

Final Report

**UPDATES TO OFF-ROAD MOBILE EMISSIONS
FOR EAST TEXAS**

Prepared for

East Texas Council of Governments
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TABLE OF CONTENTS

	Page
INTRODUCTION.....	1
CONSTRUCTION EQUIPMENT ESTIMATES.....	1
MINING EQUIPMENT.....	8
EMISSIONS ESTIMATES FOR 1999, 2003 AND 2007.....	10
REFERENCES.....	20

TABLES

Table 1. Construction equipment ownership.....	1
Table 2. Activity surrogates for East Texas counties and cities compared to the Houston/Galveston area (HGA).....	2
Table 3. Equipment population estimates from HGA survey and calculated for East Texas for municipal and other public ownership	3
Table 4. Municipal contractors equipment ownership.....	4
Table 5. Residential contractors equipment ownership	4
Table 6. Commercial building contractors equipment ownership	5
Table 7. Heavy highway contractors equipment ownership	6
Table 8. Industrial construction contractors equipment ownership.....	7
Table 9. Construction equipment at landfills for the HGA and the East Texas estimate	8
Table 10. Mining equipment ownership	9
Table 11. Coal mined in East Texas counties (EIA, 2003)	10
Table 12. 1999 Construction equipment population estimates for the East Texas Region.	10
Table 13. Perryman projections for real gross product for construction	12
Table 14. 1999 Construction and mining emission estimates (tpy).	12
Table 15. 2002 Construction and mining emission estimates (tpy)	13
Table 16. 2007 Construction and mining emission estimates (tpy)	14
Table 17. 1999 Construction and mining emissions change as compared to default NONROAD emissions (%).....	14
Table 18. 2002 Construction and mining emissions change as compared to default NONROAD emissions (%).....	15
Table 19. 2007 Construction and mining emissions change as compared to default NONROAD emissions (%).....	16
Table 20. 1999 Construction and mining emission estimates by county (tpy).	17
Table 21. 2002 Construction and mining emission estimates by county (tpy).	18
Table 22. 2007 Construction and mining emission estimates by county (tpy).	19

INTRODUCTION

Emissions from off-road mobile sources are an important contributor to the NO_x emission inventory for East Texas. EPA recommends estimating emissions for most categories of off-road sources using the NONROAD model (latest version NONROAD2002). The NONROAD model has default data for estimating emissions for all counties in the US and therefore can be applied for East Texas. However, EPA also recommends gathering local data to refine the emissions estimates from the NONROAD model where possible. Northeast Texas Air Care (NETAC) sponsored surveys to collect local data for two source sectors that are important in East Texas: construction equipment and lignite coal mining. The surveys were for the 5 county area of Gregg, Harrison, Rusk, Smith, and Upshur. Pollution Solutions conducted surveys using the design described below and ENVIRON performed the emissions modeling using the survey results and the NONROAD model.

CONSTRUCTION EQUIPMENT ESTIMATES

In order to revise the equipment ownership in East Texas, ENVIRON used the approach used by TNRCC¹ in the Dallas-Ft. Worth (DFW) SIP (TNRCC, 2000a). Houston construction survey results for greater than 50 horsepower diesel powered construction equipment (TNRCC, 2000b) were combined with relative activity surrogates between the Houston/Galveston area (HGA) and East Texas. For construction equipment estimates, there were several types of owners, each with its own relative activity surrogate. For many of these owner types, a surrogate was used to relate the equipment ownership in Houston to that of East Texas as shown in the equation below with the description of the activity surrogates shown in Table 1.

$$\text{East Texas estimate} = \text{HGA estimate} * (\text{East Texas activity}) / (\text{HGA activity})$$

Table 1. Construction equipment ownership.

Owner Type	Activity Surrogate
Public ownership (counties, cities, TxDOT)	Road maintenance budgets (counties, cities, State)
Municipal contractors	Building permit dollars
Residential contractors	Building permit dollars
Commercial building contractors	Building permit dollars
Heavy highway contractors	TxDOT lettings
Industrial construction and maintenance	Building permit dollars
Rental owners	Survey (discussed below)

¹ The Texas Natural Resource Conservation Commission, now the TCEQ.

The values for the activity surrogates were gathered from a variety of sources and shown in Table 2 with the comparable HGA values.

Table 2. Activity surrogates for East Texas counties and cities compared to the Houston/Galveston area (HGA).

Area	Total Construction Value
County Budgets	
Gregg County	\$3,391,577
Harrison County	\$3,075,575
Rusk County	\$3,146,898
Smith County	\$4,725,150
Upshur County	\$1,957,144
East Texas TOTAL	\$16,296,345
HGA Counties	\$257,938,001
City Budgets	
City of Longview	\$2,000,000
City of Kilgore	\$678,616
City of Marshall	\$646,713
City of Henderson	\$194,928
City of Tyler	\$2,025,656
City of Gilmer	\$25,000
East Texas TOTAL	\$5,570,912
HGA Cities	\$864,204,807
TxDOT Contract Lettings	
Gregg County	\$3,137,000
Harrison County	\$3,982,000
Rusk County	\$3,753,000
Smith County	\$6,076,000
Upshur County	\$2,215,000
East Texas TOTAL	\$19,163,000
HGA Counties	\$64,405,258
Building Permit Values	
City of Longview	\$96,302,737
City of Kilgore	\$6,245,996
City of Marshall	\$24,225,194
City of Henderson	\$5,377,357
City of Tyler	\$144,576,032
City of Gilmer	\$970,000
East Texas TOTAL	\$277,697,316
HGA Cities	\$1,179,277,018

In addition, a detailed survey of all rental owners were performed to improve the estimates for these equipment types. The rental companies, fifteen in all, operating in the area were contacted to obtain details about their equipment ownership.

The survey results from the HGA construction survey were allocated to the East Texas area using the activity surrogates described above. The equipment population estimates for each type of ownership category are described below. While it may appear odd to have fractional

amounts of equipment population (e.g., half an excavator), these fractions represent the relative activity (hours of use and fuel consumed) of these equipment types rather than an actual piece of equipment. Keeping the fractional estimates prevents rounding errors when estimating overall countywide activity.

Municipal and Other Public Ownership

For publicly owned equipment, three types of owners were considered: cities and municipalities, counties, and the State owned equipment, which for construction are only those owned by the Texas Department of Transportation (TxDOT). The activity surrogates for these categories include the city and county budgets and, for TxDOT equipment, local contract lettings shown in Table 2. Using these surrogates and the HGA results, the equipment estimates for East Texas were calculated and are shown in Table 3.

Table 3. Equipment population estimates from HGA survey and calculated for East Texas for municipal and other public ownership.

