Eastern Research Group, Inc.

Statewide Diesel Construction Equipment Inventory

Final Report

Prepared for:

The Texas Commission on Environmental Quality

Prepared by:

Eastern Research Group, Inc.

August 31, 2005

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STATEWIDE DIESEL CONSTRUCTION EQUIPMENT INVENTORY

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The Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, TX 78753

Prepared by:

Eastern Research Group, Inc.
5608 Parkcrest Drive, Suite 100
Austin, TX 78731

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Acronyms

AACOG	Alamo Area Council of Governments
AGC	Associated General Contractors of Texas
AVG	Average
bhp-hr	Brake horsepower-hour
CCMC	Construction Cost Management Company
CO	Carbon Monoxide
CY	Cubic Yards
CYb	Cubic Yards banked
CYl	Cubic Yards loose
DCAD	Dallas County Appraisal District
DCE	Diesel Construction Equipment
DFE	Dallas Floodway Extension
DFW	Dallas-Fort Worth
EDA	Equipment Data Associates
EF	Emission Factor
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERG	Eastern Research Group
GIS	Geographic Information System
HARC	Houston Advanced Research Center
HCIC	Houston Construction Industry Coalition
HGB	Houston-Galveston-Brazoria
HP	Horsepower
HP-HR	Horsepower-hour
HR	Hour
LB	Pound
LF	Load Factor
LNG	Liquefied Natural Gas
M	Million
MHC	McGraw-Hill Construction
MSHA	Mine Safety Health Administration
NAAQS	National Ambient Air Quality Standards
NCTCOG	North Central Texas Council of Governments
NEVES	Nonroad Engine and Vehicle Emission Study
NIF	National Inventory Format
NMHC	Non-methane Hydrocarbons
NOx	Nitrogen Oxides
PM	Particulate Matter
PM10 (-PRI)	Particulate Matter (10 microns or smaller) (-Primary)

PM2.5 (-PRI)	Particulate Matter (2.5 microns or smaller) (-Primary)
POP	Population
PSR	Power Systems Research
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
Rd	Road
REMI	Regional Economic Modeling Inc.
RFP	Request For Proposal
RRC	Railroad Commission
RTF	Rough Terrain Forklift
SCC	Source Classification Codes
SF	Square Feet
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SORE	Small Offroad Engine Rule
SSURGO	Soil Survey Geographic Database
SY	Square Yards
T/L/B	Tractor/Loader/Backhoe
TCEQ	Texas Commission on Environmental Quality
TERP	Texas Emissions Reduction Program
TNRCC	Texas Natural Resources Conservation Commission
TPD	Tons Per Day
TPY	Tons Per Year
TRE	Trinity River Express
TTI	Texas Transportation Institute
Tx	Texas
TxDOT	Texas Department of Transportation
TxLED	Texas Low Emission Diesel
U.S.	United States
UCC-1	Uniform Commercial Code
USCB	United States Census Bureau
USGS	United States Geological Survey
USPS	United States Postal Service
VOC	Volatile Organic Compounds
YR	Year

1.0 Introduction

Diesel Construction Equipment (DCE) is one of the largest sources of NOx emissions in the State of Texas. As such, accurate estimation of DCE emissions is crucial to regulatory efforts including State Implementation Plan (SIP) development, Rate of Progress (ROP) assessments, and Conformity Determinations. DCE is also one of the primary targets for voluntary emission retrofits under the Texas Emission Reduction Program (TERP).

While previous studies have developed detailed, bottom-up equipment and emission inventories for DCE operating in the Houston-Galveston-Brazoria (HGB) and Dallas-Fort Worth (DFW) regions, DCE emissions for the remainder of the State have largely relied upon default assumptions developed by EPA. In order to improve the accuracy and precision of DCE emission estimates, the Texas Commission on Environmental Quality (TCEQ) contracted with Eastern Research Group (ERG) to develop the data needed to extend existing quantification methods for statewide, County level inventories. Specifically, ERG was tasked to develop surrogate data, activity data sets, and emission inventory methodologies for DCE greater than 25 horsepower using historical and projected activity data from professional cost estimation companies and other publicly available sources. ERG used this data to develop more accurate statewide/county level DCE emission inventories for selected project categories, as well as improved NONROAD model input files. The surrogate data, the NONROAD model input files and the emissions estimates were for annual and ozone season daily emissions at the county level for all counties in Texas for the years 1999, 2002, 2005, 2007, 2009, 2010, 2012, and 2013. Emission rates for VOCs, NOx, CO, PM 2.5, and SO_2, were included in the inventories.

The inventory methodology developed by ERG, in consultation with TCEQ, relies heavily on a detailed study performed for this equipment type in the DFW area for the Houston Advanced Research Center (HARC). (1) In this study, detailed data on DCE populations and activity were collected in order to estimate emissions levels. The study area included the nine county DFW ozone nonattainment area, and emissions were estimated for the 2004 base year, and were extrapolated for several analysis years. The study employed several different data collection methods, including surveys of equipment operators, field observations at various project sites, and equipment activity profiles from professional construction cost estimators and other experts. Data collection efforts focused on equipment populations, types, horsepower (hp) requirements, and hours of use. Activity surrogates were also identified and collected for each project category, to extrapolate the collected population and activity data to each county, for each analysis year. Once the different sources of data were compiled and quality assured, composite activity profiles were developed for each project category.

Surrogates and adjustment factors were then identified and obtained for application of these methods to the remainder of the counties in the State. Surrogates were tailored to specific DCE activity profiles, such as commercial, residential, or highway construction, and were applied to each profile to provide estimates of total population and hours of use for each equipment type and hp range. County specific activity adjustments were also developed and applied to the profiles to account for such factors as elevation, ground cover, and soil type. These values were then input into EPA's NONROAD emission factor model to estimate total annual and ozone season weekday emissions for each county and analysis year.

The results significantly improve the precision of previous emission inventory efforts for the construction sector, and provide a more accurate baseline for future modeling assessments. In addition, the data collection and extrapolation methods were designed to be easily replicable for future year updates, and provide a consistent baseline for all DCE inventories across the State.

2.0 Overview

Previous efforts to estimate DCE emissions outside of the DFW and HGB areas have used defaults from EPA's NONROAD emissions model. In these cases the surrogates employed do not necessarily correlate closely with actual equipment use and therefore emissions levels. While the NONROAD model attempts to adjust the dollar value surrogate for the relative level of equipment use across different project types (e.g., Single Family housing, road construction, public works, and other buildings), these adjustments were based on a small number of responses from a 1998 survey and are therefore subject to substantial uncertainty. (2,3) In addition, DCE equipment are used in a wide variety of fundamentally different applications, each meriting its own population and use profile, and in turn, profile specific surrogates.

In order to improve upon previous activity and emissions estimates, the current study compiled data on actual equipment use in Texas whenever possible, and on physical quantities closely associated with equipment activity, for different construction project categories. In addition, surrogates were identified for each project category, specific to each Texas County.

2.1 Scope of Study

Geographic and Temporal Scope

Emissions estimates were developed at the county level, for both annual and ozone season day time frames, for all 254 Texas Counties. Emissions were estimated for several analysis years, corresponding to key State Implementation Plan (SIP) and Conformity Analysis evaluation dates, including:

- 1999
- 2002
- 2005
- 2007
- 2009
- 2010
- 2012
- 2013

Emissions estimates, expressed in tons per day or tons per year, were developed for the following pollutants:

- Nitrogen Oxides (NOx)
- Particulate Matter < 2.5 microns (PM2.5)
- Volatile Organic Compounds (VOC)
- Carbon Monoxide (CO)
- Sulfur Dioxide (SO_2)

Equipment Categories

According to EPA default estimates for the State from the NONROAD model, construction equipment powered by spark ignition engines contribute 1% or less to the total NOx and PM emissions from these sources. Similarly, small engines < 25 hp, though numerous, contribute only small amounts to the total emissions inventory – about 1% of PM10, and < 1% of NOx. (4) Therefore high hp (> 25hp) DCE was selected as the focus of this study.

EPA's NONROAD model defines nonroad DCE according to the source classification code (SCC) shown in Table 2-1. This constitutes the final approved equipment list for the study.

Table 2-1. NONROAD Diesel Construction Equipment Categories

Equipment Type	SCC #	Definition
Pavers	2270002003	Large and small (such as for curbs) primarily self-propelled pavers.
Tampers/ Rammers	2270002006	Small 'handheld,' walk-behind, or single person sized equipment for compaction such as for sidewalk or other small area compaction.
Plate Compactors	2270002009	Similar to tamper/rammers with a larger vibrating plate instead of a ram.
Rollers	2270002015	Include smooth and knobby self-propelled rollers (e.g., used in landfills and called Compactors). Not to be confused with smaller Plate Compacters.
Scrapers	2270002018	Special equipment type that is an off-highway tractor with a mid-frame bucket that lowers to scrape loose material (dirt) into the bucket to carry to another part of the job site to dump; sometimes converted to a water wagon.
Paving Equipment	2270002021	Various equipment types used to smooth and distribute paving material, including vibrators and finishers to support the work of the pavers.
Surfacing Equipment	2270002024	Other various equipment used to supplement paving activity including paving material mixers, surface profilers (road reclaiming chippers), and seal coating equipment. Not used to distribute paving material as with paving equipment.
Signal Boards/ Light Plants	2270002027	Includes both highway boards and light plants used for nighttime lighting.
Trenchers	2270002030	Large and small trenchers typically using a rotating front mounted rotating 'blade' to pull material from trench and distribute it to the side.
Bore/Drill Rigs	2270002033	Drills and boring rigs of all types that are skid mounted, trailer mounted, or self-propelled. Not to be confused with highway trucks with drill attachments running off the highway engine, though truck mounted nonroad engines\equipment exist.
Excavators	2270002036	Single purpose wheeled or tracked excavators (backhoe), distinct of multipurpose tractor/backhoe/loaders.
Concrete/ Industrial Saws	2270002039	Handheld and large engine powered saws for stone cutting.
Cement and Mortar Mixers	2270002042	Small mixers used for small batch mixing.

Equipment Type	SCC #	Definition
Cranes	2270002045	Self-propelled, typically cable hoists. Not to be confused with highway trucks with crane attachments running off the highway engine, although truck mounted nonroad engines\equipment exist.
Graders	2270002048	Called road or motor graders, often used to prepare a site, especially a road, for paving. A blade is mid-frame mounted with equipment having a long wheel base
Off-highway Trucks	2270002051	Large off-highway dump trucks not certified for highway use.
Crushing/ Processing Equipment	2270002054	Various crushing and screening equipment for bulk material.
Rough Terrain Forklifts (RTF)	2270002057	Rough terrain forklifts (RTF) can be confused with typical forklifts but have larger knobby off-road wheels, and can be confused with rubber tire loaders but are specifically designed for handling palettes. Includes telescoping lift trucks called telescopic handlers often used in building construction.
Rubber Tire Loaders	2270002060	Bucket loaders or front-end loaders with a front mounted bucket for scooping, although other attachments can be used instead of a bucket.
Tractors/ Loaders/ Backhoes	2270002066	Common and ubiquitous multipurpose equipment that is most often referred to as a Backhoe but include the combined functions of loading and a backhoe in one unit. Agricultural tractors with alternative attachments may used for similar purposes.
Crawler Tractors/ Dozers	2270002069	Tracked (not wheeled) loaders and dozers.
Skid Steer Loaders	2270002072	Smaller (able to be 'skid' mounted to transport to job site) loaders, which may have alternative attachments than a bucket for loading.
Off-Highway Tractors	2270002075	Large tractors used to primarily drag large buckets or other equipment around a job or mine site, and agricultural tractors have been used for the same purpose.
Dumpers/ Tenders	2270002078	Small loaders and other trucks for confined space and light loads typically used for small building projects and are typically walk-behind equipment.
Other Construction Equipment	2270002081	Miscellaneous category for equipment not categorized above; only example of this type supplied by Power Systems Research (an independent market research firm specializing in evaluating construction equipment) are tensioners which are large winches used in construction
Graders	2270002048	Called road or motor graders, often used to prepare a site, especially a road, for paving. A blade is mid-frame mounted with equipment having a long wheel base

2.2 Emissions Estimation Methodology

The emissions estimation methodology developed by ERG closely follows the DFW HARC study approach, the key elements of which are summarized below:[1]

[1] Much of this section reiterates material presented in the HARC DCE study Final Report. (1)

1) Establishing equipment use profiles, including number of units, hp, hours per year, and other factors influencing emissions;
2) Identifying and applying surrogates to the equipment profiles to extrapolate equipment populations and activity estimates to the entire study area;
3) Developing emissions estimates based on total equipment populations and activity profiles;
4) Spatially apportioning emissions to the desired level (e.g., county level);
5) Temporally allocating emissions (e.g., annual or ozone season daily);
6) Forecasting and backcasting emissions to other evaluation years.

EPA's NONROAD model provides a versatile tool for estimating emission rates, spatially and temporally allocating those emissions, and forecasting and backcasting estimates to different analysis years. Specifically, the model uses exhaust emission factors in grams per brake horsepower-hour (bhp-hr), accounting for emission standard phase-in and deterioration, specific to engine size and fuel type. The emission calculation used in NONROAD is of the form: (4)

Equation 1: $$\textbf{Emissions}_p\textbf{/yr} = \sum(\textbf{SCC})\ \sum(\textbf{HP})\ \textbf{Pop} * \textbf{Power} * \textbf{LF} * \textbf{A} * \textbf{EF}_p$$

Where:

Pop	=	*Number of engines*
Power	=	*Average hp (for specific hp group)*
LF	=	*Load factor (% of rated power)*
A	=	*Activity (hr/year)*
EF_p	=	*Emissions for pollutant p (grams/bhp-hr)*
$\sum$***(SCC)***	=	***summation over each DCE equipment type***
$\sum$***(HP)***	=	***summation over each equipment hp group***

The NONROAD model contains several files used to estimate allocate emissions spatially and temporally, while simultaneously accounting for the effects of growth, scrappage rates, and the introduction of new emission standards. Therefore equipment population and activity profiles were designed to be consistent with NONROAD's equipment classification and emission calculation scheme.

The following provides an overview of the methodology used to develop the data needed for input into the NONROAD model, to estimate emissions for the required geographic and temporal scope.

Defining Construction Project Categories

Three factors were considered when defining the construction project categories for the HARC study. First, categories should be fundamentally different in their equipment use

requirements, relative to their associated physical quantities (e.g., the tasks required for highway and residential projects are quite different).

Second, available surrogates for each project category should be clearly associated with actual equipment use to the extent possible. While it is not possible to directly estimate hours of equipment use for all DCE, certain correlates of activity can be identified and collected for the different project categories, such as the linear feet of utility line installation per year.

Third, all categories, when considered together, should cover the great majority of DCE use in the study area.

Experts from various construction sectors, along with technical representatives from the TCEQ were solicited for their opinions regarding the distinct types of project categories, the likely relative contribution of the different categories, and the availability of appropriate surrogate data for each category. In addition, ERG contracted with an academic expert in construction science, Dr. Neil Eldin, for input regarding overall methodology, as well as peer review and selected calculations.[2]

Based on this input it was determined that there are two fundamentally different types of project categories – those that have significant earthwork and surfacing requirements and those that do not. Earthwork project categories include:

- Highway construction (state highway and bridge work, and city/county roads)
- Utility installation (sewer, water, gas, power, and communication line installation and repair)
- Single Family housing (residential developments/subdivisions)
- Commercial structures, and
- Other construction projects - e.g., very large, unique projects such as new liquefied natural gas storage depots.

As shown in Equation 1 above, emissions are directly related to the hp-hours of work output by an engine. The hp-hours are in turn associated with the amount of work performed for a given task. While the engine work performed during non-earthwork tasks may be difficult to quantify (e.g., pothole patching, or the amount of lifting performed by cranes), earthwork and surfacing tasks are reasonably easy to quantify and link to available surrogates. Therefore, by developing equipment activity profiles directly in terms of physical quantities such as cubic

[2] Dr. Eldin is currently the Head of the Department of Construction Technology, Purdue School of Engineering and Technology.

yards of earth moved, it should be possible to develop very precise correlates for equipment activity for the earthwork categories listed above.

Note that the commercial structure category contains a particularly wide variety of building types. In fact the surrogate data obtained for the commercial sector lists over a dozen different structure categories. However, based on consultation with industry experts earthwork requirements should not vary substantially across most building types. (6) However, equipment requirements will vary significantly depending upon lot size and utility requirements as these relate to building footprint size. Accordingly commercial profiles and surrogates were stratified by large, medium, and small designations, as discussed in Section 3.

The earthwork profiles were further adjusted to account for a limited number of site specific factors anticipated to have significant impact on equipment productivity. With the assistance of an industry expert, standardized site condition categories were defined as indicated in Table 2-2. (6) These categories were selected to facilitate equipment activity adjustments for typical conditions at the county level across the State as needed.

Table 2-2. Standardized Site Condition Definitions

Ground Cover Description
Wooded lot (dense/moderate)
Small trees, shrubs, and weed
Weed and Grass
Other
Soil Type Description
Good common earth (loam)
Sand/Gravel
Easy digging (moist silt/clay)
Hard digging (dry clay)
Fragmented Rock
Intact Rock
Other

Non-earthwork project categories that may involve the use of DCE were also identified during the HARC study. Equipment use for these categories may involve specialized activities (e.g., landfill compacting). In other cases the work performed may involve earthmoving and/or surfacing, but could not be determined from available surrogates (e.g. for mining activities, where production data is considered confidential business information).

The following non-earthwork categories for the HARC study:

- Road or utility maintenance/repair activities performed by municipalities/counties/state agencies, including TxDOT operated equipment
- Landfill operations
- Surface mining – including stone/quarry operations, sand/aggregate pits
- Boring/drilling operations, including water wells, deep foundation work (piles/piers), and utility pole installation/repair.

A database of DCE purchases in the DFW area was obtained to help identify other industry sectors that are also significant users of DCE, including: (7)

- Special construction trades (e.g., performing post-earthwork activities such as concrete, electrical, heating and air conditioning installation, and other tasks)
- Landscaping companies
- Agricultural entities
- Scrap handling and recycling facilities
- Concrete product manufacturers
- Brick and stone product manufacturers
- General manufacturing operations
- Transportation/Wholesale and Retail Sales/Services

Other DCE categories were found to be inadequately characterized by the earthwork profiles. These equipment types are numerous and therefore potentially significant emitters but were often difficult to link to available earthwork or surfacing surrogates. These included:

- Cranes
- Rough terrain forklifts
- Skid steer loaders, and
- Trenchers

Population data for these equipment types were also derived from the equipment sales database, with activity estimates provided by industry experts, for both earthwork and non-earthwork project categories. Section 3 provides a detailed discussion of the data sources and calculations used to characterize the additional equipment types and non-earthwork profiles.

2.3 Data Collection

Data collection for this study was coordinated with data collection under the HARC DFW study. The equipment use profiles and surrogate data obtained for these studies are discussed below.

2.3.1 Estimator/Expert Equipment Use Profiles

Large construction projects require detailed planning and management of equipment, labor, and material resources. The construction industry relies heavily on the extensive knowledge base provided by professional cost estimators, as well as construction superintendents, site foremen, and other experts to successfully plan and execute their projects. When provided with basic information regarding site conditions such as soil and ground cover, these experts can estimate the site specific equipment and labor requirements needed to perform the various project tasks.

The current study attempted to utilize the extensive knowledge base in the construction industry to characterize earthwork and surfacing requirements for the earthwork project categories. ERG contacted 46 cost estimators about providing equipment and activity data on projects for which they had previously developed cost estimates. Of those estimators, 32 were identified from the online Construction Blue Book using the "Dallas/Ft. Worth Area" and "Cost Estimators" as the search parameters. (16) The remaining 14 estimators were identified from the web site of the American Society of Professional Estimators. (17) From the 46 cost estimators contacted by ERG, 11 agreed to accept an official Request for Purchase (RFP) for the historical data. From the 11 estimators that received the RFP, one cost estimator responded.

Commercial and Utility Profiles

At the completion of the RFP process ERG contracted with the Construction Cost Management Company (CCMC), which specializes in commercial construction projects. ERG provided CCMC with a list of the DCE equipment types of interest, and requested data for a range of different structure sizes and types, as well as the details on specific site conditions including soil type and ground cover.

CCMC provided ERG with historical earthwork quantity data for 23 projects, 13 of which were in the nine county DFW area, the remainder of which were located outside the State. Project sizes ranged from less than 7,000 square feet (SF) for a retail strip mall, to greater than 150,000 SF for a warehouse. Extensive utility related task detail was also provided within the larger commercial structure summaries, which was used to develop equipment use requirements for the Utility sector.

Detailed task level equipment assignments were provided for the target DCE types, with preferred hp and predicted hours of equipment use required to complete a specified earthwork or surfacing quantity (e.g., one 120 hp backhoe to excavate 100 cubic yards of trench material in six

hours). The detailed information provided for each of these projects may be viewed in the Cost Estimator Data Model, provided in Appendix B.

Highway Profiles

ERG contracted directly with RS Means, a nationally recognized leader in cost estimation, to provide a profile specifically for local (i.e., city and county projects, as opposed to heavy highway) road construction. Means provided a detailed task level profile for the construction of one mile of a two-lane asphalt concrete roadway in the DFW region. The details of this profile are provided in Section 3.

Despite numerous attempts to obtain estimator or other expert input for heavy highway construction profiles, no new information was identified for this sector. According to an industry expert, heavy highway construction is particularly difficult to generalize, given the highly site specific equipment and use requirements of each project. (21) For example, lane expansion in a highly urban setting will entail very different equipment use than in a rural area, given space and safety constraints, equipment movement logistics, etc. Equipment use patterns will also vary from region to region and over time, depending upon equipment, labor, and material availability, contractor preferences for certain equipment types and hp ranges, and other factors.

Given the inability to generalize equipment use profiles for heavy highway construction, ERG relied upon survey results from a previous study in the HGB area, which featured a very high (70%) response rate for this sector. (5) These results were subsequently extrapolated to the rest of the State using surrogate data from TxDOT, as discussed in Section 3.

Single Family Housing Profile

As part of a previous study performed in the Houston area, developers, estimators, and field managers were interviewed to characterize a Model residential development, to identify all stages of work requiring heavy equipment, and to create an equipment profile for each phase of development. (5) A subsequent review of the profile by local site managers found it to be a reasonable representation of subdivision development requirements in the DFW area as well. This profile was used as the basis for extrapolating to the rest of the State. (See Section 3 for further details).

Mining

The effort to obtain site specific information on surface mining operations for the HARC DFW study was largely unsuccessful. No survey responses were provided from sand and gravel

pit operators, and only one response was obtained from quarry operators. In addition, several attempts to contact and obtain data on coal mining operations under this study were also unsuccessful. Given the lack of equipment use profiles for quarries and coal/lignite mines, it was not possible to develop population and activity estimates for this sector.

2.3.2 Non-Earthwork Profiles

Non-earthwork profiles were developed primarily from surveys of equipment counts, characteristics, and hours of use. Annual activity estimates for a given equipment category were weighted by hp-hours to estimate hours per year when possible.

Texas Department of Transportation (TxDOT)

TxDOT owns and operates a substantial fleet of diesel construction equipment in each of the 25 Districts across the State. Surveys were sent via email to each District Equipment Manager. (A copy of the survey is provided in Appendix C.) The fleet managers were able to provide a complete list of equipment owned by TxDOT in each county, as well as the hours of use per year and horsepower for each piece of equipment.

Municipal and County Equipment

Survey results from the HARC DFW study were used as the basis for extrapolating city and county-operated equipment profiles to the rest of the State. Six municipalities and two counties in the DFW area responded to the HARC survey. Respondents provided equipment lists and hours of use per year. Results are provided in Appendix E.

Landfills

In recent efforts to survey landfills in the DFW area for the HARC study, ERG received limited feedback. As a result, ERG developed an alternative approach for estimating equipment population and activity for landfills in Texas.

The approach utilized a detailed study of landfill operations in the DFW area performed in 2001. (27) ERG developed equipment and activity profiles for typical landfills in each size category (large/medium/small), and combined these with the most recent landfill disposal information from the report “Municipal Solid Waste in Texas: A Year in Review” published in 2004 by the TCEQ. Once the landfills were identified and classified according to size, ERG applied the appropriate profile to the landfill. This allowed ERG to establish the expected equipment populations and activity for diesel construction equipment for all of the landfills in Texas, based upon tons of disposed waste in 2003.

Special Projects

In consultation with TCEQ, large future construction projects were identified which would not be included in typical surrogate activity projections, but which are expected to generate non-negligible emissions. These included the development of three liquefied natural gas (LNG) storage and distribution facilities along the Gulf Coast. Detailed annual emission estimates were obtained from Environmental Impact Statements (EIS) and Conformity Determinations performed for each project.

Other Industrial Sectors and Specialty Equipment

Several industry sectors and equipment types were identified that did not lend themselves to standard profile development under the HARC study. These included smaller and/or specialty equipment which are quite common at construction sites but seldom participate in earthwork/surfacing activities. As such, this equipment was not adequately represented in the estimator profiles.

Based on the initial data review ERG identified the following equipment types for subsequent evaluation:

- Skid steer loaders
- Rough terrain forklifts
- Cranes
- Boring/drilling rigs
- Trenchers

In addition, experts in construction equipment use indicated that there were several industries in addition to the sectors profiled that commonly use construction equipment, and therefore required separate profile development. These other industry groups included:

- Special Construction Trades
- Landscaping
- Scrap Handling & Recycling
- Concrete Products
- Brick/Stone/Other Products
- Agriculture
- Manufacturing
- Transportation/Sales/Services

To evaluate the above equipment types and other industrial sectors, ERG obtained a data set containing historical DCE sales records for the nine county area from Equipment Data

Associates (EDA). (7) This data set was developed from Uniform Commercial Code (UCC-1) filings from 1990 through May of 2005. UCC-1 forms are filed at the state level whenever an equipment purchase is financed, leased, rented to own, or refinanced. (29) The data fields provided included equipment type and size, year of original purchase, four digit SIC and county of purchaser.

2.4 Identification and Development of Surrogates

ERG identified surrogate data for use in extrapolating and allocating DCE activity to each county in the State for each of the different project categories noted above. Surrogates were selected based on two criteria: the likely correlation with actual work performed by DCE engines, and the ability of the surrogates to be easily obtained and applied for future inventory updates. In most cases the surrogates selected were consistent with those used for the DFW HARC study.

The following discusses the surrogates identified and collected for each project type and equipment category, including the source of the data, its appropriateness for the given category, and forecasting/backcasting approaches. A more detailed discussion of the data sets themselves and their use in the analysis is provided in Section 3.

