple (Cat 527) | 42 | 255 | 0 |
| 275 Hsp Grader (Cat 16G) | 21 | 167 | 0 |
| 170 Hsp Bulldozer (Cat D6) | 1,628 | 9,034 | 0 |
| 305 Hsp Bulldozer (Cat D8) | 33 | 357 | 0 |
| 850 Hsp Bulldozer (Cat D11) | 17 | 482 | 0 |
| 6 Ton Compactor 48"(Cat 323) | 1 | 4 | 0 |
| 10 Ton Compactor 120 hsp (Dyn CA25) | 55 | 219 | 0 |
| 23 Ton Compactor 220 hsp (Cat 815) | 881 | 7,605 | 0 |
| 18 CY Tandem Scraper (Cat 627) | 40 | 603 | 0 |
| 90 Kg Plate Tamper | 23 | 0 | 8 |
| Cat TK723 Feller Buncher | 42 | 431 | 0 |
| DT-320 Tree Mulcher | 42 | 899 | 0 |
| Tree Stumper | 84 | 258 | 0 |
| Subtotal: | 4,494 | 31,753 | 8 |
| **Pavement Equiptment** | | | |
| Asphalt Spreader Rubber (AP 1000) | 26 | 140 | 0 |
| Asphalt Steel Roller (Ferguson) | 26 | 51 | 0 |
| Asphalt 7 Ton Roller (Cat CB434) | 26 | 357 | 0 |
| Asphalt Broom -Ride On (Ten215) | 26 | 43 | 0 |
| Subtotal: | 102 | 592 | 0 |
| **Drilling & Tunneling Equipment** | | | |
| Hydraulic Drill 3" (AC1238/Tam400) | 20 | 159 | 0 |
| Truck Mounted Post Hole Auger | 120 | 133 | 0 |
| Subtotal: | 140 | 293 | 0 |
| **Service & Maintenance Equiptment** | | | |
| 3/4 Ton Pickup Truck 2x2 | 910 | 0 | 1,682 |
| 5 Ton Flat Bed Truck | 127 | 386 | 0 |
| General Service Truck | 26 | 0 | 26 |
| 16 Ton (8 CY) Tandem Truck | 1,775 | 12,145 | 0 |
| 20 Ton (10 CY) Tandem Truck | 298 | 2,038 | 0 |
| 50 Ton Off Hwy Truck 680 Hsp (Cat 773) | 46 | 514 | 0 |
| 3000 Gallon Watertruck | 881 | 3,912 | 0 |
| 5000 Gallon Watertanker | 12 | 58 | 0 |
| 10000 Gallon Cat 631 Waterwagon | 10 | 65 | 0 |
| Subtotal: | 4,084 | 19,119 | 1,708 |
| **Utilities** | | | |
| 2" Gas Water Pump 8,000 gph | 23 | 0 | 8 |
| Subtotal: | 23 | 0 | 8 |
| | | | |
| **Total:** | **8,843** | **51,756** | **1,724** |

Grading/Dozing/Scraper 2,676

**Table X-X. Permanent Roads Area E: Appraisal Level Equipment and Fuel Consumption Estimate**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthwork Equipment** | | | |
| 1.5 CY Backhoe (Cat 225) | 5 | 21 | 0 |
| 1.5 CY Backhoe (Cat 325) | 31 | 192 | 0 |
| 2.3 CY Backhoe (Cat 235) | 384 | 2,770 | 0 |
| 3.5 CY Loader (Cat 950) | 31 | 121 | 0 |
| 11.2 CY Loader (Cat 990) | 4 | 49 | 0 |
| 140 Hsp Grader (Cat 140) | 1,501 | 10,908 | 0 |
| 150 Hsp Grapple (Cat 527) | 63 | 383 | 0 |
| 275 Hsp Grader (Cat 16G) | 19 | 146 | 0 |
| 170 Hsp Bulldozer (Cat D6) | 2,035 | 11,288 | 0 |
| 305 Hsp Bulldozer (Cat D8) | 22 | 242 | 0 |
| 850 Hsp Bulldozer (Cat D11) | 5 | 149 | 0 |
| 6 Ton Compactor 48"(Cat 323) | 5 | 12 | 0 |
| 10 Ton Compactor 120 hsp (Dyn CA25) | 77 | 307 | 0 |
| 23 Ton Compactor 220 hsp (Cat 815) | 1,424 | 12,288 | 0 |
| 18 CY Tandem Scraper (Cat 627) | 61 | 931 | 0 |
| 90 Kg Plate Tamper | 31 | 0 | 10 |
| Cat TK723 Feller Buncher | 63 | 647 | 0 |
| DT-320 Tree Mulcher | 63 | 1,348 | 0 |
| Tree Stumper | 127 | 387 | 0 |
| Subtotal: | 5,952 | 42,190 | 10 |
| **Pavement Equiptment** | | | |
| Asphalt Spreader Rubber (AP 1000) | 36 | 197 | 0 |
| Asphalt Steel Roller (Ferguson) | 36 | 71 | 0 |
| Asphalt 7 Ton Roller (Cat CB434) | 36 | 500 | 0 |
| Asphalt Broom -Ride On (Ten215) | 36 | 60 | 0 |
| Subtotal: | 143 | 829 | 0 |
| **Drilling & Tunneling Equipment** | | | |
| Hydraulic Drill 3" (AC1238/Tam400) | 6 | 49 | 0 |
| Truck Mounted Post Hole Auger | 192 | 213 | 0 |
| Subtotal: | 198 | 262 | 0 |
| **Service & Maintenance Equiptment** | | | |
| 3/4 Ton Pickup Truck 2x2 | 1,137 | 0 | 2,103 |
| 5 Ton Flat Bed Truck | 194 | 592 | 0 |
| General Service Truck | 36 | 0 | 36 |
| 16 Ton (8 CY) Tandem Truck | 1,168 | 7,988 | 0 |
| 20 Ton (10 CY) Tandem Truck | 414 | 2,835 | 0 |
| 50 Ton Off Hwy Truck 680 Hsp (Cat 773) | 14 | 159 | 0 |
| 3000 Gallon Watertruck | 1,424 | 6,321 | 0 |
| 5000 Gallon Watertanker | 4 | 18 | 0 |
| 10000 Gallon Cat 631 Waterwagon | 15 | 101 | 0 |
| Subtotal: | 4,406 | 18,013 | 2,138 |
| **Utilities** | | | |
| 2" Gas Water Pump 8,000 gph | 31 | 0 | 12 |
| Subtotal: | 31 | 0 | 12 |
| | | | |
| **Total:** | **10,730** | **61,294** | **2,161** |
| Grading/Dozing/Scraper | 2,142 | | |

Table X-X. Contractor Use Areas Appraisal Level Equipment and Fuel Consumption Estimates

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthmoving Equipment** | | | |
| 2.6 CY Backhoe (Cat 350) | 725 | 7,641 | 0 |
| 3.5 CY Loader (Cat 950) | 2,815 | 10,918 | 0 |
| 11.2 CY Loader (Cat 990) | 27,410 | 374,115 | 0 |
| 18 CY Tandem Scraper (Cat 627) | 1,389 | 21,195 | 0 |
| 125 Ton Towed Packer (SWMB125) | 2,815 | 0 | 0 |
| 160 Hsp Wheel Skidder (Cat 525) | 1,450 | 5,219 | 0 |
| 200 Hsp Grader (Cat 14G) | 1,407 | 10,541 | 0 |
| 275 Hsp Grader (Cat 16G) | 27,758 | 215,608 | 0 |
| 210 Hsp Harvester (Cat 580) | 725 | 5,177 | 0 |
| 305 Hsp Bulldozer (Cat D8) | 57,983 | 627,316 | 0 |
| 850 Hsp Bulldozer (Cat D11) | 36,569 | 1,014,453 | 0 |
| 30 Ton Compactor 315 hsp (Cat 825) | 5,629 | 75,596 | 0 |
| 50 Ton Off Hwy Truck 680 Hsp (Cat 773) | 109,642 | 1,216,634 | 0 |
| Jumping Jack Handheld Packer | 2,815 | 0 | 1,608 |
| 22" Smooth Drum Manual (Bomag 55) | 2,815 | 2,413 | 0 |
| Chipper - clearing | 725 | 15,421 | 1,657 |
| Subtotal: | 282,669 | 3,602,246 | 3,265 |
| **Drilling & Tunneling Equipment** | | | |
| Hydraulic Drill 3" (AC1238/Tam400) | 41,718 | 335,621 | 0 |
| Subtotal: | 41,718 | 335,621 | 0 |
| **Service & Maintenance Equiptment** | | | |
| 3/4 Ton Pickup Truck 2x2 | 41,664 | 0 | 77,053 |
| 3/4 Ton Crew Cab Truck 4x4 | 725 | 0 | 1,628 |
| 5 Ton Flat Bed Truck | 13,906 | 42,435 | 0 |
| 631 Water Wagon | 4,222 | 60,173 | 0 |
| 5000 Gallon Watertanker | 27,410 | 136,872 | 0 |
| 10000 Gallon Cat 631 Waterwagon | 347 | 2,294 | 0 |
| Chain Saw | 1,450 | 0 | 383 |
| Subtotal: | 89,724 | 241,773 | 79,064 |
| | | | |
| **Total:** | **414,111** | **4,179,640** | **82,329** |
| Grading/Dozing/Scraper | 123,716 | | |

**Alt 1-3 Low Level Intake Structure Appraisal Level Equipment and Fuel Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthmoving Equipment** | | | |
| 170 Hsp Bulldozer ( Cat D6 ) | 369 | 2,046 | 0 |
| 305 Hsp Bulldozer ( Cat D8 ) | 1,432 | 15,495 | 0 |
| 850 Hsp Bulldozer ( Cat D11 ) | 345 | 9,571 | 0 |
| 2.0 CY Loader (CAT IT28) | 954 | 2,539 | 0 |
| 4.5 CY Loader (Cat 966) | 36 | 165 | 0 |
| 200 Hsp Grader (Cat 14G) | 1,074 | 8,043 | 0 |
| 275 Hsp Grader (Cat 16G) | 292 | 2,264 | 0 |
| Rome Plow | 146 | 0 | 0 |
| Farm Tractor | 146 | 404 | 0 |
| 2.0 CY Backhoe ( Cat 330 ) | 108 | 899 | 0 |
| 2.6 CY Backhoe (Cat 350) | 777 | 8,187 | 0 |
| 1.7 CY Backhoe Loader (Case680) | 40 | 122 | 0 |
| 30 Ton Articulated Truck (Cat D300) | 3,880 | 25,188 | 0 |
| 18 CY Tandem Scraper (Cat 627) | 1,166 | 17,792 | 0 |
| 631 Water Wagon | 755 | 10,756 | 0 |
| 10 Ton Compactor 120 hsp ( Dyn CA25) | 77 | 307 | 0 |
| 13 Ton Compactor 72" (Cat 553) | 738 | 3,794 | 0 |
| 20 Ton Compactor 190 hsp ( Bomag 217) | 77 | 505 | 0 |
| 30 Ton Compactor 315 hsp (Cat 825) | 72 | 967 | 0 |
| Grid Roller | 53 | 0 | 0 |
| 125 Ton Towed Packer (SWMB125) | 72 | 0 | 0 |
| 160 Hsp Wheel Skidder (Cat 525) | 154 | 1,014 | 0 |
| 210 Hsp Harvester (Cat 580) | 77 | 549 | 0 |
| Chipper - clearing | 77 | 1,634 | 176 |
| Subtotal: | 12,914 | 112,242 | 176 |
| **Concrete Equipment** | | | |
| 90 YPH Trailer Mounted Concrete Pump | 1,115 | 3,092 | 0 |
| Truck Mounted Concrete Pump | 2,061 | 17,152 | 0 |
| 3-CY Concrete Bucket (Gravity) | 3,344 | 0 | 0 |
| Concrete Vibrator-Normal | 8,244 | 0 | 0 |
| Concrete Vibrator-2.0 inch | 2,229 | 0 | 0 |
| Post-tensioning Jack | 71 | 0 | 0 |

**Alt 1-3 Low Level Intake Structure Appraisal Level Equipment and Fuel Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| Grout Pump | 71 | 40 | 0 |
| Grout Plant | 121 | 168 | 0 |
| 8 YPH Wet Shotcrete Pump (Swing 750) | 404 | 337 | 0 |
| Tunnel Concrete Form Gantry | 2,230 | 0 | 0 |
| Tunnel Concrete Placing Bridge | 1,115 | 0 | 0 |
| Tunnel Concrete Finishing Gantry | 304 | 0 | 0 |
| Subtotal: | 21,310 | 20,788 | 0 |
| **Utility Equipment** | | | |
| 10 KW Generator Set (Gas) | 3,435 | 0 | 2,287 |
| 500 KW Diesel Generator Set | 1,858 | 45,459 | 0 |
| 500 KW Diesel Generator Set | 2,249 | 55,034 | 0 |
| 185 CFM Diesel Compressor | 2,500 | 8,322 | 0 |
| 250 CFM Diesel Compressor | 401 | 1,467 | 0 |
| 375 CFM Diesel Compressor | 574 | 3,440 | 0 |
| 750 CFM Diesel Compressor | 4,107 | 42,386 | 0 |
| 250 Amp Diesel Welder | 2,500 | 0 | 0 |
| 350 Amp Diesel Welder | 2,500 | 0 | 0 |
| 2000 PSI Pressure Washer | 2,500 | 834 | 0 |
| Subtotal: | 22,624 | 156,943 | 2,287 |
| **Hoisting Equipment** | | | |
| 60 Ton Crawler Crane (Linkbelt118) | 2,479 | 8,542 | 0 |
| 40 Ton Hydraulic Crane (Grove700) | 29 | 81 | 0 |
| Motorized Manlift 30 Ft | 397 | 660 | 0 |
| Subtotal: | 2,904 | 9,283 | 0 |
| **Foundation & Marine Equipment** | | | |
| Truck Mounted Post Hole Auger | 246 | 328 | 0 |
| Hydraulic Hoe Ram | 44 | 0 | 0 |
| Subtotal: | 290 | 328 | 0 |
| **Drilling & Tunneling Equipment** | | | |
| Hydraulic Drill 2" (AC1032) | 41 | 343 | 0 |
| Hydraulic Drill 3" (AC1238/Tam400) | 733 | 7,079 | 0 |
| Percussion Jumbo 3- Boom(GD-P123) | 2,208 | 0 | 0 |
| Tunnel 5 CY Scoop Tram | 4,416 | 58,802 | 0 |