SCC	Equip. Type	HGA Survey (counties)	East Texas (counties)	HGA Survey (cities)	East Texas (cities)	HGA Survey (TxDOT)	EastTexas (TxDOT)
2270002003	Paver	16	1.0	11	0.1	1	0.3
2270002015	Rollers	80	5.1	40	0.3	15	4.5
2270002018	Scrapers	6	0.4	0	0.0	0	0.0
2270002021	Pav. Equip	6	0.4	0	0.0	0	0.0
2270002024	Surfacing	28	1.8	9	0.1	2	0.6
2270002027	Signals	0	0.0	3	0.0	0	0.0
2270002030	Trencher	9	0.6	7	0.0	0	0.0
2270002033	Drills	6	0.4	0	0.0	2	0.6
2270002036	Excavators	71	4.5	163	1.1	14	4.2
2270002039	Saws	16	1.0	0	0.0	0	0.0
2270002045	Cranes	0	0.0	0	0.0	18	5.4
2270002048	Graders	74	4.7	38	0.2	22	6.5
2270002051	Trucks	9	0.6	0	0.0	0	0.0
2270002054	Crush equip	0	0.0	0	0.0	0	0.0
2270002057	Forklifts	2	0.1	0	0.0	1	0.3
2270002060	RT Loader	39	2.5	59	0.4	15	4.5
2270002063	RT Dozer	0	0.0	0	0.0	0	0.0
2270002066	Tractors	173	10.9	337	2.2	41	12.2
2270002069	Dozers	41	2.6	27	0.2	13	3.9
2270002072	Skid Loader	10	0.6	19	0.1	2	0.6
2270002075	Off Hwy Trac	6	0.4	0	0.0	0	0.0
2270002081	Other	13	0.8	9	0.1	0	0.0

Municipal Contractors

Municipal contractors are firms that perform services for public work contracts including sewer, water, drainage, and other similar types of works. The activity surrogate used for this

category was overall construction permit values for HGA estimated at \$1,179,277,018 and for East Texas Counties at \$277,697,316. The ratio (0.235) of the permit values was then used to estimate the equipment population in the East Texas area shown in Table 4.

Table 4. Municipal contractors equipment ownership.

SCC	Equip. Type	HGA Survey	East Texas
2270002003	Paver	103	24.3
2270002015	Rollers	602	141.8
2270002018	Scrapers	13	3.1
2270002021	Pav Equip	65	15.3
2270002024	Surfacing	112	26.4
2270002027	Signals	11	2.6
2270002030	Trencher	22	5.2
2270002033	Drills	25	5.9
2270002036	Excavators	613	144.3
2270002039	Saws	19	4.5
2270002045	Cranes	0	0.0
2270002048	Graders	232	54.6
2270002051	Trucks	44	10.4
2270002054	Crush Equip	0	0.0
2270002057	Forklifts	5	1.2
2270002060	R T Loader	485	114.2
2270002063	RT Dozer	0	0.0
2270002066	Tractors	546	128.6
2270002069	Dozers	558	131.4
2270002072	Skid Loader	49	11.5
2270002075	Off Hwy Tract	0	0.0
2270002081	Other	162	38.1

Residential Contractors

Residential contractors are construction firms that build single-family homes and other similar light building construction projects. The overall ratio of the building permit values was used as the activity surrogate to estimate the equipment ownership for these firms, shown in Table 5.

Table 5. Residential contractors equipment ownership.

SCC	Equip Type	HGA Survey	East Texas
2270002003	Paver	29	6.8
2270002015	Rollers	210	49.5
2270002018	Scrapers	0	0.0
2270002021	Pav. Equip	0	0.0
2270002024	Surfacing	125	29.4
2270002027	Signals	0	0.0
2270002030	Trencher	79	18.6
2270002033	Drills	30	7.1
2270002036	Excavators	264	62.2

SCC	Equip Type	HGA Survey	East Texas
2270002039	Saws	0	0.0
2270002045	Cranes	0	0.0
2270002048	Graders	29	6.8
2270002051	Trucks	0	0.0
2270002054	Crush equip	0	0.0
2270002057	Forklifts	0	0.0
2270002060	RT Loader	272	64.1
2270002063	RT Dozer	0	0.0
2270002066	Tractors	91	21.4
2270002069	Dozers	328	77.2
2270002072	Skid Loader	29	6.8
2270002075	Off Hwy Tract	0	0.0
2270002081	Other	0	0.0

Commercial Building Contractors

Commercial building contractors engage in larger scale projects including apartments, offices, schools, churches, and a variety of other similar building types. The overall ratio of the building permit values was used as the activity surrogate to estimate the equipment ownership for these firms, shown in Table 6.

Table 6. Commercial building contractors equipment ownership.

SCC	Equip. Type	HGA Survey	East Texas
2270002003	Paver	0	0
2270002015	Rollers	0	0
2270002018	Scrapers	0	0
2270002021	Pav. Equip	0	0
2270002024	Surfacing	0	0
2270002027	Signals	0	0
2270002030	Trencher	0	0
2270002033	Drills	540	127.2
2270002036	Excavators	62	14.6
2270002039	Saws	0	0
2270002045	Cranes	49	11.54
2270002048	Graders	61	14.36
2270002051	Trucks	0	0
2270002054	Crush equip	0	0
2270002057	Forklifts	0	0
2270002060	RT Loader	66	15.54
2270002063	RT Dozer	0	0
2270002066	Tractors	44	10.36
2270002069	Dozers	56	13.19
2270002072	Skid Loader	62	14.6
2270002075	Off Hwy Tract	0	0
2270002081	Other	0	0

Heavy Highway Contractors

Heavy highway contractors build all manner of roads including highway, arterials, and local roadways. The ratio (0.298) of Texas Department of Transportation (TxDOT) contract values for the HGA (\$64,405,258) and East Texas (\$19,163,000) was used to estimate the ownership of equipment, shown in Table 7.

Table 7. Heavy highway contractors equipment ownership.

SCC	Equip. Type	HGA Survey	East Texas
2270002003	Paver	23	6.8
2270002015	Rollers	142	42.3
2270002018	Scrapers	0	0.0
2270002021	Pav. Equip.	16	4.8
2270002024	Surfacing	68	20.2
2270002027	Signals	13	3.9
2270002030	Trencher	11	3.3
2270002033	Drills	31	9.2
2270002036	Excavators	114	33.9
2270002039	Saws	0	0.0
2270002045	Cranes	156	46.4
2270002048	Graders	55	16.4
2270002051	Trucks	2	0.6
2270002054	Crush Equip.	0	0.0
2270002057	Forklifts	3	0.9
2270002060	RT Loader	100	29.8
2270002063	RT Dozer	25	7.4
2270002066	Tractors	84	25.0
2270002069	Dozers	132	39.3
2270002072	Skid Loader	5	1.5
2270002075	Off Hwy. Tract	0	0.0
2270002081	Other	21	6.2

Industrial Construction and Maintenance Contractors

Industrial construction and maintenance contractors are those contractors that engage in the building of structures and equipment used in commercial and industrial production of materials and products. The overall ratio of the building permit values was used as the activity surrogate to estimate the equipment ownership for these firms as shown in Table 8.