Highway Sector

Heavy Highway Road and Bridge Construction: TxDOT provided ERG with lane-miles for each project let by county during 2004. (8) Project-level detail allowed ERG to break out bridge work and other construction. The population and activity estimates used in the HARC analysis were then allocated to other counties based on lane-mile ratios. Historical data on contract dollar value for highway projects at the county level was obtained from the Texas Comptroller's website from 1999 through 2004 to allow backcasting. Projections for 2005, 2007, and 2009 were based on McGraw-Hill Construction (MHC) econometric contract dollar value projections for federal highway contracts at the county level. (12) Projections for 2010, 2012, and 2013 were based on linear extrapolation from other years.

County/Local Roadway Work: Reed Construction Data provided project listings for County and Municipal roadway projects, by county, for 2004. (10) Lane-miles were not available, but detailed paving quantities were provided for a significant subset of projects. Activity associated with pavement removal and replacement were then correlated with project value, which was provided for all projects. The resulting correlations were then used to predict

relevant paving quantities for the remaining projects. Backcasting and forecasting was based on census population estimates.

Single Family Housing Sector

Single Family units: Building permit data for the number of housing starts was collected from the U.S. Census Bureau from 1999 through 2004, at the county level. (11) This method was preferred over estimates of total square footage for this sector.[3] Future year projections were developed based on simple linear regressions of the historical data for statewide permit totals.

Commercial Sector

Commercial structures: MHC provided county level dollar value as well as square footage put in place for all commercial sector building types. (12) The MHC building types include both publicly and privately funding projects as listed below.

- Retail
- Manufacturing
- Education/Science
- Dormitories
- Hospitals and health treatment
- Public buildings
- Religious
- Amusement
- Miscellaneous structures
- Apartments

Data on projects for each building type were grouped into three bins based on footprint size in square feet (SF) (0 – 10,000 SF, 10,000 – 40,000 SF, and 40,000+ SF) to facilitate use with estimator profiles (e.g., small, medium, and large project profiles). The time frame of the data was 2002 through 2009. Projections for 1999 and 2012 were based on a linearly extrapolation from the available projection data.

Utility Sector

Reed Construction Data provided county level project data in terms of linear feet (along with size/diameter) for the 2004 base year, for the following project types: (10)

- Water lines

[3] It was noted that engine work should be more closely associated with the *number* of housing units than the square footage of the units themselves, since earthwork quantities are primarily dependent on overall subdivision size, which in turn is dependent on lot size rather than footprint or total square footage per unit. (6)

- Gas lines
- Storm water
- Power lines
- Communications (cable/fiber-optic)

Linear feet of line installation is the preferred surrogate for these projects, being most directly related to earthwork volumes. However this data is only available for a subset of the Reed projects. Therefore correlations between linear feet of utility line work and project dollar value (which was available for all projects) were developed in order to estimate linear feet quantities for the entire data set. Utility valuation data from MHC was used to forecast and backcast activity in other years, with 1999 and 2012 estimates based on linear interpolation.

Municipal/County Equipment

For municipal and county equipment operations, ERG used the equipment lists obtained from the HARC surveys to calculate the equipment population for all municipalities on a per capita basis population. Data from the Census Bureau were then used to extrapolate the results to the entire State at the county level for forecasting and backcasting.

TxDOT Equipment

ERG obtained equipment survey information for all 25 TxDOT Districts statewide, including data on 3,348 pieces of nonroad diesel equipment. Therefore surrogates were not necessary for extrapolating TxDOT survey findings. TxDOT officials also confirmed that there has been essentially no growth in their equipment fleet or activity levels over the past several years, so growth was assumed negligible for this sector. (13)

Landfills

The most recent landfill volume data available is from the TCEQ report published in December 2004 titled: "Municipal Solid Waste in Texas: A Year in Review - 2003 Data Summary and Analysis", available on the TCEQ website.[4] Tons of waste accepted in 2003 was used to classify each landfill surveyed as large, medium, or small, and to apply the appropriate equipment and activity profiles to each based on their classification. Projections were performed using the per capita disposal rate in conjunction with census population forecast information.

[4] http://www.tceq.state.tx.us/permitting/waste_permits/msw_permits/msw.html

Mining

The TCEQ Central Registry Database contains Sector J permit information for mineral mining and dressing facilities for mining operations in the State. However, upon inspection it was determined that the address of record was not a reliable indicator of mine location. (For example, of the 95 surveys mailed out during the HARC study, a large fraction were returned due to an unidentifiable address.)

While quarry production data would be the best surrogate for this sector, such data is only available at the state level. ERG thoroughly checked TCEQ, USGS, Dept of Commerce, Dun and Bradstreet, and other databases for this information. ERG ultimately identified Mine Safety Health Administration (MSHA) data, featuring employment records for all active mine sites. There are some substantial advantages to this data. First, unlike Dun and Bradstreet or other employment data sources, the MSHA data differentiates office workers, mill/plant workers, and actual pit workers. Worker hours for pit workers could be used as surrogates since those should most closely correlate with equipment use. Second, the data show the county where the mine actually is, not just the "address of record", which is often for headquarters in an altogether different location. Finally, employment data go back into the 1980's, so the data can be used to develop growth profiles as well.

Unlike other types of surface mining, detailed production data is available for coal and lignite mines across the State, from the Texas Railroad Commission (RRC). (35) This data includes site specific historical production from 1990 onward, which can be used for activity as well as growth surrogates.

Boring and Drilling

Boring and drilling consists of at least three distinct activities.

Piering and Piling for highway construction and commercial structures: Piering and piling is a relatively common task in highway and commercial projects.

Well drilling: ERG obtained a complete list of permitted water and monitoring wells from the Texas Water Development Board. (15) (Note that monitoring wells are a very small fraction of the total – less than 5%.)

Utility pole installation/repair: ERG contacted TXU Energy, the electric utility in the DFW region, requesting estimates of total activity for this subsector.

Unfortunately only two surveys were obtained for these activities under the HARC study. Therefore ERG ultimately utilized historical sales data for boring and drilling equipment in the DFW region, combined with sector specific outputs from the Texas Regional Economic Model (REMI), to estimate both populations and growth factors for this category (see Section 3).

Other Industry Sectors and Specialty Equipment Categories

The historical DCE purchase data discussed above was combined with Standard Industrial Code (SIC) specific activity estimates from industry experts to estimate in-use equipment populations and age distributions for these industries and equipment types. The 16 years of sales data also provided a robust basis for forecasting future year growth. Allocation across the rest of the State was accomplished using region-specific outputs from the Texas REMI model. A detailed discussion of the sales data and the calculation methodology for these industry sectors and equipment types is provided in Section 3.

Table 2-3 summarizes the surrogates selected for each industry sector and equipment category grouping used in this study. Table 2-4 lists the data sources used for forecasting and backcasting equipment activity to the target analysis years. More detailed discussion of these data is provided throughout Section 3.

Table 2-3. DCE Surrogates by Industry and Equipment Type Category

Sector	**Population/Geographic Distribution**
Heavy Highway	TxDOT lane-mile data for project lettings (12)
City/County Roads	Reed Construction roadway project list (10)
Single Family Housing	U.S. Census historical building permits (11)
Commercial	MHC square feet of footprint, by size bin* (12)
Utility	Reed Construction utility project list (10)
Municipal/County	Census population (25)
TxDOT	Equipment inventory (13)
Landfills	Per capita disposal rate with Census population (27)
Mining	Quarries, Sand/Gravel Pits: Mine Safety and Health Administration data – pit worker hours (34) Coal/Lignite Mines: Texas Railroad Commission (35)
Other Industry Sectors & Specialty Equipment (including Bore and Drill Rigs)	UCC-1 historical sales data for DFW region (7) combined with Tx-REMI model outputs for statewide population and geographic allocation

* Structures grouped by size of footprint (< 10,000 SF, 10,000 – 40,000 SF, > 40,000 SF)

Table 2-4. DCE Growth Factor Surrogates by Industry and Equipment Type Category

Sector	Basis
Heavy Highway	Comptroller historical highway construction and maintenance budgets for backcasting (9) 2005 – 2009 from McGraw-Hill project dollar values (12) Linear extrapolation for 2010+
City/County Roads	County level census projections (25)
Single Family Housing	County level census projections (25)
Commercial	2002 – 2009: MHC commercial structure project dollar value for structures by footprint bin * (12) 1999: Ratio of 1999 to 2002 Tx REMI statewide outputs for construction SICs (1400 series) 2010+: Linear extrapolation of MHC values
Utility	2002 – 2009: MHC utility project dollar values (12) 1999: Ratio of 1999 to 2002 Tx-REMI statewide outputs for construction SICs (1400 series) 2010+: Linear extrapolation of MHC values
Municipal/County	Census projections (25)
TxDOT	Historical purchase records (13)
Landfills	County level census projections (25)
Mining	Quarries, Sand/Gravel Pits: Mine Safety and Health Administration data – historical pit worker hours (34) Coal/Lignite Mines: Texas Railroad Commission (35)
Other Industry Sectors & Specialty Equipment (including Bore and Drill Rigs)	Trend analysis of UCC-1 historical sales data

* Structures grouped by size of footprint (< 10,000 SF, 10,000 – 40,000 SF, > 40,000 SF)

3.0 Population and Activity Estimates

ERG compiled and evaluated the results from the different data collection tasks described in Section 2. Data for each construction sector were evaluated separately to identify data gaps as well as any inconsistencies between the different sources of information. Once equipment use profiles were developed for the different sectors they were linked to appropriate surrogates, and equipment populations and activity were estimated for the base year (2004) for the entire State, and allocated to the county level. Estimating populations and activity from survey results for the non-earthwork category was a relatively straightforward process. This involved assigning equipment counts to specific equipment categories and hp groups, summing across the different equipment operators within the same sector, and calculating annual hours of use, weighted by the contribution to total hp-hrs for each SCC.[5] Total population numbers for the area were then estimated by scaling equipment counts from the surveys by the appropriate surrogate value (e.g., by the State's total population for municipal and county fleets).

Estimating equipment activity using earthwork profiles relied on a fundamentally different approach. Unlike the non-earthwork surveys, which attempted to quantify both populations and hours of use for specific pieces of equipment, the earthwork surveys focused on actual work performed over time in terms of aggregate hp-hrs per unit of equipment use. From this perspective it does not matter if one 200 hp dozer spent 10 hours to perform a task, or if two 200 hp dozers were used for five hours a piece to complete the same task – the hp-hrs are identical, and will result in approximately the same emissions estimates using NONROAD. [6] This supposition extends to different equipment types with similar hp values and load factor profiles. For example, dozers and loaders are largely interchangeable at the job site for conducting certain tasks. Therefore, since both of these equipment types are included in NONROAD's high load factor grouping (0.59), as long as the hp values are similar, so too will be their emissions estimates per hour of use.

By necessity, the estimator profiles made certain simplifying assumptions regarding the specific types of equipment assignments and precise hp values assumed for specific tasks. For example, the land clearing activities profiled by CCMC always assumed dozers in the 200 – 300 hp range, rather than loaders or other alternatives. Therefore the estimated equipment counts for

[5] Since NONROAD only has a single activity value for all hp bins, using unweighted averages across all hp bins to estimate activity may result in skewed emission estimates. This is particularly important given the non-linear relationship between NOx emissions and hp.

[6] Some error is introduced using this methodology, since cumulative hours of use, and therefore emission deterioration rates and useful life, will vary over time. However, using a quantity-based approach to emissions estimation, as opposed to surveys of individual equipment usage, necessarily entails this uncertainty.

each SCC may not reflect what is actually used in the field. However, by focusing on earthwork quantities and hp-hr per unit requirements these profiles should provide reasonable estimates of total hp-hrs, for each general hp bin, which in turn will provide accurate emissions estimates from the NONROAD model.

On the other hand it must be acknowledged that these simplifying assumptions will not capture 100% of the task requirements for the wide variety of projects and site conditions. For instance, certain jobsites may require the removal of large appurtenances, while others projects may occasionally involve extensive pier drilling through solid rock. To compensate for the possible exclusion of relatively small and/or uncommon tasks such as these, ERG consistently made liberal assumptions regarding the application of the base case estimator profiles, as discussed below.

The following presents the data, procedures, and assumptions used to develop the equipment use profiles, including total population and activity estimates for use in the NONROAD model, for each construction sector.

3.1 Development of Earthwork Profiles

The earthwork project category profiles developed for the HARC DFW analysis and this study are discussed below. The productivity factors provided in the summary tables are for base case conditions, unless otherwise noted.

3.1.1 Commercial Sector Construction

This sector includes multi-family residential as well as all non-residential building construction. Tasks profiled characterize all earthwork and surfacing tasks, including on property utility service extensions.

The 23 project profiles obtained from CCMC provided the basis for establishing both the commercial and utility sector profiles. An industry expert provided extensive QA of these profiles, evaluating the data for internal and external consistency. (6)

Task Elements and Productivity Estimates

A composite profile for commercial structures was developed based on the CCMC data. Activities were identified that were common to essentially all commercial structures for inclusion in the profile. Once task elements were identified, initial equipment productivity estimates were based on a simple average of the CCMC project data. Soil and ground cover adjustments were then applied as described in Section 3.3.4. The resulting composite commercial

equipment profile for each task is shown in Table 3-1. Note that all earthmoving volumes are expressed in cubic yards bank, referring to the soil's compacted volume, rather than its loose volume once removed from the ground.

Table 3-1. Composite Commercial Structure Profile

Task #	Task Description	Equipment Type	Quantity	HP Range–	Quantity/Hr	Percent of Projects
1	Building Demolition	Dozer	SF	200 - 300	191*	16%
2	Pavement Demolition	Dozer	SF	200 – 300	179	16%
3	Load Debris	Loader	CY	200 - 300	38	16%
4	Clear and Grub	Dozer	Acres	200 – 300	0.316	84%^
5	Strip/Stockpile Topsoil	Dozer	CY	200 – 300	28.9	84%^
6	Cut and Fill	Dozer	CY	200 – 300	109	84%^
7	Excavate Utility Trench	Excavator	CY	175 – 300	18.7	100%
8	Backfill Trench	Backhoe	CY	100 – 175	41.1	100%
9	Rough Grade	Dozer/Grader	SY	175 – 300	967	100%
10	Spread Crushed Stone	Dozer	CY	175 – 300	216	100%
11	Spread Fill	Dozer	CY	175 – 300	216	100%
12	Compact Subgrade	Roller Compactor	SY	100 – 175	714	100%
13	Finish Grade	Grader	SY	175 – 300	925	100%
14	Spread Asphalt	Paver	SY	100 – 175	358	100%
15	Compact Asphalt	Roller (Steel Wheel)	SY	100 - 175	560	100%

* From a single CCMC project
^ Tasks considered mutually exclusive of demolition activities.

Application of Surrogates

MHC provided total square footage put in place, footprint (area of building base), and project valuation for commercial projects in 211 counties across the State, for historical years 2002 – 2004, with contract value projected through 2009. Totals were binned by footprint size: <10,000 SF, 10,000 – 40,000 SF, and > 40,000 SF. Appendix A presents the MHC data by county for the 2004 base year. Note that counties without MHC data for 2004 were assumed to have a de minimus project value of $1,000 for purposes of extrapolation to other analysis years.

In order to apply the composite profile to estimate total activity for the State, it was necessary to link the quantity units of the profile to the available surrogate data. The following summarizes the calculations and assumptions made to link each task quantity with the building footprint data for each county from MHC. These steps are identical with those followed for the DFW area in the DCE study.

Task 1-3: Building, Pavement Demolition, and Loading Debris – While building permit data allowed us to estimate the fraction of commercial projects with a demolition component

(16%), this data did not provide any data on the nature or extent of the demolition work. (30, 31, 32) Therefore ERG assumed that 16% of all commercial projects involved demolition of an existing structure, equal in size to the new structure. The uncertainty of this estimate is increased as the CCMC profiles only contained a single data point regarding building demolition productivity, expressed in terms of building square feet. However, the CCMC value of 191 SF/hr did correspond roughly to an industry expert's independent estimate of two days to demolish a 2,000 SF single story structure. (6)

Details of actual pavement demolition requirements are also unknown. Therefore ERG assumed 100% of the lot was paved and would be demolished. The volume of debris to be loaded and hauled off site was estimated assuming six-inch pavement, typical of paving projects in the Reed database. The loader productivity estimates provided in the CCMC profiles were expressed in CY of loose material per hour (CYl), so a 33% "swell factor" was applied to the undemolished paving volume (equal to the square feet multiplied by the six inch depth) to estimate the quantity of debris to be loaded. (21)

Task 4: Clear and Grub – In order to associate total lot size with the available building footprint data, ERG conducted a random sampling of records from the Dallas Central Appraisal District (DCAD) database of commercial properties. (22) Wildcard searches were used to ensure random site selection. Properties without any improvements (i.e., structures), and sites developed before the 1980's were excluded from the analysis. For the remaining records total acreage and building footprint was recorded. Acreage was apportioned by building size for sites with multiple buildings. Data for over 100 commercial structures were recorded and binned by the MHC square footage bins. The average ratio of acres per thousand square feet of building footprint were calculated for each size bin, and are summarized in Table 3-2. Assuming that all new commercial development projects will clear their entire lot of land,[7] these ratios were used to estimate the amount of land clearing required for each square footage bin.

[7] This assumption will overestimate emissions to some unknown degree.

Table 3-2. Lot Size vs. Building Footprint – DCAD Property Search Results

Footprint Size (SF)	Number of Observations	Average Footprint (SF)	Average Acres/1,000 SF (footprint)	Standard Deviation (Acres/1,000 SF)
<10,000	54	3,796	0.38	0.35
10,000-40,000	44	20,829	0.13	0.084
>40,000	18	101,453	0.09	0.060

Table 3-2 clearly shows the greatest variance in the ratio of acres to building footprint (and therefore uncertainty) lies with the smallest structures. Applying the DCAD ratios to extrapolate results to other regions of the State adds additional uncertainty, to the extent that local land use and development patterns vary from those in the DFW area.

Task 5: Strip and Stockpile Topsoil – A stripping depth of six inches was assumed for the entire lot.[8] Using the DCAD ratios to estimate lot size from footprint, this allowed for a direct link between lot size and cubic yards of material stripped.

Task 6: Cut and Fill Operations – Also known as mass excavation, this task can involve minor or major dirt movement and recontouring of sites. The quantity of earth movement required in this task should depend not only on the area of the lot, but the specific condition and contour of the site itself. As such, one would expect this quantity to be highly variable from project to project. In fact, the CCMC data show a variance of over two orders of magnitude in the ratio of cubic yards (CY) of soil excavation to acres of lot.

For the purpose of this calculation ERG used the average CY per acre obtained from the commercial contractor surveys (3,720 CY/acre). However, this average was based on only four observations, and is therefore subject to great uncertainty. Upon consultation with the TCEQ project representative and a GIS expert, it is believed that U.S. Geological Service topographic maps might be used in the future to estimate regional averages for mass excavation requirements. Specifically, by obtaining digitized contours, algorithms might be developed to characterize terrain variability at the highly resolved scale needed for this task. (19)

Task 7-8: Excavate and Backfill Utility Trench – The amount of trenching required for on property utility extensions depends mainly on the distance from the main utility lines to the building itself. No data was identified showing a distribution of these dimensions, so a worst-case configuration was assumed. For a given a square lot configuration, it was assumed that commercial structures would be placed at the back of the lot, requiring a maximum of trenching

[8] Typical of values in CCMC profiles.

length. Trenching and backfilling quantities were assumed equal. In addition, for each project the following was assumed: (6)

- Separate trenches are excavated for sewer, water, and power;
- Trench depths of six feet for sewer, four feet for water, and two feet for power (four foot average);
- Trenches average two feet in width, corresponding to typical backhoe bucket widths;
- Utility connections run from the edge of the property line up to three feet from the structure.

These assumptions allowed trench lengths and excavation/backfilling volumes to be estimated for each project in the MHC surrogate data set, according to the following formula:

Equation 2:

CYb = # Projects x (3 trenches x 2 foot width x 4 foot depth x ((average SF / project)^0.5 – (average footprint/project) / (average SF / project)^0.5 – 3 feet from structure)) / 27 cubic feet/cubic yard))

The above equation effectively calculates the length of the trench L for a square lot of side X, and a rectangular structure of depth Y, as shown in the Figure 3-1. In this case:

L = X – Y – 3

X = (average SF / project)^0.5, and

Y = (average footprint/project) / (average SF / project)^0.5

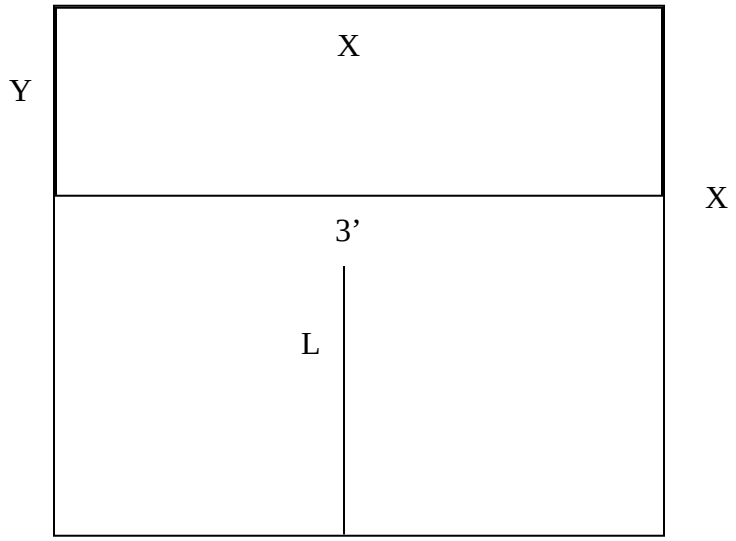
As an example, for a square lot 10,000 SF in size, and a two-story building with square footage of 8,000 SF:

X = 100;

Y = (8,000/2) / X = 40; and

L = 100 – 40 – 3 = 57 linear feet of trench

Figure 3-1. Assumed Configuration of Commercial Structure and Utility Trench



Task 9: Rough Grade – Rough grading quantities in the CCMC profiles were expressed directly in terms of surface area. Under a worst-case scenario, it was assumed that entire lots would undergo rough grading.

Task 10-11: Spreading Fill -- Typical fill depths of four inches were assumed for building footprint, and six inches for pavement subgrade. (6) Assuming the entire lot would be paved, these depths allowed for direct conversion to required volumes.

Task 12-15: Compacting and Paving – These quantities were expressed directly in terms of pavement area in the CCMC profiles. Paved area was calculated as the difference between total lot size and building footprint.

With the conversion factors established between earthwork and surfacing quantities and the square footage surrogates, the composite commercial profile could be linked with the surrogate data to estimate hours of equipment use for each task. The resulting equipment hour estimates for all commercial projects in the State are presented in Table 3-3. For emissions calculation purposes it was assumed that each of the estimated 5,074 projects utilized one piece of each equipment type listed in the table.

Table 3-3. Statewide Commercial Sector Equipment Use Requirements – Hours/Year (2004)

Task	Description	Equipment	hp	Hours/Yr
1	Building Demolition	Crawler Dozer	235.5	132,345
2	Pavement Demolition	Crawler Dozer	300	447,420
3	Load Debris	Crawler Loader	300	8,635
4	Clear and Grub	Crawler Dozer	235.5	40,114
5	Strip/Stockpile Topsoil	Crawler Dozer	235.5	353,844
6	Cut and Fill	Crawler Dozer	235.5	361,809
7	Excavate Utility Trench	Excavator	233.3	58,478
8	Backfill Trench	Backhoe	120.7	31,729
9	Rough Grade	Grader	231.2	75,561
10	Spread Crushed Stone	Crawler Dozer	235.5	6,348
11	Spread Fill	Crawler Dozer	235.5	46,854
12	Compact Subgrade	Roller	132.2	102,294
13	Finish Grade	Grader	231.2	78,994
14	Spread Asphalt	Paver	134.6	169,370
15	Compact Asphalt	Roller	132.2	108,377

In order to illustrate how the MHC project data and other information were used to estimate equipment activity, an example calculation is presented below for structures with a footprint less than 10,000 square feet in Bexar County, for the 2004 calendar year.

1) Calculate the number of projects by dividing the footprint total from MHC by the average footprint for structures less than 10,000 SF from DCAD – 726,867/3,796 = 191 projects.
2) Calculate the total lot size to be cleared/demolished (in acres) by multiplying the sum of all footprints from MHC (726,867 SF) by the average number of acres per square foot of footprint from the DCAD data set, for structures less than 10,000 SF (0.00038), equaling 276 acres.
3) Divide the number of acres (276) by the productivity factor for crawler dozers for land clearing (0.316 acres/hour) from the commercial equipment profile. Adjust the hour estimate to account for the fraction of projects without land clearing (16% with demolition). 276/0.316*(1-0.16) = **734 hours of clear and grub activity for a crawler dozer.**
4) Multiply the total acreage by 806.7 cubic yards bank(CYb)/acre to obtain the amount of soil to be stripped and stockpiled, equaling 222,827 CYb.
5) Divide the soil volume (222,827) by the productivity factor for crawler dozers for stripping and stockpiling of soil (28.9 CYb/hour) from the commercial equipment profile. Adjust the hour estimate to account for the fraction of projects without land clearing (16% with demolition). 222,827/28.9*(1-0.16) = **6,477 hours of strip and stockpile activity for a crawler dozer.**
6) Multiply the total acreage by 3,720 cubic yards bank/acre from the estimator profiles to obtain the amount of soil to be cut and filled, equaling 1,027,499 CYb.

7) Divide the soil volume (1,027,499) by the productivity factor for crawler dozers for cut and fill operations (130.3 CYb/hour) from the commercial equipment profile. Adjust the hour estimate to account for the fraction of projects without land clearing (16% with demolition). 1,027,499/130.3*(1-0.16) = **6,622 hours of cut and fill activity for a crawler dozer.**

8) Multiply the number of projects by the length, width, and depth of the utility trenches, as shown in Equation 2, giving 39,577 CyB of excavation.

9) Divide the soil volume (39,577) by the productivity factor for excavators for trenching operations (22.3 CYb/hour) from the commercial equipment profile = **1,775 hours of trenching activity for an excavator.**

10) Divide the excavated soil volume (39,577) by the productivity factor for backhoes for backfilling operations (41.1 CYb/hour) from the commercial equipment profile = **963 hours of backfilling activity for a backhoe**.