**Alt 1-3 Low Level Intake Structure Appraisal Level Equipment and Fuel Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| Tunnel Ventilation Fan 42" | 2,249 | 0 | 0 |
| Subtotal: | 9,648 | 66,224 | 0 |
| **Service & Maintenance Equipment** | | | |
| Compact Pickup Truck 2x2 | 64 | 0 | 75 |
| 1/2 Ton Pickup Truck 2x2 | 32 | 0 | 51 |
| 1/2 Ton Pickup Truck 4x4 | 2,904 | 0 | 5,525 |
| 3/4 Ton Pickup Truck 2x2 | 76,554 | 0 | 169,894 |
| 3/4 Ton Pickup Truck 4x4 | 98 | 0 | 233 |
| 3/4 Ton Crew Cab Truck | 2,112 | 0 | 5,357 |
| 3/4 Ton Crew Cab Truck 4x4 | 6,573 | 0 | 17,714 |
| 5 Ton Flat Bed Truck | 3,714 | 14,836 | 0 |
| 2-Ton Mechanic Truck | 7,500 | 39,947 | 0 |
| Lube Truck | 2,500 | 9,987 | 0 |
| Fuel Truck (Tandem Axle 20000 litres) | 2,500 | 13,316 | 0 |
| 3000 Gallon Watertruck | 128 | 682 | 0 |
| 10000 Gallon Cat 631 Waterwagon | 243 | 4,155 | 0 |
| 5 Ton Boomtruck | 33 | 79 | 0 |
| 15 Ton Pitman Boom Truck | 1,322 | 4,752 | 0 |
| Storage Trailer 40 Ft | 27,600 | 0 | 0 |
| First Aid Trailer 10 x 40 | 7,200 | 0 | 0 |
| Foreman Shack (8x12) | 14,400 | 0 | 0 |
| Lunch Trailer (8x20) | 7,200 | 0 | 0 |
| Office Trailer (12x50 ) | 3,000 | 0 | 0 |
| Parts Storage 8x10 | 3,000 | 0 | 0 |
| Chain Saw | 128 | 0 | 41 |
| Subtotal: | 168,805 | 87,754 | 198,889 |
| | | | |
| **Total:** | **238,495** | **453,562** | **201,351** |

Grading/Dozing/Scraper 4,969

**Alt 4 Selective Level Intake Structure Feasibility Level Equipment and Fuel Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthmoving Equipment** | | | |
| 170 Hsp Bulldozer ( Cat D6 ) | 489 | 2,712 | 0 |
| 305 Hsp Bulldozer ( Cat D8 ) | 1,705 | 18,445 | 0 |
| 850 Hsp Bulldozer ( Cat D11 ) | 486 | 13,482 | 0 |
| 2.0 CY Loader (CAT IT28) | 954 | 2,540 | 0 |
| 4.5 CY Loader (Cat 966) | 36 | 165 | 0 |
| 200 Hsp Grader (Cat 14G) | 1,287 | 9,636 | 0 |
| 275 Hsp Grader (Cat 16G) | 292 | 2,264 | 0 |
| Rome Plow | 146 | 0 | 0 |
| Farm Tractor | 146 | 404 | 0 |
| 2.0 CY Backhoe ( Cat 330 ) | 108 | 899 | 0 |
| 2.6 CY Backhoe (Cat 350) | 929 | 9,797 | 0 |
| 1.7 CY Backhoe Loader (Case680) | 40 | 122 | 0 |
| 30 Ton Articulated Truck (Cat D300) | 4,744 | 30,795 | 0 |
| 18 CY Tandem Scraper (Cat 627) | 1,166 | 17,792 | 0 |
| 631 Water Wagon | 899 | 0 | 0 |
| 10 Ton Compactor 120 hsp ( Dyn CA25) | 77 | 307 | 0 |
| 13 Ton Compactor 72" (Cat 553) | 978 | 5,028 | 0 |
| 20 Ton Compactor 190 hsp ( Bomag 217) | 77 | 505 | 0 |
| 30 Ton Compactor 315 hsp (Cat 825) | 72 | 967 | 0 |
| Grid Roller | 62 | 0 | 0 |
| 125 Ton Towed Packer (SWMB125) | 72 | 0 | 0 |
| 160 Hsp Wheel Skidder (Cat 525) | 154 | 1,015 | 0 |
| 210 Hsp Harvester (Cat 580) | 77 | 549 | 0 |
| Chipper - clearing | 77 | 878 | 0 |
| Subtotal: | 15,069 | 118,301 | 0 |
| **Concrete Equipment** | | | |
| 90 YPH Trailer Mounted Concrete Pump | 1,115 | 3,092 | 0 |
| Truck Mounted Concrete Pump | 7,369 | 61,327 | 0 |
| 3-CY Concrete Bucket (Gravity) | 3,344 | 0 | 0 |
| Concrete Vibrator-Normal | 29,476 | 0 | 0 |
| Concrete Vibrator-2.0 inch | 2,229 | 0 | 0 |
| Post-tensioning Jack | 71 | 0 | 0 |

**Alt 4 Selective Level Intake Structure Feasibility Level Equipment and Fuel Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| Grout Pump | 71 | 40 | 0 |
| Grout Plant | 121 | 168 | 0 |
| 8 YPH Wet Shotcrete Pump (Swing 750) | 404 | 337 | 0 |
| Tunnel Concrete Form Gantry | 2,230 | 0 | 0 |
| Tunnel Concrete Placing Bridge | 1,115 | 0 | 0 |
| Tunnel Concrete Finishing Gantry | 304 | 0 | 0 |
| Subtotal: | 47,850 | 64,964 | 0 |
| **Utility Equipment** | | | |
| 10 KW Generator Set (Gas) | 14,738 | 0 | 0 |
| 500 KW Diesel Generator Set | 2,230 | 45,459 | 0 |
| 500 KW Diesel Generator Set | 2,699 | 55,034 | 0 |
| 185 CFM Diesel Compressor | 6,000 | 16,645 | 0 |
| 250 CFM Diesel Compressor | 2,832 | 8,643 | 0 |
| 375 CFM Diesel Compressor | 689 | 3,441 | 0 |
| 750 CFM Diesel Compressor | 4,929 | 42,385 | 0 |
| 250 Amp Diesel Welder | 6,000 | 0 | 0 |
| 350 Amp Diesel Welder | 6,000 | 0 | 0 |
| 2000 PSI Pressure Washer | 6,000 | 51,598 | 0 |
| Subtotal: | 52,117 | 223,204 | 0 |
| **Hoisting Equipment** | | | |
| 60 Ton Crawler Crane (Linkbelt118) | 6,786 | 19,485 | 0 |
| 40 Ton Hydraulic Crane (Grove700) | 34 | 81 | 0 |
| Motorized Manlift 30 Ft | 476 | 660 | 0 |
| Subtotal: | 7,296 | 20,226 | 0 |
| **Foundation & Marine Equipment** | | | |
| Truck Mounted Post Hole Auger | 295 | 328 | 0 |
| Hydraulic Hoe Ram | 62 | 0 | 0 |
| Subtotal: | 357 | 328 | 0 |
| **Drilling & Tunneling Equipment** | | | |
| Hydraulic Drill 2" (AC1032) | 50 | 343 | 0 |
| Hydraulic Drill 3" (AC1238/Tam400) | 1,027 | 8,264 | 0 |
| Percussion Jumbo 3- Boom(GD-P123) | 2,650 | 0 | 0 |
| Tunnel 5 CY Scoop Tram | 5,299 | 58,802 | 0 |

**Alt 4 Selective Level Intake Structure Feasibility Level Equipment and Fuel Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| Tunnel Ventilation Fan 42" | 2,699 | 0 | 0 |
| Subtotal: | 11,725 | 67,410 | 0 |
| **Service & Maintenance Equipment** | | | |
| Compact Pickup Truck 2x2 | 77 | 0 | 75 |
| 1/2 Ton Pickup Truck 2x2 | 38 | 0 | 51 |
| 1/2 Ton Pickup Truck 4x4 | 3,485 | 0 | 5,525 |
| 3/4 Ton Pickup Truck 2x2 | 132,353 | 0 | 244,773 |
| 3/4 Ton Pickup Truck 4x4 | 194 | 0 | 385 |
| 3/4 Ton Crew Cab Truck | 5,069 | 0 | 10,713 |
| 3/4 Ton Crew Cab Truck 4x4 | 19,707 | 0 | 44,255 |
| 5 Ton Flat Bed Truck | 9,834 | 30,009 | 0 |
| 2-Ton Mechanic Truck | 18,000 | 79,894 | 0 |
| Lube Truck | 6,000 | 19,974 | 0 |
| Fuel Truck (Tandem Axle 20000 litres) | 6,000 | 26,631 | 0 |
| 3000 Gallon Watertruck | 154 | 682 | 0 |
| 10000 Gallon Cat 631 Waterwagon | 292 | 1,926 | 0 |
| 5 Ton Boomtruck | 40 | 79 | 0 |
| 15 Ton Pitman Boom Truck | 2,769 | 8,295 | 0 |
| Storage Trailer 40 Ft | 48,960 | 0 | 0 |
| First Aid Trailer 10 x 40 | 11,520 | 0 | 0 |
| Foreman Shack (8x12) | 23,040 | 0 | 0 |
| Lunch Trailer (8x20) | 11,520 | 0 | 0 |
| Office Trailer (12x50 ) | 7,200 | 0 | 0 |
| Parts Storage 8x10 | 7,200 | 0 | 0 |
| Chain Saw | 154 | 0 | 41 |
| Subtotal: | 313,604 | 167,489 | 305,818 |
| | | | |
| **Total:** | **448,018** | **661,922** | **305,818** |

Grading/Dozing/Scraper 5,715

**Powerhouse and Valve House Feasibility Level Equipment and Fuel Consumption Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthmoving Equipment** | | | |
| 170 Hsp Bulldozer ( Cat D6 ) | 120 | 666 | 0 |
| 305 Hsp Bulldozer ( Cat D8 ) | 6,050 | 65,456 | 0 |
| 850 Hsp Bulldozer ( Cat D11 ) | 2,203 | 61,103 | 0 |
| 3.5 CY Loader (Cat 950) | 413 | 1,601 | 0 |
| 6.5 CY Loader (Cat 980) | 288 | 1,924 | 0 |
| 11.2 CY Loader (Cat 990) | 2,761 | 37,678 | 0 |
| 2.1 CY Track Loader (Cat 939) | 444 | 1,848 | 0 |
| 200 Hsp Grader (Cat 14G) | 826 | 6,188 | 0 |
| 275 Hsp Grader (Cat 16G) | 3,015 | 23,416 | 0 |
| Rome Plow | 127 | 0 | 0 |
| Farm Tractor | 127 | 352 | 0 |
| 2.0 CY Backhoe ( Cat 330 ) | 72 | 599 | 0 |
| 2.6 CY Backhoe (Cat 350) | 125 | 1,316 | 0 |
| 1.7 CY Backhoe Loader (Case680) | 40 | 122 | 0 |
| 5 Ton Flatbed Truck | 300 | 999 | 0 |
| 50 Ton Off Hwy Truck 680 Hsp (Cat 773) | 11,112 | 123,306 | 0 |
| 18 CY Tandem Scraper (Cat 627) | 1,016 | 15,509 | 0 |
| 631 Water Wagon | 1,857 | 26,468 | 0 |
| Jumping Jack Handheld Packer | 413 | 0 | 236 |
| 22" Smooth Drum Manual (Bomag 55) | 1,493 | 1,280 | 0 |
| 10 Ton Compactor 120 hsp ( Dyn CA25) | 77 | 307 | 0 |
| 13 Ton Compactor 72" (Cat 553) | 240 | 1,234 | 0 |
| 15 Ton Compactor 84" (Cat 563) | 192 | 1,097 | 0 |
| 20 Ton Compactor 190 hsp ( Bomag 217) | 77 | 505 | 0 |
| 30 Ton Compactor 315 hsp (Cat 825) | 2,003 | 26,896 | 0 |
| Grid Roller | 58 | 0 | 0 |
| 125 Ton Towed Packer (SWMB125) | 1,110 | 0 | 0 |
| 160 Hsp Wheel Skidder (Cat 525) | 134 | 0 | 0 |
| 210 Hsp Harvester (Cat 580) | 67 | 480 | 0 |
| Chipper - clearing | 67 | 1,430 | 154 |
| Subtotal: | 36,826 | 401,780 | 390 |

**Powerhouse and Valve House Feasibility Level Equipment and Fuel Consumption Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Paving Equipment** | | | |
| 2 Deck 8x24 Screen | 96 | 186 | 0 |
| Plate Feeder 36inx6Ft | 96 | 160 | 0 |
| Radial Stacker 24"x100 15 Hsp | 96 | 107 | 0 |
| Subtotal: | 288 | 453 | 0 |
| **Pipeline Equipment** | | | |
| 250 Amp Diesel Welder | 564 | 0 | 0 |
| 400 Amp Diesel Welder | 79,808 | 0 | 0 |
| Acetylene Cutting Torch | 564 | 0 | 0 |
| Subtotal: | 80,936 | 0 | 0 |
| **Concrete Equipment** | | | |
| Concrete Pump | 5,256 | 14,579 | 0 |
| Truck Mounted Concrete Pump | 11,221 | 93,388 | 0 |
| Concrete Vibrator-Normal | 22,443 | 0 | 0 |
| Post-tensioning Jack | 361 | 0 | 0 |
| Grout Pump | 661 | 367 | 0 |
| Grout Plant | 741 | 1,028 | 0 |
| 8 YPH Wet Shotcrete Pump (Swing 750) | 206 | 171 | 0 |
| Subtotal: | 40,889 | 109,534 | 0 |
| **Utility Equipment** | | | |
| 10 KW Generator Set (Gas) | 22,443 | 0 | 12,452 |
| 15 KW Generator Set (Gas) | 592 | 0 | 493 |
| 150 KW Diesel Generator Set | 9,845 | 49,159 | 0 |
| 500 KW Diesel Generator Set | 1,170 | 23,856 | 0 |
| 125 CFM Diesel Compressor | 965 | 2,143 | 0 |
| 185 CFM Diesel Compressor | 6,030 | 16,728 | 0 |
| 250 CFM Diesel Compressor | 787 | 2,400 | 0 |
| 750 CFM Diesel Compressor | 1,170 | 10,062 | 0 |
| 250 Amp Diesel Welder | 6,000 | 0 | 0 |
| 350 Amp Diesel Welder | 6,000 | 0 | 0 |
| 2000 PSI Pressure Washer | 6,000 | 51,598 | 0 |
| Subtotal: | 61,002 | 155,946 | 12,945 |