Table 8. Industrial construction contractors equipment ownership.

SCC	Equip. Type	HGA Survey	East Texas
2270002003	Paver	0	0.0
2270002015	Rollers	35	8.2
2270002018	Scrapers	0	0.0
2270002021	Pav. Equip.	0	0.0
2270002024	Surfacing	3	0.7
2270002027	Signals	0	0.0
2270002030	Trencher	0	0.0
2270002033	Drills	0	0.0
2270002036	Excavators	21	4.9
2270002039	Saws	0	0.0
2270002045	Cranes	136	32.0
2270002048	Graders	14	3.3
2270002051	Trucks	0	0.0
2270002054	Crush equip	0	0.0
2270002057	Forklifts	60	14.1
2270002060	RT Loader	38	8.9
2270002063	RT Dozer	3	0.7
2270002066	Tractors	78	18.4
2270002069	Dozers	47	11.1
2270002072	Skid Loader	7	1.6
2270002075	Off Hwy. Tract	0	0.0
2270002081	Other	0	0.0

Landfill Equipment

There were only two small landfills operating in the East Texas area; Greenwood Farms in Smith Co. - 65,000 tonnes/yr and Pine Hill in Gregg Co. - 52,000 tonnes/yr for a total of 128,969 tons per year compared with 5,445,966 tons per year for the 8-county Houston area from TCEQ records of sequestered tonnage in 1999. East Texas landfills are only 2.4% of activity compared to the Houston area landfills so the total equipment estimates at these landfills is proportionally lower, as shown in Table 9. However, because the landfill equipment is typically used at higher rates than the average, this equipment could be considered to represent more than the typical activity. For instance, rollers (also called compactors) are operated at landfills typically 2,251 hours per year while the average roller is operated 719 hours, so each roller at a landfill is equivalent to approximately 3 typical rollers in terms of activity. The estimate adjusting for this high activity level is also shown in Table 9. Depending upon how this estimate is used, either as an overall county-level average (where the high landfill activity rates were apparently combined into one average HGA activity estimate per equipment type) or for emission reductions at a particular site are of interest, either estimate could be used.

Table 9. Construction equipment at landfills for the HGA and the East Texas estimate.

SCC	Equipment Type	HGA Total	East Texas Estimate	East Texas adjusted for high activity
2270002003	Pavers	0.0	0.0	
2270002006	Tampers/Rammers	0.0	0.0	
2270002009	Plate Compactors	0.0	0.0	
2270002012	Concrete Pavers (unused)	0.0	0.0	
2270002015	Rollers	29.2	0.7	2.2
2270002018	Scrapers	1.8	0.0	0.2
2270002021	Paving Equipment	0.0	0.0	
2270002024	Surfacing Equipment	0.0	0.0	
2270002027	Signal Boards	0.0	0.0	
2270002030	Trenchers	0.0	0.0	
2270002033	Bore/Drill Rigs	0.0	0.0	
2270002036	Excavators	12.8	0.3	0.6
2270002039	Concrete/Industrial Saws	0.0	0.0	
2270002042	Cement & Mortar Mixers	0.0	0.0	
2270002045	Cranes	0.0	0.0	
2270002048	Graders	14.6	0.3	0.2
2270002051	Off-highway Trucks	3.6	0.1	0.2
2270002054	Crushing/Proc. Equipment	0.0	0.0	
2270002057	Rough Terrain Forklifts	0.0	0.0	
2270002060	Rubber Tire Loaders	1.8	0.0	0.1
2270002063	Rubber Tire Dozers	0.0	0.0	
2270002066	Tractors/Loaders/Backhoes	1.8	0.0	0.1
2270002069	Crawler Tractors	45.6	1.1	3.1
2270002072	Skid Steer Loaders	0.0	0.0	
2270002075	Off-Highway Tractors	0.0	0.0	
2270002078	Dumpers/Tenders	0.0	0.0	
2270002081	Other Construction Equipment	0.0	0.0	

Calculating Construction Activity Emissions

Emission estimates from construction activity were formatted to NONROAD input files. Besides the revised population estimates, the estimate of the activity in hours per year from TNRCC (2000b, Table 1), were used and modified NONROAD input files were prepared. Using modified population and activity input files, the emissions were estimated using the NONROAD model. The sand and gravel mining equipment ownership (described below) were combined with the construction equipment population estimates, but coal mining equipment ownership was separately estimated according to the procedure described below.

MINING EQUIPMENT

There are two types of mining activity in East Texas, coal (lignite) and aggregate (sand, gravel, crushed stone). The aggregate mining equipment were estimated from the HGA survey results and estimated for the East Texas area using a ratio of employees engaged in this type of

mining. For coal mining, all facets of the mining (including the mining company, its contractors, and the delivery of product to the power plants) were surveyed in detail for equipment ownership and activity. These are shown in Table 10.

Table 10. Mining equipment ownership.

Owner Type	Activity Surrogate
Sand, gravel, stone, and other aggregate	Nonmetallic mining employees (NAISC – 327)
TXU Mining Co.	Survey
TXU Mining contractors	Survey
Sabine Mining Co.	Survey
Sabine Mining contractors	Survey
HW Pirkey power plant	Survey
Martin Lake power plant	Survey

For the mining activity other than coal mining, the HGA survey results were used to estimate activity, using employees gathered from the Census employment in North American Industrial Coding System (NAICS) category 327 for the HGA and East Texas counties.

Aggregate Mining

The aggregate mining activity was restricted to the concrete and asphalt batch plants surveyed in the HGA area. The HGA survey included estimates of 245 rubber tire loaders used at these locations. Using the standard industrial code (SIC, an older coding system used by the Census Bureau) of 3273 and the County Business Patterns for 1998 (Census, 1998), the employees in HGA under SIC was 4,594 and for East Texas was 1,950.

$$\text{East Texas Loaders used in mixing paving material} = 104 = 254 * 1950 / 4594$$

As shown above, the number of loaders was then estimated to be 104 in East Texas based of the ratio of employees in each of the two areas. These loaders were included with the construction owner/operators in the emission estimates.

Other mining activity was considered to be minor compared with aggregate and coal mining for the counties in East Texas. The most recent review of minerals mining in Texas (USGS, 2003) indicates a small amount of clay mining in the East Texas counties as the only other mining activity.

Coal Mining

The predominant mining activity in the East Texas counties is at two large coal mines: Oak Hills and Sabine Mines. Because of the importance of this activity to overall construction and mining equipment usage, the equipment activity at these two mines was thoroughly detailed in a survey by Pollution Solutions. Historic mined product and the estimated totals for 2002, the survey year, is shown in Table 11. Another mine, the Darco Mine, operated until 2001; it was

not included in the thorough review of equipment usage but is reflected in the totals, shown in Table 11.

Table 11. Coal mined in East Texas counties (EIA, 2003).