11) Convert total acreage to square yards (276 acres x 4,840 = 1,336,853 SY) and divide by the productivity factor for graders for rough grading operations (966.6 SY/hour) from the commercial equipment profile = **1,383 hours of rough grading activity for a grader.**

12) Multiply the total footprint in square feet (726,867) by 0.012 CYl/SF, and divide by the productivity factor for crawler dozers for spreading crushed stone, expressed in cubic yards loose (CYl) (216.1 CYl/hour) from the commercial equipment profile = **42 hours of spreading crushed stone for a crawler dozer.**

13) Multiply the portion of the lots not including the footprints, in square feet (276 acres x 43,560 square feet/acre – 726,867) by a six inch base course volume (0.019 CYl/SF), equaling 209,516 CYl of base course material.

14) Divide the base course volume (209,516) by the productivity factor for crawler dozers for spreading fill (216.1 CYl/hour) from the commercial equipment profile = **970 hours of spreading fill for a crawler dozer**.

15) Divide the total acreage in square yards (276 x 4,840 SY/acre) by the productivity factor for rollers for compacting subgrade (714 SY/hour) from the commercial equipment profile = **1,872 hours of compacting subgrade for a roller**.

16) Divide the total acreage in square yards (276 x 4,840 SY/acre) by the productivity factor for graders for finish grading (924.6 SY/hour) from the commercial equipment profile = **1,446 hours of finish grading for a grader**.

17) Divide the portion of the lots not including the footprints, in square yards (276 acres x 4,840 square yards/acre – 726,867/9) by the productivity factor for pavers for spreading asphalt (358.4 SY/hour) from the commercial equipment profile = **3,505 hours of spreading asphalt for a paver**.

18) Divide the portion of the lots not including the footprints, in square yards (276 acres x 4,840 square yards/acre – 726,867/9) by the productivity factor for rollers for compacting asphalt (560.1 SY/hour) from the commercial equipment profile = **2,243 hours of compacting asphalt for a roller**.

19) Calculate the square footage of building space to be demolished by multiplying total acreage from MHC (787,000) by the fraction of commercial permits with demolition components (16%), equaling 125,920 SF, and divide by the productivity factor for crawler dozers for building demolition (191 SF/hour) from

the commercial equipment profile = **659 hours of building demolition for a crawler dozer.**

20) Calculate the square footage of pavement to be demolished by multiplying acreage excluding footprint (276 acres x 43,560 SF/acre – 125,920 SF) by the fraction of commercial permits with demolition components (16%), equaling 1,799,149 SF, and divide by the productivity factor for crawler dozers for concrete pavement demolition (179 SF/hour) from the commercial equipment profile = **10,075 hours of concrete pavement demolition for a crawler dozer**.

21) Multiply the square feet of pavement demolished (1,799,149) by the conversion factor of 0.0041 SF/cy of debris, equaling 7,384 CYl demolished pavement. This factor assumes six inch pavement and a 33% "swell" factor.

22) Divide the debris pavement volume (7,384 CYl) by the productivity factor for loaders for loading debris (38 CY/hour) from the commercial equipment profile = **194 hours of loading debris for a loader**.

The above steps are repeated for the 10,000 – 40,000, and the 40,000+ square foot footprint bins, and hours are then summed to obtain activity totals for the entire sector.

In addition to the above equipment requirements, field observations and time-lapse photos appeared to indicate that that backhoes are a ubiquitous feature of most commercial construction projects. The maximum number of backhoes observed at any site was three. In order to capture the non-specific activity attributed to backhoes during earthwork and surfacing phases, ERG made a general equipment assignment rule: sites with footprints less than 10,000 square feet were assigned one backhoe; sites between 10,000 and 40,000 square feet were assigned two backhoes; and sites greater than 40,000 square feet were assigned three backhoes. This assumption resulted in the addition of 7,731 backhoes to the statewide profile.

Daily activity for backhoes was derived from the NONROAD default value for this category (1,135 hrs/yr), assuming 260 work days per year (1,135 hr/yr / 260 = 4.4 hr/day). The number of days of backhoe activity was based on the average number of earthwork days per 1,000 SF of building area, as reported in the CCMC projects. The resulting value of 2.0 days per 1,000 SF of building was highly variable across the 21 projects with available data, with more than an order of magnitude between the high and low values. Accordingly, extrapolation of total backhoe activity is subject to substantial uncertainty.

The backhoe population and activity estimates were then distributed across hp bins assuming the default power distribution found in the NONROAD model. The resulting backhoe population profile is presented in Table 3-4.

Table 3-4. Backhoe Distribution for Commercial Projects (Statewide Total)

HP Range	Equipment Count	Hr/Yr/Unit
25-40	110	**128**
40-50	59	
50-75	1,097	
75-100	3,874	
100-175	2,578	
175+	14	
All	**7,731**	

Once the 2004 statewide equipment population and activity profiles were developed, county level allocation was performed based on the total reported footprint value for commercial construction in each county (see Appendix A). Historical and future year projections of commercial project dollar values from MHC were then used to forecast and backcast activity for the 2002 – 2009 period. The factor for 2002 MHC value was adjusted for 1999 using the ratio of 2002 and 1999 statewide output values from the Texas REMI model, for construction SICs (1400 series). Factors for 2010, 2012, and 2013 were developed from simple linear extrapolation of the MHC projection data. Table 3-5 summarizes the statewide growth factors for the 2004 base year, derived from the contract value data and projections. County specific growth factors are provided in Appendix A for those counties found in the MHC data.

Table 3-5. Historical and Projected Statewide Commercial Project Values and Growth Factors

Year	Project Value ($000)*	Growth Factor
1999	$14,567,417	0.962
2002	$14,951,675	0.988
2003	$15,300,019	1.011
2004	$15,138,535	1.000
2005	$16,483,354	1.089
2006	$17,975,556	1.187
2007	$19,447,324	1.285
2008	$20,062,923	1.325
2009	$20,150,635	1.331
2010	$20,238,346	1.337
2011	$20,326,058	1.343
2012	$20,413,769	1.348
2013	$20,501,481	1.354

*Constant 2005 dollars.

3.1.2 Utility Sector

This sector involves the installation and maintenance of water, sewer, power, communication, and gas lines, off property of commercial and residential developments. The

profile for this sector is relatively simple, consisting of excavation, backfilling, and repaving tasks. This work can also consist of pavement demolition and removal, though the frequency of these activities is unknown. Although many projects will not involve pavement demolition and removal, ERG assumed all such projects would involve these tasks in order to be conservative from an emissions inventory perspective. Similarly, concrete pavement was assumed to be present in each case, having significantly higher hp-hr removal requirements than asphalt.

Task Elements and Equipment Productivity

ERG constructed the composite utility profile using the CCMC project dataset. The resulting utility equipment profile for each task is shown in Table 3-6.

Table 3-6. Composite Utility Profile

Task #	Task Description	Equipment Assignment	Quantity	HP Range	Quantity/Hr
1	Remove Site Pavement (concrete)	Dozer	SF	200 – 300	179
2	Load from Pile	Loader	CY	200 – 300	37.8
3	Excavate Utility Trench	Excavator	CY	175 – 300	18.7
4	Crushed Stone Pipe Bedding	Backhoe	CY	50 – 75	18.75
5	Backfill and Compact Trench	Backhoe	CY	100 – 175	41.1
6	Compact Subgrade	Dozer/Grader	SY	175 – 300	714
7	Spread Asphalt	Paver	SY	100 – 175	358
8	Compact Asphalt	Roller (Steel Wheel)	SY	100 – 175	560

The productivity values for the utility tasks are based upon simple averages from the CCMC project data, adjusted for soil conditions at the county level, similar to the commercial profile.

Application of Surrogates

Reed Construction data provided project valuation estimates for 932 utility related projects for the State in 2004. (10) Of these projects, information on linear feet of utility line installation was provided for 230 projects representing 29% of total project valuations. A smaller fraction of these projects also had information on maximum pipe diameter and/or depths. In order to estimate earthwork and surfacing requirements for the complete list of projects, ERG made the following assumptions:

- All trenches are assumed six feet in depth, based on the average value reported from the equipment operator surveys; [9]
- The minimum trench width of two feet, unless a larger diameter pipe was specified.

16 observations contained specifications for both linear feet of pipe installation and square yards of paving requirements, providing a poor correlation between paving and piping (with $R^2 < 0.10$).[10] Given the small paired data set and the poor correlation between paving and piping project requirements, ERG conservatively assumed that for every linear foot of piping installed, an entire 12 foot wide lane of pavement would need to be removed and replaced. The degree to which this assumption overestimates activity is unknown.

Next, task specific equipment use was linked to the available surrogate data on piping. The composite profile quantities for pavement removal, compacting subgrade, and asphalt paving were provided in units of square feet or square yards, so no additional conversions were needed to tie these tasks to the surrogates. In order to estimate pavement debris volumes for the loading task, six-inch pavement was assumed, the same as for the commercial profile. Estimating volumes for excavating and backfilling tasks was straightforward, based on linear feet multiplied by width and depth. A ratio of 435 CY of bedding per mile of pipe was taken directly from one CCMC project.

Each of these conversion factors was applied as appropriate for each task, for each of the 230 utility projects with piping and/or paving specifications. There were an additional 702 projects with no information on either of these parameters. Since dollar value was available for all projects, the paving and piping requirements for the 702 projects were estimated by scaling up the total activity requirements for the 230 projects with quantity specifications by the relative dollar value of the other 702 projects, as follows:

230 projects with quantity information = $250M

702 projects without quantity information = $627M

Scaling factor applied to equipment profile for 230 projects = 1 / [250/(250+627)] = 3.51

[9] While sewer lines are typically placed at six feet, water and power lines are commonly installed at shallower depths (two to four feet). Therefore assuming six feet for and average trenching depth is likely to overestimate utility requirements somewhat.

[10] Reed Construction Data has confirmed that the exclusion of certain information from their database comment fields, such as feet of pipe or square feet of paving does not imply these projects did not involve these tasks – Means is simply inconsistent in the completion of their comment fields. (Tim Duggan, Reed Construction Data, personal communication, August 2005).

Finally, comparing dollar value surrogates from the Reed Construction and MHC data sets, ERG found the MHC data had higher estimates for water supply projects ($1,184M vs. $878M for Reed). In addition, the MHC data had a separate breakout for power, gas, and communication lines (~$72M) that was not evident in the Reed data. Therefore the equipment activity estimates built from the Means data set was scaled up again using relative project dollar values (by a factor of (1,184+72)/878 = 1.43), on the assumption that the MHC data was more complete than the Reed data.

The final equipment populations and hours of use by task for this sector are presented in Table 3-7. County level population allocation factors were based on 2004 project totals from the Reed data, and are presented in Appendix A.

Table 3-7. Utility Equipment Populations and Activity By Task (Statewide, 2004)

Task #	Description	Equipment Type	HP Range	#Units	Hrs/Unit
1	Remove Site Pavement (concrete)	Dozer	175-300	1,154	643
2	Load from Pile	Track Loader/Dozer	175-300	1,154	85
3	Excavate Utility Trench	Excavator	175-300	1,154	279
4	Crushed Stone Pipe Bedding	Backhoe	50-75	1,154	42
5	Backfill and Compact Trench	Excavator	175-300	1,154	115
6	Compact Lifts	Roller	100-175	1,154	48
7	Spread Asphalt	Paver	100-175	1,154	65
8	Compact Asphalt	Roller	100-175	1,154	55
			Total	**9,233**	

Once the 2004 base year equipment population and activity profiles were developed, historical and future year projections of water and sewer project dollar values from MHC were used to forecast and backcast activity for other scenario years. The factor for 2002 MHC value was adjusted for 1999 using the ratio of 2002 and 1999 statewide output values from the Texas REMI model, for construction SICs (1400 series). Factors for 2010, 2012, and 2013 were developed from simple linear extrapolation of the MHC projection data. Table 3-8 summarizes the statewide growth factors for the 2004 base year, derived from the contract value data and projections. County specific growth factors are provided in Appendix A for those counties found in the MHC data. Counties without reported projects for 2004 were assigned a de minimus level ($1,000) in order to facilitate forecasting and backcasting to other years.

Table 3-8. Historical and Projected Statewide Utility Project Values and Growth Factors

Year	Project Value ($000)*	Growth Factor
1999	$1,534,369	1.220
2002	$1,574,842	1.253
2003	$1,015,959	0.808
2004	$1,257,168	1.000
2005	$1,272,298	1.012
2006	$1,238,559	0.985
2007	$1,299,727	1.034
2008	$1,417,108	1.127
2009	$1,427,068	1.135
2010	$1,437,029	1.143
2011	$1,446,989	1.151
2012	$1,456,950	1.159
2013	$1,466,910	1.167

*Constant 2005 dollars.

3.1.3 Single Family Housing Sector

This sector evaluated single family construction across the State. Multi-family construction including apartments is included in the commercial sector. The single family sector also includes utility contract work associated with service extension inside the property line. Note that off property utility service extensions, for both residential and commercial developments, are included in the utility sector profile discussed above.

As discussed in Section 2, equipment use profiles developed for typical residential subdivision construction in the Houston area were reviewed by three local site managers for applicability to the DFW region. Two of the managers concurred that the equipment requirements were a reasonable representation of their own projects, while one noted that land clearing requirements were more significant in the Houston area and might be less for DFW. (23, 24, 25) As a conservative measure, the Houston profile was adopted for both the DFW area and the rest of the State without modification. The details of the profile are described in Tables 3-9 and 3-10.

Table 3-9. Single Family Construction Profile – Model Subdivision

Assumptions
1. 100 lot subdivision
2. Lots between 50 and 80' x 120'
3. Total area - 20 - 30 acres.
4. Forested lots assumed - clearing required for lots and street/utility right of ways.
5. Felled trees assumed logged off site rather than pit burned - on highway trucks used (estimator consensus).
6. Finishing activities did not include landscaping.
7. Utility work beyond property lines not included - estimated separately.
8. Eight hrs engine operation per day, five days per week assumed - estimator consensus
9. Slipform/screed paving rather than form paving assumed - more equipment intensive.
10. Assume backfilling on site with cut dirt rather than hauling off site (estimator consensus)
11. Upper end of equipment #s, activity and hp ranges selected to be conservative.

Table 3-10. Single Family Construction Equipment Profile

Phase	Duration	Equipment Type	#Units/Subdivision	HP*
Land Clearing	43 work days	Crawler Dozer	2	140
		Excavator	1	220
		Rubber Tire Loader	1	130
Utility Work	43 work days	Excavator	2	300
		Crawler Dozer	1	155
		Rubber Tire Loader	1	130
		Vibratory Compactor	1	100
Street Cutting/Dirt Moving	12 work days	Excavator	1	220
		Crawler Dozer	2	155
		Maintainer	1	140
Compaction	9 work days	Soil Stabilizer	1	300
		Maintainer	2	165
		Pneumatic Roller	1	100
		Crawler Dozer	1	80
Paving	14 work days	Grader	1	140
		Pavers (slipform/screeds)	2	230
		Crawler Dozer	2	80
		Nine Wheel Roller	1	100
Finishing	7 work days	Crawler Tractor (three days)	1	90
		Curbing Machine (two days)	1	149
		Rubber Tire Loader	1	130
		Rubber Tire Roller	1	100

*From specific equipment models cited as typical for the given application.

Under the HGB study each phase of the development process was identified, and contractors working in each phase were interviewed by phone to determine equipment types and hour requirements. Interviews were performed with two land clearing contractors, three utility contractors, and four paving/finishing contractors to obtain the following information. In each

case the person interviewed was either the general manager or chief estimator. When discrepancies among interview results were identified, the other contractors were contacted to reconcile any differences as needed. The findings are summarized in Table 3-10.

In order to extrapolate the base profile to the entire State, historical housing permit records were obtained for 231 counties, from 1999 through 2004. (11) (23 rural counties were not included in the Census Bureau data, and were assumed to have no significant activity for this sector.) The number of housing permits for each county was then extrapolated to future years by performing a simple linear regression of the historical data at the state level. These values are summarized in Table 3-11 for the State as a whole. Allocation to the county level was based on 2004 permit distributions, and is presented in Appendix A.

Table 3-11. Statewide Single Family Housing Permits, Historical and Projected

Year	Units (000s)	Growth Factor
1999	101.9	673
2000	108.8	719
2001	111.9	739
2002	122.9	812
2003	137.5	908
2004	151.4	1,000
2005	156.8	1,036
2007	176.5	1,166
2009	196.2	1,296
2010	206.0	1,361
2012	225.7	1,491
2013	235.5	1,556

These surrogates were applied to the base equipment profile shown in Table 3-10 to estimate equipment populations for the NONROAD input file (see Section 4).

3.1.4 City and County Roads

City and county road projects are generally much smaller in scale than the highway projects sponsored by TxDOT. These projects commonly include short road extensions or widening efforts, intersection and shoulder improvements, and similar small size projects.

Task Elements and Equipment Productivity

RS Means provided a profile for a typical two-lane highway for the DFW area. (10) Using this profile to estimate equipment requirements for city and county road projects will

likely overestimate earthwork and surfacing quantities, and therefore emissions, since only some unknown fraction of these projects involve construction of entirely new road segments.

The profile provided by Means is discussed in detail in the HARC DCE report. (1) The resulting composite equipment use profile for this sector is presented in Table 3-12. This profile is assumed to apply to all counties across the State, with appropriate adjustments for soil type and altitude.

Table 3-12. Composite City and County Road Work Profile (R.S. Means)

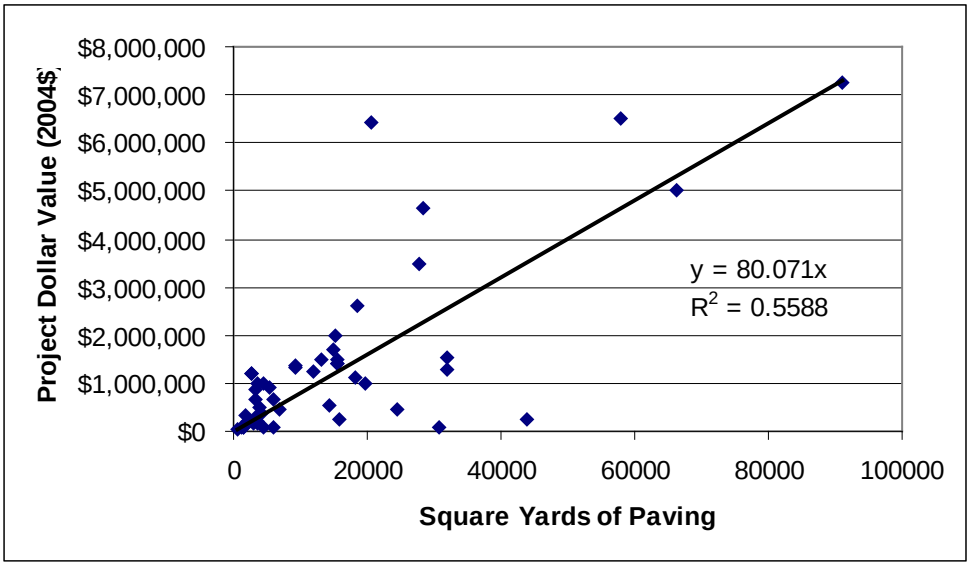
Task #	Task	Equipment	HP Min	HP Max	Avg HP	Hrs/1,000 SY	Hr/Mi
1	Demo Concrete Pavement	Crawler Dozer	175	300	236	55.0	N/A
2	Load Debris	Loader	175	300	230	4.5	N/A
3	Spread/Compact Base	Crawler Dozer	175	300	236	3.3	36
4	Spread/Compact Base	Grader	100	175	141	3.3	36
5	Spread/Compact Base	Roller	100	175	132	3.3	36
6	Place Binder	Paver	100	175	135	3.8	41
7	Place Binder	Roller	100	175	132	3.8	41
8	Place Binder	Roller	50	75	61	3.8	41
9	Place Wear Course	Paver	100	175	135	2.5	27
10	Place Wear Course	Roller	50	75	61	7.5	81

Application of Surrogates

Reed Construction Data provided project level breakouts for municipal and county funded road projects, distinct from state funded (i.e., TxDOT) projects. (10) 366 projects were identified in Texas in 2004. Based on the comment field of the dataset, most of these projects appeared to involve relatively small paving, road widening, and related improvements. The projects were valued at a total of $441.3M.

The comment field in the Reed data did not provide a comprehensive listing of paving quantities for all projects. In this case only 48 project records contained clear data on the amount of paving required. Using these data a correlation was developed between paving area and project dollar value, as shown in Figure 3-2. As seen in the figure, the correlation between these parameters was relatively strong, and the resulting regression equation was used to predict paving requirements for the remaining projects based on reported dollar value.

Figure 3-2. City and County Roads – Value vs. Square Yards (SY) Paving



Once paving requirements were estimated for each project they were combined with the Means profile data to estimate equipment activity for the entire sector using total dollar valuation. Means provided an estimate of 85% coverage for their tracking and reporting of civil contracts such as these, therefore the equipment activity estimates were scaled up by an additional 15% to account for projects not reported in the dataset.

The final equipment population and activity estimates developed for the NONROAD model for this sector are presented in Table 3-13. As with the other earthwork profiles, one unique piece of equipment was assigned to each task for each project.

Table 3-13. City and County Roadwork Populations and Activity By Task (Statewide Total, 2004)

Task	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Equip	**Tr. Dozer**	**RT Loader**	**Tr. Dozer**	**Grader**	**Roller**	**Paver**	**Roller**	**Roller**	**Paver**	**Roller**
Avg hp	236	230	236	141	132	135	132	61	135	61
Count	431	431	431	431	431	431	431	431	431	431
Total hrs	356,490	29,167	21,499	21,499	21,499	24,485	24,485	24,485	16,124	48,373
Hr/Unit	828	68	50	50	50	57	57	57	37	112

Task 1-Demo Concrete Pavement
Task 2 - Load Debris
Task 3 - Spread/Compact Base
Task 4 - Spread/Compact Base
Task 5 - Spread/Compact Base
Task 6 - Place Binder
Task 7 - Place Binder
Task 8 - Place Binder
Task 9 - Place Wear Course
Task 10 - Place Wear Course

Geographic allocation of statewide equipment population totals was based on Reed data dollar value totals, and is presented in Appendix A. Data was provided for 63 counties, and remaining counties (all rural) were assumed to have negligible activity in this sector.

Forecasts and backcasts to different scenario years were based on census population.

3.1.5 Heavy Highway Sector[11]

Heavy highway projects are funded through TxDOT, and include freeway and interstate construction, and bridgework. Basic maintenance activities such as pothole repair, signage, and right-of-way maintenance (which do not involve significant DCE use) are excluded.

As discussed in detail in the HARC report, the DCE study performed for the Houston area in 2000 was used to develop the equipment population and activity profile for the heavy highway sector. (5) To the extent that the overall mix of project work is roughly similar between the Houston area in 1999, and the remainder of the State in 2004, extrapolation of the Houston results based on the relative amount of lane-miles should provide a reasonable estimate of equipment population and activity for this sector.[12]

Project level data was obtained from TxDOT for the entire State for 2004. Projects involving basic maintenance activities such as pothole repair and right-of-way maintenance were determined to use little if any DCE, and were excluded from the dataset. For the remaining projects the ratio of overall lane-miles for the State versus the eight county Houston region (4,970/241 = 20.6) was applied to the results of the Houston survey to estimate equipment populations for the State as a whole. The resulting equipment counts (15,466 DCE) are summarized in Table 3-14 by equipment category.

[11] Since this sector was ultimately developed from previous equipment count surveys, the profile was assigned to the non-earthwork category. Therefore no ground cover or soil adjustment factors were applied.

[12] Highway projects in the Houston area included a substantial amount of "urban rehabilitation" work, which involves activity in restricted spaces under special safety and other constraints. Project work in rural counties will most likely involve a different (likely more efficient) equipment use profile, although no source of "rural" highway project profile data has been identified at this time.

Table 3-14. Statewide Highway Sector Equipment Populations (2004)

Equipment Type	Population
Paver	474
Roller	2,927
Paving Equipment	330
Surfacing Equipment	1,402
Excavator	2,350
Grader	1,139
Off Highway Truck	41
Loader	3,092
Backhoe	1,732
Crawler Tractor/Dozer	515
Trenchers	227
Boring/Drilling Rigs	639
Rough Terrain Forklift	62
Skid Steer Loader	103
Other	433

Once the Houston area equipment fleet totals were adjusted for the state level, county allocations were developed using the lane-miles of construction from TxDOT. Of the 254 counties, 61 did not have project letting data for 2004. For these counties, a very small amount of lane-mile work was assumed (~0.1 miles) to allow for straightforward forecasting and backcasting to other years. The resulting county level geographic allocation for the 2004 base year is provided in Appendix A.

Historical county level highway construction and maintenance budgets obtained from the Texas Comptroller's Office were used to backcast equipment populations to 1999 and 2002. (9) Projected contract dollar values ($2004) for highway construction, obtained from McGraw Hill (MHC), were used to estimate population growth from 2005 through 2009. (12) A small number of counties (43 rural counties) were not included in the MHC projections. Projected dollar values for these counties were set equal to the 2004 Comptroller values. Equipment populations for 2010 – 2013 were based on linear extrapolation of the Comptroller and MHC data. If an extrapolation resulted in a negative dollar value, values were set to zero. All dollar values were adjusted to 2004 dollars using the national Consumer Price Index (CPI).

Aggregated state level growth factors were used to revise the NONROAD model input files for emissions estimation, and are presented below in Table 3-15. County level growth factors are presented in Appendix A for all target years, assuming a 2004 base year. These values were applied during post processing of the NONROAD model outputs to adjust for county specific growth, as described later in this section.

Table 3-15. Statewide Highway Construction Project Dollar Values and Growth Factors ($2004)

Year	Dollars	Growth Factor
1999	$3,031,371,901	0.823
2002	$3,680,176,230	0.999
2004	$3,682,903,166	1.000
2005	$3,847,407,213	1.045
2006	$3,951,196,226	1.073
2007	$4,486,739,676	1.218
2008	$4,959,116,694	1.347
2009	$5,256,349,063	1.427
2010	$5,537,742,144	1.504
2011	$5,873,110,754	1.595
2012	$6,208,479,365	1.686
2013	$6,543,847,976	1.777

3.1.6 Profiles for Special Projects

In consultation with TCEQ, large future construction projects were identified which are not included in typical surrogate activity projections. These included the development of three liquefied natural gas (LNG) storage and distribution facilities along the Gulf Coast. Detailed annual emission estimates were obtained from Environmental Impact Statements (EIS) and Conformity Determinations performed for each project.

Specific LNG projects identified included:

- Port Arthur LNG project (Jefferson County), 2006 – 2010; (36)
- Freeport LNG project (Brazoria County), 2004 – 2007; (37)
- Cheniere Corpus Christi LNG project (Nueces and San Patricio Counties), [13] 2005 – 2008 (38)

Annual emissions estimates were obtained from the EIS and Conformity background documents for each of these projects. All emissions estimates were developed using NONROAD combined with equipment specific activity estimates, as presented in Section 4.