**Powerhouse and Valve House Feasibility Level Equipment and Fuel Consumption Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Hoisting Equipment** | | | |
| 60 Ton Crawler Crane (Linkbelt118) | 1,980 | 5,685 | 0 |
| 150 Ton Crawler Crane (American 9260) | 6,085 | 23,547 | 0 |
| 40 Ton Hydraulic Crane (Grove700) | 2,770 | 6,570 | 0 |
| Motorized Manlift 30 Ft | 206 | 286 | 0 |
| Knucklboom Manlift 36 Ft | 373 | 622 | 0 |
| Motorized Manlift 120FT ( JLG 120FXJ) | 373 | 1,184 | 0 |
| Subtotal: | 11,787 | 37,893 | 0 |
| **Foundation & Marine Equipment** | | | |
| Truck Mounted Post Hole Auger | 308 | 342 | 0 |
| Hydraulic Hoe Ram | 58 | 0 | 0 |
| Subtotal: | 366 | 342 | 0 |
| **Drilling & Tunneling Equipment** | | | |
| Hydraulic Drill 3" (AC1238/Tam400) | 1,828 | 14,703 | 0 |
| Diamond Core Drill (Hilti) | 30 | 0 | 0 |
| Tunnel 5 CY Scoop Tram | 120 | 1,332 | 0 |
| Tunnel Ventilation Fan 42" | 10,075 | 0 | 0 |
| Subtotal: | 12,052 | 16,035 | 0 |
| **Service & Maintenance Equipment** | | | |
| Compact Pickup Truck 2x2 | 77 | 0 | 75 |
| 1/2 Ton Pickup Truck 2x2 | 38 | 0 | 51 |
| 1/2 Ton Pickup Truck 4x4 | 2,598 | 0 | 4,118 |
| 3/4 Ton Pickup Truck 2x2 | 195,072 | 0 | 360,766 |
| 3/4 Ton Pickup Truck 4x4 | 346 | 0 | 685 |
| 3/4 Ton Crew Cab Truck | 5,069 | 0 | 10,713 |
| 3/4 Ton Crew Cab Truck 4x4 | 29,293 | 0 | 65,782 |
| 5 Ton Flat Bed Truck | 15,023 | 45,842 | 0 |
| 2-Ton Mechanic Truck | 18,000 | 79,894 | 0 |
| Lube Truck | 12,000 | 39,947 | 0 |
| Fuel Truck (Tandem Axle 20000 litres) | 6,000 | 26,631 | 0 |
| 3000 Gallon Watertruck | 154 | 682 | 0 |
| 5000 Gallon Watertanker | 2,761 | 13,785 | 0 |
| 10000 Gallon Cat 631 Waterwagon | 254 | 1,678 | 0 |

**Powerhouse and Valve House Feasibility Level Equipment and Fuel Consumption Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| 5 Ton Boomtruck | 40 | 79 | 0 |
| 15 Ton Pitman Boom Truck | 3,639 | 10,902 | 0 |
| Tractor & Hi-Trailer | 2,177 | 13,889 | 0 |
| Storage Trailer 40 Ft | 48,960 | 0 | 0 |
| First Aid Trailer 10 x 40 | 11,520 | 0 | 0 |
| Foreman Shack (8x12) | 46,080 | 0 | 0 |
| Lunch Trailer (8x20) | 23,040 | 0 | 0 |
| Office Trailer (12x50 ) | 7,200 | 0 | 0 |
| Parts Storage 8x10 | 7,200 | 0 | 0 |
| Chain Saw | 134 | 0 | 36 |
| Subtotal: | 436,672 | 233,330 | 442,226 |
| | | | |
| **Total:** | **680,820** | **955,313** | **455,560** |

Grading/Dozing/Scraper 13,484

**LeGrande-Sanger Transmission Line Appraisal Level Equipment and Fuel Consumption Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Service & Maintenance Equiptment** | | | |
| 3/4 Ton Pickup Truck 2x2 | 1,642 | 2,462 | - |
| 3/4 Ton Crew Cab Truck 4x4 | 1,642 | 2,462 | - |
| 40 Ton Hydraulic Crane (Grove700) | 1,642 | - | 3,940 |
| Drill Rig Truck Mount | 1,642 | - | 3,283 |
| 170 Hsp Bulldozer (Cat D6) | 1,642 | - | 8,208 |
| Subtotal: | 8,208 | 4,925 | 15,431 |
| | | | |
| **Total:** | **8,208** | **4,925** | **15,431** |

Grading/Dozing/Scraper 1,642

**Reservoir Area Recreation Appraisal Level Equipment and Fuel Consumption Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthmoving Equipment** | | | |
| 1.4 CY Backhoe Loader (JD 410) | 832 | 1,616 | 0 |
| 1.5 CY Backhoe (Cat 325) | 4,190 | 11,431 | 0 |
| 1.7 CY Backhoe Loader (Case 680) | 0 | 1 | 0 |
| 10 Ton Compactor 120 hsp (Dyn CA25) | 179 | 718 | 0 |
| 110 Hsp Bulldozer (Cat D5) | 13 | 53 | 0 |
| 125 Hsp Grader (Cat 120) | 1,139 | 8,212 | 0 |
| 125 Ton Towed Packer (SWMB125) | 6 | 0 | 0 |
| 13 Ton Compactor 72" (Cat 553) | 939 | 4,829 | 0 |
| 1300LB Skid Steer Loader (Bobcat 743) | 1 | 2 | 0 |
| 15 Ton Compactor 84" (Cat 563) | 40 | 228 | 0 |
| 150 Hsp Grapple (Cat 527) | 21 | 125 | 0 |
| 170 Hsp Bulldozer (Cat D6) | 179 | 994 | 0 |
| 2.0 CY Backhoe (Cat 330) | 103 | 859 | 0 |
| 2.3 CY Backhoe (Cat 235) | 121 | 1,138 | 0 |
| 2.6 CY Backhoe (Cat 350) | 171 | 1,804 | 0 |
| 2.7 CY Loader (JD 644) | 1,383 | 5,266 | 0 |
| 200 Hsp Grader (Cat 14G) | 237 | 1,772 | 0 |
| 22" Smooth Drum Manual (Bomag 55) | 1,125 | 965 | 0 |
| 3.0 CY Track Loader (Cat 963) | 121 | 487 | 0 |
| 6.5 CY Loader (Cat 980) | 171 | 1,143 | 0 |
| 80 LB Jackhammer | 342 | 0 | 0 |
| Cat TK723 Feller Buncher | 21 | 210 | 0 |
| Farm Tractor-4 Wheel Drive | 0 | 0 | 0 |
| Hoe Hammer 4X | 57 | 0 | 0 |
| DT-320 Tree Mulcher | 0 | 0 | 0 |
| Tree Stumper | 41 | 126 | 0 |
| Subtotal: | 11,433 | 41,979 | 0 |
| **Pipeline Equipment** | | | |
| Acetylene Cutting Torch | 121 | 0 | 0 |
| Subtotal: | 121 | 0 | 0 |
| **Concrete Equipment** | | | |
| 90 YPH Trailer-Mounted Concrete Pump | 0 | 0 | 0 |
| Subtotal: | 0 | 0 | 0 |

**Reservoir Area Recreation Appraisal Level Equipment and Fuel Consumption Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Utility Equipment** | | | |
| 10 KW Generator Set (Gas) | 211 | 0 | 117 |
| 250 CFM Diesel Compressor | 366 | 1,118 | 0 |
| Subtotal: | 577 | 1,118 | 117 |
| **Hoisting Equipment** | | | |
| 60 Ton Hydraulic Crane (Grove) | 12 | 28 | 0 |
| 75 Ton Crawler Crane (Linkbelt 138) | 9 | 25 | 0 |
| Subtotal: | 21 | 54 | 0 |
| **Foundation & Marine Equipment** | | | |
| 125 Hsp Marina Workboat | 1 | 0 | 14 |
| 700 Hsp Marine Inland Tugboat | 79 | 3,065 | 0 |
| Hydraulic Hoe Ram | 101 | 0 | 0 |
| Truck Mounted Post Hole Auger | 54 | 60 | 0 |
| Subtotal: | 235 | 3,125 | 14 |
| **Service & Maintenance Equipment** | | | |
| 1/2 Ton Pickup Truck 4x4 | 1,102 | 0 | 1,748 |
| 10 Ton Boomtruck | 3 | 8 | 0 |
| 15 Ton Pitman Boom Truck | 12 | 36 | 0 |
| 20 Ton (10 CY) Tandem Truck | 2,984 | 20,420 | 0 |
| 24 Ton (12 CY) Tandem Truck | 171 | 1,171 | 0 |
| 3/4 Ton Crew Cab Truck 4x4 | 13 | 0 | 30 |
| 3/4 Ton Pickup Truck 2x2 | 141 | 0 | 261 |
| 3000 Gallon Watertruck | 196 | 870 | 0 |
| 32 Ton (16 CY) Triaxle Truck-Operated | 275 | 1,943 | 0 |
| 5 Ton Flat Bed Truck | 506 | 1,544 | 0 |
| 500 Ton Marine Barge | 79 | 0 | 0 |
| 80 Ton Lowboy | 9 | 72 | 0 |
| 8000 Gallon Watertanker | 6 | 34 | 0 |
| Dozer Winch (American) | 79 | 0 | 0 |
| Helicopter 5000lbs (Aviation Fuel) | 19 | 0 | 1,632 |
| Subtotal: | 5,596 | 26,098 | 3,671 |
| | | | |
| **Total:** | **17,983** | **72,374** | **3,802** |
| Grading/Dozing/Scraper | 1,568 | | |

**Reservoir Area Utilities Appraisal Level Equipment and Fuel Consumption Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthmoving Equipment** | | | |
| 1.0 CY Backhoe Loader (Case 580) | 304 | 583 | 0 |
| 1.5 CY Backhoe (Cat 225) | 226 | 615 | 0 |
| 1.5 CY Backhoe (Cat 325) | 21 | 58 | 0 |
| 1.7 CY Backhoe Loader (Case 680) | 1 | 3 | 0 |
| 10 Ton Compactor 12 hsp (Cyn CA25) | 1 | 4 | 0 |
| 125 Hsp Grader (Cat 120) | 7 | 49 | 0 |
| 150 Hsp Grapple (Cat 527) | 0 | 0 | 0 |
| 2.0 CY Backhoe (Cat 330) | 3 | 23 | 0 |
| 2.3 CY Backhoe (Cat 235) | 114 | 1,074 | 0 |
| 2.6 CY Backhoe (Cat 350) | 2 | 24 | 0 |
| 2.7 CY Loader (JD644) | 9 | 33 | 0 |
| 22" Smooth Drum Manual (Bomag 55) | 3 | 3 | 0 |
| 3.0 CY Track Loader (Cat 963) | 3 | 14 | 0 |
| 3.5 CY Loader (Cat 950) | 336 | 1,482 | 0 |
| 5 Ft Wheel Mounted Chain Trencher | 44 | 153 | 0 |
| 6.5 CY Loader (Cat 980) | 2 | 15 | 0 |
| 80 LB Jackhammer | 5 | 0 | 0 |
| 90 Kg Plate Tamper | 10 | 0 | 3 |
| Cat TK723 Feller Buncher | 0 | 0 | 0 |
| DT-320 Tree Mulcher | 0 | 1 | 0 |
| Hoe Hammer 4X | 2 | 0 | 0 |
| Tree Stumper | 0 | 0 | 0 |
| Subtotal: | 1,091 | 4,134 | 3 |
| **Pipeline Equipment** | | | |
| Acetylene Cutting Torch | 3 | 0 | 0 |
| Subtotal: | 3 | 0 | 0 |
| **Concrete Equipment** | | | |
| Grout Pump | 45 | 0 | 25 |
| Subtotal: | 45 | 0 | 25 |

**Reservoir Area Utilities Appraisal Level Equipment and Fuel Consumption Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Utility Equipment** | | | |
| 10 KW Generator Set (Gas) | 1 | 0 | 1 |
| 250 CFM Diesel Compressor | 4 | 11 | 0 |
| Subtotal: | 5 | 11 | 1 |
| **Foundation & Marine Equipment** | | | |
| Hydraulic Hoe Ram | 3 | 0 | 0 |
| Truck-Mounted Direct Rotary Drill Rig | 10 | 24 | 0 |
| Subtotal: | 12 | 24 | 0 |
| **Service & Maintenance Equipment** | | | |
| 1/2 Ton Pickup Truck 4x4 | 6 | 0 | 10 |
| 10 Ton Boomtruck | 275 | 823 | 0 |
| 20 Ton (10 CY) Tandem Truck | 24 | 162 | 0 |
| 24 Ton (12 CY) Tandem Truck | 2 | 16 | 0 |
| 3/4 Ton Pickup Truck 2x2 | 404 | 0 | 746 |
| 32 Ton (16 CY) Triaxle Truck-Operated | 6 | 42 | 0 |
| 5 Ton Flatbed Truck | 70 | 213 | 0 |
| Electrical Service truck | 375 | 0 | 594 |
| Tractor & Trailer | 255 | 708 | 0 |
| Subtotal: | 1,416 | 1,964 | 1,350 |
| | | | |
| **Total:** | **2,573** | **6,133** | **1,379** |