County/Year	Coal Mined (in 1000 Short Tons)			
	1999	2000	2001	2002
Rusk	6237.2	6886	5260	4500 est.
Harrison (total)	3744	3719	3477	4000 est.
East Texas Total	9,981	10,605	8,737	8,500

To accurately reflect coal mining equipment usage, the equipment activity was surveyed in detail for the two mines. The equipment used at the mines by the mining company, by contractors at the site, and the material handling to the end of the distribution chain by the power plants was thoroughly reviewed for ownership and activity. For each piece of equipment, the rated power, annual hours of use, and fuel consumed (to determine the load factor) was recorded. This information allowed ENVIRON to modify NONROAD input files to reflect the specifics of each piece of equipment.

EMISSIONS ESTIMATES FOR 1999, 2003 AND 2003

The input data for the NONROAD2002 model (equipment population by rated power, activity and load factor) was modified for each equipment type for each of the 6 categories of construction owner/operators, each mining company, contractors at each mine, and each power plant for two mines. Adjusted NONROAD population and activity (for hours of use and load factors) input files were prepared for mines, contractors at each mine, and power plants associated with the two mines. So six separate sets of NONROAD input files were prepared and used to estimate the emissions generated at each mine. By using the NONROAD model, the age distribution of equipment and emission factors by model year are incorporated into the emission estimates. In this manner, EPA default information was combined with local information. The estimated construction equipment population for the 5-county region of the East Texas for the year 1999 is shown in Table 12.

Table 12. 1999 Construction equipment population estimates for the East Texas Region.

SCC	Equipment Description	Gregg	Harrison	Rusk	Smith	Upshur
2270002003	Dsl - Pavers	28.4	19.7	17.4	34.6	16.2
2270002015	Dsl - Rollers	92.3	33.3	18.0	135.0	9.9
2270002018	Dsl - Scrapers	3.1	1.3	0.9	4.5	0.7
2270002021	Dsl - Paving Equipment	6.5	2.4	1.3	9.6	0.6
2270002024	Dsl - Surfacing Equipment	24.7	9.6	5.5	36.6	2.8
2270002027	Dsl - Signal Boards/Light Plants	6.1	3.4	2.6	9.4	1.9
2270002030	Dsl - Trenchers	13.5	5.0	2.8	19.6	1.8
2270002033	Dsl - Bore/Drill Rigs	53.0	14.2	4.7	75.6	1.7
2270002036	Dsl - Excavators	103.1	34.9	17.6	149.4	9.6
2270002039	Dsl - Concrete/Industrial Saws	4.8	2.1	1.5	7.0	1.1
2270002042	Dsl - Cement & Mortar Mixers	4.8	2.1	1.5	7.0	1.1
2270002045	Dsl - Cranes	27.8	16.2	12.3	43.9	7.2

SCC	Equipment Description	Gregg	Harrison	Rusk	Smith	Upshur
2270002048	Dsl - Graders	41.2	16.4	9.8	60.7	5.8
2270002051	Dsl - Off-highway Trucks	7.2	2.8	1.7	10.5	1.2
2270002054	Dsl - Crushing/Proc. Equipment	0.0	0.0	0.0	0.0	0.0
2270002057	Dsl - Rough Terrain Forklifts	34.9	16.9	12.3	51.9	9.6
2270002060	Dsl - Rubber Tire Loaders	130.8	57.5	22.9	140.2	11.5
2270002063	Dsl - Rubber Tire Dozers	1.7	1.7	1.6	3.1	0.9
2270002066	Dsl - Tractors/Loaders/Backhoes	109.5	43.6	26.7	159.9	17.3
2270002069	Dsl - Crawler Tractor/Dozers	105.9	36.3	18.4	154.1	10.1
2270002072	Dsl - Skid Steer Loaders	25.0	9.8	5.9	36.5	4.2
2270002075	Dsl - Off-Highway Tractors	0.6	0.4	0.3	0.9	0.2
2270002078	Dsl - Dumpers/Tenders	0.9	0.5	0.4	1.4	0.3
2270002081	Dsl - Other Construction Equipment	31.8	13.5	8.8	46.9	6.3

Overall Emission Estimates

The NONROAD2002 model was publicly released on the NONROAD model website in late June 2003 (EPA, 2003), along with an updated User Guide and technical reports. The NONROAD2002 model incorporates updated population data, load factors, and median life; increased PM deterioration rates; revised PM and SO_x calculations; revised equipment growth and scrappage; revised activity data for all terrain vehicles; and revised algorithms for allocating national to county-level equipment populations. With all of these changes, the emission inventory estimates from the NONROAD2002 model are substantially different from the June 2000 draft version. Total U.S. emissions for 1996 are 13 percent lower for VOC in NONROAD2002, 35 percent lower for NO_x, 28 percent lower for PM_{2.5}, and 72 percent lower for SO₂. Construction and mining equipment are the largest source of emissions for NO_x, PM_{2.5}, and SO₂. Diesel emissions for construction and mining and other equipment types are reduced in NONROAD2002 relative to earlier versions because the population numbers are lower, and also because lower average equipment lifetimes result in an age distribution with more newer equipment.

The survey results for coal mining and greater than 50 hp diesel powered construction equipment were used to revise the equipment population and activity NONROAD input files. For other equipment, less than 50 hp diesel and spark-ignition (gasoline, LPG, and CNG), default NONROAD2002 information was used.

To project to future year emissions, coal mining and construction projections were used to forecast and backcast equipment activity. Coal mining activity, Table 11, shows a decrease in activity from 1999 to 2002, and projections do not expect increases in activity, tons of coal, for future years. Construction activity was estimated using real (adjusted for inflation using constant 1996 dollars) gross product for construction in the Longview-Marshall & Tyler Metropolitan Areas (Perryman, 2002) to project overall activity from 1999 forward. These projections are shown in Table 13.

Table 13. Perryman projections for real gross product for construction.

Year	Millions of 1996 Dollars
1999	\$ 155.015
2002	\$ 155.193
2007	\$ 180.056

These changes in overall activity were incorporated in the NONROAD growth input file. The relative activity rates for construction activity from the base year for the survey results were projected to 2002 and 2007, and for coal mining activity were forecasted from 2002 to 2007 and backcasted from 2002 to 1999. The total emissions estimated for construction activity (using the revised large diesel equipment estimates and default information for smaller diesel and all other fuel types) and coal mining equipment are shown in Tables 14 through 16, in units of tonnes per year. Comparison of the emission estimates with the NONROAD2002 model default emissions are shown in Tables 17 through 19. These figures in percent show the change in the emissions with respect to the default emissions. Tables 20 through 22 show the total construction and mining emissions estimates for years 1999, 2002 and 2007 by equipment and county.

Table 14. 1999 Construction and mining emission estimates (tpy).