3.2 Development of Non-Earthwork Profiles

Some sectors that utilize DCE do not lend themselves to profiling through earthwork quantity data. For these sectors, earthwork quantities are either not available or not applicable. For many of these categories, ERG requested equipment inventory lists with horsepower, hours

[13] Emission allocation assumed to be 50/50 across counties.

of use per year, and other supporting information for each piece of equipment in the operator's inventory. These surveys also attempted to capture temporal use information from each of these sectors.

3.2.1 Texas Department of Transportation (TxDOT) Equipment

The Texas Department of Transportation owns and operates its own fleet of diesel construction equipment. TxDOT Fleet Managers in each of the 25 Districts provided ERG with a complete list of equipment owned and operated by TxDOT in 248 of the 254 counties in the State, for a total of 3,348 pieces of nonroad diesel equipment. The equipment lists included horsepower and hours of use in 2004 for each piece of equipment. In addition TxDOT indicated that their fleet has not experienced growth over the last several years. As TxDOT updates their fleet with newer equipment, older pieces are retired at the same rate in which new ones are purchased. (13)

The resulting equipment populations and activities used as inputs to the NONROAD model are presented in Table 3-16. As seen in the table, TxDOT equipment is utilized significantly less than comparable equipment in the private sector.

County level allocations are provided in Appendix A.

Table 3-16. TxDOT Equipment Population and Activity (Statewide 2004)

Equipment Type	Population	Hr/Yr
Pavers	15	244
Rollers	653	152
Scrapers	1	303
Paving Equipment	329	324
Trenchers	16	60
Bore/Drill Rigs	14	124
Excavators	146	409
Concrete/Industrial Saws	7	48
Cement/Mortar Mixers	4	244
Cranes	84	379
Graders	560	321
Rough Terrain Forklifts	48	267
Tractors/Loaders/Backhoes	1,116	203
Crawler Tractors	154	156
Skid Steer Loaders	201	102

3.2.2 Municipal and County Owned Equipment

Survey results from the HARC DFW study were used as the basis for extrapolating city and county operated equipment profiles to the rest of the State. (1) Six municipalities in the DFW area responded to the HARC survey. These municipalities provided equipment lists and hours of use per year, as shown in Appendix E, although not every municipality provided horsepower information. (Therefore default average horsepower values from NONROAD were used for all equipment in calculating emissions from municipal fleets. The hours per year of activity provided by the municipalities allowed ERG to calculate new activity profiles for municipal fleets.) ERG also used the equipment lists from these six municipalities to calculate the equipment population for all municipalities on a per capita basis, and extrapolated this to the county level using population data from the United States Census Bureau (USCB).

All four districts from Dallas County responded to the HARC survey and provided ERG with equipment lists complete with horsepower and hours per year of use. Three out of four districts for Tarrant County responded to the survey, also providing equipment lists complete with horsepower and hours per year of use. Results are provided in Appendix E. ERG used the three reporting districts of Tarrant County to estimate an equipment list for the fourth, non-reporting district, based upon the averages of the other three districts. This allowed ERG to calculate new activity profiles for county owned and operated equipment. As with the municipality calculations, ERG used the county equipment lists from the responding counties to calculate total county owned equipment for the region on a per capita basis, and extrapolated this to the county level across the State using population data from the USCB. County allocation factors are presented in Appendix A.

The resulting state level equipment populations and activities used as inputs to the NONROAD model are presented in Table 3-17.

Table 3-17. Municipal & County Population and Activity (Statewide Totals)

	Municipalities		Counties	
Equipment Type	**Population**	**Hr/Yr**	**Population**	**Hr/Yr**
Pavers	21	90	35	1,195
Rollers	677	158	359	385
Scrapers	41	208		
Paving Equipment	42	155	133	212
Surfacing Equipment			6	239
Trenchers	1,210	94		
Bore/Drill Rigs	62	433		
Excavators	123	804	70	709

	Municipalities		Counties	
Equipment Type	**Population**	**Hr/Yr**	**Population**	**Hr/Yr**
Concrete/Industrial Saws	164	204	12	8
Cement/Mortar Mixers			23	542
Graders	472	377	139	543
Rough Terrain Forklifts	21	171		
Rubber Tire Loaders	246	506	151	246
Tractors/Loaders/Backhoes	2,071	1,777	35	385
Crawler Tractors	492	384	64	250
Skid Steer Loaders	697	296	52	353
Off-Highway Tractors	308	289	58	187
Other Construction Equipment	287	318	58	195

As an independent check, ERG compared the emission results from the NONROAD model for the nine county DFW region municipal and county equipment totals, with comparable totals from the eight county Houston region. (5) On a per capita basis it was found that the municipal and county fleets in the DFW region had about twice the equipment population of the Houston area. This may be explained by regional differences in public works budgets and utility contracting practices, although the exact reasons for the difference are unknown. To the extent that equipment mix and utilization vary in other regions of the State, additional uncertainty in the extrapolations will result.

3.2.3 Landfills

In recent efforts to survey landfills in the DFW area, ERG received very low response rates (< 10%). As a result of such low response rates, ERG used an alternative approach for developing equipment population and activity profiles for landfills in Texas.

In April 2000, the Texas Natural Resource Conservation Commission (TNRCC, now TCEQ) promulgated two rules that would affect the use of diesel construction equipment in the DFW area. The rules included a construction ban between the hours of 6 am and 10 am, and accelerated the required purchase of lower-emitting Tier 2/Tier 3 equipment. The now rescinded rules allowed for owners and operators of a facility subject to these rules to develop an alternative plan that would achieve the same emission reductions as the rules, in place of complying with the rules themselves. Facing these rules and in an attempt to develop an alternative Emission Reduction Plan, the North Central Texas Council of Governments contracted with TRC Environmental to perform a very detailed study of landfills in the DFW area. In light of the pending rules, TRC was able to gain wide cooperation from the landfill industry for the study. TRC classified the landfills into three categories: large, medium, and small based on the amount of waste collected at each landfill. Representative landfills from each

size classification were chosen for detailed analysis. As a result of the study, very thorough equipment lists and activity data are available for eight landfills in the DFW area. (27)

The approach for calculating emissions from landfills was based on the methodology and information developed in the TRC study. First, an equipment and activity profile was developed for a typical landfill in each size category. Second, the most recent landfill disposal information was obtained from the 2004 report, Municipal Solid Waste in Texas: A Year in Review, from the TCEQ. Based upon the 2003 disposal rates available in this report, each of the landfills in the DFW area was classified as large (greater than 500,000 tons of waste), medium (between 100,000 and 500,000 tons of waste), or small (less than 100,000 tons of waste). Once the landfills were identified and classified according to size, the appropriate profile was applied to the landfill. This allowed for the development of new equipment population and activity files for the NONROAD model, for DCE for all of the landfills in Texas, based upon tons of disposed waste in 2003.

3.2.4 Mining Operations

The effort to obtain site specific information on surface mining operations for the HARC DFW study was largely unsuccessful. No survey responses were provided from sand and gravel pit operators, and only one response was obtained from quarry operators. In addition, several attempts to contact and obtain data on coal mining operations under this study were also unsuccessful. Given the lack of equipment use profiles for quarries and coal/lignite mines, it was not possible to develop population and activity estimates for this sector. Recommendations for development of this data in the future are provided in Section 4. Once developed, such profiles could be combined with surrogates from the Mine Health and Safety Administration (MHSA) for quarries and sand/aggregate pits, and from the Texas Railroad Commission (RRC) for coal/lignite mines to estimate county level equipment population and activity across the State.

3.3 Other Industry Sectors and Specialty Equipment Categories

The above equipment profiles cover a broad range of DCE equipment types and applications. Nevertheless certain specialized activities and equipment types were not surveyed adequately, or at all, under this approach. The following provides a brief discussion of these additional activities and equipment types, and the methods developed to characterize them.

3.3.1 Data Sources and Methodology

Certain specialty equipment owners and operators did not respond to requests for surveys or interviews, even after repeated attempts, including boring and drilling contractors, and crane

rental suppliers. Therefore ERG was not able to use surveys to characterize equipment populations or activity for these SCCs, for any project category.

In addition, upon review of the final survey responses, field observations, and time-lapse photos from the HARC DFW study, it was determined that additional equipment categories were not adequately represented in the final equipment profiles. These included certain specialty pieces of equipment that are not used for earthwork, such as rough terrain forklifts, as well as equipment used in multiple ways that are difficult to quantify, such as skid steer loaders. Skid steers are of particular concern given the high numbers and use in dozens of different applications.

Based on the initial data review ERG identified the following equipment types for subsequent evaluation:

- Skid steer loaders
- Rough terrain forklifts
- Cranes
- Boring/drilling rigs
- Trenchers

To address the above shortcomings ERG obtained a data set containing historical DCE sales records for the nine county DFW area from Equipment Data Associates (EDA). (7) This data set was developed from Uniform Commercial Code (UCC-1) filings from 1990 through May of 2005. UCC-1 forms are filed at the state level whenever an equipment purchase is financed, leased, rented to own, or refinanced. (29) Analysis of this data was conducted as part of the HARC DFW study. (1) Records were screened for original purchases only, to avoid double counting of equipment. The data fields provided included the following:

- Equipment type
- Equipment size
- Year of original purchase
- 4-digit SIC of purchaser
- County of purchaser

A list of the EDA equipment types and their associated NONROAD categories are provided in Table 3-18.

Table 3-18. EDA and NONROAD Equipment Classifications

EDA Description	NONROAD Category
1 DRUM VIBRATORY COMPACTOR	Roller
2 DRUM VIBRATORY COMPACTOR	Roller
ARTICULATED HAUL UNIT	Off-Rd Truck
ALL TERRAIN CRANE	Crane
BLASTHOLE DRILL	Boring/Drilling
COMPACTOR	Roller
CONCRETE PAVER	Paver
CONV SCRAPER	Scraper
CORE DRILL	Boring/Drilling
CRAWLER CRANE	Crane
CRAWLER DOZER	Crawler Dozer/Loader
CRAWLER LOADER	Crawler Dozer/Loader
CRAWLER TRACTOR	Crawler Dozer/Loader
DRAGLINE	Crane
DRILL	Boring/Drilling
ELEV SCRAPER	Scraper
EMBANKMENT COMP	Roller
EXCAVATOR	Excavator
FRONT SHOVEL EXC	Excavator
IND TRACTOR	T/L/B
LANDFILL COMP	Roller
LOADER BACKHOE	T/L/B
MINI EXCAVATOR	Excavator
MOTOR GRADER	Grader
OFF ROAD TRUCK	Off-Rd Truck
PAVER	Paver
PLANER/MILL MACH	Surfacing Equipment
RECLAIMER/STABIL	Surfacing Equipment
ROAD WIDENER	Paving Equipment
RUBBER TIRE CRANE	Crane
RUBBER TIRE EXC	Excavator
RUBBR TIRE PAVER	Paver
SKID STEER LOADER	Skid Steer Loader
STRAIGHT MAST FORKLIFT	Rough Terrain Forklift
TELESCOPING FORKLIFT	Rough Terrain Forklift
TRACKED SKID LOADER	Skid Steer Loader
TRACKED PAVER	Paver
TRACTOR LOADER	T/L/B
TRENCHER	Trencher
WATER WELL DRILL	Boring/Drilling
WHEEL DOZER	Wheeled Loader/Dozer
WHEEL LOADER	Wheeled Loader/Dozer

Equipment size description varied depending on the type of equipment. While certain equipment featured an explicit hp range, other types were characterized by gross weight or lift capacity. ERG used equipment manufacturer product catalogues to develop a cross-reference between unit weight/lift capacity and the likely NONROAD hp bin, as discussed in more detail in the HARC study. (1)

In order to estimate in use equipment populations from the historical sales records, several steps were required.

Step 1 -- For each equipment type of interest, sort records by year of original sale (assumed to be equivalent to year of manufacture) and the SIC group of the purchaser.

Step 2 -- Assign NONROAD equipment category and hp values based on weight and/or lift capacity as needed.

Step 3 -- Extrapolate sales back to 1985 using historical data. 1985 was selected as a reasonable estimate of the oldest DCE likely to be in service in 2004. (14)

Step 4 -- Estimate annual hours of operation for each equipment type/size/SIC group based on expert input. Utilizing their expert knowledge of use patterns and scrap rates, two equipment manufacturer representatives provided estimates of typical annual equipment use for equipment types in various industry sectors. (14, 28) Industries were grouped based on similar equipment use requirements. NONROAD default values were used for those industry groups with which the manufacturer representatives were not familiar. Annual hours for different equipment types are shown for each of the industry grouping in Table 3-19.

Table 3-19. Estimated Annual Hours by Equipment Type and Industry Group*

Equipment Type	Size	Special Trades	Surface Mining	Landscaping	Scrap Handling & Recycling	Concrete Products	Brick/ Stone/ Other Products	Agriculture	Manufacturing	Transportation/ Sales/ Services
Wheeled Loaders	Small	1,000	2,000	1,000	1,500	1,800	1,800	1,000	1,200	1,000
	Medium	1,200	2,400	1,200	1,500	2,000	2,000	1,200	1,500	1,200
	Large	1,200	2,700	1,500	2,000	2,200	2,200	1,500	1,800	1,400
Skid Steer Loaders	All	1,500	1,500	1,500	1,500	818	818	1,200	818	1,200
Crawler Tractor/Dozer/ Loader	Small	1,000	2,800	1,000	936	936	936	1,000	936	1,200
	Medium	1,200	2,800	1,000	936	936	936	1,200	936	1,400
	Large	1,200	2,800	1,000	936	936	936	1,200	936	1,200
Excavators	Small	1,200	1,200	1,000	2,000	1,092	1,092	1,300	1,092	1,200
	Medium	1,500	1,600	1,000	2,000	1,092	1,092	1,000	1,092	1,400
	Large	1,500	1,900	1,000	2,000	1,092	1,092	1,000	1,092	1,200
Graders	All	1,000	200	962	962	962	962	1,000	962	1,000
Tractor/Loader/Backhoes	All	1,500	1,500	1,000	1,135	1,000	1,000	1,200	1,000	1,500
Off-Road Trucks	All	1,641	3,900	1,641	1,641	1,641	1,641	1,641	1,641	1,200
Pavers	All	1,000	821	821	821	821	821	821	821	821
Rollers	All	1,000	760	760	760	760	760	760	760	760
Rough Terrain Forklifts	All	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250
Scrapers	Medium	2,000	2,000	914	914	914	914	2,000	914	914
	Large	2,500	2,500	914	914	914	914	2,500	914	914
Reclaimers/Stabilizers	All	800	561	na	561	561	561	561	561	561
Boring/Drilling Equipment	All	1,200	1,200	466	466	466	466	466	466	1,000
Trenchers	All	1,000	593	593	593	593	593	593	593	1,000

*Cells in yellow indicate NONROAD default values.

The industry groups themselves are defined in terms of 4-digit SIC in Table 3-20.

Table 3-20. Industry Groupings

Industry Group	SIC Description
Special Trades	Concrete, Erection, & finishing work -- SIC 1700's, excluding 1794 (demolition) and 1795 (excavation)
Surface Mining	Primarily quarries, sand/aggregate pits -- SIC 1400's
Landscaping	Landscaping, lawn and garden services - SIC codes 781, 782
Scrap Handling & Recycling	Scrap and waste materials - SIC codes 4955 and 5093
Concrete Products	Block, brick, other, and ready-mix - SIC codes 3271, 3272, 3273
Brick/Stone/Other Products	Related construction materials -- SIC code 5032
Agriculture	Agriculture, forestry, fishing -- SIC 100s - 900s (except landscaping)
Manufacturing	SIC 2000s - 3000s (except concrete products)
Other	Transportation/Sales/Services --SIC 4000s - 8000s (except sanitary services, scrap, and brick/stone)

Note that the 1500 (Building Construction) and 1600 (Heavy Construction) SIC series were excluded from this analysis, as these sectors are characterized by the earthwork profiles. The Special Trades category excluded demolition and excavation contractors for this same reason. SIC codes for sanitary and related landfills (4952, 4953, and 4959) were also excluded, since profiles have been developed for these as well. The 9000 SIC series was also screened out, since government operated fleets were profiled through direct surveys. (14)

The “Other” (Transportation/Sales/Services) SIC grouping contained the widest variety of establishments, including a very large number of units in SIC 5082 (Construction Equipment Sales), and SIC 7353 (Equipment Rentals). After the initial UCC-1 filing, most of the units in the Sales and Rental categories would be reallocated to earthwork and related sectors. Therefore to avoid double counting of equipment originally purchased by these two SICs, 67% of these units were assumed to be included in the previously profiled earthwork and surfacing sectors, with the rest remaining in the transportation category. Therefore this correction effectively screened out 67% of the equipment in the “Other” category from further analysis.

Step 5 -- Assign load factor and median engine life using NONROAD model default values, for appropriate equipment type and hp bin. Median engine life is defined as the hours of use at full load at which 50% of engines are scrapped. NONROAD has three broad diesel engine life groups, depending on rated hp: 2,500 hours for <50 hp; 4,667 hours for 50 – 300 hp; and 7,000 hours for >300hp. NONROAD’s load factor assignments for the different DCE equipment types range from 0.21 for backhoes and skid steer loaders, to 0.43 for bore/drill rigs and cranes, to 0.59 for all other equipment categories of interest.

Step 6 - Using year of manufacture, annual hours of use, load factor, and median life, estimate the remaining fraction of median life for each unit, as of 2004. This calculation assumes constant hours of use independent of age. It also assumes that, with the exception of the equipment sales and rental SICs, each unit remains in its original SIC group for its useful life.

Step 7 -- Apply NONROAD default scrappage curve to estimate the surviving population in 2004. The default scrap factors are provided in Table 3-21.

Table 3-21. NONROAD Default Scrap Factors

Fraction of Med. Life	Surviving Fraction	Fraction of Med. Life	Surviving Fraction
0	1	1.0010	0.45
0.0588	0.99	1.0027	0.43
0.1694	0.97	1.0058	0.41
0.2710	0.95	1.0106	0.39
0.3639	0.93	1.0176	0.37
0.4486	0.91	1.0270	0.35
0.5254	0.89	1.0393	0.33
0.5948	0.87	1.0549	0.31
0.6570	0.85	1.0741	0.29
0.7125	0.83	1.0973	0.27
0.7617	0.81	1.1250	0.25
0.8049	0.79	1.1575	0.23
0.8425	0.77	1.1951	0.21
0.8750	0.75	1.2383	0.19
0.9027	0.73	1.2875	0.17
0.9259	0.71	1.3430	0.15
0.9451	0.69	1.4052	0.13
0.9607	0.67	1.4746	0.11
0.9730	0.65	1.5514	0.09
0.9824	0.63	1.6361	0.07
0.9894	0.61	1.7290	0.05
0.9942	0.59	1.8306	0.03
0.9973	0.57	1.9412	0.01
0.9990	0.55	2.0000	0
1.0000	0.5	1.0010	0.45

Step 8 -- Adjust population to account for transactions not covered by UCC-1 filings. UCC-1 records are not executed for equipment purchases involving cash transactions or when extended lines of credit are used. EDA market research indicates that UCC-1 filings cover between 60 and 70% of all transactions. (26) Accordingly, the 2004 in-use equipment population totals were inflated to account for the fraction of non-recorded transactions (60% for equipment greater than 300 hp, and 70% for all other equipment). (33)

The following provides an example calculation for determining in use populations for skid steer loaders in the nine county DFW region.

1. Skid steer loader sales for the DFW region were sorted by year and SIC group, as shown below;

SIC Group	Year	Total
1	2005	17
2	2005	48
3	2005	113
4	2005	7
5	2005	2
6	2005	206
7	2005	10
8	2005	2
9	2005	6
10	2005	38
11	2005	2
12	2005	50
1	2004	26
2	2004	88
3	2004	165
4	2004	5
5	2004	3
6	2004	325
7	2004	14
8	2004	3
9	2004	8
10	2004	37
11	2004	6
12	2004	94
1	2003	31
2	2003	63
3	2003	171
4	2003	6
5	2003	4
6	2003	309
7	2003	13
8	2003	2
9	2003	3
10	2003	39
11	2003	6
12	2003	100
1	2002	31
2	2002	71
3	2002	146
4	2002	1

SIC Group	Year	Total
5	2002	2
6	2002	318
7	2002	9
8	2002	2
9	2002	7
10	2002	49
11	2002	5
12	2002	105
1	2001	46
2	2001	75
3	2001	210
4	2001	4
5	2001	5
6	2001	370
7	2001	12
8	2001	7
9	2001	5
10	2001	27
11	2001	2
12	2001	78
1	2000	43
2	2000	64
3	2000	185
4	2000	13
5	2000	3
6	2000	280
7	2000	1
9	2000	4
10	2000	30
11	2000	8
12	2000	72
1	1999	53
2	1999	72
3	1999	210
4	1999	3
5	1999	2
6	1999	271
7	1999	5
8	1999	2
9	1999	4

SIC Group	Year	Total
10	1999	42
11	1999	8
12	1999	116
1	1998	49
2	1998	62
3	1998	151
4	1998	1
5	1998	4
6	1998	196
7	1998	2
8	1998	6
9	1998	4
10	1998	19
11	1998	7
12	1998	90
1	1997	37
2	1997	56
3	1997	114
4	1997	3
6	1997	129
7	1997	8
8	1997	5
10	1997	15
11	1997	6
12	1997	57
1	1996	30
2	1996	46
3	1996	105
4	1996	2
5	1996	2
6	1996	96
7	1996	9
8	1996	5
9	1996	3
10	1996	6
11	1996	5
12	1996	45
1	1995	28
2	1995	33
3	1995	98
4	1995	1
5	1995	2
6	1995	103
7	1995	4
8	1995	3
9	1995	3
10	1995	5

SIC Group	Year	Total
11	1995	2
12	1995	63
1	1994	22
2	1994	35
3	1994	101
4	1994	3
5	1994	7
6	1994	77
7	1994	3
8	1994	12
9	1994	1
10	1994	6
11	1994	8
12	1994	49
1	1993	15
2	1993	34
3	1993	87
4	1993	1
5	1993	1
6	1993	59
7	1993	1
8	1993	1
10	1993	5
11	1993	7
12	1993	36
1	1992	7
2	1992	28
3	1992	59
4	1992	2
5	1992	2
6	1992	45
7	1992	1
8	1992	1
9	1992	1
10	1992	4
11	1992	11
12	1992	38
1	1991	10
2	1991	21
3	1991	46
4	1991	1
6	1991	38
7	1991	3
8	1991	1
9	1991	1
10	1991	5
11	1991	3

SIC Group	Year	Total
12	1991	22
1	1990 and older	11
2	1990 and older	26
3	1990 and older	48
4	1990 and older	1
6	1990 and older	41

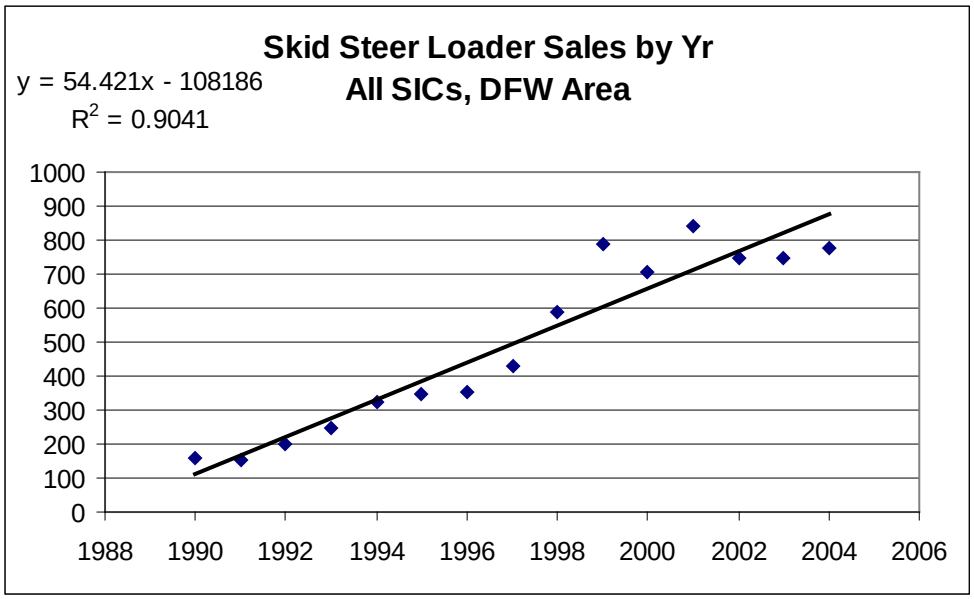
SIC Group	Year	Total
7	1990 and older	2
8	1990 and older	1
10	1990 and older	2
11	1990 and older	1
12	1990 and older	28

The 12 SIC groupings are listed below.

SIC Grp #	SIC Group
1	Building Construction
2	Heavy Construction
3	Special Trades
4	Mining
5	Sanitary Services
6	Landscaping
7	Scrap Handling & Recycling
8	Concrete Products
9	Brick/Stone/Other Products
10	Agriculture
11	Manufacturing
12	Transportation/Sales/Services

2. Bobcat is the leading manufacturer of skid steer loaders. Bobcat's website (http://www.bobcat.com/products/ssl/index.html) was consulted to correlate the skid steer loader lift capacity reported in the UCC-1 data to typical hp ratings. Accordingly 58% of skid steer loaders were estimated to have between 25 and 50 hp, while 42% were estimated at between 50 and 100 hp.

3. Historical sales were evaluated to identify reasonable backcasting methods of skid steer loaders. Trends are shown below.



As seen above, straight-line extrapolation or regression modeling of the historical data will quickly lead to negative sales estimates prior to 1990. Therefore pre-1990 annual sales totals were assumed to equal 1990 values. Sales totals were allocated across SIC groups based on total sales fractions over the 1990 – 2004 period, as shown below.

SIC Group	Total Sales (1990 – 2004)	Fraction	Pre-1990 Annual Sales
1	456	0.058	9
2	822	0.104	17
3	2,009	0.254	41
4	54	0.007	1
5	39	0.005	1
6	2,863	0.362	58
7	97	0.012	2
8	53	0.007	1
9	50	0.006	1
10	329	0.042	7
11	87	0.011	2
12	1,043	0.132	21

4. Annual activity for each SIC group was determined based on consultation with industry experts (14), and is summarized below.