Grading/Dozing/Scraper 7

**Kerckhoff Project Decommissioning Appraisal Level Equipment and Fuel Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthmoving Equipment** | | | |
| 110 Hsp Bulldozer (Cat D5) | 10 | 40 | 0 |
| 170 Hsp Bulldozer ( Cat D6 ) | 115 | 639 | 0 |
| 3.5 CY Loader (Cat 950) | 91 | 354 | 0 |
| 6.5 CY Loader (Cat 980) | 10 | 64 | 0 |
| 3.0 CY Track Loader ( Cat 963 ) | 162 | 988 | 0 |
| 1300LB Skid Steer Loader (Bobcat 743) | 10 | 13 | 0 |
| 125 Hsp Grader (Cat 120) | 10 | 40 | 0 |
| 275 Hsp Grader (Cat 16G) | 41 | 320 | 0 |
| 1.5 CY Backhoe ( Cat 225 ) | 26 | 146 | 0 |
| 1.5 CY Backhoe (Cat 325) | 38 | 266 | 0 |
| 2.0 CY Backhoe ( Cat 330 ) | 48 | 403 | 0 |
| 2.6 CY Backhoe (Cat 350) | 72 | 759 | 0 |
| 2.7 CY Backhoe ( Cat 345 BL ) | 368 | 3,676 | 0 |
| 20 Ton (10 CY) Tandem Truck | 232 | 1,610 | 0 |
| 15 Ton Compactor 84" (Cat 563) | 41 | 235 | 0 |
| 23 Ton Compactor 220 hsp (Cat 815) | 19 | 214 | 0 |
| Subtotal: | 1,294 | 9,768 | 0 |
| **Pipeline Equipment** | | | |
| 300 Amp Gas Welder | 29 | 21 | 0 |
| 350 Amp Diesel Welder | 58 | 48 | 0 |
| Subtotal: | 86 | 69 | 0 |
| **Concrete Equipment** | | | |
| 124 YPH Trailer Mounted Concrete Pump | 182 | 1,265 | 0 |
| Concrete Saw 10" | 29 | 0 | 8 |
| Subtotal: | 211 | 1,265 | 8 |
| **Utility Equipment** | | | |
| 10 KW Generator Set (Gas) | 1,681 | 0 | 933 |
| 60 KW Diesel Generator Set | 115 | 288 | 0 |
| 100 KW Diesel Generator Set | 634 | 2,353 | 0 |
| Tower 6-Lights 16 Hsp | 304 | 202 | 0 |

**Kerckhoff Project Decommissioning Appraisal Level Equipment and Fuel Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| 2" Diesel Water Pump 8,000 gph | 67 | 36 | 0 |
| 250 CFM Diesel Compressor | 259 | 790 | 0 |
| 750 CFM Diesel Compressor | 29 | 248 | 0 |
| Subtotal: | 3,088 | 3,916 | 933 |
| **Hoisting Equipment** | | | |
| 20 Ton Truck Crane | 10 | 30 | 0 |
| 40 Ton Truck Crane | 130 | 453 | 0 |
| 100 Ton Truck Crane (Linkbelt 218) | 624 | 2,037 | 0 |
| 125 Ton Truck Crane (Linkbelt 228) | 19 | 91 | 0 |
| 150 Ton Crawler Crane (American 9260) | 163 | 632 | 0 |
| 250 Ton Crawler Crane (American 9320) | 622 | 2,949 | 0 |
| 30 Ton Hydraulic Crane (Grove500) | 1,053 | 2,234 | 0 |
| 40 Ton Hydraulic Crane (Grove700) | 106 | 250 | 0 |
| 50 Ton Hydraulic Crane (Grove) | 134 | 336 | 0 |
| 60 Ton Hydraulic Crane (Grove) | 38 | 120 | 0 |
| 2 Tonne Forklift (JCB-5500lb) | 24 | 47 | 0 |
| 6 Tonne Forklift(12,000lb) | 466 | 1,808 | 0 |
| Motorized Manlift 30 Ft | 58 | 80 | 0 |
| Knucklboom Manlift 36 Ft | 173 | 288 | 0 |
| Motorized Manlift 120FT ( JLG 120FXJ) | 38 | 122 | 0 |
| Swing Stage | 302 | 503 | 0 |
| Subtotal: | 3,959 | 11,979 | 0 |
| **Foundation & Marine Equipment** | | | |
| Concrete Crusher | 368 | 1,838 | 0 |
| Subtotal: | 368 | 1,838 | 0 |
| **Service & Maintenance Equipment** | | | |
| Sedan Car 4-Door | 144 | 0 | 160 |
| 1/2 Ton Pickup Truck 4x4 | 285 | 0 | 451 |
| 3/4 Ton Pickup Truck 2x2 | 4,412 | 0 | 8,160 |
| 3/4 Ton Pickup Truck 4x4 | 29 | 0 | 57 |
| 1-Ton Crew Cab | 60 | 0 | 143 |

**Kerckhoff Project Decommissioning Appraisal Level Equipment and Fuel Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| 5 Ton Flat Bed Truck | 654 | 1,996 | 0 |
| 1- Ton Mechanic Truck | 29 | 96 | 0 |
| 2-Ton Mechanic Truck | 144 | 639 | 0 |
| Electrical Service truck | 749 | 3,324 | 0 |
| Fuel Truck (Single Axle) | 67 | 242 | 0 |
| 1000 Gallon Watertruck | 144 | 439 | 0 |
| 5 Ton Boomtruck | 19 | 38 | 0 |
| 15 Ton Pitman Boom Truck | 19 | 58 | 0 |
| Tractor & Trailer | 1,164 | 7,107 | 0 |
| 20 Ton Lowboy | 158 | 439 | 0 |
| 40 Ton Lowboy | 10 | 40 | 0 |
| Chain Saw | 38 | 0 | 10 |
| Subtotal: | 8,126 | 14,419 | 8,981 |
| **Subcontract Equipment Est** | | | |
| Subcontract Equipment Est | 0 | 38,987 | 0 |
| Subtotal: | 0 | 38,987 | 0 |
| | | | |
| **Total:** | **17,133** | **82,240** | **9,922** |

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**Reservoir Clearing Appraisal Level Equipment and Fuel Estimates**

| Description | Equipment Hours | Total Diesel Consumption (gal) | Total Gas Consumption (gal) |
|---|---|---|---|
| **Earthmoving Equipment** | | | |
| 305 Hsp Bulldozer ( Cat D8 ) | 5,670 | 56,699 | |
| 2.0 CY Backhoe ( Cat 330 ) | 4,501 | 36,007 | |
| 140 Hsp Wheel Skidder (Cat 515) | 31,000 | 180,185 | |
| 160 Hsp Wheel Skidder (Cat 525) | 1,600 | 10,568 | |
| 200 Hsp Wheel Skidder (Cat 545) | 1,169 | 9,352 | |
| 210 Hsp Harvester (Cat 580) | 800 | 5,715 | |
| Cat TK723 Feller Buncher | 16,469 | 164,701 | |
| Cat 330 LC Log Loader | 16,469 | 143,587 | |
| Chipper - clearing | 16,500 | 188,584 | |
| DT-320 Tree Mulcher | 15,300 | 428,400 | |
| Subtotal: | 109,478 | 1,223,797 | 0 |
| **Pipeline Equipment** | | | |
| 250 Amp Diesel Welder | 6,667 | 3,329 | |
| 350 Amp Diesel Welder | 6,667 | 5,548 | |
| Subtotal: | 13,333 | 8,877 | 0 |
| **Utility Equipment** | | | |
| Tower 6-Lights 16 Hsp | 41,600 | 83,200 | |
| 185 CFM Diesel Compressor | 6,667 | 18,494 | |
| 2000 PSI Pressure Washer | 6,667 | 1,849 | |
| Subtotal: | 54,933 | 103,543 | 0 |
| **Service & Maintenance Equipment** | | | |
| 3/4 Ton Pickup Truck 4x4 | 372 | | 737 |
| 3/4 Ton Crew Cab Truck 4x4 | 22,761 | | 45,522 |
| 2-Ton Mechanic Truck | 13,333 | | 37,054 |
| Lube Truck | 16,000 | 59,181 | |
| Fuel Truck (Tandem Axle 20000 litres) | 8,000 | 28,000 | |
| 5000 Gallon Watertanker | 3,332 | 11,662 | |
| Survey Total Station | 1,760 | | |
| Chain Saw | 49,900 | | 24,950 |
| Subtotal: | 115,458 | 98,843 | 108,263 |
| | | | |
| **Total:** | **293,203** | **1,435,060** | **108,263** |

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## USJRBSI Construction Mass Emissions Calculations

| | |
|---|---|
| **Green Tabs G1-G7** | *Green tabs include emissions calculations/summaries* |
| **Orange Tabs O1-O5** | *Orange tabs include emission factor calculations, conversion factors, and other pertinant information used to calculate emissions* |
| **Yellow Tabs Y1-Y8** | *Yellow tabs include construction equipment estimates for Phase 1 of construction* |
| **Red Tabs R1-R3** | *Red tabs include construction equipment estimates for Phase 2 of construction* |
| **Blue Tabs B1-B5** | *Blue tabs include construction equipment estimates for Phase 3 of construction* |

## Emissions Summary

*this sheet summarizes total mass emissions for each alternative by construction phase*

| | Alternative 1-3, 5 | | | | Alternative 4 | | | |
|---|---|---|---|---|---|---|---|---|
| | Average (TPY) | Phase 1 (TPY) | Phase 2 (TPY) | Phase 3 (TPY) | Average (TPY) | Phase 1 (TPY) | Phase 2 (TPY) | Phase 3 (TPY) |
| ***ROG*** | 17 | 20 | 4 | 20 | 17 | 20 | 5 | 20 |
| ***NOX*** | 142 | 185 | 35 | 192 | 145 | 185 | 41 | 192 |
| ***PM10 (exhaust)*** | 5 | 6 | 1 | 6 | 5 | 6 | 1 | 6 |
| ***PM10 (dust)*** | 165 | 131 | 8 | 233 | 165 | 131 | 8 | 233 |
| ***CO2 (MT)*** | 22,205 | 24,865 | 5,993 | 27,021 | 22,574 | 24,865 | 6,932 | 27,021 |

## Off-Road Emissions Summary Alternative 1-3, 5

*this sheet summarizes exhaust and fugitive dust emissions from the use of off-road equipmnet for alternatives 1-3*

| | | Fuel Consumption | | | Fugitive Dust Sources | |
|---|---|---|---|---|---|---|
| **Phase 1 Activities** | **Phase 1 Equipment Use/Fuel Consumption** | **Diesel (gal)** | **Gasoline (gal)** | **Grading/Dozing (hours)** | **Truck Loading (tons)** | **Batch Plant (cy)** |
| | Contractor Use Area | 4,179,640 | 82,329 | 123,716 | | |
| | Transmission | 6,530 | 20,462 | 2,177 | | |
| *Site Access and Staging* | Haul Roads | 752,281 | 24,958 | 20,508 | | |
| | PermiRoads | 419,428 | 13,758 | 19,768 | | |
| | USJRB - RM274 - Subgrp A - Fine Gold Crk Brdge - 2013 | 0 | 0 | 0 | | |
| | USJRV - RM274 - Subgrp E - Pwrplt Acc Rd Brdg - 2013 | 50,694 | 19 | 0 | | |
| *Cofferdam Material Processing* | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt | 798,930 | 159,777 | 5,277 | | |
| *Marine Cofferdam Work** | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (marine vessels) | 0 | 0 | 0 | | |
| *Diversion Tunnel* | USJRB - Subgrp B - Outlet Works Tunnel - March 2013 | 596,113 | 0 | 3,101 | | |
| **Phase Total** | | 6,803,617 | 301,303 | 174,548 | 25,687,193 | 2,754,252 |
| *Per Day* | | 8,836 | 391 | 227 | 33,360 | 3,577 |
| *Per year* | | 1,943,891 | 86,086 | 49,871 | 7,339,198 | 786,929 |
| **Phase 2 Activities** | **Phase 2 Equipment Use/Fuel Consumption** | **Diesel (gal)** | **Gasoline (gal)** | **Grading/Dozing (hours)** | **Truck Loading (tons)** | **Batch Plant (cy)** |
| *Powerhouse/Valve house* | PH&Row | 955,313 | 455,560 | 13,484 | | |
| *Intake Structure* | LLIS (Alt1-3) | 226,781 | 100,676 | 2,485 | | |
| *Tunnel Connection* | LLIS (Alt1-3) | 226,781 | 100,676 | 2,485 | | |
| **Phase Total** | | 1,408,875 | 656,911 | 18,453 | 2,145,720 | 162,768 |
| *Per Day* | | 1,601 | 746 | 21 | 2,438 | 185 |
| *Per year* | | 352,219 | 164,228 | 4,613 | 536,430 | 40,692 |
| **Phase 3 Activities** | **Phase 3 Equipment Use/Fuel Consumption** | **Diesel (gal)** | **Gasoline (gal)** | **Grading/Dozing (hours)** | **Truck Loading (tons)** | **Batch Plant (cy)** |
| *Dam Material Processing* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| *Complete Cofferdams* | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (PDF) + 1/2 marine vessels | 798,930 | 159,777 | 5,277 | | |
| *Foundation Preparation* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| *RCC Arch Dam* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| | USJRB - RM274 - Subgrp C - Spillway Curved Arch Dam - 2013 - 1 (PDF) | 741,605 | 48,910 | 1,408 | | |
| *Reclamation and Demobilization* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| | Kerckhoff Decom (spreadsheet) | 82,240 | 9,922 | 176 | | |
| *Affected Existing Facilities* | Recreation (spreadsheet) | 72,374 | 3,802 | 1,568 | | |
| | Utilities (spreadsheet) | 6,133 | 1,379 | 7 | | |
| | LeGrande Transmission Line (spreadsheet) | 4,925 | 15,431 | 1,642 | | |
| *Reservoir Clearing* | Reservoir Clearning (spreadsheet) | 1,435,060 | 108,263 | 5,670 | | |
| **Phase Total** | | 9,301,746 | 817,377 | 47,051 | 9,880,993 | 7,811,123 |
| *Per Day* | | 8,456 | 743 | 43 | 8,983 | 7,101 |
| *Per year* | | 1,860,349 | 163,475 | 9,410 | 1,976,199 | 1,562,225 |

| Alternative 1-3 Totals | Diesel (gal) | Gasoline (gal) | Grading/Dozing (hours) | Truck Loading (tons) | Batch Plant (cy) |
|---|---|---|---|---|---|
| *EMFAC Input Alt Total* | 17,514,238 | 1,775,590 | 240,052 | 37,713,906 | 10,728,142 |

| | | | | | |
|---|---|---|---|---|---|
| **Emissions Summary** | | | | | |
| ***Exhaust (Off-Road)*** | | | | | |
| ROG (tons) | 160 | | | | |
| NOX (tons) | 1,271 | | | | |
| PM10 Exhaust (tons) | 47 | | | | |
| CO2 (tons) | 212,673 | | | | |
| CO2 (MT) | 191,406 | | | | |
| ***Exhaust (Marine Vessel)*** | | | | | |
| ROG (tons) | 6 | | | | |
| NOX (tons) | 100 | | | | |
| PM10 Exhaust (tons) | 3 | | | | |
| CO2 (tons) | 7,311 | | | | |
| CO2 (MT) | 6,580 | | | | |
| ***Fugitive Dust Summary*** | | | | | |
| pounds/activity | | | 146,960 | 4,557 | 3,117,598 |
| tons/activity | | | 73 | 2 | 1,559 |
| PM10 Dust Alt Total (tons) | 1,635 | | | | |
| | | | | | |
| ***Alternative Average*** | | | | | |
| ROG (TPY) | 17 | | | | |
| NOX (TPY) | 137 | | | | |
| PM10 (TPY) | 5 | | | | |
| PM10 Dust | 163 | | | | |
| CO2 (MT/YR) | 19,799 | | | | |