Equipment	CO exh	NOx exh	VOC total	SOx exh	PM10 exh
Bore/Drill Rigs	60.4	65.8	8.2	5.8	5.8
Cement & Mortar Mixers	108.7	2.9	5.0	0.3	0.3
Concrete/Industrial Saws	349.0	4.7	43.5	0.4	2.6
Cranes	28.6	71.2	6.5	7.1	5.3
Crawler Tractor/Dozers	300.4	621.3	50.9	71.9	47.0
Crushing/Proc. Equipment	17.3	7.1	1.1	0.8	0.4
Dumpers/Tenders	17.3	0.4	0.7	0.0	0.1
Excavators	175.9	334.3	31.0	37.2	28.1
Graders	55.0	128.0	11.3	15.5	10.0
Off-Highway Tractors	8.7	12.6	1.4	1.2	1.3
Off-highway Trucks	289.0	526.6	48.1	55.6	39.0
Other Construction Equipment	74.2	105.2	10.5	10.5	10.6
Pavers	46.9	20.2	3.1	2.4	2.0
Paving Equipment	126.8	5.2	5.6	0.5	0.6
Plate Compactors	63.1	0.8	3.7	0.1	0.1
Rollers	120.8	87.1	12.1	10.2	9.8
Rough Terrain Forklifts	50.6	56.5	7.7	7.4	6.9
Rubber Tire Loaders	252.4	433.6	39.8	48.5	35.9
Rubber Tire Tractor/Dozers	5.8	12.6	0.9	1.5	0.9
Scrapers	15.8	25.7	2.2	2.9	2.6
Signal Boards/Light Plants	61.7	13.4	5.6	1.4	2.4
Skid Steer Loaders	62.7	8.1	4.4	0.9	1.7
Surfacing Equipment	51.0	17.7	16.1	2.1	3.1
Tractors/Loaders/Backhoes	138.4	68.2	17.5	7.1	10.6

Equipment	CO exh	NOx exh	VOC total	SOx exh	PM10 exh
Trenchers	115.8	11.1	5.0	1.3	1.4
Tampers/Rammers	0.0	0.0	0.0	0.0	0.0
Total Emissions	2596	2640	342	293	228

Table 15. 2002 Construction and mining emission estimates (tpy).

Equipment	CO exh	NOx exh	VOC total	SOx exh	PM exh
Bore/Drill Rigs	55.6	59.3	7.1	5.8	4.8
Cement & Mortar Mixers	105.8	2.8	3.9	0.3	0.2
Concrete/Industrial Saws	360.6	4.1	39.8	0.4	2.4
Cranes	24.5	62.7	5.2	7.2	4.1
Crawler Tractor/Dozers	214.5	528.5	37.4	72.0	36.3
Crushing/Proc. Equipment	17.2	6.1	0.8	0.8	0.3
Dumpers/Tenders	16.7	0.4	0.6	0.0	0.1
Excavators	101.8	277.3	20.8	37.3	19.9
Graders	40.4	114.0	8.7	15.5	8.5
Off-Highway Tractors	6.4	11.2	1.0	1.2	0.9
Off-highway Trucks	174.3	444.1	31.4	55.7	27.7
Other Construction Equipment	57.5	88.6	8.1	10.0	7.9
Pavers	44.6	17.6	2.4	2.4	1.6
Paving Equipment	124.4	4.7	4.8	0.5	0.5
Plate Compactors	62.7	0.7	3.3	0.1	0.1
Rollers	113.4	78.2	9.8	10.2	8.2
Rough Terrain Forklifts	39.8	49.5	5.5	7.5	5.5
Rubber Tire Loaders	178.4	368.6	28.4	48.6	26.7
Rubber Tire Tractor/Dozers	4.8	11.2	0.8	1.5	0.8
Scrapers	14.0	23.3	1.8	2.9	2.1
Signal Boards/Light Plants	59.9	12.5	4.9	1.4	2.2
Skid Steer Loaders	63.7	7.4	3.8	0.9	1.5
Surfacing Equipment	46.6	15.7	14.9	2.1	2.6
Tractors/Loaders/Backhoes	137.1	62.8	15.7	7.1	9.8
Trenchers	117.6	10.0	4.2	1.3	1.2
Tampers/Rammers	0.0	0.0	0.0	0.0	0.0
Total Emissions	2182	2261	265	293	176

Table 16. 2007 Construction and mining emission estimates (tpy).

Equipment	CO exh	NOx exh	VOC total	SOx exh	PM exh
Bore/Drill Rigs	52.7	55.5	6.2	6.5	4.1
Cement & Mortar Mixers	107.6	2.8	3.3	0.3	0.2
Concrete/Industrial Saws	365.0	3.7	19.4	0.4	2.7
Cranes	20.5	53.3	4.0	7.9	3.2
Crawler Tractor/Dozers	168.3	419.8	28.1	76.5	30.8
Crushing/Proc. Equipment	17.4	3.9	0.5	0.7	0.2
Dumpers/Tenders	17.1	0.4	0.5	0.0	0.1
Excavators	76.7	224.7	15.7	39.4	15.9
Graders	31.3	87.9	6.6	16.8	6.9
Off-Highway Tractors	4.1	9.1	0.7	1.3	0.6
Off-highway Trucks	101.0	351.1	19.5	56.2	19.2
Other Construction Equipment	47.0	77.8	6.4	11.1	6.2
Pavers	44.2	14.7	1.9	2.6	1.3
Paving Equipment	129.1	4.1	3.3	0.5	0.4
Plate Compactors	64.3	0.6	2.4	0.1	0.1
Rollers	106.8	69.3	7.5	11.3	6.7
Rough Terrain Forklifts	37.0	42.8	4.3	8.0	4.2
Rubber Tire Loaders	142.1	304.9	21.2	52.7	20.9
Rubber Tire Tractor/Dozers	2.1	5.2	0.4	0.9	0.4
Scrapers	12.7	20.0	1.5	3.0	1.8
Signal Boards/Light Plants	49.8	6.8	2.4	0.8	0.8
Skid Steer Loaders	64.9	7.5	3.2	1.1	1.5
Surfacing Equipment	45.8	14.9	8.2	2.4	2.4
Tractors/Loaders/Backhoes	131.9	52.0	12.6	6.8	8.1
Trenchers	120.1	8.3	3.2	1.3	0.8
Tampers/Rammers	3.2	0.0	0.7	0.0	0.1
Total Emissions	1963	1841	183	309	140

Table 17. 1999 Construction and mining emissions change as compared to default NONROAD emissions (%).