SIC Group #	SIC Group	Hrs/Yr
1	Building Construction	1,500
2	Heavy Construction	1,900
3	Special Trades	1,500

4	Mining	1,500
5	Sanitary Services	818
6	Landscaping	1,500
7	Scrap Handling & Recycling	1,500
8	Concrete Products	818
9	Brick/Stone/Other Products	818
10	Agriculture	1,200
11	Manufacturing	818
12	Transportation/Sales/Services	1,200

5. NONROAD default values indicate skid steer loaders have an average load factor of 0.21. NONROAD also estimates that diesel engines less than 50 hp have a median life of 2,500 hours at full load, and engines between 50 and 100 hp have a median life of 4,667 hours.

6. For each year of manufacture remaining useful life is calculated for each unit, using the appropriate hours per year for each SIC group. For example, 43 skid steer loaders were sold in the region in 2000 to operators in SIC Group 1 (@ 1,500 hrs/yr). Through 2005 these engines will have operated for 9,000 hours, or 1,890 equivalent hours at full load (9,000 hrs x 0.21 load factor). For units less than 50 hp, this translates to 0.76 of the median life of 2,500 hours at full load (2,500/1,890 = 0.76). For units greater than 50 hp this translates to 0.40 of the median life of 4,667. Fraction of median life is determined similarly for each SIC group, year of manufacture, and hp range.

7. NONROAD default scrap rates are applied to the fraction of median life estimates to determine the number of units still in use for each year of manufacture. For instance, of the 43 units sold in 2000 to SIC Group 1, 58% or 25 are assumed to be less than 50 hp. These units will have aged to 0.76 of their median life, corresponding to a surviving fraction of 0.81, derived from Table 3-21 above. This corresponds to 25 x 0.81 = 20 surviving units for this year/SIC/hp range combination. Equivalent calculations are performed to determine the surviving population for all years, SIC groups, and hp values, totaling 6,118 units.

8. Increase the in use population estimate to account for sales transactions not recorded in the UCC-1 records, in this case 40% for small units like skid steer loaders (6,118/0.6 = 10,196).

Once in use populations were estimated for the different equipment types and SIC groups of interest in the DFW area, the resulting population and activity values were extrapolated to the remainder of the State using surrogates appropriate to each equipment type and/or SIC group, as discussed in the following section.

3.3.2 Specialty Equipment and Industry Profiles and Surrogates

Profiles by Equipment Category -- The population and activity estimates for all skid steer loaders, boring/drilling rigs, rough terrain forklifts, cranes, and trenchers operating in the nine county area, estimated in the HARC DFW report, provide the basis for estimating statewide equipment populations for these SCCs. Surrogates for extrapolating equipment populations were obtained from the Texas REMI model. This model was specially designed for use in forecasting and backcasting SIC-specific outputs for 44 regions of the State. (39) The REMI model was run for 2004 to obtain dollar value outputs for general construction SICs (1500-1700). Dollar outputs for each SIC group were allocated from the 44 regions to the county level using census population figures for 2004. Equipment population totals for each county were then determined by multiplying the nine county DFW population total by the ratio of the county level dollar outputs to the dollar output for the nine county DFW area. County level dollar output estimates from the Texas REMI model are presented in Appendix A. Summing across all counties provides statewide total equipment populations, as shown in Table 3-22 below.

Table 3-22. Specialty Equipment Population and Activity (Statewide 2004)

	Skid Steer Loaders	Cranes	Bore/Drill	Rough Terrain Forklifts	Trenchers
Avg Hrs/Yr/Unit	*1,453*	*990**	*466**	*1,250*	*1,308*
HP Range					
25-40	394		70	279	7,314
40-50	1,038		71	314	1,653
50-75	20,242		116	621	2,054
75-100	15,590	306	118	3,552	
100-175		1,152	173	1,824	
175-300		1,179	150	97	
300-600		725	87	125	
600-750			20		
>750			11		
Total	**37,264**	**3,361**	**816**	**6,813**	**11,021**

*NONROAD model default values.

The average hours per unit per year were determined by weighting the sector specific hours per year shown in Table 3-22 by the relative dollar outputs for each SIC grouping for the State as a whole. ERG was not able to obtain input on typical hours of use from industry experts

familiar with crane and boring/drilling rig use, so NONROAD default values were used in these cases. Note that the hour estimates provided by the experts for the remaining equipment categories were consistently higher than the NONROAD default values. Also note that ERG subsequently applied the county specific soil adjustment factors to the above trencher and bore/drill activity estimates before modeling emission for these categories in NONROAD.

Geographic allocation in NONROAD for these equipment types was based on county level population, as shown in Appendix A.

Profiles by Industry Group – A process similar to that described for specialty equipment was used to develop equipment profiles for the industry groupings listed in Table 3-20, using Texas REMI model outputs for SIC groups corresponding to these industries (also shown in Table 3-20). Mr. R.L. Lindsey of Holt/Caterpillar volunteered to review the equipment types reported for each industry group for reasonableness. (14) While most equipment distributions for the DFW area were found to be reasonable, certain equipment were reassigned to more appropriate, heavier applications. Specifically, numerous offroad trucks were reported as sold to the Specialty Trade and Landscaping SIC classifications. Based on Mr. Lindsey's familiarity with the overall offroad truck market, these units were reassigned to the general heavy construction category.

The statewide population and activity estimates for equipment types in the remaining industry groups of interest are presented in Table 3-23. County allocation factors for each group, again based on ratios from Texas REMI model outputs for 2004, are presented in Appendix A.

Table 3-23. Statewide Industry Equipment Population and Activity Estimates (Tx REMI Dollar Output Basis, 2004)

	Other		Agriculture		Manufacturing		Special Trades		Landscaping		Brick and Stone		Concrete		Scrap/Recycling	
Equipment Type	**Number**	**Hr/Yr**	**Number**	**Hr/Yr**	**Number**	**Hr/Yr**	**Number**	**Hr/Yr**	**Number**	**Hr/Yr**	**Number**	**Hr/Yr**	**Number**	**Hr/Yr**	**Number**	**Hr/Yr**
Cr Dozer/Loader	642	1,306	1,104	1,152	218	936	781	1,175	475	1,000	55	936	62	936	77	936
Excavator	599	1,288	181	1,008	28	1,092	748	1,478	134	1,000	112	1,092	101	1,092	401	2,000
Grader	278	1,000	114	1,000			291	1,000	71	962			11	962		
Off-Rd Truck	143	1,194	132	1,616	30	1,641										
Paver	58	821					195	1,000								
Roller	59	760					111	1,000	28	760			12	760		
Scraper	199	801	42	1,003			144	1,087	6	914						
Surfacing Equipment	160	803					207	907	30	756			6	561		
Tractor/Loader/Backhoe	1,818	1,500	2,267	1,200	157	1,000	5,339	1,500	6,419	1,000	52	1,000	39	1,000	42	1,135
Wheeled Loader/Dozer	634	1,268	270	1,340	74	1,630	900	1,199	127	1,166	85	2,058	87	1,546	367	1,811
Total	**4,588**		**4,109**		**507**		**8,717**		**7,288**		**317**		**317**		**887**	

Growth for all specialty equipment and other industry groups was based on historical and projected dollar outputs at the state level, from the Tx REMI model, for each industry group, as shown in Table 3-24.

Table 3-24. Statewide Growth Factors by SIC Group (from Tx REMI Model*)

SIC Group	1999	2002	2004	2005	2007	2009	2010	2012	2013
Agriculture	4.3276	5.0949	5.2392	5.3252	5.5495	5.7918	5.9212	6.1696	6.2975
Landscaping	5.2531	6.2658	6.5005	6.6485	6.9926	7.3543	7.5409	7.9448	8.1483
Construction	78.6511	80.7252	78.6769	79.5818	82.8178	87.0748	89.6507	90.9980	91.8951
Concrete	4.0555	4.1711	4.2274	4.2928	4.4873	4.7082	4.8269	4.9642	5.0388
Scrap Handling	2.2369	2.3733	2.4335	2.4693	2.5520	2.6234	2.6615	2.7944	2.8606
Brick/Stone	72.19	74.72	78.96	81.47	87.30	93.28	96.37	101.75	104.51
Manufacturing	282.52	305.61	332.74	344.74	372.95	402.65	418.32	444.00	459.56
Other	635.5281	686.5009	726.7157	749.8120	803.1435	858.1648	887.0742	928.1224	948.5826
Total	**1,085**	**1,165**	**1,235**	**1,274**	**1,366**	**1,462**	**1,512**	**1,587**	**1,627**

* Billions of 1996 dollars

3.3.3 Unaddressed Equipment Categories

The following NONROAD equipment categories were not included in the UCC-1 data purchase, nor were they adequately characterized in the earthwork profiles:

- Off-road tractors
- Crushing/processing equipment
- Signal boards/light plants
- Concrete/industrial saws
- Cement and mortar mixers
- Plate compactors
- Dumpers/tenders
- Tampers/rammers
- Other construction equipment

While the above list is extensive, most of these categories are very low hp applications, and/or specialty pieces with low population numbers. As such, these equipment categories are responsible for a relatively small part of the DCE inventory. Therefore ERG relied upon NONROAD default population and activity values to estimate emissions for these categories.

3.3.4 Productivity Adjustment Factors

Substantial variations in equipment productivity, and therefore activity, can arise depending on a number of different factors, including altitude, soil and ground cover conditions at a given project site. ERG consulted with an industry expert to develop activity adjustment

factors to be applied to the base case profiles, accounting for county specific conditions. Diesel engine productivity was deemed to suffer a 1% loss for each 1,000-foot increase in altitude. (6) In other words, an activity requiring 100 hours at see level would require 1001 hours at 1,000 in elevation. Representative altitudes for each county were determined from GIS data containing altitude for each county seat, as shown in Appendix D.

Adjustments for standard soil and ground cover conditions are based on field experience and engineering judgment, and are summarized in Table 3-25. (6)

Table 3-25. Site Condition Activity Adjustments to Base Case

Ground Cover	**Adjustment Factor***
Wooded lot (dense/moderate)	1.5
Small trees, shrubs, and weed	1.3
Weed and Grass	1.0
Other	Varies
Soil Type	**Adjustment Factor***
Good common earth (loam)	1.0
Sand/Gravel	1.0
Easy digging (moist silt/clay)	1.0
Hard digging (dry clay)	1.1
Fragmented Rock	1.2
Intact Rock	1.7
Other	Varies

*1.0 represents base case conditions

The above factors represent the increase in the time required to complete a certain task, relative to base case conditions, (equivalent to an increase in work, since engine load factors are assumed constant under all conditions). Ground cover adjustments are applicable to land clearing activities, while soil type adjustments are applicable to cut and fill operations as well as trenching tasks.

Application of soil and ground cover adjustments proceeded in two steps. First, soil and ground cover conditions for each CCMC project were identified, and hours of equipment use for land clearing, cut and fill, and trenching were adjusted to base case conditions using the factors in Table 3-25. Second, average values for soil and ground cover characteristics were developed for each county, weighted by relative area. Weighted average adjustment factors specific to each county were then applied to the base case equipment profiles to account for area-specific conditions.

TCEQ provided a statewide USGS data set for determining ground cover characteristics. (20) The 35 ground cover categories provided in the USGS data were mapped to one of the

standard classifications, as show in Table 3-26. Assignments were based on GIS engineering judgment. (19)

Table 3-26. USGS Ground Cover Category Assignments

USGS Category	Productivity Adjustment Category
Urban or Built-up Land	impermeable/existing structures
Agricultural Land	grass/weeds
Rangeland	grass/weeds
Forest Land	heavily wooded
Water	water
Wetland	grass/weeds
Barren Land	grass/weeds
Residential	impermeable/existing structures
Commercial and Services	impermeable/existing structures
Industrial	impermeable/existing structures
Transportation, Communications, and Services	impermeable/existing structures
Industrial and Commercial Complexes	impermeable/existing structures
Mixed Urban or Built-up Land	impermeable/existing structures
Other Urban or Built-up Land	impermeable/existing structures
Cropland and Pasture	grass/weeds
Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticultural Areas	mixed trees/brush
Confined Feeding Operations	impermeable/existing structures
Other Agricultural Areas	grass/weeds
Herbaceous Rangeland	grass/weeds
Shrub-Brushland Rangeland	mixed trees/brush
Mixed Rangeland	mixed trees/brush
Deciduous Forest Land	heavily wooded
Evergreen Forest Land	heavily wooded
Mixed Forest Land	heavily wooded
Streams and Canals	water
Lakes	water
Reservoirs	water
Bays and Estuaries	water
Forested Wetland	heavily wooded
Nonforested Wetland	grass/weeds
Beaches	grass/weeds
Sandy Areas Other than Beaches	grass/weeds
Bare Exposed Rock	impermeable/existing structures
Strip Mines, Quarries, and Gravel Pits	impermeable/existing structures
Transitional Areas	impermeable/existing structures

Land designated as having water or impermeable/existing structures were removed from the database, and the relative areal extent of the remaining categories was renormalized. For example, after excluding water and impermeable/existing structures, Hutchinson County is

characterized by 62.5% grass/weeds, 36.1% mixed vegetation, and 1.3% wooded land. This results in a county level weighted average ground cover adjustment of:

$$0.625 \times 1.0 + 0.361 \times 1.3 + 0.013 \times 1.5 = 1.115$$

Appendix D provides the weighted average ground cover adjustments for each county. These factors were applied to the commercial and residential profiles, but only for equipment involved in land clearing activities (crawler dozers).

In order to characterize soil conditions across the State, the Soil Survey Geographic Database (SSURGO) was obtained from the U.S. Natural Resource Conservation Service. (18) Three soil layers were extracted from this database, including the surface layer, the layer found at 90 cm., and the layer found at 150 cm., near or at the maximum depth of the data. (19) The Uniform Classifications of these layers were then correlated with the standard soil classifications used in this project, as shown in Table 3-27.

Table 3-27. SSURGO Soil Classifications (18)

Unified Classification	DCE Classification	Activity Adjustment
CH	Hard Digging	1.11
CL	Hard Digging	1.11
CL-ML	Easy Digging	1.00
GC	Sand/gravel	1.00
Indurated	Intact Rock	2.50
ML	Common Earth	1.00
Moderately cemented	Intact Rock	2.50
Noncemented	Fragmented Rock	1.25
SC	Common Earth	1.00
SC-SM	Common Earth	1.00
SM	Sand/gravel	1.00
SP-SM	Common Earth	1.00
Strongly cemented	Intact Rock	2.50
Weakly cemented	Fragmented Rock	1.25

Both the spatial extent and depth of each layer were used to develop weights for the trenching and cut/fill adjustments. The productivity adjustment for each layer was weighted by the relative thickness of the layers and summed to provide a weighted average adjustment for the soil as a whole.

The resulting countywide activity adjustment factors were subsequently applied to the base case commercial, residential and utility sector profiles, as well as the trencher and boring/drilling profiles. Appendix D presents the weighted average soil adjustment factors for

each county. The inverse of the county level weighted average soil productivity adjustments are presented graphically in Figure 3-3.

ERG evaluated the earthwork profiles to establish what portion of equipment activity should be subject to the soil productivity adjustments. The fraction of time each equipment type spends performing earthwork is summarized below in Table 3-28.

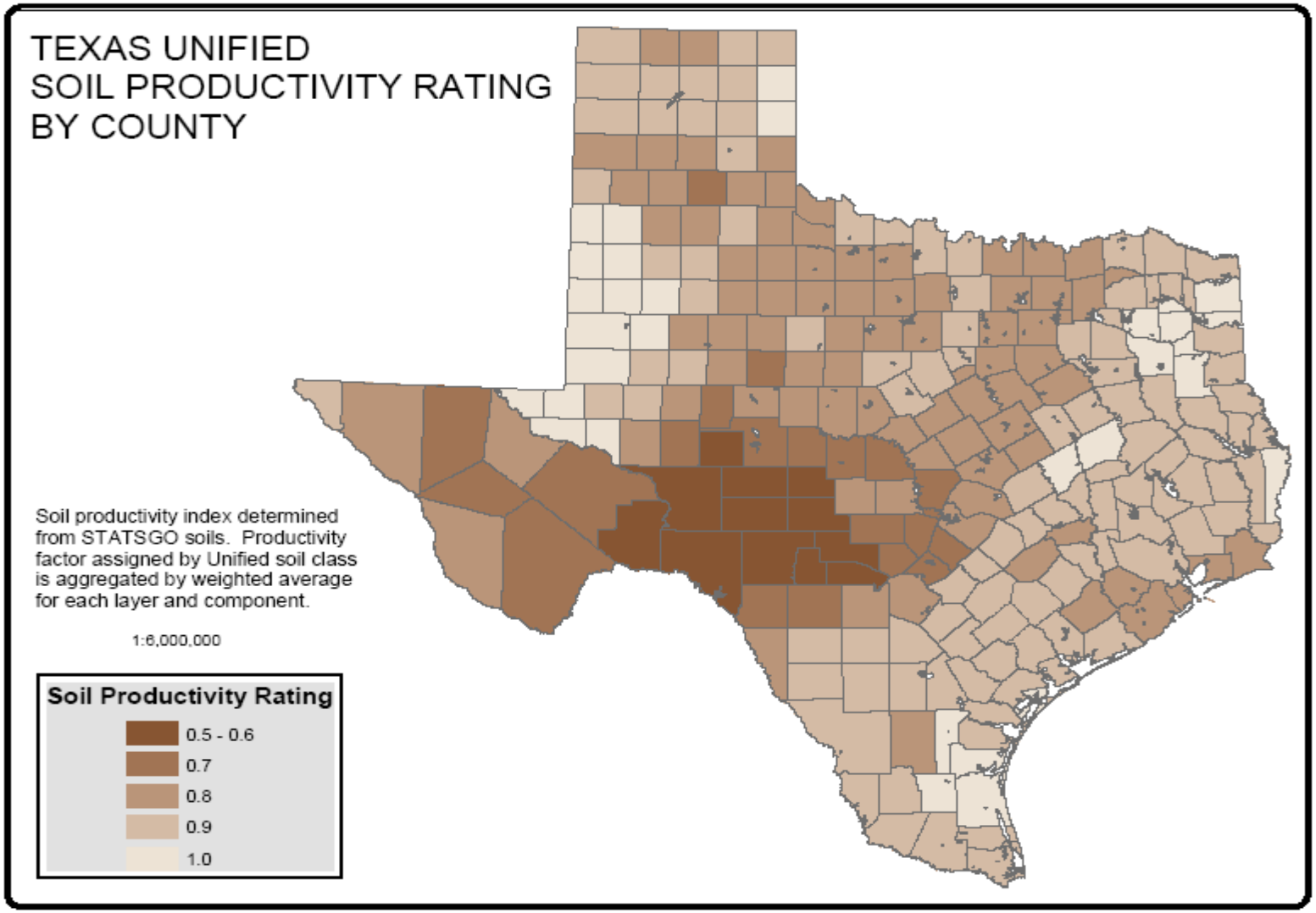
Table 3-28. Earthwork Weighting Factors for Soil Adjustments

Profile	Equipment Type	Earthwork Fraction*
All	Trencher	100%
All	Boring/Drilling	100%
Commercial	Excavator	100%
	Backhoe	100%
	Grader	49%
	Crawler Dozer	40%
Utility	Excavator	100%
Residential	Excavator	100%
	Crawler Dozer	41%

* % of time, weighted by hp-hours

Accordingly, a 10% soil adjustment would be applied to commercial grader activity in the following way: 1.1 x 0.49 + 1.0 x 0.51 = 1.05. In this instance total commercial grader hours would be increased by 5% to account for soil impacts on the earthwork component of operations.

Figure 3-3. County Level Weighted Average Soil Adjustment Factor (inverse)



4.0 Study Findings

4.1 Preparation of NONROAD Files

In order to create a DCE emissions inventory that reflects state specific data, it is necessary to alter the input files to the NONROAD model. The following external files were modified to reflect the equipment use profiles developed for each project sector:

- Population
- Activity
- Growth, and
- Allocation

Derivation of this information has been discussed extensively in Section 3. Additional NONROAD files were left as default, including Deterioration Factor, Emission Factor, and Technology. The Season file was updated to reflect area specific weekday vs. weekend activity levels. The NONROAD model default values allocate 83 percent of all construction activity to weekdays, Monday through Friday, with 17 percent of all construction occurring on weekend days, Saturday and Sunday. ERG updated these values to reflect earlier contractor estimates provided to the NCTCOG, adjusting the SEASON file for 90 percent of activity on weekdays, and only 10 percent occurring on weekends. (48) Adjusting the daily allocation in this way adjusts ozone season day estimates from NONROAD in a one-to-one fashion. This adjustment increases ozone season daily emissions by approximately 7.5% over default assumptions. This allocation was used for all ozone season day estimates.

Since diesel emissions do not have a temperature dependence in the model, default temperature values were used for all NONROAD modeling, with the exception of diesel sulfur content, which was set to 15 ppm in 2007 and beyond, to reflect the introduction of the upcoming federal sulfur standards.

Statewide NONROAD population and activity files were compiled for each of the industry groups, along with county level allocation files, and run for each scenario year. Since population estimates for skid steer loaders, cranes, boring/drilling units, rough terrain forklifts, and trenchers were profiled separately, the equipment population entries for these five equipment types were deleted from the associated NONROAD runs for these industry groups to avoid double counting.

The complete set of adjusted NONROAD input and option files used to create the emissions estimates were provided in electronic format to TCEQ.

4.2 Emission Estimates

The NONROAD model was run using the sector specific inputs and external files to generate annual and ozone season daily emission estimates for various pollutants. County level outputs were generated for scenario years 1999, 2002, 2005, 2007, 2009, 2010, 2012 and 2013. Table 4-1 summarizes the statewide annual and ozone season daily emissions for the different pollutants in tons, for each analysis year. Figure 4-1 shows the trend line for emissions, clearly indicating the reductions expected from fleet turnover and the introduction of new standards. County level emissions totals for each analysis year, broken out by SCC, were provided to TCEQ in NIF2.0 format and loaded into TexAERS.

Figure 4-2 groups the NOx emissions by sector/equipment type for a key analysis year to indicate relative contribution to overall NOx emissions. Note that the second part of the figure features a different scale to improve resolution.

Table 4-1. Statewide Emissions (Tons) by Pollutant, Analysis Year, and Time Period

Year	VOC		NOX		CO		PM25-PRI		SO_2	
	TPY	TPD	TPY	TPD	TPY	TPD	TPY	TPD	TPY	TPD
1999	7,618	34.46	53,722	243.12	35,308	159.78	5,970	27.00	5,760	26.05
2002	6,629	29.99	52,725	238.60	31,212	141.24	5,540	25.06	6,333	28.58
2005	6,640	30.03	57,747	261.32	31,969	144.67	5,649	25.54	7,827	35.33
2007	5,903	26.39	51,215	226.69	29,691	132.48	4,550	20.31	50	0.19
2009	5,544	25.07	50,470	228.39	29,946	135.50	4,561	20.62	56	0.22
2010	5,364	24.25	50,112	226.76	30,177	136.54	4,594	20.76	58	0.23
2012	4,878	22.06	47,043	212.88	28,001	126.69	4,296	19.42	61	0.25
2013	4,509	20.40	44,081	199.48	25,339	114.65	3,886	17.58	61	0.28

Figure 4-1. Statewide Emissions Totals by Year and Pollutant (TPD)

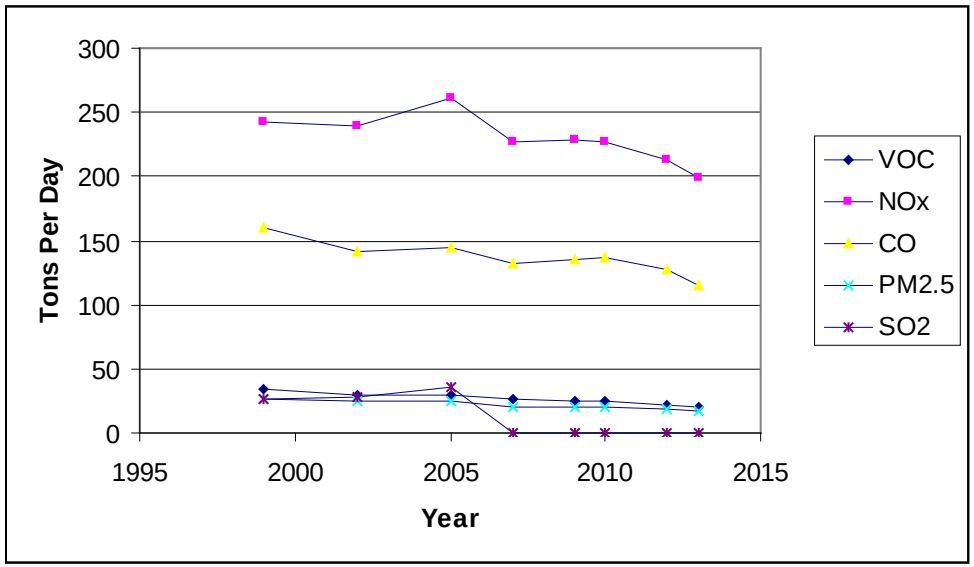
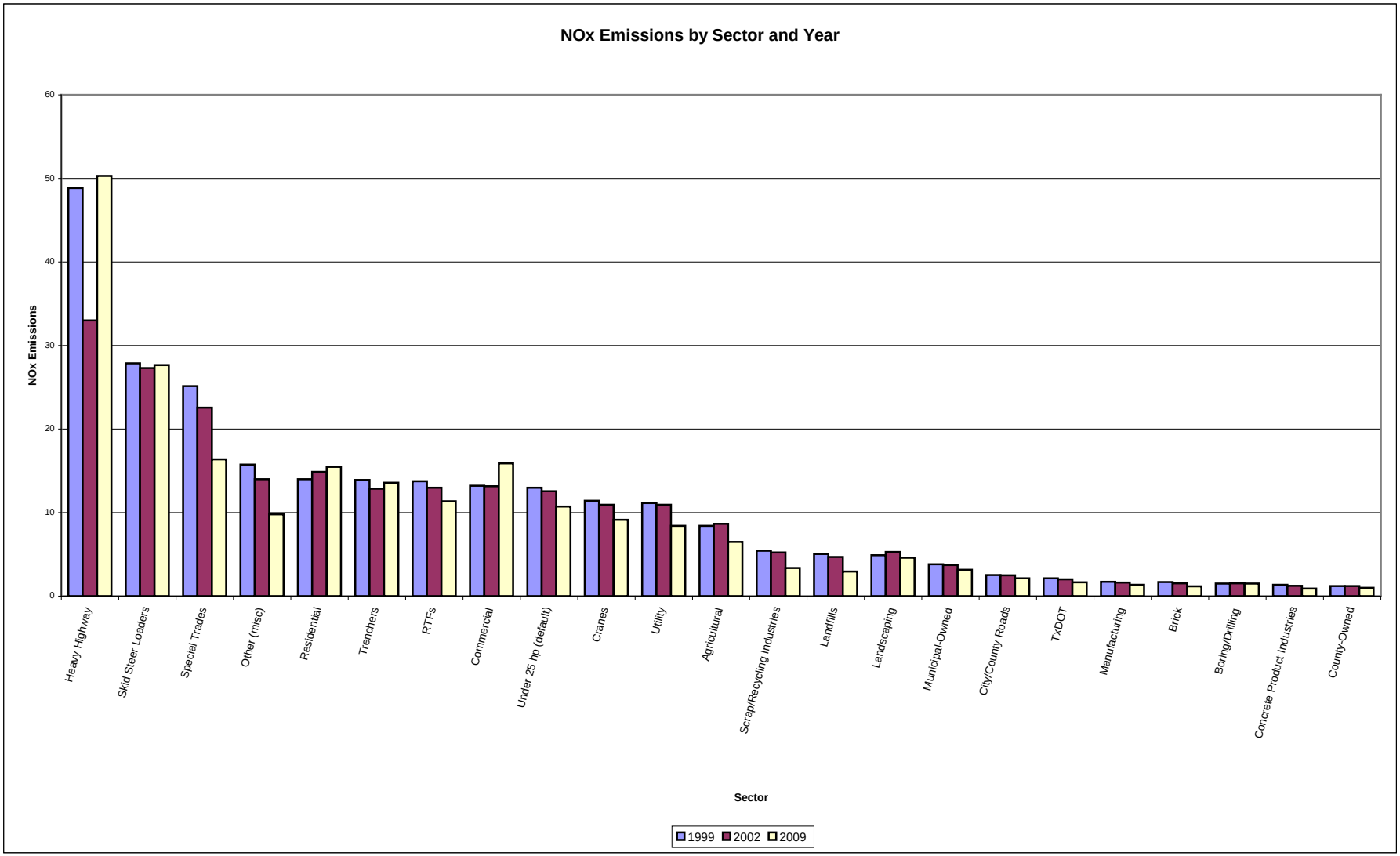


Figure 4-2. Statewide DCE Inventory by Sector for Key Analysis Years



4.2.1 Inventory Adjustments: TERP

The Texas Emission Reduction Program (TERP) has been providing subsidies for NOx reduction strategies for both on and offroad diesel engines since 2002. The latest TERP funding project summary is available from the TCEQ website. Only TERP projects that were exclusively dedicated to nonroad DCE equipment are included in our calculations. **As of August 2006 the TERP program claims 6.08 tons per day of NOx emission reduction in 2007 for DCE in the State, involving 1,322 pieces of equipment.** Given that many of the DCE projects on the list have an expected life of five years, reductions from these projects will begin to decline after this time, although additional reductions from some unknown amount of future TERP projects should make up at least a portion of this decline.