* See "Exhaust Emission Factors" sheet for marine vessel exhaust calculations

## On-Road Emissions Summary Alternative 1-3, 5

*this sheet summarizes exhaust and dust emissions from the use of on-road vehicles (worker commute and haul trucks) for alternative 1-3*

| | Exhaust | | Fugitive Dust Sources | | |
|---|---|---|---|---|---|
| **Phase 1 Activities** | **Haul Trip VMT** | **Worker VMT** | **Heavy DutyTravel on Paved Road VMT** | **Heavy DutyTravel on Unpaved Road VMT** | **Worker Commute on Paved Roads VMT** |
| | 49,560 | 2,759,120 | 44,604 | 4,956 | 2,759,120 |
| *Site Access and Staging* | 280 | 4,231,360 | 252 | 28 | 4,231,360 |
| | 37,520 | 360,220 | 33,768 | 3,752 | 360,220 |
| | 55,840 | 0 | 50,256 | 5,584 | 0 |
| *Cofferdam Material Processing* | 0 | 1,347,290 | 0 | 0 | 1,347,290 |
| *Marine Cofferdam Work* | 0 | 1,347,290 | 0 | 0 | 1,347,290 |
| | 130,480 | 1,760,640 | 117,432 | 13,048 | 1,760,640 |
| *Diversion Tunnel* | 20,860 | 0 | 18,774 | 2,086 | 0 |
| | 52,824 | 0 | 47,542 | 5,282 | 0 |
| **Phase Total** | 347,364 | 11,805,920 | 312,628 | 34,736 | 11,805,920 |
| *Per Day* | 451 | 15,332 | 406 | 45 | 15,332 |
| *Per year* | 99,247 | 3,373,120 | 89,322 | 9,925 | 3,373,120 |

| **Phase 2 Activities** | **Haul Trip VMT** | **Worker VMT** | **Heavy DutyTravel on Paved Road** | **Heavy DutyTravel on Unpaved Road** | **Worker Commute on Paved Roads** |
|---|---|---|---|---|---|
| | 170,660 | 5,278,140 | 153,594 | 17,066 | 5,278,140 |
| *Powerhouse/Valve house* | 96,320 | 0 | 86,688 | 9,632 | 0 |
| | 72,008 | 0 | 64,807 | 7,201 | 0 |
| *Intake Structure* | 122,640 | 941,430 | 110,376 | 12,264 | 941,430 |
| *Tunnel Connection* | 0 | 941,430 | 0 | 0 | 941,430 |
| **Phase Total** | 461,628 | 7,161,000 | 415,465 | 46,163 | 7,161,000 |
| *Per Day* | 525 | 8,138 | 472 | 52 | 8,138 |
| *Per year* | 115,407 | 1,790,250 | 103,866 | 11,541 | 1,790,250 |

| Phase 3 Activities | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road | Heavy DutyTravel on Unpaved Road | Worker Commute on Paved Roads |
|---|---|---|---|---|---|
| *Dam Material Processing* | 0 | 2,351,300 | 0 | 0 | 2,351,300 |
| *Complete Cofferdams* | 0 | 931,840 | 0 | 0 | 931,840 |
| *Foundation Preparation* | 90,020 | 1,687,560 | 81,018 | 9,002 | 1,687,560 |
| *RCC Arch Dam* | 5,146,540 | 10,377,360 | 4,631,886 | 514,654 | 10,377,360 |
| *Reclamation and Demobilzation* | 0 | 137,200 | 0 | 0 | 137,200 |
| | 82,600 | 813,800 | 74,340 | 8,260 | 813,800 |
| | 47,800 | 273,400 | 43,020 | 4,780 | 273,400 |
| | 0 | 7,980 | 0 | 0 | 7,980 |
| *Affected Existing Facilities* | 87,220 | 0 | 78,498 | 8,722 | 0 |
| | 342,800 | 0 | 308,520 | 34,280 | 0 |
| | 1,200 | 0 | 1,080 | 120 | 0 |
| | 7,520 | 0 | 6,768 | 752 | 0 |
| *Reservoir Clearing* | 411,800 | 3,518,600 | 370,620 | 41,180 | 3,518,600 |
| **Phase Total** | 6,217,500 | 20,099,040 | 5,595,750 | 621,750 | 20,099,040 |
| *Per Day* | 5,652 | 18,272 | 5,087 | 565 | 18,272 |
| *Per year* | 1,243,500 | 4,019,808 | 1,119,150 | 124,350 | 4,019,808 |

| Alternative 1-3 Totals | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road | Heavy DutyTravel on Unpaved Road | Worker Commute on Paved Roads |
|---|---|---|---|---|---|
| *EMFAC Input Alt Total* | 7,026,492 | 39,065,960 | 6,323,843 | 702,649 | 39,065,960 |

| Emissions Summary | | | | | |
|---|---|---|---|---|---|
| ***Alternative Total by Source*** | | | | | |
| ROG (tons) | 2 | 2 | | | |
| NOX (tons) | 49 | 6 | | | |
| PM10 Exhaust (tons) | 1 | 0.08 | | | |
| PM10 Dust (tons) | | | 8 | 4 | 7 |
| CO2 (tons) | 13,473 | 16,229 | | | |
| CO2 (MT) | 12,126 | 14,606 | | | |
| ***Alternative Total*** | | | | | |
| ROG (tons) | 4 | | | | |
| NOX (tons) | 54 | | | | |
| PM10 Exhaust (tons) | 1 | | | | |
| PM10 Dust (tons) | 19 | | | | |
| CO2 (tons) | 26,732 | | | | |
| CO2 (MT) | 24,059 | | | | |
| ***Alternative Average*** | | | | | |
| ROG (TPY) | 0 | | | | |
| NOX (TPY) | 5 | | | | |
| PM10 (TPY) | 0 | | | | |
| PM10 Dust | 2 | | | | |
| CO2 (MT/YR) | 2,406 | | | | |

## Emissions Summary by Phase Alternative 1-3, 5

*This sheet summarizes the total mass emissions on a per phase basis for alternatives 1-3*

| | Off-Road Emissions | | | | | | | | On-Road Emissions | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Phase 1** | off road diesel | off road gas | total fuel | grading hours | truck loading tons | batch plant (cy) | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road VMT | Heavy DutyTravel on Unpaved Road VMT | Worker Commute on Paved Roads VMT |
| | 1,943,891 | 86,086 | 2,029,977 | 49,871 | 7,339,198 | 786,929 | 99,247 | 3,373,120 | 89,322 | 9,925 | 3,373,120 |
| **Emissions Summary** | | | | | | | | | | | |
| ***Exhaust*** | | | | | | | | | | | |
| ROG (tons) | | | 17 | | | | 0.03 | 0.15 | | | |
| NOX (tons) | | | 134 | | | | 0.69 | 0.49 | | | |
| PM10 Exhaust (tons) | | | 5 | | | | 0.01 | 0.01 | | | |
| CO2 (tons) | | | 22,381 | | | | 190 | 1,401 | | | |
| CO2 (MT) | | | 20,143 | | | | 171 | 1,261 | | | |
| ***Exhaust (Marine Vessel)*** | | | | | | | | | | | |
| ROG (tons) | 3 | | | | | | | | | | |
| NOX (tons) | 50 | | | | | | | | | | |
| PM10 Exhaust (tons) | 1 | | | | | | | | | | |
| CO2 (tons) | 3,656 | | | | | | | | | | |
| CO2 (MT) | 3,290 | | | | | | | | | | |
| ***Fugitive Dust*** | | | | | | | | | | | |
| Batch Plant/Quarry (lbs) | | | | | | 228,682 | | | | | |
| PM10 Dust (tons) | | | | 15 | 0.44 | 114 | | | 0.11 | 0.06 | 1 |

| Phase 1 Total (TPY) | |
|---|---|
| ROG | 20 |
| NOX | 185 |
| PM10 Exhaust | 6.3 |
| PM2.5 Exhaust | |
| PM10 Dust | 131 |
| PM2.5 Dust | |
| CO2 (MT) | 24,865 |

| Phase 2 | off road diesel | off road gas | total fuel | grading hours | truck loading tons | batch plant (cy) | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road VMT | Heavy DutyTravel on Unpaved Road VMT | Worker Commute on Paved Roads VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 352,219 | 164,228 | 516,446 | 4,613 | 536,430 | 40,692 | 115,407 | 1,790,250 | 103,866 | 11,541 | 1,790,250 |
| **Emissions Summary** | | | | | | | | | | | |
| ***Exhaust*** | | | | | | | | | | | |
| ROG (tons) | | | 4 | | | | 0.04 | 0.079 | | | |
| NOX (tons) | | | 34 | | | | 0.80 | 0.258 | | | |
| PM10 Exhaust (tons) | | | 1 | | | | 0.01 | 0.004 | | | |
| CO2 (tons) | | | 5,694 | | | | 221.29 | 743.7 | | | |
| CO2 (MT) | | | 5,125 | | | | 199 | 669 | | | |
| ***Fugitive Dust*** | | | | | | | | | | | |
| Batch Plant/Quarry (lbs) | | | | | | 11,825.08 | | | | | |
| PM10 Dust (tons) | | | | 1.41 | 0.03 | 5.91 | | | 0.13 | 0.07 | 0.31 |

| Phase 2 Total (TPY) | |
|---|---|
| ROG | 4.39 |
| NOX | 35.08 |
| PM10 Exhaust | 1.27 |
| PM2.5 Exhaust | |
| PM10 Dust | 7.86 |
| PM2.5 Dust | |
| CO2 (MT) | 5,993 |

| Phase 3 | off road diesel | off road gas | total fuel | grading hours | truck loading tons | batch plant (cy) | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road VMT | Heavy DutyTravel on Unpaved Road VMT | Worker Commute on Paved Roads VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Emissions Summary** | 1,860,349 | 163,475 | 2,023,825 | 9,410 | 1,976,199 | 1,562,225 | 1,243,500 | 4,019,808 | 1,119,150 | 124,350 | 4,019,808 |
| ***Exhaust*** | | | | | | | | | | | |
| ROG (tons) | | | 17 | | | | 0.38 | 0.18 | | | |
| NOX (tons) | | | 133 | | | | 8.64 | 0.58 | | | |
| PM10 Exhaust (tons) | | | 5 | | | | 0.16 | 0.01 | | | |
| CO2 (tons) | | | 22,313 | | | | 2384 | 1670 | | | |
| CO2 (MT) | | | 20,082 | | | | 2146 | 1503 | | | |
| ***Exhaust (Marine Vessel)*** | | | | | | | | | | | |
| ROG (tons) | 3 | | | | | | | | | | |
| NOX (tons) | 50 | | | | | | | | | | |
| PM10 Exhaust (tons) | 1 | | | | | | | | | | |
| CO2 (tons) | 3,656 | | | | | | | | | | |
| CO2 (MT) | 3,290 | | | | | | | | | | |
| ***Fugitive Dust*** | | | | | | | | | | | |
| Batch Plant/Quarry (lbs) | | | | | | 453982.46 | | | | | |
| PM10 Dust (tons) | | | | 2.88 | 0.12 | 226.9912286 | | | 1.355212366 | 0.73722868 | 0.702971068 |

| Phase 3 Total (TPY) | |
|---|---|
| ROG | 20 |
| NOX | 192 |
| PM10 Exhaust | 6 |
| PM2.5 Exhaust | |
| PM10 Dust | 232.79 |
| PM2.5 Dust | |
| CO2 (MT) | 27,021 |