Equipment	CO exh	NOx exh	VOC total	SOx exh	PM exh
Bore/Drill Rigs	0.6	2.2	1.3	2.3	2.3
Cement & Mortar Mixers	0.1	1.4	0.2	1.4	1.4
Concrete/Industrial Saws	0.1	0.4	0.1	0.7	0.2
Cranes	0.9	1.5	1.5	1.4	1.8
Crawler Tractor/Dozers	1.9	2.1	1.8	2.2	2.0
Crushing/Proc. Equipment	0.1	0.1	! 0.1	0.3	! 0.2
Dumpers/Tenders	0.1	0.9	0.2	1.0	1.2
Excavators	1.8	1.6	1.6	1.3	1.6
Graders	1.7	1.9	1.9	1.9	2.0
Off-Highway Tractors	0.1	0.1	0.1	0.1	0.2

Equipment	CO exh	NOx exh	VOC total	SOx exh	PM exh
Off-highway Trucks	2.9	2.7	3.0	2.6	2.9
Other Construction Equipment	2.7	4.6	4.0	4.7	4.9
Pavers	0.2	0.7	0.5	0.7	0.8
Paving Equipment	0.1	0.5	0.2	0.4	0.7
Plate Compactors	0.1	0.1	0.1	0.1	0.1
Rollers	0.5	1.7	1.3	1.6	1.8
Rough Terrain Forklifts	0.3	0.4	0.3	0.5	0.4
Rubber Tire Loaders	1.1	1.3	1.3	1.3	1.2
Scrapers	! 0.3	! -0.4	! 0.4	! 0.5	! 0.3
Signal Boards/Light Plants	13.9	3.7	7.7	3.7	5.8
Skid Steer Loaders	! 0.4	! -0.8	! 0.8	! 0.8	! 0.8
Surfacing Equipment	0.1	17.0	10.0	21.4	30.1
Tractors/Loaders/Backhoes	! 0.2	! -0.3	! 0.3	! 0.4	! 0.4
Trenchers	0.1	! 0.2	0.0	! 0.2	! 0.2
Tampers/Rammers	! 1.0	! 1.0	! 1.0	! 1.0	! 1.0
Total Emissions	0.5	1.4	0.6	1.3	1.1

Table 18. 2002 Construction and mining emissions change as compared to default NONROAD emissions (%).

Equipment	CO exh	NOx exh	VOC total	SOx exh	PM exh
Bore/Drill Rigs	0.5	1.9	1.1	2.1	1.8
Cement & Mortar Mixers	0.1	1.1	0.2	1.3	1.2
Concrete/Industrial Saws	0.1	0.4	0.1	0.7	0.1
Cranes	0.7	1.3	1.2	1.2	1.4
Crawler Tractor/Dozers	1.5	1.7	1.4	1.9	1.5
Crushing/Proc. Equipment	0.1	0.0	! 0.2	0.2	! 0.3
Dumpers/Tenders	0.1	0.7	0.2	0.9	0.9
Excavators	1.2	1.3	1.2	1.1	1.1
Graders	1.8	1.7	1.7	1.7	1.8
Off-Highway Tractors	0.0	0.0	0.0	0.0	0.1
Off-highway Trucks	2.1	2.3	2.4	2.3	2.3
Other Construction Equipment	2.0	3.8	3.2	4.0	4.0
Pavers	0.2	0.5	0.4	0.5	0.5
Paving Equipment	0.1	0.4	0.1	0.3	0.6
Plate Compactors	0.1	0.0	0.1	0.0	0.0
Rollers	0.4	1.5	1.2	1.4	1.5
Rough Terrain Forklifts	0.1	0.2	0.1	0.4	0.1
Rubber Tire Loaders	0.6	1.0	0.8	1.1	0.8
Scrapers	! 0.3	! 0.5	! 0.4	! 0.5	! 0.3
Signal Boards/Light Plants	13.5	3.5	7.5	3.3	5.5
Skid Steer Loaders	! 0.4	! 0.9	! 0.8	! 0.9	! 0.9
Surfacing Equipment	! 0.1	16.2	10.7	20.2	28.3
Tractors/Loaders/Backhoes	! 0.2	! 0.4	! 0.4	! 0.4	! 0.4
Trenchers	0.1	! -0.3	! 0.1	! 0.3	! 0.3

Equipment	CO exh	NOx exh	VOC total	SOx exh	PM exh
Tampers/Rammers	! 1.0	! 1.0	! 1.0	! 1.0	! 1.0
Total Emissions	0.3	1.1	0.4	1.2	0.7

Table 19. 2007 Construction and mining emissions change as compared to default NONROAD emissions (%).

Equipment	CO exh	NOx exh	VOC total	SOx exh	PM exh
Bore/Drill Rigs	0.4	1.7	1.0	2.0	1.6
Cement & Mortar Mixers	0.1	1.1	0.2	1.3	1.2
Concrete/Industrial Saws	0.1	0.4	0.2	0.7	0.2
Cranes	0.6	1.2	1.2	1.2	1.3
Crawler Tractor/Dozers	1.5	1.4	1.4	1.7	1.6
Crushing/Proc. Equipment	0.1	! 0.3	! 0.2	! 0.1	! 0.4
Dumpers/Tenders	0.1	0.7	0.2	0.9	0.7
Excavators	1.0	1.2	1.0	1.0	1.0
Graders	1.7	1.5	1.5	1.5	1.6
Off-Highway Tractors	! 0.1	! 0.1	! 0.1	! 0.1	! 0.1
Off-highway Trucks	1.8	2.0	2.1	1.9	2.0
Other Construction Equipment	1.8	3.7	3.1	3.9	4.0
Pavers	0.1	0.4	0.3	0.5	0.5
Paving Equipment	0.1	0.4	0.2	0.2	0.5
Plate Compactors	0.1	0.0	0.1	! 0.1	0.0
Rollers	0.4	1.5	1.2	1.3	1.5
Rough Terrain Forklifts	0.1	0.1	0.0	0.3	0.0
Rubber Tire Loaders	0.5	0.9	0.7	1.0	0.7
Scrapers	! 0.2	! 0.5	! 0.3	! 0.5	! 0.3
Signal Boards/Light Plants	11.6	1.7	4.7	1.3	2.2
Skid Steer Loaders	! 0.4	! 0.9	! 0.8	! 0.9	! 0.9
Surfacing Equipment	! 0.1	17.0	7.4	21.2	31.7
Tractors/Loaders/Backhoes	! 0.2	! 0.5	! 0.5	! 0.5	! 0.5
Trenchers	0.1	! 0.4	! 0.1	! 0.4	! 0.4
Tampers/Rammers	! 0.9	! 0.9	! 0.9	! 0.9	! 0.9
Total Emissions	0.2	0.9	0.3	1.0	0.6

Table 20. 1999 Construction and mining emission estimates by county (tpy).