Accounting for TERP reductions claimed to date, the adjusted NOx ozone season daily statewide inventory for the area is 220.61 tons per day in 2007.

4.2.2 Inventory Adjustments: Special Projects

As discussed in Section 3.1.6, three large LNG projects were identified as scheduled for construction along the Gulf Coast in the near future. These projects are unusual in size, and are not captured by the standard surrogates used in this analysis.

Annual emission reduction estimates were taken directly from the supporting EIS and Conformity Determinations for these projects, and are presented in Table 4-2 below. Table 4-3 provides the corresponding ton per day estimates, calculated by dividing annual emissions by 260 working days per year. These values can be subtracted directly from the emission total presented in Table 4-1 and the county level NIF2.0 files.

Table 4-2. LNG Project Emissions Estimates and County Allocation (TPY)

Corpus Christi (50% San Patricio, 50% Nueces)				
TPY	**NOx**	**VOC**	**SO_2**	**PM10**
2005	48.99	4.13	8	4.32
2006	172.33	14.62	29.4	14.98
2007	170.83	15.54	30.14	15.26
2008	26.03	2.88	4.48	2.68
Port Arthur (100% Jefferson County)				
TPY	**NOx**	**VOC**	**SO_2**	**PM10**
2006	259.9	12.4	37.5	15
2007	259.6	12.3	37.5	15
2008	259.6	12.3	37.5	15
2009	91.7	6.4	12.3	6.1
2010	43.1	2.8	6	2.7
Freeport (100% Brazoria County)				
TPY	**NOx**	**VOC**	**SO_2**	**PM10**
2004	52.6	4.34	8.56	4.59
2005	227.79	18.77	38.31	19.37
2006	217.81	18.87	37.58	18.81
2007	27.43	2.99	4.7	2.77

Table 4-3. LNG Project Emissions Estimates and County Allocation (TPD)

Corpus Christi (50% San Patricio, 50% Nueces)				
TPY	**NOx**	**VOC**	**SO_2**	**PM10**
2005	48.99	0.188	0.016	0.031
2006	172.33	0.663	0.056	0.113
2007	170.83	0.657	0.060	0.116
2008	26.03	0.100	0.011	0.017
Port Arthur (100% Jefferson County)				
TPY	**NOx**	**VOC**	**SO_2**	**PM10**
2006	259.9	1.000	0.048	0.144
2007	259.6	0.998	0.047	0.144
2008	259.6	0.998	0.047	0.144
2009	91.7	0.353	0.025	0.047
2010	43.1	0.166	0.011	0.023
Freeport (100% Brazoria County)				
TPY	**NOx**	**VOC**	**SO_2**	**PM10**
2004	52.6	0.202	0.017	0.033
2005	227.79	0.876	0.072	0.147
2006	217.81	0.838	0.073	0.145
2007	27.43	0.106	0.012	0.018

4.2.3 TxLED Adjustments

Adjustments for adoption of TxLED have not been applied to the results presented above. A standard factor of 6.2% for nonroad diesel engines can be used to adjust NOx reductions in the NIF files for the 110 counties in the TxLED area.

4.3 Conclusions

The inventory methodology developed for this project provides highly resolved emission estimates for 18 different equipment operator sectors, and six specialty equipment categories. The level of disaggregation is unique among DCE inventory efforts to date, and provides a substantial advance in the precision of previous emissions estimates for these sources. The following observations are apparent from the summary figures and tables above.

- NOx, VOC, and PM remain relatively stable across all years with a slight downward trend. Given the increase in most growth indicators over this period the downward trend is attributable to the influence of new emission standard penetration.
- $S0_2$ is virtually eliminated by 2007 due to the introduction of the new federal diesel fuel requirements.
- The Heavy highway sector has the largest contribution to the NOx inventory. While most activity is tied to population centers, the heavy highway sector is ubiquitous, contributing moderate emissions in both rural and urban counties alike. In many rural counties this sector may be the only significant source of DCE emissions. Similarly, TxDOT emissions are relatively more important at the state level.
- The relative importance of the remaining sectors roughly follows that seen in the HARC DFW study, with the exception of trenchers, which are significantly higher in proportion at the state level.
- In spite of their relatively lower horsepower, skid steer loaders are collectively the second highest emitters of NOx.
- Several other “specialty” equipment categories had NOx emissions comparable to the earthwork sectors, often due to the shear number derived from the UCC-1 equipment sales data (e.g., cranes and rough terrain forklifts).
- The Special Trades construction sector is estimated to produce much more NOx than originally anticipated, due to a surprisingly large number of earthwork machines reported for this SIC group in the UCC-1 sales data.
- The “Other” industry category containing transportation, sales, and services had higher emission estimates than many other earthwork sectors, apparently due to the shear number of establishments in this large SIC grouping.
- The “Default” category shown in the figures, which includes those equipment types without reasonable population and activity estimates in this study, contribute a relatively large amount of NOx to the inventory. Of these equipment

types approximately 1/3 of the NOx is attributable to off highway tractors. Equipment less than 25 hp are also included here.

- While most sectors have a general downward trend over time, heavy highway emissions are more erratic, most likely due to fluctuations in annual letting dollars.
- Commercial emissions peak in 2009.

4.4 Recommendations

While the breadth of the study was quite comprehensive, a few remaining equipment categories merit additional evaluation or refinement. Most importantly, the heavy highway sector is the single highest emitting sector at the state level. To the extent that these emissions, which are predominately located in attainment counties, are deemed important, additional resources can be allocated to reducing uncertainty in these estimates. Namely, future contractor surveys could be conducted to characterize different general classes of highway construction, including new construction, rehabilitation, bridgework, and other categories, for both urban and rural environments. These disaggregated profiles could then be extrapolated across the State more precisely than the Houston-based survey results used in this analysis.

In addition, due to a consistent lack of response to our survey efforts, ERG was not able to successfully develop profiles for quarry and coalmine equipment use. We therefore recommend working with cooperative equipment vendors to identify points of contacts at a representative sample of quarries, sand/aggregate pits, and coalmines across the State to develop this data. These profiles can then be combined with surrogate data from the MHSA to develop a comprehensive inventory for these sources across the State.

In addition, where default NONROAD values were used (referred to as the “Default” equipment category) the estimated emissions still provide a substantial source of uncertainty. Future studies may attempt quantification of population and activity specifically for these equipment types, especially for the relatively low population but high hp off highway tractor category.

Several other sources of uncertainty remain as well. Due to difficulties standardizing the field data collection process across the wide range of site conditions, it was difficult to validate the equipment productivity estimates provided by the cost estimator for the earthwork profiles. These estimates are central to estimating activity for the commercial and utility sectors, and could benefit from further validation in the future.

Developing the earthwork and other profiles was a data-intensive process. Certain data elements were based very limited survey responses, field observations, estimator project data, and/or defaults from the NONROAD model. The following highlights other data elements with significant remaining uncertainty:

- Activity validation for skid steer loaders. Skid steer loaders are the second largest single source of NOx emissions at the state level. The great variety of possible applications make skid steers very difficult to profile through field observation alone. However, improved estimates of in-use populations might be made through a comprehensive survey of operators across a wide range of SICs.
- Activity validation for other specialty equipment. Some other equipment types are easier profile, at least in theory. For example, a very large fraction of in use cranes appear to be provided by a handful of specialty rental companies. If a few of these companies were to agree to cooperate in a combined survey and field data collection effort, a reliable crane profile could be developed. Similarly, boring and drilling units are used by a limited number of highly specialized contractors who could provide profile information through surveys.
- Validation of NONROAD activity parameters. NONROAD defaults were used in a number of instances throughout this study, most notably for the load factors, median useful life, and scrap curves used to generate the in-use equipment population estimates from the UCC-1 dataset. However, these values are highly aggregated across large hp ranges and equipment categories, and are not necessarily representative of specific SIC/equipment type applications. For example, load factors derived from the Caterpillar Performance Manual for "typical" backhoe operating conditions are approximately a factor of two higher than the NONROAD default for this category (0.41 vs. 0.21). Similarly, using NONROAD values for load factor and median life, combined with the UCC-1 sales data, one would estimate approximately 10% of the in use fleet at greater than 20 years of age, which is unrealistic according to an industry expert. While not definitive, these findings indicate that there may be significant uncertainty associated with using NONROAD parameters to estimate in use populations and model year distributions.
- Model year distributions. Despite repeated attempts ERG was not able to develop a reliable profile of in use DCE age distributions. While information on engine make, model, and perhaps even hours of use is commonly available from site foremen and fleet managers, engine age is often unknown even to the equipment operators. One industry expert recommended requesting insurance records for a sample of DCE fleets to obtain this information. To the extent that the in use age distribution is different from that predicted by the NONROAD scrappage curve, one might find new emission standards being introduced into the fleet at a faster rate than anticipated. This in turn would accelerate the downward trend in emissions forecasts. Similarly, a survey of major equipment vendors could be used to adjust the NONROAD technology phase-in schedule to account for any early introduction of Tier 2-3 equipment.

- Average mass excavation (cut and fill) quantities, as a function of lot size for commercial projects. These estimates could be developed in the future through a statistical analysis of digitized topographical maps of the region.
- Surfacing requirements for utility projects. The amount of paving and related work required as a function of linear feet of pipeline variation could be established through detailed review of a subset of public works records.

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Appendix A –County Level Data

Heavy Highway Geographic Allocation (2004 Base Year)

County	Allocation
Anderson	0.00205
Andrews	0.00652
Angelina	0.00260
Aransas	0.00043
Archer	0.01396
Armstrong	0.00106
Atascosa	0.00895
Austin	0.00429
Bailey	0.00003
Bandera	0.00685
Bastrop	0.00272
Baylor	0.00003
Bee	0.00263
Bell	0.00634
Bexar	0.02037
Blanco	0.00140
Borden	0.00003
Bosque	0.00007
Bowie	0.00706
Brazoria	0.00673
Brazos	0.00534
Brewster	0.00264
Briscoe	0.00003
Brooks	0.00003
Brown	0.00043
Burleson	0.00232
Burnet	0.00324
Caldwell	0.00287
Calhoun	0.00701
Callahan	0.00003
Cameron	0.02389
Camp	0.00105
Carson	0.00003
Cass	0.00407
Castro	0.00003
Chambers	0.00413
Cherokee	0.00329

County	Allocation
Childress	0.00100
Clay	0.01204
Cochran	0.00003
Coke	0.01447
Coleman	0.00021
Collin	0.00640
Collingsworth	0.00482
Colorado	0.00727
Comal	0.00527
Comanche	0.00008
Concho	0.00066
Cooke	0.00342
Coryell	0.00319
Cottle	0.00003
Crane	0.00928
Crockett	0.01722
Crosby	0.00326
Culberson	0.00003
Dallam	0.00331
Dallas	0.01452
Dawson	0.00003
Deaf Smith	0.00111
Delta	0.00011
Denton	0.00593
DeWitt	0.00526
Dickens	0.00003
Dimmit	0.00055
Donley	0.00474
Duval	0.00003
Eastland	0.00990
Ector	0.00786
Edwards	0.00003
Ellis	0.00810
El Paso	0.00644
Erath	0.00591
Falls	0.00201
Fannin	0.00312
Fayette	0.01026
Fisher	0.00102
Floyd	0.00332

County	Allocation
Foard	0.00003
Fort Bend	0.01993
Franklin	0.00003
Freestone	0.00315
Frio	0.00197
Gaines	0.00003
Galveston	0.00234
Garza	0.00622
Gillespie	0.00003
Glasscock	0.01447
Goliad	0.00003
Gonzales	0.01325
Gray	0.00003
Grayson	0.00465
Gregg	0.00020
Grimes	0.00256
Guadalupe	0.00933
Hale	0.00003
Hall	0.00239
Hamilton	0.00003
Hansford	0.00003
Hardeman	0.00128
Hardin	0.01109
Harris	0.02347
Harrison	0.00275
Hartley	0.00003
Haskell	0.00323
Hays	0.00668
Hemphill	0.00456
Henderson	0.00421
Hidalgo	0.02760
Hill	0.00007
Hockley	0.00163
Hood	0.00090
Hopkins	0.00076
Houston	0.00086
Howard	0.02142
Hudspeth	0.00001
Hunt	0.00003
Hutchinson	0.00003

County	Allocation
Irion	0.00003
Jack	0.00019
Jackson	0.00580
Jasper	0.01147
Jeff Davis	0.00202
Jefferson	0.01195
Jim Hogg	0.00003
Jim Wells	0.00029
Johnson	0.00846
Jones	0.00003
Karnes	0.00061
Kaufman	0.00325
Kendall	0.00003
Kenedy	0.00003
Kent	0.00003
Kerr	0.00072
Kimble	0.00002
King	0.00008
Kinney	0.00659
Kleberg	0.00003
Knox	0.00204
Lamar	0.00088
Lamb	0.00003
Lampasas	0.00003
La Salle	0.00364
Lavaca	0.00948
Lee	0.00157
Leon	0.00534
Liberty	0.00430
Limestone	0.00205
Lipscomb	0.00003
Live Oak	0.00259
Llano	0.00500
Loving	0.00003
Lubbock	0.00183
Lynn	0.00256
Mcculloch	0.00039
Mclennan	0.00005
Mcmullen	0.00117
Madison	0.00003

County	Allocation
Marion	0.00161
Martin	0.00659
Mason	0.00003
Matagorda	0.00830
Maverick	0.00324
Medina	0.00452
Menard	0.00007
Midland	0.00144
Milam	0.00086
Mills	0.00001
Mitchell	0.00003
Montague	0.01081
Montgomery	0.01182
Moore	0.00071
Morris	0.00115
Motley	0.00188
Nacogdoches	0.00394
Navarro	0.00762
Newton	0.01065
Nolan	0.00056
Nueces	0.00431
Ochiltree	0.00414
Oldham	0.00003
Orange	0.01107
Palo Pinto	0.00343
Panola	0.00166
Parker	0.00793
Parmer	0.00038
Pecos	0.00003
Polk	0.00128
Potter	0.03037
Presidio	0.00003
Rains	0.00191
Randall	0.00166
Reagan	0.00003
Real	0.00154
Red River	0.00050
Reeves	0.00464
Refugio	0.00003
Roberts	0.00003

County	Allocation
Robertson	0.00339
Rockwall	0.00145
Runnels	0.01447
Rusk	0.00329
Sabine	0.00015
San Augustine	0.00002
San Jacinto	0.00832
San Patricio	0.00203
San Saba	0.00003
Schleicher	0.01447
Scurry	0.00025
Shackelford	0.00142
Shelby	0.00071
Sherman	0.00003
Smith	0.01566
Somervell	0.00506
Starr	0.00011
Stephens	0.00003
Sterling	0.01447
Stonewall	0.00019
Sutton	0.00003
Swisher	0.00003
Tarrant	0.01013
Taylor	0.00141
Terrell	0.00003
Terry	0.00003
Throckmorton	0.00148
Titus	0.00003
Tom Green	0.01953
Travis	0.01311
Trinity	0.00004
Tyler	0.00002
Upshur	0.00003
Upton	0.00362
Uvalde	0.00287
Val Verde	0.00088
Van Zandt	0.00154
Victoria	0.00572
Walker	0.00124
Waller	0.00728

County	Allocation
Ward	0.00275
Washington	0.00165
Webb	0.00828
Wharton	0.01095
Wheeler	0.00003
Wichita	0.01721
Wilbarger	0.00145
Willacy	0.00003
Williamson	0.00548
Wilson	0.00381
Winkler	0.00003
Wise	0.00468
Wood	0.00012
Yoakum	0.00003
Young	0.00241
Zapata	0.00003
Zavala	0.01302

Heavy Highway County Level Growth Factors

	Historical			MHC Growth Factors					Extrapolated			
County	**1999**	**2002**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Anderson	0.670	0.792	1.000	0.829	1.158	1.242	1.371	1.507	1.642	1.778	1.913	2.048
Andrews	0.667	0.687	1.000	1.949	5.990	8.932	11.716	14.323	16.929	19.535	22.142	24.748
Angelina	2.204	1.820	1.000	0.385	0.636	0.948	1.244	1.520	1.797	2.074	2.350	2.627
Aransas	0.592	1.196	1.000	1.181	2.884	4.040	5.162	6.219	7.276	8.334	9.391	10.448
Archer	1.577	0.491	1.000	54.330	5.381	8.023	10.524	12.865	15.206	17.547	19.888	22.230
Armstrong	1.403	9.692	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Atascosa	1.436	1.534	1.000	0.063	0.053	0.079	0.103	0.126	0.149	0.172	0.195	0.218
Austin	0.828	0.284	1.000	0.047	0.146	0.217	0.285	0.348	0.411	0.475	0.538	0.602
Bailey	0.455	0.324	1.000	0.054	0.165	0.247	0.324	0.396	0.468	0.540	0.612	0.684
Bandera	2.209	1.495	1.000	0.014	0.042	0.062	0.081	0.099	0.117	0.135	0.154	0.172
Bastrop	0.454	0.796	1.000	1.629	1.152	1.253	1.396	1.544	1.692	1.840	1.988	2.135
Baylor	7.602	2.133	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bee	0.778	1.096	1.000	1.095	0.265	0.298	0.391	0.478	0.565	0.652	0.738	0.825
Bell	0.516	0.492	1.000	8.607	6.221	6.501	7.053	7.650	8.248	8.845	9.442	10.040
Bexar	0.582	1.070	1.000	0.642	0.783	0.874	0.990	1.108	1.225	1.343	1.460	1.578
Blanco	4.723	9.385	1.000	0.071	0.217	0.324	0.424	0.519	0.613	0.708	0.802	0.897
Borden	0.740	2.292	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bosque	0.539	0.380	1.000	0.078	0.241	0.360	0.472	0.577	0.681	0.786	0.891	0.996
Bowie	1.249	1.942	1.000	0.376	0.789	1.121	1.440	1.741	2.042	2.343	2.644	2.945
Brazoria	1.083	0.953	1.000	0.342	0.495	0.599	0.712	0.822	0.932	1.042	1.151	1.261
Brazos	0.597	0.652	1.000	0.339	0.588	0.735	0.889	1.037	1.185	1.334	1.482	1.630
Brewster	0.412	0.631	1.000	0.104	0.319	0.475	0.623	0.762	0.901	1.039	1.178	1.317
Briscoe	4.005	1.202	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Brooks	1.426	0.509	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Brown	1.342	1.429	1.000	0.420	0.748	1.093	1.422	1.730	2.039	2.347	2.656	2.964
Burleson	1.387	1.403	1.000	7.308	5.864	8.743	11.469	14.020	16.571	19.122	21.674	24.225
Burnet	1.627	4.226	1.000	1.245	0.143	0.214	0.281	0.343	0.405	0.468	0.530	0.593

	Historical			MHC Growth Factors					Extrapolated			
County	**1999**	**2002**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Caldwell	1.847	0.987	1.000	0.041	0.126	24.343	24.459	2.521	0.000	0.000	0.000	0.000
Calhoun	2.263	0.383	1.000	0.039	0.121	0.181	0.237	0.290	0.343	0.396	0.448	0.501
Callahan	1.132	1.848	1.000	29.855	46.145	52.915	60.968	68.969	76.970	84.971	92.972	100.972
Cameron	0.356	0.666	1.000	3.933	2.798	2.655	2.676	2.740	2.804	2.868	2.932	2.996
Camp	0.771	0.534	1.000	0.950	1.078	0.966	0.926	0.907	0.888	0.870	0.851	0.832
Carson	0.949	3.370	1.000	30.276	37.157	35.931	36.786	38.154	39.521	40.889	42.256	43.624
Cass	1.729	1.957	1.000	0.126	0.132	0.197	0.258	0.316	0.373	0.431	0.488	0.546
Castro	0.328	0.258	1.000	45.031	9.961	14.852	19.482	23.816	28.150	32.484	36.818	41.152
Chambers	0.435	0.123	1.000	2.182	2.396	2.187	2.133	2.123	2.113	2.102	2.092	2.081
Cherokee	0.829	0.639	1.000	0.443	1.361	2.030	2.662	3.255	3.847	4.439	5.031	5.624
Childress	0.801	1.047	1.000	0.503	0.225	0.336	0.441	0.539	0.637	0.735	0.833	0.931
Clay	0.912	1.573	1.000	2.196	2.196	3.275	4.296	5.251	6.207	7.162	8.118	9.074
Cochran	26.557	18.166	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Coke	1.679	2.650	1.000	0.644	1.981	2.953	3.874	4.736	5.597	6.459	7.321	8.183
Coleman	0.602	0.428	1.000	0.731	2.247	3.350	4.394	5.372	6.350	7.327	8.305	9.282
Collin	1.144	1.027	1.000	2.038	1.549	1.543	1.616	1.707	1.799	1.890	1.981	2.072
Collingsworth	1.133	0.909	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Colorado	2.613	1.307	1.000	0.035	0.107	0.159	0.209	0.255	0.302	0.348	0.395	0.441
Comal	0.850	0.877	1.000	0.516	0.642	0.648	0.685	0.730	0.774	0.818	0.862	0.906
Comanche	1.849	1.064	1.000	0.657	2.018	3.009	3.947	4.825	5.703	6.581	7.459	8.336
Concho	1.144	2.306	1.000	0.780	1.164	1.306	1.485	1.665	1.844	2.024	2.204	2.384
Cooke	2.109	1.786	1.000	0.915	0.422	0.630	0.826	1.010	1.193	1.377	1.561	1.744
Coryell	1.632	1.378	1.000	0.359	0.450	0.445	0.463	0.486	0.510	0.533	0.556	0.580
Cottle	0.071	0.493	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Crane	1.553	0.975	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Crockett	1.602	3.405	1.000	0.015	0.045	0.067	0.088	0.108	0.127	0.147	0.166	0.186
Crosby	1.089	0.656	1.000	0.002	0.007	0.011	0.014	0.017	0.021	0.024	0.027	0.030
Culberson	0.402	0.477	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Dallam	1.377	0.961	1.000	0.003	0.008	0.012	0.016	0.019	0.023	0.027	0.030	0.034

	Historical			MHC Growth Factors					Extrapolated			
County	**1999**	**2002**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Dallas	0.778	0.940	1.000	1.507	1.727	1.986	2.292	2.596	2.900	3.203	3.507	3.811
Dawson	3.705	11.795	1.000	8.159	15.825	23.594	30.951	37.836	44.721	51.606	58.492	65.377
Deaf Smith	0.305	2.485	1.000	0.189	0.457	0.638	0.814	0.980	1.146	1.312	1.478	1.644
Delta	6.969	3.327	1.000	16.297	1.588	2.367	3.106	3.797	4.487	5.178	5.869	6.560
Denton	0.451	0.451	1.000	2.584	2.967	3.140	3.437	3.752	4.068	4.383	4.698	5.014
De Witt	1.300	1.425	1.000	80.254	71.758	64.902	62.769	61.998	61.227	60.456	59.685	58.914
Dickens	1.484	0.984	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Dimmit	1.131	2.492	1.000	0.051	0.112	0.152	0.191	0.228	0.264	0.301	0.338	0.375
Donley	0.901	1.893	1.000	0.901	1.129	1.112	1.154	1.211	1.268	1.325	1.381	1.438
Duval	0.921	1.234	1.000	0.721	2.215	3.303	4.333	5.296	6.260	7.224	8.188	9.152
Eastland	1.604	0.771	1.000	0.537	0.077	0.114	0.150	0.183	0.217	0.250	0.284	0.317
Ector	0.835	0.971	1.000	1.159	0.703	1.021	1.325	1.610	1.895	2.181	2.466	2.751
Edwards	2.666	1.459	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Ellis	0.316	0.322	1.000	1.066	1.287	1.269	1.319	1.384	1.450	1.515	1.581	1.646
El Paso	0.933	0.780	1.000	0.255	0.374	0.506	0.636	0.759	0.882	1.005	1.129	1.252
Erath	1.609	0.438	1.000	0.072	0.157	0.234	0.307	0.375	0.444	0.512	0.580	0.648
Falls	0.259	1.334	1.000	0.068	0.209	0.312	0.409	0.500	0.591	0.682	0.772	0.863
Fannin	2.408	1.896	1.000	1.180	3.626	5.406	7.091	8.668	10.246	11.823	13.401	14.978
Fayette	1.126	1.807	1.000	0.071	0.016	0.024	0.031	0.038	0.045	0.052	0.059	0.066
Fisher	1.182	0.519	1.000	31.383	4.373	6.520	8.552	10.455	12.357	14.260	16.162	18.065
Floyd	3.160	2.420	1.000	0.093	0.287	0.427	0.561	0.685	0.810	0.935	1.060	1.184
Foard	2.062	0.308	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Fort Bend	0.626	1.141	1.000	0.376	0.472	0.476	0.503	0.535	0.567	0.598	0.630	0.662
Franklin	0.651	0.716	1.000	1.024	3.147	4.692	6.155	7.524	8.894	10.263	11.632	13.001
Freestone	1.186	0.849	1.000	0.183	0.561	0.837	1.098	1.342	1.587	1.831	2.075	2.319
Frio	3.774	1.619	1.000	0.374	0.538	0.589	0.659	0.730	0.802	0.874	0.946	1.018
Gaines	2.301	1.264	1.000	1.487	4.572	6.817	8.942	10.931	12.920	14.909	16.899	18.888
Galveston	0.666	0.406	1.000	0.426	0.455	0.537	0.630	0.720	0.811	0.902	0.993	1.083
Garza	0.354	0.171	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