## Off-Road Emissions Summary Alternative 4

*this sheet summarizes exhaust and fugitive dust emissions from the use of off-road equipmnet for alternatives 1-3*

| | | Fuel Consumption | | | Fugitive Dust Sources | |
|---|---|---|---|---|---|---|
| **Phase 1 Activities** | **Phase 1 Equipment Use/Fuel Consumption** | **Diesel (gal)** | **Gasoline (gal)** | **Grading/Dozing (hours)** | **Truck Loading (tons)** | **Batch Plant (cy)** |
| | Contractor Use Area | 4,179,640 | 82,329 | 123,716 | | |
| | Transmission | 6,530 | 20,462 | 2,177 | | |
| *Site Access and Staging* | Haul Roads | 752,281 | 24,958 | 20,508 | | |
| | PermRoads | 419,428 | 13,758 | 19,768 | | |
| | USJRB - RM274 - Subgrp A - Fine Gold Crk Brdge - 2013 | 0 | 0 | 0 | | |
| | USJRV - RM274 - Subgrp E - Pwrplt Acc Rd Brdg - 2013 | 50,694 | 19 | 0 | | |
| *Cofferdam Material Processing* | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt | 798,930 | 159,777 | 5,277 | | |
| *Marine Cofferdam Work** | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (marine vessels) | 0 | 0 | 0 | | |
| *Diversion Tunnel* | USJRB - Subgrp B - Outlet Works Tunnel - March 2013 | 596,113 | 0 | 3,101 | | |
| **Phase Total** | | 6,803,617 | 301,303 | 174,548 | 25,687,193 | 2,754,252 |
| *Per Day* | | 8,836 | 391 | 227 | 33,360 | 3,577 |
| *Per year* | | 1,943,891 | 86,086 | 49,871 | 7,339,198 | 786,929 |
| **Phase 2 Activities** | **Phase 2 Equipment Use/Fuel Consumption** | **Diesel (gal)** | **Gasoline (gal)** | **Grading/Dozing (hours)** | **Truck Loading (tons)** | **Batch Plant (cy)** |
| *Powerhouse/Valve house* | PH&Row | 955,313 | 455,560 | 13,484 | | |
| *Intake Structure* | SLIS (Alt 4) | 330,961 | 152,909 | 2,485 | | |
| *Tunnel Connection* | SLIS (Alt 4) | 330,961 | 152,909 | 2,485 | | |
| **Phase Total** | | 1,617,235 | 761,378 | 18,453 | 2,145,720 | 162,768 |
| *Per Day* | | 1,838 | 865 | 21 | 2,438 | 185 |
| *Per year* | | 404,309 | 190,344 | 4,613 | 536,430 | 40,692 |
| **Phase 3 Activities** | **Phase 3 Equipment Use/Fuel Consumption** | **Diesel (gal)** | **Gasoline (gal)** | **Grading/Dozing (hours)** | **Truck Loading (tons)** | **Batch Plant (cy)** |
| *Dam Material Processing* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| *Complete Cofferdams* | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (PDF) + 1/2 marine vessels | 798,930 | 159,777 | 5,277 | | |
| *Foundation Preparation* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| *RCC Arch Dam* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| | USJRB - RM274 - Subgrp C - Spillway Curved Arch Dam - 2013 -1 (PDF) | 741,605 | 48,910 | 1,408 | | |
| *Reclamation and Demobilization* | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) | 1,540,120 | 117,473 | 7,826 | | |
| | Kerckhoff Decom (spreadsheet) | 82,240 | 9,922 | 176 | | |
| *Affected Existing Facilities* | Recreation (spreadsheet) | 72,374 | 3,802 | 1,568 | | |
| | Utilities (spreadsheet) | 6,133 | 1,379 | 7 | | |
| | LeGrande Transmission Line (spreadsheet) | 4,925 | 15,431 | 1,642 | | |
| *Reservoir Clearing* | Reservoir Clearning (spreadsheet) | 1,435,060 | 108,263 | 5,670 | | |
| **Phase Total** | | 9,301,746 | 817,377 | 47,051 | 9,880,993 | 7,811,123 |
| *Per Day* | | 8,456 | 743 | 43 | 8,983 | 7,101 |
| *Per year* | | 1,860,349 | 163,475 | 9,410 | 1,976,199 | 1,562,225 |

| Alternative 1-3 Totals | Diesel (gal) | Gasoline (gal) | Grading/Dozing (hours) | Truck Loading (tons) | Batch Plant (cy) |
|---|---|---|---|---|---|
| *EMFAC Input Alt Total* | 17,722,598 | 1,880,057 | 240,052 | 37,713,906 | 10,728,142 |

| **Emissions Summary** | | | | | |
|---|---|---|---|---|---|
| ***Exhaust (Off-Road)*** | | | | | |
| ROG (tons) | 162 | | | | |
| NOX (tons) | 1,291 | | | | |
| PM10 Exhaust (tons) | 48 | | | | |
| CO2 (tons) | 216,122 | | | | |
| CO2 (MT) | 194,510 | | | | |
| ***Exhaust (Marine Vessel)*** | | | | | |
| ROG (tons) | 6 | | | | |
| NOX (tons) | 100 | | | | |
| PM10 Exhaust (tons) | 3 | | | | |
| CO2 (tons) | 7,311 | | | | |
| CO2 (MT) | 6,580 | | | | |
| ***Fugitive Dust Summary*** | | | | | |
| pounds/activity | | | 146,960 | 4,557 | 3,117,598 |
| tons/activity | | | 73 | 2 | 1,559 |
| PM10 Dust Alt Total (tons) | 1,635 | | | | |
| | | | | | |
| ***Alternative Average*** | | | | | |
| ROG (TPY) | 17 | | | | |
| NOX (TPY) | 139 | | | | |
| PM10 (TPY) | 5 | | | | |
| PM10 Dust | 163 | | | | |
| CO2 (MT/YR) | 20,109 | | | | |

* See "Exhaust Emission Factors" sheet for marine vessel exhaust calculations

## On-Road Emissions Summary Alternative 4

*this sheet summarizes exhaust and dust emissions from the use of on-road vehicles (worker commute and haul trucks) for alternative 4*

| | Exhaust | | Fugitive Dust Sources | | |
|---|---|---|---|---|---|
| **Phase 1 Activities** | **Haul Trip VMT** | **Worker VMT** | **Heavy DutyTravel on Paved Road VMT** | **Heavy DutyTravel on Unpaved Road VMT** | **Worker Commute on Paved Roads VMT** |
| | 49,560 | 2,759,120 | 44,604 | 4,956 | 2,759,120 |
| *Site Access and Staging* | 280 | 4,231,360 | 252 | 28 | 4,231,360 |
| | 37,520 | 360,220 | 33,768 | 3,752 | 360,220 |
| | 55,840 | 0 | 50,256 | 5,584 | 0 |
| *Cofferdam Material Processing* | 0 | 1,347,290 | 0 | 0 | 1,347,290 |
| *Marine Cofferdam Work* | 0 | 1,347,290 | 0 | 0 | 1,347,290 |
| | 130,480 | 1,760,640 | 117,432 | 13,048 | 1,760,640 |
| *Diversion Tunnel* | 20,860 | 0 | 18,774 | 2,086 | 0 |
| | 52,824 | 0 | 47,542 | 5,282 | 0 |
| **Phase Total** | 347,364 | 11,805,920 | 312,628 | 34,736 | 11,805,920 |
| *Per Day* | 451 | 15,332 | 406 | 45 | 15,332 |
| *Per year* | 99,247 | 3,373,120 | 89,322 | 9,925 | 3,373,120 |

| **Phase 2 Activities** | **Haul Trip VMT** | **Worker VMT** | **Heavy DutyTravel on Paved Road** | **Heavy DutyTravel on Unpaved Road** | **Worker Commute on Paved Roads** |
|---|---|---|---|---|---|
| | 170,660 | 5,278,350 | 153,594 | 17,066 | 5,278,350 |
| *Powerhouse/Valve house* | 96,320 | 0 | 86,688 | 9,632 | 0 |
| | 72,008 | 0 | 64,807 | 7,201 | 0 |
| *Intake Structure* | 270,620 | 1,473,990 | 243,558 | 27,062 | 1,473,990 |
| *Tunnel Connection* | 0 | 1,473,990 | 0 | 0 | 1,473,990 |
| **Phase Total** | 609,608 | 8,226,330 | 548,647 | 60,961 | 8,226,330 |
| *Per Day* | 693 | 9,348 | 623 | 69 | 9,348 |
| *Per year* | 152,402 | 2,056,583 | 137,162 | 15,240 | 2,056,583 |

| Phase 3 Activities | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road | Heavy DutyTravel on Unpaved Road | Worker Commute on Paved Roads |
|---|---|---|---|---|---|
| *Dam Material Processing* | 0 | 2,351,300 | 0 | 0 | 2,351,300 |
| *Complete Cofferdams* | 0 | 931,840 | 0 | 0 | 931,840 |
| *Foundation Preparation* | 90,020 | 1,687,560 | 81,018 | 9,002 | 1,687,560 |
| *RCC Arch Dam* | 5,146,540 | 10,377,360 | 4,631,886 | 514,654 | 10,377,360 |
| *Reclamation and Demobilzation* | 0 | 137,200 | 0 | 0 | 137,200 |
| | 82,600 | 813,800 | 74,340 | 8,260 | 813,800 |
| | 47,800 | 273,400 | 43,020 | 4,780 | 273,400 |
| | 0 | 7,980 | 0 | 0 | 7,980 |
| *Affected Existing Facilities* | 87,220 | 0 | 78,498 | 8,722 | 0 |
| | 342,800 | 0 | 308,520 | 34,280 | 0 |
| | 1,200 | 0 | 1,080 | 120 | 0 |
| | 7,520 | 0 | 6,768 | 752 | 0 |
| *Reservoir Clearing* | 411,800 | 3,518,600 | 370,620 | 41,180 | 3,518,600 |
| **Phase Total** | 6,217,500 | 20,099,040 | 5,595,750 | 621,750 | 20,099,040 |
| *Per Day* | 5,652 | 18,272 | 5,087 | 565 | 18,272 |
| *Per year* | 1,243,500 | 4,019,808 | 1,119,150 | 124,350 | 4,019,808 |

| Alternative 1-3 Totals | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road | Heavy DutyTravel on Unpaved Road | Worker Commute on Paved Roads |
|---|---|---|---|---|---|
| *EMFAC Input Alt Total* | 7,174,472 | 40,131,290 | 6,457,025 | 717,447 | 40,131,290 |

| Emissions Summary | | | | | |
|---|---|---|---|---|---|
| ***Alternative Total by Source*** | | | | | |
| ROG (tons) | 2 | 2 | | | |
| NOX (tons) | 50 | 6 | | | |
| PM10 Exhaust (tons) | 1 | 0.08 | | | |
| PM10 Dust (tons) | | | 8 | 4 | 7 |
| CO2 (tons) | 13,757 | 16,672 | | | |
| CO2 (MT) | 12,381 | 15,005 | | | |
| ***Alternative Total*** | | | | | |
| ROG (tons) | 4 | | | | |
| NOX (tons) | 56 | | | | |
| PM10 Exhaust (tons) | 1 | | | | |
| PM10 Dust (tons) | 19 | | | | |
| CO2 (tons) | 27,386 | | | | |
| CO2 (MT) | 24,647 | | | | |
| ***Alternative Average*** | | | | | |
| ROG (TPY) | 0 | | | | |
| NOX (TPY) | 6 | | | | |
| PM10 (TPY) | 0 | | | | |
| PM10 Dust | 2 | | | | |
| CO2 (MT/YR) | 2,465 | | | | |

## Emissions Summary by Phase Alternative 4

*This sheet summarizes the total mass emissions on a per phase basis for alternatives 1-3*

| | Off-Road Emissions | | | | | | On-Road Emissions | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Phase 1** | off road diesel | off road gas | total fuel | grading hours | truck loading tons | batch plant (cy) | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road VMT | Heavy DutyTravel on Unpaved Road VMT | Worker Commute on Paved Roads VMT |
| | 1,943,891 | 86,086 | 2,029,977 | 49,871 | 7,339,198 | 786,929 | 99,247 | 3,373,120 | 89,322 | 9,925 | 3,373,120 |
| **Emissions Summary** | | | | | | | | | | | |
| ***Exhaust*** | | | | | | | | | | | |
| ROG (tons) | | | 17 | | | | 0.03 | 0.15 | | | |
| NOX (tons) | | | 134 | | | | 0.69 | 0.49 | | | |
| PM10 Exhaust (tons) | | | 5 | | | | 0.01 | 0.01 | | | |
| CO2 (tons) | | | 22,381 | | | | 190 | 1,401 | | | |
| CO2 (MT) | | | 20,143 | | | | 171 | 1,261 | | | |
| ***Exhaust (Marine Vessel)*** | | | | | | | | | | | |
| ROG (tons) | 3 | | | | | | | | | | |
| NOX (tons) | 50 | | | | | | | | | | |
| PM10 Exhaust (tons) | 1 | | | | | | | | | | |
| CO2 (tons) | 3,656 | | | | | | | | | | |
| CO2 (MT) | 3,290 | | | | | | | | | | |
| ***Fugitive Dust*** | | | | | | | | | | | |
| Batch Plant/Quarry (lbs) | | | | | | 228,682 | | | | | |
| PM10 Dust (tons) | | | | 15 | 0.44 | 114 | | | 0.11 | 0.06 | 1 |

| Phase 1 Total (TPY) | |
|---|---|
| ROG | 20 |
| NOX | 185 |
| PM10 Exhaust | 6.3 |
| PM2.5 Exhaust | |
| PM10 Dust | 131 |
| PM2.5 Dust | |
| CO2 (MT) | 24,865 |

| **Phase 2** | off road diesel | off road gas | total fuel | grading hours | truck loading tons | batch plant (cy) | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road VMT | Heavy DutyTravel on Unpaved Road VMT | Worker Commute on Paved Roads VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 404,309 | 190,344 | 594,653 | 4,613 | 536,430 | 40,692 | 152,402 | 2,056,583 | 137,162 | 15,240 | 2,056,583 |
| **Emissions Summary** | | | | | | | | | | | |
| ***Exhaust*** | | | | | | | | | | | |
| ROG (tons) | | | 5 | | | | 0.05 | 0.091 | | | |
| NOX (tons) | | | 39 | | | | 1.06 | 0.296 | | | |
| PM10 Exhaust (tons) | | | 1 | | | | 0.02 | 0.004 | | | |
| CO2 (tons) | | | 6,556 | | | | 292.23 | 854.4 | | | |
| CO2 (MT) | | | 5,901 | | | | 263 | 769 | | | |
| ***Fugitive Dust*** | | | | | | | | | | | |
| Batch Plant/Quarry (lbs) | | | | | | 11,825.08 | | | | | |
| PM10 Dust (tons) | | | | 1.41 | 0.03 | 5.91 | | | 0.17 | 0.09 | 0.36 |

| Phase 2 Total (TPY) | |
|---|---|
| ROG | 5.06 |
| NOX | 40.53 |
| PM10 Exhaust | 1.47 |
| PM2.5 Exhaust | |
| PM10 Dust | 7.97 |
| PM2.5 Dust | |
| CO2 (MT) | 6,932 |

| Phase 3 | off road diesel | off road gas | total fuel | grading hours | truck loading tons | batch plant (cy) | Haul Trip VMT | Worker VMT | Heavy DutyTravel on Paved Road VMT | Heavy DutyTravel on Unpaved Road VMT | Worker Commute on Paved Roads VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Emissions Summary** | 1,860,349 | 163,475 | 2,023,825 | 9,410 | 1,976,199 | 1,562,225 | 1,243,500 | 4,019,808 | 1,119,150 | 124,350 | 4,019,808 |
| ***Exhaust*** | | | | | | | | | | | |
| ROG (tons) | | | 17 | | | | 0.38 | 0.18 | | | |
| NOX (tons) | | | 133 | | | | 8.64 | 0.58 | | | |
| PM10 Exhaust (tons) | | | 5 | | | | 0.16 | 0.01 | | | |
| CO2 (tons) | | | 22,313 | | | | 2384 | 1670 | | | |
| CO2 (MT) | | | 20,082 | | | | 2146 | 1503 | | | |
| ***Exhaust (Marine Vessel)*** | | | | | | | | | | | |
| ROG (tons) | 3 | | | | | | | | | | |
| NOX (tons) | 50 | | | | | | | | | | |
| PM10 Exhaust (tons) | 1 | | | | | | | | | | |
| CO2 (tons) | 3,656 | | | | | | | | | | |
| CO2 (MT) | 3,290 | | | | | | | | | | |
| ***Fugitive Dust*** | | | | | | | | | | | |
| Batch Plant/Quarry (lbs) | | | | | | 453982.46 | | | | | |
| PM10 Dust (tons) | | | | 2.88 | 0.12 | 226.9912286 | | | 1.355212366 | 0.73722868 | 0.702971068 |
| **Phase 3 Total (TPY)** | | | | | | | | | | | |
| ROG | 20 | | | | | | | | | | |
| NOX | 192 | | | | | | | | | | |
| PM10 Exhaust | 6 | | | | | | | | | | |
| PM2.5 Exhaust | | | | | | | | | | | |
| PM10 Dust | 232.79 | | | | | | | | | | |
| PM2.5 Dust | | | | | | | | | | | |
| CO2 (MT) | 27,021 | | | | | | | | | | |