Equipment	Gregg			Harrison			Rusk			Smith			Upshur		
	CO	NOX	VOC	CO	NOX	VOC									
Tampers/Rammers	11.6	0.1	4.1	5.0	0.0	1.8	2.6	0.0	0.9	15.6	0.1	5.5	2.4	0.0	0.8
Plate Compactors	19.7	0.2	1.2	8.6	0.1	0.5	4.4	0.1	0.3	26.4	0.3	1.6	4.1	0.0	0.2
Paving Equipment	39.5	1.6	1.8	17.2	0.8	0.8	8.8	0.4	0.4	53.2	2.3	2.5	8.0	0.1	0.3
Signal Boards	1.8	1.6	0.3	0.9	0.9	0.2	0.5	0.6	0.1	2.5	2.3	0.4	0.4	0.4	0.1
Concrete/Industrial Saws	108.8	1.4	13.3	47.4	0.7	5.8	24.2	0.4	3.0	146.2	1.9	17.8	22.5	0.3	2.7
Crushing/Proc. Equip.	4.7	0.0	0.2	4.1	6.7	0.5	1.1	0.2	0.1	6.3	0.1	0.3	1.0	0.0	0.0
Pavers	14.6	6.2	1.0	6.5	3.0	0.4	3.3	1.6	0.2	19.9	8.9	1.3	2.6	0.5	0.1
Rollers	37.0	26.0	3.5	17.7	13.9	1.8	8.5	6.3	0.8	51.7	38.0	5.1	6.0	2.9	0.4
Surfacing Equipment	20.7	5.6	1.3	8.9	2.3	0.5	4.6	1.2	0.3	28.3	8.2	1.8	3.9	0.7	0.2
Trenchers	35.7	3.0	1.5	16.2	2.1	0.8	8.3	1.1	0.4	48.3	4.4	2.1	7.2	0.4	0.3
Bore/Drill Rigs	19.7	22.5	2.7	7.8	8.0	1.0	3.4	2.7	0.4	27.2	31.9	3.8	2.4	0.6	0.2
Cement & Mortar Mixers	33.9	0.9	1.7	14.7	0.3	0.7	7.5	0.3	0.4	45.5	1.2	2.2	7.0	0.2	0.3
Cranes	7.4	17.1	1.5	4.8	12.6	1.1	3.5	10.5	0.9	11.1	26.9	2.3	1.7	4.3	0.4
Rough Terrain Forklifts	13.5	14.5	1.9	8.7	10.0	1.3	5.4	6.5	0.8	19.5	21.5	2.8	3.5	4.0	0.5
Rubber Tire Loaders	73.3	126.9	11.0	47.8	84.9	7.4	42.8	74.6	6.7	81.0	136.0	11.8	7.5	11.2	1.0
Tractors/Loaders/Backhoes	39.3	17.2	4.3	24.2	15.0	3.6	12.8	8.2	1.9	54.7	25.1	6.3	7.4	2.7	0.7
Skid Steer Loaders	19.4	3.7	1.8	13.3	5.3	2.1	6.8	2.7	1.1	26.4	5.2	2.5	3.9	0.7	0.3
Dumpers/Tenders	5.4	0.1	0.2	2.3	0.1	0.1	1.2	0.1	0.1	7.2	0.1	0.3	1.1	0.0	0.0
Other Construction Equip.	19.1	25.8	2.5	10.1	13.5	1.4	13.7	23.3	2.1	27.5	37.6	3.6	3.7	5.0	0.5
Scrapers	1.4	2.7	0.2	9.4	18.9	1.2	1.2	2.5	0.2	2.0	4.0	0.3	0.3	0.5	0.0
Excavators	34.5	67.7	5.9	54.5	101.4	9.0	33.2	59.8	5.4	50.6	99.3	8.6	3.1	6.1	0.5
Graders	14.3	30.5	2.7	10.1	25.4	2.1	7.4	22.8	1.6	21.1	44.9	3.9	2.0	4.3	0.4
Off-highway Trucks	21.1	39.6	3.3	107.7	195.7	17.0	127.0	228.9	20.1	29.8	55.9	4.7	3.4	6.4	0.5
Rubber Tire Dozers	0.3	0.7	0.1	1.8	4.3	0.2	0.3	0.7	0.1	0.6	1.3	0.1	0.2	0.4	0.0
Crawler Tractors	64.8	127.0	11.0	92.8	194.2	14.8	42.2	103.1	5.4	94.2	184.6	16.0	6.4	12.5	1.1
Off-Highway Tractors	1.3	2.0	0.2	1.6	2.4	0.2	3.2	4.1	0.5	2.5	3.8	0.4	0.2	0.3	0.0
Total Emissions	663	545	79	544	722	76	378	563	54	899	746	108	112	65	12

Table 21. 2002 Construction and mining emission estimates by county (tpy).

Equipment	Gregg			Harrison			Rusk			Smith			Upshur		
	CO	NOX	VOC	CO	NOX	VOC									
Tampers/Rammers	11.0	0.0	3.9	4.9	0.0	1.7	2.5	0.0	0.9	14.8	0.1	5.2	2.3	0.0	0.8
Plate Compactors	19.5	0.2	1.1	8.5	0.1	0.5	4.3	0.0	0.2	26.3	0.3	1.4	4.0	0.0	0.2
Paving Equipment	38.8	1.5	1.5	16.9	0.7	0.7	8.6	0.4	0.4	52.2	2.1	2.1	7.9	0.1	0.3
Signal Boards	1.6	1.4	0.2	0.8	0.8	0.1	0.5	0.5	0.1	2.3	2.1	0.3	0.4	0.4	0.1
Concrete/Industrial Saws	112.3	1.2	12.1	49.1	0.6	5.4	25.0	0.3	2.7	150.9	1.7	16.3	23.2	0.2	2.5
Crushing/Proc. Equipment	4.8	0.0	0.2	3.7	5.8	0.3	1.2	0.2	0.1	6.5	0.1	0.2	1.0	0.0	0.0
Pavers	13.9	5.4	0.7	6.2	2.6	0.3	3.2	1.4	0.2	18.9	7.7	1.0	2.5	0.5	0.1
Rollers	34.7	23.3	2.8	16.5	12.6	1.5	8.0	5.7	0.7	48.3	34.1	4.1	5.9	2.6	0.3
Surfacing Equipment	20.5	5.0	1.1	8.8	2.0	0.4	4.5	1.1	0.2	28.0	7.3	1.5	3.9	0.6	0.2
Trenchers	36.4	2.7	1.3	16.4	1.9	0.7	8.4	1.0	0.3	49.1	3.9	1.8	7.4	0.3	0.2
Bore/Drill Rigs	18.0	20.3	2.3	7.3	7.3	0.9	3.2	2.4	0.3	24.8	28.8	3.3	2.3	0.5	0.2
Cement & Mortar Mixers	33.0	0.8	1.3	14.3	0.3	0.6	7.3	0.3	0.3	44.3	1.2	1.8	6.8	0.2	0.3
Cranes	6.4	15.0	1.2	4.1	11.0	0.9	3.0	9.4	0.7	9.5	23.6	1.9	1.5	3.8	0.3
Rough Terrain Forklifts	10.7	12.6	1.4	6.9	8.8	1.0	4.3	5.8	0.6	15.3	18.7	2.0	2.7	3.5	0.4
Rubber Tire Loaders	54.9	109.1	8.1	34.0	72.7	5.3	22.4	60.1	4.0	61.3	117.0	8.8	5.9	9.7	0.8
Tractors/Loaders/Backhoes	39.2	15.8	3.9	23.6	13.9	3.2	12.5	7.5	1.7	54.4	23.1	5.6	7.4	2.5	0.6
Skid Steer Loaders	18.8	3.4	1.5	12.7	5.0	1.9	6.5	2.5	1.0	25.6	4.8	2.1	3.8	0.6	0.3
Dumpers/Tenders	5.2	0.1	0.2	2.3	0.1	0.1	1.2	0.1	0.0	7.0	0.1	0.3	1.1	0.0	0.0
Other Construction Equip.	15.6	22.8	2.0	8.4	12.0	1.1	10.6	20.7	1.7	19.8	28.8	2.6	3.1	4.4	0.4
Scrapers	1.2	2.5	0.2	7.9	17.1	0.9	1.0	2.2	0.2	1.8	3.7	0.3	0.2	0.5	0.0
Excavators	23.7	57.9	4.4	28.0	82.8	5.6	13.0	46.4	2.8	34.9	85.0	6.5	2.1	5.2	0.4
Graders	10.1	26.5	2.0	7.8	23.1	1.7	6.2	21.7	1.4	14.9	39.0	2.9	1.4	3.7	0.3
Off-highway Trucks	15.2	34.5	2.4	74.5	171.5	12.4	60.6	183.8	11.3	21.5	48.7	3.3	2.5	5.6	0.4
Rubber Tire Dozers	0.3	0.6	0.1	1.4	3.7	0.2	0.3	0.6	0.0	0.5	1.2	0.1	0.1	0.3	0.0
Crawler Tractors	49.2	111.1	8.3	57.3	161.0	10.0	31.6	83.9	4.4	71.5	161.5	12.1	4.9	11.0	0.8
Off-Highway Tractors	0.9	1.8	0.1	1.2	2.1	0.2	2.5	3.7	0.4	1.7	3.3	0.3	0.1	0.3	0.0
Total Emissions	596	476	64	423	620	57	252	462	37	806	648	88	105	56	10