	Historical			MHC Growth Factors					Extrapolated			
County	**1999**	**2002**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Gillespie	1.710	3.419	1.000	0.134	0.413	0.616	0.808	0.988	1.168	1.348	1.528	1.707
Glasscock	0.183	0.169	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Goliad	1.792	1.989	1.000	0.751	2.308	3.442	4.515	5.519	6.523	7.528	8.532	9.536
Gonzales	0.568	1.386	1.000	0.018	0.055	0.082	0.108	0.131	0.155	0.179	0.203	0.227
Gray	2.657	6.427	1.000	0.759	0.240	0.358	0.469	0.574	0.678	0.783	0.887	0.992
Grayson	0.921	0.805	1.000	0.994	1.331	1.505	1.720	1.935	2.149	2.364	2.579	2.794
Gregg	0.691	1.477	1.000	0.554	1.702	2.537	3.329	4.069	4.810	5.550	6.290	7.031
Grimes	0.695	0.310	1.000	0.186	0.573	0.854	1.120	1.370	1.619	1.868	2.117	2.366
Guadalupe	0.810	1.014	1.000	0.379	0.420	0.449	0.496	0.544	0.593	0.641	0.690	0.739
Hale	3.106	8.578	1.000	9.508	3.405	5.076	6.659	8.140	9.622	11.103	12.585	14.066
Hall	3.472	4.880	1.000	0.030	0.093	0.139	0.182	0.222	0.263	0.303	0.344	0.384
Hamilton	3.740	2.508	1.000	3.103	9.538	14.222	18.656	22.806	26.956	31.106	35.256	39.406
Hansford	2.806	4.680	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hardeman	0.387	1.736	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hardin	0.379	0.510	1.000	0.309	0.447	0.491	0.551	0.612	0.673	0.734	0.795	0.856
Harris	0.567	0.564	1.000	2.384	2.177	2.208	2.345	2.503	2.662	2.820	2.979	3.137
Harrison	1.379	1.991	1.000	0.236	0.669	0.997	1.308	1.599	1.890	2.180	2.471	2.762
Hartley	8.877	3.355	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Haskell	1.403	1.449	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Hays	0.350	1.262	1.000	0.223	0.476	0.668	0.855	1.031	1.206	1.382	1.558	1.734
Hemphill	0.627	0.127	1.000	0.044	0.136	0.203	0.267	0.326	0.386	0.445	0.504	0.564
Henderson	1.161	0.589	1.000	1.524	2.019	2.258	2.562	2.869	3.175	3.482	3.788	4.095
Hidalgo	0.607	1.148	1.000	1.031	1.305	1.313	1.385	1.472	1.558	1.645	1.732	1.818
Hill	0.946	0.479	1.000	1.251	3.845	5.732	7.519	9.192	10.865	12.538	14.210	15.883
Hockley	9.452	2.630	1.000	0.056	0.079	0.085	0.094	0.103	0.112	0.122	0.131	0.140
Hood	1.939	5.325	1.000	11.830	15.698	18.069	20.867	23.641	26.415	29.189	31.963	34.737
Hopkins	2.353	2.026	1.000	0.109	0.336	0.501	0.658	0.804	0.950	1.096	1.243	1.389
Houston	1.163	2.231	1.000	0.191	0.069	0.103	0.135	0.165	0.195	0.225	0.255	0.285
Howard	1.927	4.092	1.000	0.067	0.206	0.307	0.402	0.492	0.581	0.671	0.760	0.850

	Historical			MHC Growth Factors					Extrapolated			
County	**1999**	**2002**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Hudspeth	0.213	2.611	1.000	3.633	10.492	15.409	20.089	24.476	28.862	33.249	37.636	42.023
Hunt	2.718	2.091	1.000	4.842	3.174	4.689	6.128	7.475	8.823	10.171	11.519	12.867
Hutchinson	0.572	0.234	1.000	0.924	2.839	4.233	5.552	6.787	8.023	9.258	10.493	11.728
Irion	0.842	0.453	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Jack	1.276	4.104	1.000	0.495	1.521	2.268	2.976	3.637	4.299	4.961	5.623	6.285
Jackson	1.400	1.339	1.000	0.274	0.177	0.208	0.244	0.278	0.313	0.348	0.383	0.418
Jasper	0.642	0.754	1.000	0.967	1.167	1.166	1.225	1.296	1.368	1.439	1.511	1.582
Jeff Davis	28.435	59.979	1.000	0.013	0.041	0.060	0.079	0.097	0.115	0.132	0.150	0.167
Jefferson	1.016	0.880	1.000	3.451	2.054	3.053	4.000	4.887	5.774	6.660	7.547	8.433
Jim Hogg	2.713	10.401	1.000	9.983	30.684	45.748	60.012	73.362	86.712	100.062	113.412	126.762
Jim Wells	3.503	0.966	1.000	0.371	0.361	0.536	0.702	0.857	1.012	1.168	1.323	1.478
Johnson	1.041	1.823	1.000	0.168	0.516	0.769	1.008	1.233	1.457	1.681	1.906	2.130
Jones	0.704	1.463	1.000	0.142	0.436	0.650	0.853	1.043	1.233	1.422	1.612	1.802
Karnes	0.560	0.525	1.000	0.062	0.191	0.285	0.373	0.456	0.539	0.622	0.705	0.788
Kaufman	0.525	0.773	1.000	1.028	0.988	1.158	1.351	1.542	1.732	1.922	2.112	2.303
Kendall	7.334	2.628	1.000	0.974	1.756	2.186	2.638	3.074	3.510	3.946	4.381	4.817
Kenedy	3.679	1.261	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Kent	1.955	0.137	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Kerr	0.528	0.342	1.000	0.401	0.541	0.565	0.614	0.666	0.718	0.770	0.822	0.874
Kimble	0.243	0.112	1.000	0.135	0.415	0.618	0.811	0.991	1.172	1.352	1.532	1.713
King	1.474	0.743	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Kinney	2.648	1.962	1.000	39.574	1.551	2.312	3.033	3.707	4.382	5.057	5.731	6.406
Kleberg	0.311	0.057	1.000	0.466	0.652	0.701	0.776	0.854	0.931	1.009	1.087	1.164
Knox	1.123	3.141	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lamar	2.634	1.312	1.000	0.173	0.475	0.709	0.929	1.136	1.343	1.550	1.756	1.963
Lamb	29.158	73.398	1.000	6.287	19.324	28.812	37.796	46.203	54.611	63.019	71.427	79.835
Lampasas	1.740	0.778	1.000	3.710	5.524	6.189	7.031	7.878	8.725	9.572	10.420	11.267
La Salle	0.582	3.202	1.000	0.186	0.572	0.853	1.120	1.369	1.618	1.867	2.116	2.365
Lavaca	0.480	0.370	1.000	0.093	0.047	0.060	0.073	0.086	0.098	0.111	0.124	0.136

	Historical			MHC Growth Factors					Extrapolated			
County	**1999**	**2002**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Lee	2.207	3.187	1.000	0.201	0.618	0.922	1.209	1.478	1.747	2.016	2.285	2.555
Leon	0.992	0.892	1.000	0.034	0.105	0.156	0.205	0.250	0.296	0.341	0.387	0.432
Liberty	1.539	0.591	1.000	0.136	0.418	0.623	0.818	1.000	1.182	1.363	1.545	1.727
Limestone	1.682	0.642	1.000	0.052	0.160	0.238	0.312	0.382	0.451	0.521	0.591	0.660
Lipscomb	3.227	2.745	1.000	0.829	2.548	3.800	4.984	6.093	7.202	8.311	9.419	10.528
Live Oak	0.275	1.337	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Llano	0.511	0.654	1.000	5.884	6.720	6.061	5.847	5.762	5.677	5.592	5.507	5.421
Loving	0.157	0.017	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lubbock	0.843	1.627	1.000	1.650	0.961	0.911	0.917	0.937	0.958	0.979	1.000	1.021
Lynn	0.498	2.561	1.000	0.092	0.003	0.005	0.007	0.008	0.010	0.011	0.012	0.014
Madison	1.294	0.656	1.000	0.689	2.116	3.155	4.139	5.060	5.981	6.901	7.822	8.743
Marion	1.123	1.225	1.000	4.758	14.624	21.804	28.602	34.965	41.328	47.691	54.054	60.416
Martin	0.644	0.321	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mason	7.003	1.840	1.000	8.988	1.007	1.502	1.970	2.408	2.846	3.284	3.722	4.161
Matagorda	2.014	1.761	1.000	0.172	0.528	0.786	1.032	1.261	1.491	1.720	1.950	2.179
Maverick	2.252	4.149	1.000	3.046	9.361	13.957	18.309	22.382	26.455	30.528	34.601	38.673
McCulloch	2.040	4.484	1.000	0.007	0.020	0.030	0.039	0.048	0.057	0.066	0.074	0.083
McLennan	0.270	0.503	1.000	0.645	0.605	0.580	0.590	0.608	0.627	0.645	0.663	0.682
McMullen	4.059	2.015	1.000	0.045	0.140	0.208	0.273	0.334	0.394	0.455	0.516	0.576
Medina	1.552	0.603	1.000	0.177	0.434	0.647	0.849	1.038	1.227	1.416	1.605	1.794
Menard	2.765	6.186	1.000	1.775	5.456	8.135	10.671	13.045	15.419	17.793	20.167	22.541
Midland	1.156	0.948	1.000	0.702	0.823	1.154	1.474	1.776	2.078	2.381	2.683	2.985
Milam	2.535	4.585	1.000	0.171	0.150	0.203	0.256	0.306	0.355	0.405	0.455	0.505
Mills	1.447	0.457	1.000	0.598	1.837	2.739	3.594	4.393	5.192	5.992	6.791	7.591
Mitchell	1.421	0.219	1.000	0.273	0.368	0.384	0.417	0.452	0.488	0.523	0.558	0.593
Montague	1.887	1.671	1.000	0.210	0.297	0.321	0.357	0.394	0.431	0.468	0.506	0.543
Montgomery	1.231	1.480	1.000	0.716	0.753	1.058	1.354	1.632	1.911	2.190	2.468	2.747
Moore	0.557	0.114	1.000	0.273	0.838	1.249	1.638	2.003	2.367	2.732	3.096	3.461
Morris	0.823	0.721	1.000	75.113	6.588	9.822	12.885	15.751	18.618	21.484	24.350	27.217

	Historical			MHC Growth Factors					Extrapolated			
County	**1999**	**2002**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Motley	3.102	0.653	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Nacogdoches	1.176	1.246	1.000	0.219	0.618	0.902	1.173	1.427	1.681	1.935	2.190	2.444
Navarro	0.411	0.630	1.000	0.637	0.848	0.877	0.945	1.019	1.094	1.169	1.243	1.318
Newton	0.330	0.227	1.000	0.769	1.786	2.662	3.492	4.269	5.046	5.823	6.600	7.377
Nolan	1.932	1.239	1.000	0.201	0.617	0.920	1.207	1.476	1.744	2.013	2.281	2.550
Nueces	0.343	0.876	1.000	1.036	1.067	1.238	1.436	1.632	1.828	2.024	2.219	2.415
Ochiltree	0.412	1.597	1.000	5.832	17.926	26.728	35.061	42.861	50.660	58.460	66.260	74.059
Oldham	0.501	1.105	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Orange	0.258	0.687	1.000	4.837	5.376	4.944	4.853	4.858	4.862	4.866	4.871	4.875
Palo Pinto	0.234	0.314	1.000	0.057	0.175	0.261	0.342	0.419	0.495	0.571	0.647	0.723
Panola	0.604	1.700	1.000	1.703	1.045	1.558	2.043	2.498	2.952	3.407	3.861	4.316
Parker	1.393	0.983	1.000	0.686	0.162	0.241	0.317	0.387	0.457	0.528	0.598	0.669
Parmer	0.319	0.300	1.000	0.034	0.103	0.154	0.202	0.247	0.291	0.336	0.381	0.426
Pecos	1.506	0.943	1.000	16.746	4.849	7.229	9.483	11.593	13.702	15.812	17.922	20.031
Polk	1.705	0.914	1.000	0.558	0.949	1.415	1.857	2.270	2.683	3.096	3.509	3.922
Potter	1.154	1.513	1.000	0.527	0.728	0.999	1.264	1.514	1.765	2.015	2.266	2.516
Presidio	1.302	2.206	1.000	3.520	2.489	3.711	4.868	5.951	7.034	8.116	9.199	10.282
Rains	5.060	2.610	1.000	0.046	0.142	0.212	0.278	0.339	0.401	0.463	0.525	0.587
Randall	1.045	1.785	1.000	2.856	3.770	3.877	4.158	4.472	4.786	5.101	5.415	5.729
Reagan	0.153	0.283	1.000	1.629	5.007	7.466	9.794	11.973	14.151	16.330	18.509	20.687
Real	1.717	0.071	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Red River	0.819	0.446	1.000	0.397	0.348	0.519	0.681	0.833	0.985	1.136	1.288	1.439
Reeves	1.042	0.284	1.000	0.054	0.166	0.247	0.324	0.396	0.468	0.541	0.613	0.685
Refugio	1.741	2.306	1.000	5.731	17.614	26.262	34.450	42.113	49.777	57.440	65.104	72.767
Roberts	4.763	6.158	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Robertson	1.676	1.607	1.000	0.005	0.016	0.024	0.032	0.039	0.046	0.053	0.060	0.068
Rockwall	1.233	6.563	1.000	0.426	0.530	0.725	0.916	1.097	1.277	1.458	1.639	1.820
Runnels	1.747	1.440	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Rusk	0.936	2.834	1.000	2.659	8.174	12.188	15.988	19.544	23.101	26.657	30.214	33.770

	Historical			MHC Growth Factors					Extrapolated			
County	**1999**	**2002**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Sabine	1.301	1.438	1.000	11.713	23.611	30.889	38.227	45.220	52.213	59.206	66.200	73.193
San Augustine	3.195	3.022	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
San Jacinto	0.587	0.809	1.000	0.210	0.646	0.963	1.263	1.544	1.825	2.106	2.387	2.668
San Patricio	0.757	0.265	1.000	1.122	1.368	1.541	1.756	1.973	2.189	2.405	2.621	2.837
San Saba	1.012	4.911	1.000	1.632	5.015	7.477	9.808	11.990	14.172	16.354	18.536	20.718
Schleicher	0.734	1.606	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Scurry	0.246	0.658	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Shackelford	0.754	3.414	1.000	2.216	6.813	10.157	13.324	16.288	19.252	22.216	25.180	28.144
Shelby	0.846	1.843	1.000	0.167	0.513	0.765	1.003	1.227	1.450	1.673	1.896	2.120
Sherman	3.730	11.295	1.000	0.927	2.848	4.247	5.570	6.810	8.049	9.288	10.527	11.766
Smith	0.771	0.430	1.000	0.870	1.133	1.269	1.441	1.614	1.787	1.960	2.133	2.307
Somervell	1.952	7.051	1.000	0.044	0.134	0.200	0.262	0.320	0.378	0.437	0.495	0.553
Starr	0.995	0.468	1.000	3.569	7.870	11.734	15.392	18.816	22.240	25.664	29.088	32.512
Stephens	1.230	0.704	1.000	0.877	2.695	4.019	5.272	6.445	7.617	8.790	9.963	11.136
Sterling	0.509	1.287	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Stonewall	1.964	4.043	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Sutton	1.439	1.589	1.000	0.042	0.130	0.194	0.254	0.310	0.367	0.423	0.480	0.536
Swisher	2.841	2.273	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Tarrant	1.331	1.249	1.000	0.507	0.826	1.109	1.390	1.656	1.923	2.189	2.455	2.721
Taylor	1.041	0.920	1.000	1.471	0.751	1.120	1.469	1.795	2.122	2.449	2.775	3.102
Terrell	17.031	5.613	1.000	32.990	5.613	5.613	5.613	5.613	5.613	5.613	5.613	5.613
Terry	1.541	2.600	1.000	1.134	3.485	5.196	6.816	8.332	9.848	11.364	12.880	14.397
Throckmorton	1.567	1.262	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Titus	1.588	1.333	1.000	0.409	1.209	1.785	2.333	2.845	3.358	3.871	4.384	4.897
Tom Green	0.603	1.420	1.000	1.129	1.386	2.010	2.607	3.167	3.727	4.287	4.848	5.408
Travis	0.299	0.355	1.000	0.820	1.037	1.116	1.235	1.359	1.483	1.608	1.732	1.856
Trinity	0.429	1.372	1.000	16.957	24.639	27.165	30.548	33.994	37.439	40.884	44.329	47.774
Tyler	1.482	0.586	1.000	7.837	2.911	4.340	5.694	6.960	8.227	9.493	10.760	12.026
Upshur	1.142	2.781	1.000	9.976	13.144	19.598	25.708	31.427	37.146	42.865	48.584	54.302

	Historical			MHC Growth Factors					Extrapolated			
County	**1999**	**2002**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Upton	0.475	0.073	1.000	1.044	3.209	4.785	6.277	7.673	9.069	10.466	11.862	13.258
Uvalde	2.025	2.181	1.000	2.259	0.927	1.184	1.448	1.700	1.953	2.205	2.458	2.711
Val Verde	0.545	0.768	1.000	0.546	0.428	0.451	0.493	0.537	0.581	0.626	0.670	0.714
Van Zandt	2.808	1.877	1.000	0.090	0.277	0.413	0.541	0.661	0.782	0.902	1.023	1.143
Victoria	0.505	1.064	1.000	5.252	4.125	4.823	5.622	6.408	7.195	7.981	8.767	9.553
Walker	1.741	1.762	1.000	1.203	1.547	1.301	1.635	1.999	2.363	2.727	3.090	3.454
Waller	0.637	1.114	1.000	1.043	0.442	0.660	0.865	1.058	1.250	1.443	1.636	1.828
Ward	0.241	0.632	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Washington	3.194	3.532	1.000	0.027	0.082	0.122	0.160	0.195	0.231	0.266	0.302	0.337
Webb	1.349	1.188	1.000	1.104	1.527	1.688	1.901	2.118	2.334	2.551	2.768	2.984
Wharton	0.849	0.839	1.000	0.131	0.089	0.132	0.173	0.212	0.251	0.289	0.328	0.366
Wheeler	7.686	11.105	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Wichita	1.098	1.335	1.000	0.728	0.557	0.598	0.661	0.727	0.793	0.859	0.925	0.991
Wilbarger	0.664	1.169	1.000	1.426	1.826	1.833	1.931	2.049	2.167	2.285	2.403	2.521
Willacy	0.304	1.973	1.000	2.131	4.071	5.206	6.371	7.486	8.601	9.717	10.832	11.947
Williamson	0.097	0.313	1.000	2.057	2.415	2.319	2.361	2.437	2.514	2.590	2.667	2.743
Wilson	0.641	2.541	1.000	0.251	0.504	0.659	0.815	0.964	1.113	1.261	1.410	1.559
Winkler	0.523	0.696	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Wise	0.615	0.537	1.000	0.071	0.104	0.115	0.130	0.145	0.159	0.174	0.189	0.204
Wood	0.986	0.602	1.000	0.653	1.112	1.347	1.601	1.848	2.095	2.341	2.588	2.835
Yoakum	33.755	10.997	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Young	1.534	0.775	1.000	23.421	18.311	20.495	23.268	26.061	28.854	31.647	34.440	37.233
Zapata	0.446	0.289	1.000	0.118	0.363	0.541	0.710	0.868	1.026	1.184	1.342	1.500
Zavala	0.467	0.479	1.000	0.038	0.117	0.175	0.229	0.280	0.331	0.382	0.433	0.484

City and County Road Geographic Allocation ($2004 Project Value Basis)

County	Value	Fraction
Angelina	$50,000	0.0001
Bastrop	$975,000	0.0022
Bell	$350,000	0.0008
Bexar	$35,540,559	0.0805
Bowie	$723,490	0.0016
Brazoria	$2,378,154	0.0054
Brazos	$7,087,390	0.0161
Calhoun	$1,101,241	0.0025
Cameron	$9,767,264	0.0221
Collin	$22,152,270	0.0502
Dallas	$135,544,195	0.3071
Denton	$9,445,693	0.0214
Dimmit	$168,873	0.0004
Ector	$1,002,700	0.0023
El Paso	$3,435,274	0.0078
Ellis	$1,120,000	0.0025
Fort Bend	$610,500	0.0014
Franklin	$250,000	0.0006
Galveston	$1,144,000	0.0026
Grayson	$284,413	0.0006
Gregg	$1,353,977	0.0031
Guadalupe	$604,858	0.0014
Harris	$63,929,605	0.1449
Hays	$9,761,675	0.0221
Hidalgo	$3,329,158	0.0075
Hood	$150,000	0.0003
Hunt	$590,000	0.0013
Jefferson	$184,000	0.0004
Jim Wells	$2,050,000	0.0046
Karnes	$356,000	0.0008
Kerr	$2,115,933	0.0048
Lamar	$150,000	0.0003
Lampasas	$50,000	0.0001
Lubbock	$62,000	0.0001
McLennan	$2,727,915	0.0062
Medina	$80,000	0.0002
Midland	$52,000	0.0001
Montgomery	$305,784	0.0007
Moore	$190,000	0.0004
Nacogdoches	$253,000	0.0006
Nueces	$36,780,000	0.0833
Ochiltree	$60,000	0.0001
Rains	$168,196	0.0004
Red River	$200,000	0.0005

County	Value	Fraction
Rockwall	$3,302,191	0.0075
Rusk	$1,487,131	0.0034
San Patricio	$60,000	0.0001
Smith	$53,000	0.0001
Tarrant	$47,448,595	0.1075
Taylor	$131,613	0.0003
Travis	$14,713,424	0.0333
Val Verde	$3,000,000	0.0068
Van Zandt	$1,115,855	0.0025
Victoria	$500,000	0.0011
Ward	$150,000	0.0003
Webb	$980,986	0.0022
Wichita	$785,005	0.0018
Wilbarger	$408,717	0.0009
Willacy	$285,000	0.0006
Williamson	$8,015,080	0.0182
Wilson	$150,000	0.0003
Wood	$80,000	0.0002
Total	$441,301,714	

Commercial Sector County Level Surrogates (2004 Base Year MHC Project Detail)

County	# Projects	Footprint (000 SF)	Total (000 SF)	$1,000s	Average # Stories
Anderson	3	47	63	$5,941	1.34
Andrews	1	17	17	$2,294	1.00
Angelina	17	317	317	$23,198	1.00
Aransas	3	167	167	$6,134	1.00
Archer	1	4	4	$400	1.00
Armstrong	0	0	0	$0	0.00
Atascosa	2	10	10	$2,027	1.00
Austin	14	1,231	1,231	$68,500	1.00
Bailey	1	1	1	$1	1.00
Bandera	1	1	1	$1	1.00
Bastrop	13	229	733	$108,536	3.20
Baylor	0	0	0	$0	0.00
Bee	2	58	63	$4,068	1.08
Bell	41	1,424	1,953	$161,453	1.37
Bexar	321	9,945	15,773	$1,366,632	1.59
Blanco	1	77	77	$6,468	1.00
Borden	0	0	0	$0	0.00
Bosque	1	6	6	$271	1.00
Bowie	35	741	774	$55,932	1.04
Brazoria	75	1,861	2,534	$203,791	1.36
Brazos	31	627	1,282	$98,343	2.04
Brewster	0	45	45	$3,000	1.00
Briscoe	0	0	0	$0	0.00
Brooks	0	0	0	$0	0.00
Brown	5	148	191	$11,606	1.29
Burleson	0	1	1	$162	1.00
Burnet	4	121	121	$8,440	1.00
Caldwell	1	69	69	$7,052	1.00

County	# Projects	Footprint (000 SF)	Total (000 SF)	$1,000s	Average # Stories
Calhoun	4	250	250	$15,059	1.00
Callahan	1	1	1	$1	1.00
Cameron	134	1,780	2,252	$161,242	1.27
Camp	1	15	15	$1,100	1.00
Carson	1	1	1	$1	1.00
Cass	3	34	34	$2,680	1.00
Castro	1	1	1	$1	1.00
Chambers	1	12	12	$600	1.00
Cherokee	7	92	102	$9,976	1.11
Childress	1	1	1	$1	1.00
Clay	1	3	3	$217	1.00
Cochran	0	0	0	$0	0.00
Coke	1	19	19	$1,850	1.00
Coleman	1	6	6	$471	1.00
Collin	222	5,196	7,058	$658,912	1.36
Collingsworth	0	0	0	$0	0.00
Colorado	4	124	124	$14,673	1.00
Comal	22	589	957	$75,156	1.62
Comanche	1	86	86	$12,162	1.00
Concho	1	1	1	$1	1.00
Cooke	2	97	97	$10,200	1.00
Coryell	2	155	155	$6,500	1.00
Cottle	0	0	0	$0	0.00
Crane	0	0	0	$0	0.00
Crockett	1	11	11	$1,133	1.00
Crosby	1	1	1	$1	1.00
Culberson	0	0	0	$0	0.00
Dallam	0	10	10	$1,250	1.00
Dallas	557	12,996	21,311	$1,668,572	1.64
Dawson	1	1	1	$1	1.00