## Phasing Summary

*this sheet summarizes the activities within each phase and the associated sources of construction equipment estimates for each.*

| **Schedule** | |
|---|---|
| ***Phase 1*** | ***Source for fuel consumption and equipment hours*** |
| Site Access and Staging | Contractor Use Area (spreadsheet) |
| | Transmission (spreadsheet) |
| | Haul Roads (spreadsheet) |
| | PermRoads (spreadsheet) |
| | USJRB - RM274 - Subgrp A - Fine Gold Crk Brdge - 2013 (PDF) |
| | USJRV - RM274 - Subgrp E - Pwrplt Acc Rd Brdg - 2013 (PDF) |
| Cofferdam Material Processing | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (PDF) |
| Marine Cofferdam Work | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (PDF) |
| Diversion Tunnel | USJRB - Subgrp B - Outlet Works Tunnel - March 2013 (PDF) |
| ***Phase 2*** | |
| Powerhouse/Valve house | PH&Row (spreadsheet) |
| Intake Structure | LLIS (Alt1-3)/SLIS (Alt. 4) (spreadsheet) |
| Tunnel Connection | LLIS (Alt1-3)/SLIS (Alt. 4) (spreadsheet) |
| ***Phase 3*** | |
| Dam Material Processing | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) |
| Complete Cofferdams | USJRB-RM274 Subgrp B - Emb Coffdms - Arch Alt (PDF) |
| Foundation Preparation | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) |
| RCC Arch Dam | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) |
| | USJRB - RM274 - Subgrp C - Spillway Curved Arch Dam - 2013 - 1 (PDF) |
| Reclamation and Demobilzation | USJRB - RM 274 - Subgrp A - RCC Dam - VE Prop 6 Curved (PDF) |
| Affected Existing Facilities | Kerckhoff Decom (spreadsheet) |
| | Recreation (spreadsheet) |
| | Utilities (spreadsheet) |
| | LeGrande Transmission Line (spreadsheet) |
| Reservoir Clearing | Reservoir Clearning (spreadsheet) |

## Conversion Factors and Dust Emission Factors

*this sheet contains common conversion factors and construction timing assumptions used throughout this entire spreadsheet as well as calculated emission factors for fugitive dust emissions based on EPA's AP-42*

### Construction Timing

| | Years | days |
|---|---|---|
| Phase 1 | 3.5 | 770 |
| Phase 2 | 4 | 880 |
| Phase 3 | 5 | 1100 |
| Alternatives | 10 | |

### Conversions

| | Units | Source |
|---|---|---|
| 220 | days/yr | conversion |
| 8 | hours/day | conversion |
| 2000 | lbs/ton | conversion |
| 0.9 | ton/mt | conversion |
| 1.3 | tons/cubic yard | calEEMod v2013.2 |
| 2.3 | mph= 1m/s | conversion |
| 0.1 | % unpaved roads | assumption |
| 453.6 | g/lb | conversion |
| 1.34 | hp/kW | conversion |

### Fugitive Dust Emissions

*This section provides calculated emission factors for the various sources of fugitive dust emissions using formulas from EPS's AP-42*

1 Bulldozing/Grading/Scraping

*Equation is applied to dozers/scrapers, and graders to estimate fugitive dust from grading activity*
*Emissions factors for P10 from bulldozing are scaled from those of PM15*

**E(lbs/hr)=C(PM15)*s^1.5/M^1.5** **Where** **E(PM10)=E(PM15)*F(PM10)**

| Where: | PM15 Unit | Source |
|---|---|---|
| C= coeffiecient | 1 constant | AP-42 Table 11.9-1, PM15,overburden |
| M= material moisture content | 7.9 % | AP-42 Table 11.9-3,Overburden |
| s= material silt content | 6.9 % | AP-42 Table 11.9-3,Overburden |
| F= scaling factor | 0.75 constant | AP-42 Table 11.9-1, PM10 Bulldozing |

| Emission Factors | | | |
|---|---|---|---|
| | **PM15** | **0.82** | lbs/hr |
| | **PM10** | **0.61** | lbs/hr |
| | **PM10** | **0.00031** | tons/hr |

Source: *EPA 1998. AP-42 Chapter 11.9 Mineral Products Industry, Western Surface Coal Mining, Equation 11.9-1 Bulldozing*

2 Batch Plant

| Batching Operations | Emission Factor PM10 (lbs/cy) | Emission Factor PM2.5 (lbs/cy) |
|---|---|---|
| Aggregate Transfer | 0.0031 | 0.00047 |
| Sand Transfer | 0.0007 | 0.00011 |
| Cement unloading | 0.113 | 0.0152 |
| Cement supplement unloading | 0.04 | 0.0054 |
| weigh hopper loading | 0.13 | 0.0175 |
| Mixer loading (central mix) | 0.0038 | 0.00058 |

*Source: SMAQMD 2010 (June 28). Concrete Batching Operations Policy Manual. Last updated March 31, 2011.*

3 Truck Loading

*Emissions result from several distinct processes within the stockpiling/loading cycle: 1. loading in of materials through batch or drop operations, 2. equipment traffic in storage areas, 3. wind erosion of piles, 4. loadout of material through batch or drop operations*

**E(lb/ton)=(k)(0.0032)(U/5)^1.3/(M/2)^1.4**

| Where: | PM10 | Unit | Source |
|---|---|---|---|
| k= Particle Size Multiplier: | 0.35 | lbs/ton | AP-42 Chapter 13.2.4-3, PM10 emissions |
| U=mean wind speed | 2.7 | m/s | CalEEMod wind speed for San Joquin County |
| U=mean wind speed | 6.2 | mph | Calculation based on wind speed for San Joaquin County from CalEEMod |
| M=moisture content (%) | 12.0 | constant | AP-42 Chapter 13.2.4-3, Table 13.2.4-1, as used by CalEEMod |
| Emission Factor | **0.000120827** | **lbs/ton** | |
| | **0.0000000604** | **tons pm10/ton** | |

*Source: EPA 1998. AP-42 Chapter 13.2 Miscelaneous Sources, Aggregate Handling and Storage Piles*

4 Travel on Unpaved Roads (Heavy Duty Trucks)

**E(lbs/VMT)=(k)(s/12)^a (W/3)^b**

| Where: | PM10 | Unit | Source |
|---|---|---|---|
| k= Particle Size Multiplier: | 1.5 | lbs/VMT | AP-42 Chapter 13.2.2-2, PM10 emissions; industrial roads |
| s= Silt Content | 0.043 | constant | AP-42 Chapter 13.2.2-2, service roads |
| a= constant | 0.9 | constant | AP-42 Chapter 13.2.2-2, industrial roads |
| b= constant | 0.45 | constant | AP-42 Chapter 13.2.2-2, industrial roads |
| W=Vehicle Weight | 14 | tons | Average weight of loaded and unloaded truck: assumed empty truck weights 2 tons, 20 CY truck capacity and 1 CY of fill equals 1.3 tons ((2+(20cy*1.3 tons+2))/2) |
| | 0.01 | lbs/VMT | |
| | 0.0000069 | tons/VMT | |

Correction for Natural Precipitation

**E(ext)=E[(365-P)/365]**

| Where: | | Unit | Source |
|---|---|---|---|
| P=#days/yr with>=0.01 precip | 51 | inches | CalEEMod for San Joaquin County |
| Emission Factors | **0.012** | **lbs/VMT** | |
| | **0.0000059** | **tons/VMT** | |

*Source: EPA 1998. AP-42 Chapter 13.2 Miscelaneous Sources, Unpaved Roads*

5 Travel on Paved Roads (Heavy Duty Trucks and Worker Commute)

**E(lbs/VMT)=(k)(sL)^.91 (W)^1.02**

| Where: | PM10 | Unit | Source |
|---|---|---|---|
| k= Particle Size Multiplier: | 0.0022 | lbs/VMT | AP-42 Chapter 13.2.1, Table 13.2.1-1, PM10 emissions |
| sL= road surface silt loading | 0.06 | g/m^2 | AP-42 Chapter 13.2.1, Table 13.2.1-2 |
| W=Vehicle Weight | 2.1 | tons | Worker Commute Vehicle Weight Calculation shown below |
| W=Vehicle Weight | 14 | tons | Heavy Duty Average weight of loaded and unloaded truck: assumed empty truck weights 2 tons, 20 CY truck capacity and 1 CY of fill equals 1.3 tons ((2+(20cy*1.3 tons+2))/2) |
| | 0.000362413 | lbs/vmt | Worker Vehicle |
| | 0.002509521 | lbs/vmt | Heav Duty Vehicle |

Correction for Natural Precipitation

E(ext)=E[(1-P/4N)]

| Where: | | Unit | Source |
|---|---|---|---|
| P=#days/yr with>=0.01 precip | 51 | days | CalEEMod for San Joaquin County |
| N=# days in averaging period | 365 | days | NA |

| | | | |
|---|---|---|---|
| Emission Factors | **0.000349754** | **lbs/vmt** | Worker Vehicle |
| | **0.000000175** | **tons/vmt** | Worker Vehicle |
| | **0.002421860** | **lbs/vmt** | Heavy Duty Vehicle |
| | **0.000001211** | **tons/vmt** | Heavy Duty Vehicle |

| ***Worker Commute Vehicle Weight Calculation*** | | Units | Source |
|---|---|---|---|
| Vehicle class for worker trips | LDA, LDT1, LDT2 | NA | default value in CalEEMod's for Trips/VMT in the Construction module |
| Weight | 4230 | lb | average of vehicle categoriy weight (LDA-3,190 lbs, LDT1-3,750 lbs, LDT2-5,750 lbs) from EMFAC2011 |
| Mass conversion | 2000 | lb/ton | conversion |
| Weight | 2.12 | ton | calculation |

*Source: EPA 1998. AP-42 Chapter 13.2 Miscelaneous Sources, Paved Roads*

## Exhaust Emissions (Off-Road and On-Road Vehicles)

*this sheet provides calculations of emission factors from off-road fuel consumption based on OFFROAD 2007, on-road exhaust emissions from haul trucks and worker commute based on EMFAC 2011 and AP-42, and exhaust emissions from marine vessels, and is used to estimate exhaust emissions from construction activities.*

### Fuel Consumption/Emissions (off-road equipment)

OFFROAD 2007: San Joaquin County, 2015

| Equipment | MaxHP | Population | Activity (hr/day) | Consumption (gal/day) | ROG Exhaust (tons/day) | NOX Exhaust (tons/day) | CO2 (tons/day) | PM Exhaust (tons/day) |
|---|---|---|---|---|---|---|---|---|
| Pavers | 500 | 102 | 233 | 2470 | 0.02 | 0.21 | 27.18 | 0.01 |
| Rollers | 500 | 219 | 420 | 4172 | 0.03 | 0.29 | 46.02 | 0.01 |
| Scrapers | 500 | 1239 | 3773 | 55045 | 0.54 | 4.54 | 605.85 | 0.18 |
| Surfacing Equipment | 500 | 65 | 80 | 804 | 0.01 | 0.06 | 8.87 | 0.00 |
| Trenchers | 500 | 66 | 114 | 1610 | 0.02 | 0.14 | 17.71 | 0.01 |
| Bore/Drill Rigs | 500 | 230 | 531 | 7474 | 0.03 | 0.20 | 82.65 | 0.01 |
| Excavators | 500 | 2770 | 10786 | 114105 | 0.85 | 6.26 | 1259.39 | 0.22 |
| Cranes | 500 | 343 | 1203 | 9821 | 0.08 | 0.71 | 108.28 | 0.03 |
| Graders | 500 | 72 | 189 | 1962 | 0.02 | 0.13 | 21.63 | 0.00 |
| Off-Highway Trucks | 500 | 875 | 4763 | 58730 | 0.47 | 3.37 | 648.03 | 0.12 |
| Crushing/Proc. Equipment | 500 | 138 | 362 | 6129 | 0.04 | 0.39 | 67.66 | 0.01 |
| Rough Terrain Forklifts | 500 | 32 | 100 | 1165 | 0.01 | 0.07 | 12.86 | 0.00 |
| Rubber Tired Loaders | 500 | 2232 | 5963 | 64012 | 0.50 | 4.17 | 706.05 | 0.15 |
| Rubber Tired Dozers | 500 | 488 | 2172 | 26196 | 0.32 | 2.60 | 287.46 | 0.11 |
| Tractors/Loaders/Backhoes | 500 | 1136 | 3005 | 46887 | 0.31 | 2.41 | 517.70 | 0.08 |
| Crawler Tractors | 500 | 2048 | 5859 | 68924 | 0.67 | 5.56 | 758.75 | 0.21 |
| Other Construction Equipment | 500 | 589 | 1131 | 13007 | 0.07 | 0.67 | 143.69 | 0.02 |
| Totals | | | | 482513 | 3.9930186 | 31.7854338 | 5319.7855180 | 1.1715923 |
| Tons/gal | | | | | 0.0000082755 | 0.0000658748 | 0.0110251616 | 0.0000024281 |

| Emission Factor | ROG | NOX | PM Exh | CO2 |
|---|---|---|---|---|
| Tons/gal | 0.0000083 | 0.0000659 | 0.0000024 | 0.0110252 |
| lbs/gal | 0.016550921 | 0.131749502 | 0.004856209 | 22.05032328 |