Table 22. 2007 Construction and mining emission estimates by county (tpy).

Equipment	Gregg			Harrison			Rusk			Smith			Upshur		
	CO	NOX	VOC	CO	NOX	VOC									
Tampers/Rammers	10.7	0.0	2.2	4.4	0.0	0.9	2.3	0.0	0.5	14.3	0.0	3.0	2.2	0.0	0.5
Plate Compactors	20.1	0.2	0.8	8.6	0.1	0.3	4.4	0.0	0.2	27.0	0.3	1.1	4.2	0.0	0.2
Paving Equipment	40.4	1.3	1.1	17.4	0.5	0.5	8.9	0.3	0.2	54.3	1.9	1.5	8.2	0.0	0.2
Signal Boards	1.6	1.3	0.2	0.7	0.6	0.1	0.4	0.4	0.1	2.2	2.0	0.3	0.4	0.4	0.1
Concrete/Industrial Saws	114.3	1.1	6.0	48.7	0.5	2.5	24.9	0.3	1.3	153.6	1.6	8.1	23.7	0.2	1.2
Crushing/Proc. Equipment	5.0	0.0	0.1	3.4	3.8	0.2	1.1	0.0	0.0	6.8	0.0	0.2	1.0	0.0	0.0
Pavers	13.9	4.9	0.6	5.8	1.6	0.2	3.0	0.9	0.1	18.9	6.9	0.8	2.6	0.4	0.1
Rollers	33.3	21.6	2.2	14.6	9.6	1.0	7.0	4.2	0.4	46.1	31.6	3.2	5.8	2.4	0.3
Surfacing Equipment	20.7	4.7	0.8	8.8	1.9	0.3	4.5	1.0	0.2	28.2	6.9	1.1	4.0	0.6	0.1
Trenchers	37.6	2.6	1.0	16.1	1.0	0.4	8.2	0.5	0.2	50.6	3.8	1.4	7.7	0.3	0.2
Bore/Drill Rigs	17.3	19.7	2.1	6.4	5.7	0.7	2.9	1.7	0.2	23.8	27.9	2.9	2.3	0.5	0.1
Cement & Mortar Mixers	33.6	0.8	1.1	14.4	0.3	0.5	7.4	0.2	0.2	45.2	1.2	1.5	7.0	0.2	0.2
Cranes	5.6	13.3	1.0	3.0	8.1	0.6	2.3	7.5	0.5	8.3	21.0	1.5	1.3	3.3	0.2
Rough Terrain Forklifts	10.7	11.9	1.2	5.0	5.8	0.6	3.3	4.1	0.4	15.4	17.7	1.7	2.7	3.3	0.3
Rubber Tire Loaders	46.4	96.2	6.6	22.6	51.8	3.4	15.6	45.2	2.6	52.3	103.2	7.1	5.2	8.5	0.6
Tractors/Loaders/Backhoes	40.9	15.9	3.7	17.3	6.6	1.5	9.3	3.9	0.9	56.6	23.2	5.3	7.7	2.5	0.6
Skid Steer Loaders	19.4	3.4	1.3	8.1	1.3	0.5	4.2	0.7	0.3	26.3	4.8	1.9	3.9	0.6	0.2
Dumpers/Tenders	5.3	0.1	0.2	2.3	0.1	0.1	1.2	0.0	0.0	7.2	0.1	0.2	1.1	0.0	0.0
Other Construction Equip.	13.3	20.9	1.7	6.5	9.8	0.8	8.0	16.6	1.3	16.7	26.4	2.1	2.6	4.0	0.3
Scrapers	1.2	2.5	0.2	5.9	11.3	0.6	0.3	0.6	0.0	1.7	3.6	0.2	0.2	0.5	0.0
Excavators	19.0	50.7	3.7	18.2	61.2	3.6	10.0	33.8	1.9	27.9	74.5	5.4	1.7	4.5	0.3
Graders	7.9	22.9	1.6	5.5	15.2	1.1	5.2	12.9	0.9	11.6	33.7	2.4	1.1	3.2	0.2
Off-highway Trucks	9.9	30.8	1.6	36.8	128.1	7.0	38.6	143.8	7.3	14.1	43.5	2.3	1.6	5.0	0.3
Rubber Tire Dozers	0.2	0.6	0.0	1.1	2.7	0.2	0.2	0.5	0.0	0.4	1.1	0.1	0.1	0.3	0.0
Crawler Tractors	39.1	99.8	6.5	43.4	112.4	6.8	25.0	52.8	3.4	56.9	145.0	9.4	3.9	9.9	0.6
Off-Highway Tractors	0.7	1.6	0.1	0.5	1.2	0.1	1.6	2.9	0.2	1.2	3.1	0.2	0.1	0.2	0.0
Total Emissions	568	429	48	326	441	34	200	335	24	767	585	65	102	51	7

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