### On-Road (Commute and Haul Trip) Exhaust Emission Factors

*EMFAC2011 Emission Rates* *Region Type: County* *Region: San Joaquin* *Calendar Year: 2015* *Season: Summer* *Vehicle Classification: EMFAC2007 Categories*

**Raw Emission Factors from EMFAC2011**

| Veh_Class | Fuel | MdlYr | Speed (miles/hr) | Population (vehicles) | VMT (miles/day) | Trips (trips/day) | ROG_RUNEX (gms/mile) | NOX_RUNEX (gms/mile) | CO2_RUNEX (gms/mile) | PM10_RUNEX (gms/mile) | PM2_5_RUNEX (gms/mile) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LDA | GAS | Aggregated | Aggregated | 221,452 | 8,373,837 | 1,395,737 | 0.035 | 0.104 | 374.205 | 0.002 | 0.002 |
| LDA | DSL | Aggregated | Aggregated | 711 | 24,969 | 4,237 | 0.034 | 0.589 | 386.822 | 0.024 | 0.022 |
| LDT1 | GAS | Aggregated | Aggregated | 32,747 | 1,170,489 | 198,959 | 0.091 | 0.276 | 428.735 | 0.004 | 0.003 |
| LDT1 | DSL | Aggregated | Aggregated | 43 | 1,417 | 230 | 0.055 | 0.642 | 391.012 | 0.045 | 0.041 |
| LDT2 | GAS | Aggregated | Aggregated | 74,971 | 2,892,650 | 470,876 | 0.049 | 0.196 | 508.491 | 0.002 | 0.002 |
| LDT2 | DSL | Aggregated | Aggregated | 39 | 1,453 | 227 | 0.039 | 0.653 | 387.562 | 0.030 | 0.028 |
| T7 | GAS | Aggregated | Aggregated | 57 | 8,199 | 1,131 | 0.719 | 4.428 | 580.568 | 0.001 | 0.001 |
| T7 | DSL | Aggregated | Aggregated | 6,429 | 1,104,570 | 0 | 0.279 | 6.306 | 1739.505 | 0.113 | 0.104 |
| **Total** | | | | | **13,577,584** | | | | | | |

**Ratio of Vehicle/Fuel Type to Total VMT**

| Veh | Fuel | Ratio |
|---|---|---|
| LDA | GAS | 61.7% |
| LDA | DSL | 0.2% |
| LDT1 | GAS | 8.6% |
| LDT1 | DSL | 0.0% |
| LDT2 | GAS | 21.3% |
| LDT2 | DSL | 0.0% |

**On-Road Emission Factor Calculations**

| | Worker (light duty)[1] | | | Haul Truck (heavy duty)[2] | | |
|---|---|---|---|---|---|---|
| Pollutant | g/mile | lbs/mile | tons/mile | g/mile | lbs/mile | tons/mile |
| ROG | 0.0400233 | 8.82364E-05 | 0.00000004 | 0.279 | 0.00061444 | 0.00000031 |
| NOX | 0.1305610 | 0.000287838 | 0.00000014 | 6.306 | 0.013902 | 0.00000695 |
| PM10 | 0.0018070 | 3.98378E-06 | 0.00000000 | 0.113 | 0.0002495 | 0.00000012 |
| PM2.5 | 0.0016487 | 3.63482E-06 | 0.00000000 | 0.104 | 0.00022954 | 0.00000011 |
| CO2 | 376.87 | 0.830862056 | 0.00041543 | 1,740 | 3.83495297 | 0.00191748 |

1. Emission factors calculated based on the composite mix light duty vehicles (LDA, LDT1, LDT2) and the ratio of vehicle/fuel type to total VMT
2. CalEEMod assumes that Heavy-Heavy Diesel Trucks (HHDT) are used to haul materials and equipment during construction. Therefore, haul truck emissions are estimated using EMFAC2011 emission factors for a Heavy-Heavy Duty Diesel CA International Registration Plan Construction Truck (T7 CAIRP construction).

## Marine Vessels

Emission Factor Algorithm

**E= a*(fractional Load)^(x)+b**

| | a | Fractional Load | x | b |
|---|---|---|---|---|
| ROG | 0.0667 | 20% | -1.5 | 0 |
| NOx | 0.1255 | 20% | -1.5 | 10.4496 |
| PM | 0.0059 | 20% | -1.5 | 0.2551 |
| CO2 | 44.1 | 20% | -1 | 648.6 |

| Emission Factors | g/kWh | g/bhp-hr | Adjusted g/bhp-hr |
|---|---|---|---|
| ROG | 0.75 | 1.0 | 0.20 |
| NOx | 11.85 | 15.9 | 3.18 |
| PM | 0.32 | 0.4 | 0.09 |
| CO2 | 869.10 | 1165.5 | 233.10 |

Load Factor 0.2

*Source:EPA 2000. p. 5-2. Emission factors are calculated using the Emission Factor Algorithm and pollutant factors. 20% is the fractional load for many harborcraft when maneuvering. See Table 4-2 on p. 4-13. It is assumed that all of the PM emissions are PM10.*

## Project Boat Emissions

*boats would be used during the marine cofferdam work during phase 1 and to complete the cofferdam in phase 3. Thus, boat hours and emissions are divided evenly between these two activities.*

| Boats | HP | source | Total Work | phase 1 / 2 hrs |
|---|---|---|---|---|
| Speed Boat | 250 | assumed | 82 | 41 |
| Tug Boat | 900 | applicant | 31,593 | 15,797 |

**Speed Boat Emissions (Phase 1/ Phase 2)**

| pollutant | g/phase | lbs/phase | tons/phase |
|---|---|---|---|
| ROG | 2,050 | 5 | 0.0023 |
| NOX | 32,584 | 72 | 0.0359 |
| PM10 | 883 | 2 | 0.0010 |
| CO2 | 2,389,239 | 5,267 | 2.6 |

**Tug Boat Emissions (Phase 1/ Phase 2)**

| pollutant | g/phase | lbs/phase | tons/phase |
|---|---|---|---|
| ROG | 2,843,480 | 6,269 | 3 |
| NOX | 45,194,730 | 99,637 | 50 |
| PM10 | 1,224,224 | 2,699 | 1 |
| CO2 | 3,313,897,409 | 7,305,893 | 3,653 |

## On-Road Vehicle Miles Traveled

*This sheet includes trip numbers provided by the project applicant for each phase/alternative as well as VMT calculation used to estimate exhaust dust emissions from material hauling and travel on paved/unpaved roads*

### Material Haul VMT

| Construction Activity | Route Number | one way (miles) | round trip length (miles) | Alternative 1 Trips | Alternative 1 VMT | Alternative 2 Trips | Alternative 2 VMT | Alternative 3 Trips | Alternative 3 VMT | Alternative 4 Trips | Alternative 4 VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 35 | 70 | 708 | 49,560 | 708 | 49,560 | 708 | 49,560 | 708 | 49,560 |
| *Site Access and Staging* | 1 | 35 | 70 | 4 | 280 | 4 | 280 | 4 | 280 | 4 | 280 |
| | 3 | 35 | 70 | 536 | 37,520 | 536 | 37,520 | 536 | 37,520 | 536 | 37,520 |
| | 11 | 20 | 40 | 1,396 | 55,840 | 1,396 | 55,840 | 1,396 | 55,840 | 1,396 | 55,840 |
| *Cofferdam Material Processing* | 1 | 35 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Marine Cofferdam Work* | 1 | 35 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 35 | 70 | 1,864 | 130,480 | 1,864 | 130,480 | 1,864 | 130,480 | 1,864 | 130,480 |
| *Diversion Tunnel* | 3 | 35 | 70 | 298 | 20,860 | 298 | 20,860 | 298 | 20,860 | 298 | 20,860 |
| | 10 | 2 | 4 | 13,206 | 52,824 | 13,206 | 52,824 | 13,206 | 52,824 | 13,206 | 52,824 |
| | 1 | 35 | 70 | 2,438 | 170,660 | 2,438 | 170,660 | 2,438 | 170,660 | 2,438 | 170,660 |
| *Powerhouse/Valve House* | 3 | 35 | 70 | 1,376 | 96,320 | 1,376 | 96,320 | 1,376 | 96,320 | 1,376 | 96,320 |
| | 10 | 2 | 4 | 18,002 | 72,008 | 18,002 | 72,008 | 18,002 | 72,008 | 18,002 | 72,008 |
| *Intake Structure* | 1 | 35 | 70 | 1,752 | 122,640 | 1,752 | 122,640 | 1,752 | 122,640 | 3,866 | 270,620 |
| *Tunnel Connection* | 1 | 35 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Dam Material Processing* | 1 | 35 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Complete Cofferdams* | 1 | 35 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Foundation Preparation* | 1 | 35 | 70 | 1,286 | 90,020 | 1,286 | 90,020 | 1,286 | 90,020 | 1,286 | 90,020 |
| *RCC Arch Dam* | 1 | 35 | 70 | 73,522 | 5,146,540 | 73,522 | 5,146,540 | 73,522 | 5,146,540 | 73,522 | 5,146,540 |
| *Reclamation and Demobilization* | 1 | 35 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 4 | 50 | 100 | 826 | 82,600 | 826 | 82,600 | 826 | 82,600 | 826 | 82,600 |
| | 5 | 50 | 100 | 478 | 47,800 | 478 | 47,800 | 478 | 47,800 | 478 | 47,800 |
| | 1 | 35 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Affected Existing Facilities* | 6 | 35 | 70 | 1,246 | 87,220 | 1,246 | 87,220 | 1,246 | 87,220 | 1,246 | 87,220 |
| | 7 | 25 | 50 | 6,856 | 342,800 | 6,856 | 342,800 | 6,856 | 342,800 | 6,856 | 342,800 |
| | 11 | 20 | 40 | 30 | 1,200 | 30 | 1,200 | 30 | 1,200 | 30 | 1,200 |
| | 9 | 20 | 40 | 188 | 7,520 | 188 | 7,520 | 188 | 7,520 | 188 | 7,520 |
| *Reservoir Clearing* | 7 | 25 | 50 | 8,236 | 411,800 | 8,236 | 411,800 | 8,236 | 411,800 | 8,236 | 411,800 |

### Worker Commute VMT

| Construction Activity | Route Number | one way (miles) | round trip length (miles) | Alternative 1 Trips | Alternative 1 VMT | Alternative 2 Trips | Alternative 2 VMT | Alternative 3 Trips | Alternative 3 VMT | Alternative 4 Trips | Alternative 4 VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 35 | 70 | 39,416 | 2,759,120 | 39,416 | 2,759,120 | 39,416 | 2,759,120 | 39,416 | 2,759,120 |
| *Site Access and Staging* | 1 | 35 | 70 | 60,448 | 4,231,360 | 60,448 | 4,231,360 | 60,448 | 4,231,360 | 60,448 | 4,231,360 |
| | 3 | 35 | 70 | 5,146 | 360,220 | 5,146 | 360,220 | 5,146 | 360,220 | 5,146 | 360,220 |
| *Cofferdam Material Process and Marine Cofferdam Work* | 1 | 35 | 70 | 38,494 | 2,694,580 | 38,494 | 2,694,580 | 38,494 | 2,694,580 | 38,494 | 2,694,580 |
| *Diversion Tunnel* | 3 | 35 | 70 | 25,152 | 1,760,640 | 25,152 | 1,760,640 | 25,152 | 1,760,640 | 25,152 | 1,760,640 |
| *Powerhouse/Valve House* | 3 | 35 | 70 | 75,402 | 5,278,140 | 75,402 | 5,278,140 | 75,402 | 5,278,140 | 75,405 | 5,278,350 |
| *Intake Structure and Tunnel Connection* | 1 | 35 | 70 | 26,898 | 1,882,860 | 26,898 | 1,882,860 | 26,898 | 1,882,860 | 42,114 | 2,947,980 |
| *Dam Material Processing* | 1 | 35 | 70 | 33,590 | 2,351,300 | 33,590 | 2,351,300 | 33,590 | 2,351,300 | 33,590 | 2,351,300 |
| *Complete Cofferdams* | 1 | 35 | 70 | 13,312 | 931,840 | 13,312 | 931,840 | 13,312 | 931,840 | 13,312 | 931,840 |
| *Foundation Preparation* | 1 | 35 | 70 | 24,108 | 1,687,560 | 24,108 | 1,687,560 | 24,108 | 1,687,560 | 24,108 | 1,687,560 |
| *RCC Arch Dam* | 1 | 35 | 70 | 148,248 | 10,377,360 | 148,248 | 10,377,360 | 148,248 | 10,377,360 | 148,248 | 10,377,360 |
| *Reclamation and Demobilization* | 1 | 35 | 70 | 1,960 | 137,200 | 1,960 | 137,200 | 1,960 | 137,200 | 1,960 | 137,200 |
| | 4 | 50 | 100 | 8,138 | 813,800 | 8,138 | 813,800 | 8,138 | 813,800 | 8,138 | 813,800 |
| *Affected Existing Facilities* | 5 | 50 | 100 | 2,734 | 273,400 | 2,734 | 273,400 | 2,734 | 273,400 | 2,734 | 273,400 |
| | 1 | 35 | 70 | 114 | 7,980 | 114 | 7,980 | 114 | 7,980 | 114 | 7,980 |
| *Reservoir Clearing* | 5 | 50 | 100 | 35,186 | 3,518,600 | 35,186 | 3,518,600 | 35,186 | 3,518,600 | 35,186 | 3,518,600 |