County	# Projects	Footprint (000 SF)	Total (000 SF)	$1,000s	Average # Stories
Deaf Smith	4	165	165	$7,131	1.00
Delta	1	1	1	$1	1.00
Denton	128	3,672	4,931	$363,334	1.34
DeWitt	0	0	0	$0	0.00
Dickens	0	0	0	$0	0.00
Dimmit	1	1	1	$1	1.00
Donley	0	0	0	$0	0.00
Duval	1	4	4	$400	1.00
Eastland	2	38	38	$1,700	1.00
Ector	15	233	233	$28,503	1.00
Edwards	0	0	0	$0	0.00
Ellis	39	601	751	$58,400	1.25
El Paso	182	2,757	3,452	$229,302	1.25
Erath	1	15	15	$1,250	1.00
Falls	0	0	0	$0	0.00
Fannin	1	24	24	$1,320	1.00
Fayette	2	88	135	$30,536	1.53
Fisher	1	11	11	$750	1.00
Floyd	1	1	1	$1	1.00
Foard	0	0	0	$0	0.00
Fort Bend	110	2,570	3,535	$278,803	1.38
Franklin	1	1	1	$1	1.00
Freestone	1	1	1	$1	1.00
Frio	1	1	1	$1	1.00
Gaines	0	0	0	$0	0.00
Galveston	66	1,450	2,122	$178,658	1.46
Garza	0	0	0	$0	0.00
Gillespie	6	174	182	$11,761	1.05
Glasscock	0	0	0	$0	0.00
Goliad	1	1	1	$1	1.00

County	# Projects	Footprint (000 SF)	Total (000 SF)	$1,000s	Average # Stories
Gonzales	2	24	24	$1,430	1.00
Gray	2	158	158	$6,750	1.00
Grayson	14	360	371	$26,528	1.03
Gregg	26	336	470	$30,783	1.40
Grimes	1	20	20	$1,220	1.00
Guadalupe	23	1,059	1,156	$80,639	1.09
Hale	2	8	8	$1,000	1.00
Hall	0	0	0	$0	0.00
Hamilton	2	35	35	$3,000	1.00
Hansford	0	0	0	$0	0.00
Hardeman	0	0	0	$0	0.00
Hardin	1	4	4	$300	1.00
Harris	1,141	22,781	34,304	$2,456,063	1.51
Harrison	4	99	99	$8,620	1.00
Hartley	0	0	0	$0	0.00
Haskell	0	0	0	$0	0.00
Hays	21	730	1,045	$110,463	1.43
Hemphill	1	1	1	$1	1.00
Henderson	8	70	70	$6,884	1.00
Hidalgo	295	3,344	3,909	$239,690	1.17
Hill	1	12	12	$1,200	1.00
Hockley	3	22	22	$2,088	1.00
Hood	2	95	124	$7,968	1.30
Hopkins	1	3	3	$250	1.00
Houston	1	21	62	$5,000	3.00
Howard	3	29	29	$2,350	1.00
Hudspeth	1	1	1	$1	1.00
Hunt	7	99	184	$27,314	1.87
Hutchinson	0	0	0	$0	0.00
Irion	0	0	0	$0	0.00

County	# Projects	Footprint (000 SF)	Total (000 SF)	$1,000s	Average # Stories
Jack	1	1	1	$1	1.00
Jackson	0	0	0	$0	0.00
Jasper	1	1	1	$1	1.00
Jeff Davis	1	77	221	$10,800	2.87
Jefferson	41	530	685	$60,804	1.29
Jim Hogg	0	10	10	$1,057	1.00
Jim Wells	3	28	28	$2,450	1.00
Johnson	9	298	298	$19,706	1.00
Jones	1	1	1	$1	1.00
Karnes	0	0	0	$0	0.00
Kaufman	10	353	353	$26,537	1.00
Kendall	4	47	47	$6,805	1.00
Kenedy	0	0	0	$0	0.00
Kent	0	0	0	$0	0.00
Kerr	2	49	49	$7,460	1.00
Kimble	1	1	1	$1	1.00
King	0	0	0	$0	0.00
Kinney	1	5	9	$417	2.00
Kleberg	7	232	282	$19,962	1.22
Knox	0	0	0	$0	0.00
Lamar	5	33	48	$6,243	1.46
Lamb	1	11	11	$1,028	1.00
Lampasas	3	37	37	$4,885	1.00
La Salle	1	1	1	$1	1.00
Lavaca	2	22	22	$2,710	1.00
Lee	3	12	12	$789	1.00
Leon	1	22	22	$2,000	1.00
Liberty	6	328	393	$36,000	1.20
Limestone	2	8	8	$752	1.00
Lipscomb	1	1	1	$1	1.00

County	# Projects	Footprint (000 SF)	Total (000 SF)	$1,000s	Average # Stories
Live Oak	0	0	0	$0	0.00
Llano	1	1	1	$1	1.00
Loving	0	0	0	$0	0.00
Lubbock	76	1,164	1,776	$119,298	1.53
Lynn	1	6	6	$750	1.00
McCulloch	1	1	1	$1	1.00
McLennan	15	266	392	$29,293	1.47
McMullen	1	4	4	$270	1.00
Madison	1	1	1	$1	1.00
Marion	4	16	24	$8,300	1.48
Martin	0	0	0	$0	0.00
Mason	1	1	1	$1	1.00
Matagorda	1	21	62	$5,000	3.00
Maverick	8	203	337	$43,845	1.66
Medina	7	275	314	$15,377	1.14
Menard	1	5	5	$555	1.00
Midland	34	577	691	$79,231	1.20
Milam	2	102	102	$7,250	1.00
Mills	1	1	1	$1	1.00
Mitchell	0	0	0	$0	0.00
Montague	2	102	102	$7,500	1.00
Montgomery	108	1,939	3,133	$224,755	1.62
Moore	0	0	0	$0	0.00
Morris	0	1	1	$165	1.00
Motley	0	0	0	$0	0.00
Nacogdoches	11	92	228	$13,238	2.48
Navarro	5	235	255	$23,650	1.09
Newton	1	1	1	$1	1.00
Nolan	1	100	100	$6,500	1.00
Nueces	19	769	1,081	$99,092	1.41

County	# Projects	Footprint (000 SF)	Total (000 SF)	$1,000s	Average # Stories
Ochiltree	2	35	35	$2,500	1.00
Oldham	0	0	0	$0	0.00
Orange	4	186	186	$18,348	1.00
Palo Pinto	3	208	208	$8,609	1.00
Panola	1	1	1	$1	1.00
Parker	13	570	608	$29,322	1.07
Parmer	1	1	1	$1	1.00
Pecos	1	13	40	$2,200	3.00
Polk	5	22	22	$2,040	1.00
Potter	42	647	974	$119,470	1.51
Presidio	3	13	13	$1,221	1.00
Rains	1	14	14	$2,500	1.00
Randall	8	239	239	$11,985	1.00
Reagan	1	1	1	$1	1.00
Real	0	0	0	$0	0.00
Red River	0	1	1	$207	1.00
Reeves	2	15	15	$850	1.00
Refugio	0	0	0	$0	0.00
Roberts	0	0	0	$0	0.00
Robertson	1	3	3	$330	1.00
Rockwall	29	415	726	$68,702	1.75
Runnels	0	0	0	$0	0.00
Rusk	1	140	140	$4,250	1.00
Sabine	1	6	6	$650	1.00
San Augustine	0	0	0	$0	0.00
San Jacinto	1	1	1	$1	1.00
San Patricio	8	234	241	$16,585	1.03
San Saba	0	10	21	$2,000	2.00
Schleicher	0	0	0	$0	0.00
Scurry	0	0	0	$0	0.00

County	# Projects	Footprint (000 SF)	Total (000 SF)	$1,000s	Average # Stories
Shackelford	1	1	1	$1	1.00
Shelby	4	192	192	$10,450	1.00
Sherman	1	4	4	$500	1.00
Smith	32	516	615	$54,552	1.19
Somervell	1	12	12	$1,000	1.00
Starr	2	96	96	$8,396	1.00
Stephens	1	20	20	$2,476	1.00
Sterling	0	0	0	$0	0.00
Stonewall	0	0	0	$0	0.00
Sutton	4	17	25	$4,300	1.43
Swisher	0	0	0	$0	0.00
Tarrant	405	9,644	12,404	$912,817	1.29
Taylor	24	745	855	$60,938	1.15
Terrell	1	50	50	$4,871	1.00
Terry	1	5	5	$300	1.00
Throckmorton	0	0	0	$0	0.00
Titus	0	0	0	$0	0.00
Tom Green	42	490	668	$55,619	1.36
Travis	184	3,950	6,536	$529,338	1.65
Trinity	0	45	45	$6,000	1.00
Tyler	2	121	121	$8,500	1.00
Upshur	1	77	77	$6,570	1.00
Upton	0	0	0	$0	0.00
Uvalde	7	262	262	$11,012	1.00
Val Verde	5	123	123	$12,291	1.00
Van Zandt	4	19	27	$4,255	1.43
Victoria	7	183	372	$21,638	2.03
Walker	3	45	106	$18,064	2.35
Waller	2	22	22	$1,150	1.00
Ward	0	0	0	$0	0.00

County	# Projects	Footprint (000 SF)	Total (000 SF)	$1,000s	Average # Stories
Washington	6	259	259	$8,590	1.00
Webb	36	859	1,180	$88,076	1.37
Wharton	9	95	120	$10,620	1.27
Wheeler	0	0	0	$0	0.00
Wichita	25	355	684	$69,098	1.93
Wilbarger	1	61	61	$2,632	1.00
Willacy	3	41	41	$5,500	1.00
Williamson	40	1,621	1,861	$180,432	1.15
Wilson	4	115	156	$21,080	1.36
Winkler	0	0	0	$0	0.00
Wise	5	287	503	$63,000	1.75
Wood	4	26	26	$2,200	1.00
Yoakum	0	0	0	$0	0.00
Young	1	3	3	$329	1.00
Zapata	1	146	146	$14,500	1.00
Zavala	1	1	1	$1	1.00
TOTAL	5,074	111,020	157,987	12,384,762	1.42

Commercial Sector County Level Allocation Factors (2004 Footprint Basis)

County	Total Footprint
Anderson	47
Andrews	17
Angelina	317
Aransas	167
Archer	4
Armstrong	0
Atascosa	10
Austin	1,231
Bailey	1
Bandera	1
Bastrop	229
Baylor	0
Bee	58
Bell	1,424
Bexar	9,945
Blanco	77
Borden	0
Bosque	6
Bowie	741
Brazoria	1,861
Brazos	627
Brewster	45
Briscoe	0
Brooks	0
Brown	148
Burleson	1
Burnet	121
Caldwell	69
Calhoun	250
Callahan	1
Cameron	1,780
Camp	15
Carson	1
Cass	34
Castro	1
Chambers	12
Cherokee	92
Childress	1
Clay	3
Cochran	0
Coke	19
Coleman	6

County	Total Footprint
Collin	5,196
Collingsworth	0
Colorado	124
Comal	589
Comanche	86
Concho	1
Cooke	97
Coryell	155
Cottle	0
Crane	0
Crockett	11
Crosby	1
Culberson	0
Dallam	10
Dallas	12,996
Dawson	1
Deaf Smith	165
Delta	1
Denton	3,672
DeWitt	0
Dickens	0
Dimmit	1
Donley	0
Duval	4
Eastland	38
Ector	233
Edwards	0
Ellis	601
El Paso	2,757
Erath	15
Falls	0
Fannin	24
Fayette	88
Fisher	11
Floyd	1
Foard	0
Fort Bend	2,570
Franklin	1
Freestone	1
Frio	1
Gaines	0
Galveston	1,450
Garza	0
Gillespie	174

County	Total Footprint
Glasscock	0
Goliad	1
Gonzales	24
Gray	158
Grayson	360
Gregg	336
Grimes	20
Guadalupe	1,059
Hale	8
Hall	0
Hamilton	35
Hansford	0
Hardeman	0
Hardin	4
Harris	22,781
Harrison	99
Hartley	0
Haskell	0
Hays	730
Hemphill	1
Henderson	70
Hidalgo	3,344
Hill	12
Hockley	22
Hood	95
Hopkins	3
Houston	21
Howard	29
Hudspeth	1
Hunt	99
Hutchinson	0
Irion	0
Jack	1
Jackson	0
Jasper	1
Jeff Davis	77
Jefferson	530
Jim Hogg	10
Jim Wells	28
Johnson	298
Jones	1
Karnes	0
Kaufman	353
Kendall	47

County	Total Footprint
Kenedy	0
Kent	0
Kerr	49
Kimble	1
King	0
Kinney	5
Kleberg	232
Knox	0
Lamar	33
Lamb	11
Lampasas	37
La Salle	1
Lavaca	22
Lee	12
Leon	22
Liberty	328
Limestone	8
Lipscomb	1
Live Oak	0
Llano	1
Loving	0
Lubbock	1,164
Lynn	6
McCulloch	1
McLennan	266
McMullen	4
Madison	1
Marion	16
Martin	0
Mason	1
Matagorda	21
Maverick	203
Medina	275
Menard	5
Midland	577
Milam	102
Mills	1
Mitchell	0
Montague	102
Montgomery	1,939
Moore	0
Morris	1
Motley	0
Nacogdoches	92

County	Total Footprint
Navarro	235
Newton	1
Nolan	100
Nueces	769
Ochiltree	35
Oldham	0
Orange	186
Palo Pinto	208
Panola	1
Parker	570
Parmer	1
Pecos	13
Polk	22
Potter	647
Presidio	13
Rains	14
Randall	239
Reagan	1
Real	0
Red River	1
Reeves	15
Refugio	0
Roberts	0
Robertson	3
Rockwall	415
Runnels	0
Rusk	140
Sabine	6
San Augustine	0
San Jacinto	1
San Patricio	234
San Saba	10
Schleicher	0
Scurry	0
Shackelford	1
Shelby	192
Sherman	4
Smith	516
Somervell	12
Starr	96
Stephens	20
Sterling	0
Stonewall	0
Sutton	17

County	Total Footprint
Swisher	0
Tarrant	9,644
Taylor	745
Terrell	50
Terry	5
Throckmorton	0
Titus	0
Tom Green	490
Travis	3,950
Trinity	45
Tyler	121
Upshur	77
Upton	0
Uvalde	262
Val Verde	123
Van Zandt	19
Victoria	183
Walker	45
Waller	22
Ward	0
Washington	259
Webb	859
Wharton	95
Wheeler	0
Wichita	355
Wilbarger	61
Willacy	41
Williamson	1,621
Wilson	115
Winkler	0
Wise	287
Wood	26
Yoakum	0
Young	3
Zapata	146
Zavala	1

Commercial Sector County Level Growth Factors (2004 Base Year)

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Anderson	0.89	0.88	0.55	1.00	1.07	1.07	1.13	1.13	1.12	1.12	1.11	1.11
Andrews	0.05	0.64	0.38	1.00	0.53	0.28	0.26	0.24	0.21	0.19	0.16	0.14
Angelina	0.60	1.07	1.29	1.00	1.56	1.88	2.13	2.24	2.35	2.46	2.58	2.69
Aransas	0.98	1.99	1.04	1.00	1.32	1.29	1.30	1.27	1.23	1.20	1.17	1.14
Archer	0.67	3.42	0.28	1.00	1.40	1.55	1.57	1.54	1.51	1.48	1.45	1.42
Atascosa	2.15	0.52	0.35	1.00	1.56	1.90	2.16	2.28	2.40	2.53	2.65	2.77
Austin	0.00	0.86	2.45	1.00	1.02	0.88	0.80	0.74	0.68	0.61	0.55	0.48
Bailey	1.54	0.00	0.01	1.00	3.30	4.83	6.09	6.75	7.42	8.08	8.74	9.40
Bandera	0.00	3.09	0.00	1.00	1.40	0.92	0.71	0.61	0.51	0.41	0.31	0.20
Bastrop	0.60	0.56	1.66	1.00	0.92	0.77	0.69	0.63	0.57	0.52	0.46	0.40
Bee	0.06	2.54	1.58	1.00	1.55	1.57	1.46	1.39	1.31	1.24	1.16	1.09
Bell	0.60	0.76	0.88	1.00	0.86	0.93	0.95	0.92	0.88	0.85	0.81	0.78
Bexar	0.62	0.80	1.03	1.00	1.01	1.10	1.18	1.18	1.19	1.20	1.21	1.21
Blanco	0.13	0.00	4.40	1.00	1.37	1.61	1.62	1.57	1.53	1.48	1.43	1.39
Bosque	3.09	0.00	0.37	1.00	1.88	2.63	2.93	3.04	3.15	3.26	3.37	3.48
Bowie	0.65	1.61	1.47	1.00	1.40	1.48	1.54	1.50	1.47	1.43	1.40	1.36
Brazoria	0.82	0.73	1.24	1.00	1.14	1.18	1.18	1.18	1.18	1.18	1.18	1.18
Brazos	1.40	0.88	0.88	1.00	1.35	1.57	1.67	1.65	1.63	1.62	1.60	1.58
Brewster	0.23	1.26	0.54	1.00	1.25	1.01	0.99	1.00	1.01	1.02	1.03	1.04
Brown	1.71	0.23	2.20	1.00	1.81	2.10	2.39	2.46	2.54	2.61	2.68	2.76
Burleson	3.48	0.00	0.08	1.00	1.64	2.05	2.35	2.44	2.53	2.63	2.72	2.81
Burnet	1.04	2.70	0.50	1.00	1.37	1.37	1.37	1.32	1.27	1.22	1.18	1.13
Caldwell	2.60	1.01	1.44	1.00	1.47	1.76	1.88	1.92	1.96	2.00	2.03	2.07
Calhoun	0.00	0.35	1.21	1.00	2.07	2.39	2.65	2.79	2.93	3.07	3.21	3.36
Callahan	1.19	0.00	0.00	1.00	3.13	5.16	6.40	7.10	7.80	8.50	9.21	9.91
Cameron	0.99	1.04	0.97	1.00	1.27	1.44	1.51	1.50	1.49	1.48	1.48	1.47
Camp	1.18	0.12	3.13	1.00	1.25	1.40	1.48	1.53	1.57	1.61	1.66	1.70
Carson	0.74	0.31	0.00	1.00	2.53	3.69	4.47	4.84	5.22	5.60	5.98	6.35
Cass	0.15	0.00	0.66	1.00	0.82	0.99	1.12	1.20	1.28	1.36	1.44	1.53
Castro	0.00	3.08	0.00	1.00	1.72	2.06	2.20	2.33	2.45	2.58	2.71	2.84
Chambers	0.44	0.46	0.36	1.00	0.63	0.73	0.76	0.78	0.79	0.81	0.82	0.84
Cherokee	2.42	0.61	0.95	1.00	1.38	1.50	1.60	1.60	1.61	1.61	1.62	1.63
Childress	2.27	0.15	0.00	1.00	1.88	2.45	2.79	2.96	3.14	3.31	3.49	3.66
Clay	0.31	0.78	0.42	1.00	2.18	3.27	3.98	4.25	4.52	4.78	5.05	5.32
Coke	0.00	0.00	2.99	1.00	1.32	1.49	1.57	1.65	1.72	1.80	1.88	1.95
Coleman	0.00	2.89	0.71	1.00	1.73	2.10	2.33	2.45	2.58	2.71	2.84	2.96
Collin	0.94	0.82	1.00	1.00	1.04	1.17	1.21	1.22	1.22	1.23	1.24	1.25
Colorado	0.10	0.71	3.36	1.00	1.49	1.81	1.93	1.89	1.85	1.81	1.77	1.73
Comal	1.40	0.33	1.52	1.00	1.25	1.33	1.37	1.39	1.40	1.42	1.44	1.45
Comanche	0.83	0.00	3.32	1.00	1.18	1.12	1.07	0.97	0.88	0.78	0.69	0.59
Concho	4.51	0.00	0.00	1.00	1.36	1.41	1.43	1.33	1.23	1.12	1.02	0.91
Cooke	0.69	1.25	0.86	1.00	1.09	1.17	1.21	1.20	1.18	1.17	1.16	1.14

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Coryell	0.10	0.07	0.36	1.00	0.66	0.58	0.67	0.72	0.76	0.81	0.85	0.90
Crockett	1.25	0.00	2.67	1.00	1.51	1.88	2.05	2.16	2.27	2.39	2.50	2.61
Crosby	2.66	2.23	0.00	1.00	1.70	2.28	2.68	2.89	3.09	3.30	3.51	3.72
Dallam	0.00	0.00	1.30	1.00	0.61	0.62	0.62	0.59	0.56	0.53	0.50	0.47
Dallas	0.87	0.72	0.88	1.00	1.00	1.11	1.14	1.16	1.18	1.19	1.21	1.23
Dawson	0.73	0.28	0.00	1.00	2.87	4.53	5.87	6.44	7.01	7.58	8.15	8.72
De Witt	0.26	0.79	0.43	1.00	0.68	0.70	0.65	0.61	0.57	0.53	0.49	0.45
Deaf Smith	0.05	1.02	2.43	1.00	1.51	1.69	1.81	1.84	1.87	1.91	1.94	1.97
Delta	0.00	0.34	0.00	1.00	2.68	4.42	5.48	6.08	6.68	7.29	7.89	8.49
Denton	0.96	1.23	0.84	1.00	1.00	1.08	1.08	1.08	1.07	1.06	1.05	1.04
Dimmit	0.04	4.64	0.00	1.00	1.39	1.49	1.54	1.46	1.38	1.29	1.21	1.13
Donley	1.70	1.66	0.29	1.00	1.28	1.40	1.43	1.38	1.33	1.29	1.24	1.19
Duval	4.46	0.19	0.12	1.00	1.26	1.38	1.32	1.19	1.07	0.95	0.82	0.70
Eastland	0.14	0.12	0.17	1.00	0.32	0.30	0.30	0.30	0.29	0.29	0.28	0.27
Ector	1.78	0.68	0.69	1.00	1.11	1.09	1.03	0.98	0.93	0.88	0.82	0.77
El Paso	1.01	1.00	0.85	1.00	1.14	1.26	1.31	1.32	1.33	1.34	1.35	1.36
Ellis	0.99	0.51	0.74	1.00	0.98	0.99	1.02	1.05	1.09	1.12	1.15	1.18
Erath	0.65	0.95	1.56	1.00	1.42	1.69	1.82	1.85	1.88	1.90	1.93	1.96
Falls	0.17	0.29	0.09	1.00	0.94	1.38	1.68	1.83	1.98	2.14	2.29	2.44
Fannin	1.51	0.00	1.25	1.00	1.98	2.60	3.02	3.24	3.46	3.68	3.89	4.11
Fayette	0.10	1.71	2.41	1.00	1.11	1.02	0.94	0.83	0.72	0.61	0.50	0.39
Fisher	0.00	1.75	1.75	1.00	1.50	1.72	1.86	1.94	2.02	2.10	2.18	2.26
Floyd	3.80	0.00	0.00	1.00	1.55	1.92	2.03	2.06	2.08	2.11	2.14	2.16
Fort Bend	0.71	0.79	1.02	1.00	0.96	1.04	1.08	1.09	1.10	1.11	1.12	1.13
Franklin	0.33	3.38	0.00	1.00	2.45	2.76	2.68	2.81	2.95	3.08	3.22	3.35
Freestone	3.20	0.88	0.00	1.00	2.10	2.42	2.37	2.39	2.40	2.42	2.43	2.45
Frio	0.30	0.16	0.00	1.00	0.34	0.21	0.22	0.22	0.22	0.23	0.23	0.24
Gaines	1.31	1.12	2.27	1.00	1.59	1.84	1.98	2.07	2.16	2.25	2.34	2.43
Galveston	2.13	0.83	1.05	1.00	1.13	1.12	1.12	1.12	1.12	1.12	1.12	1.13
Gillespie	0.77	0.11	1.85	1.00	1.76	1.28	1.28	1.33	1.37	1.42	1.46	1.51
Goliad	1.62	0.00	0.00	1.00	1.92	0.68	0.45	0.44	0.43	0.41	0.40	0.39
Gonzales	0.40	0.07	0.49	1.00	2.40	1.49	1.55	1.67	1.80	1.92	2.04	2.17
Gray	1.28	1.47	1.54	1.00	1.48	1.60	1.70	1.71	1.73	1.75	1.77	1.79
Grayson	0.63	1.37	0.73	1.00	1.72	1.97	2.15	2.23	2.31	2.39	2.46	2.54
Gregg	1.06	0.62	0.75	1.00	1.12	1.23	1.33	1.35	1.36	1.38	1.40	1.41
Grimes	0.00	0.00	1.54	1.00	1.64	2.39	2.88	3.11	3.34	3.56	3.79	4.02
Guadalupe	0.47	1.28	1.44	1.00	1.13	1.09	1.11	1.09	1.06	1.04	1.02	0.99
Hale	0.24	0.57	0.08	1.00	0.62	0.63	0.66	0.65	0.64	0.63	0.62	0.61
Hall	1.57	0.00	0.93	1.00	1.73	2.22	2.42	2.47	2.51	2.56	2.60	2.65
Hamilton	0.32	0.00	3.24	1.00	1.53	1.88	2.09	2.14	2.19	2.23	2.28	2.33
Hardin	1.93	2.14	0.15	1.00	1.65	2.05	2.27	2.37	2.47	2.57	2.67	2.77
Harris	1.05	1.05	0.96	1.00	1.12	1.23	1.27	1.28	1.30	1.31	1.32	1.34
Harrison	0.44	0.77	0.78	1.00	0.92	0.97	1.02	1.04	1.06	1.08	1.10	1.11
Hays	0.65	0.50	0.93	1.00	1.26	0.94	0.96	0.96	0.96	0.97	0.97	0.97

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Hemphill	0.00	0.42	0.00	1.00	0.41	0.42	0.43	0.41	0.40	0.38	0.36	0.34
Henderson	0.51	0.82	0.95	1.00	1.88	1.94	2.17	2.34	2.50	2.67	2.84	3.00
Hidalgo	1.09	1.12	0.70	1.00	1.11	1.23	1.28	1.27	1.26	1.24	1.23	1.21
Hill	3.09	1.37	0.35	1.00	2.07	2.96	3.51	3.79	4.07	4.35	4.63	4.91
Hockley	0.26	1.56	0.51	1.00	1.85	0.85	0.81	0.82	0.83	0.84	0.85	0.86
Hood	0.95	0.89	1.28	1.00	1.98	2.68	3.11	3.31	3.50	3.70	3.89	4.08
Hopkins	1.26	1.08	0.03	1.00	1.05	1.08	1.10	1.13	1.15	1.18	1.21	1.23
Houston	0.04	0.40	2.23	1.00	2.51	3.23	3.76	3.99	4.22	4.45	4.67	4.90
Howard	1.13	0.00	0.41	1.00	2.05	1.20	1.29	1.39	1.50	1.60	1.71	1.82
Hudspeth	1.58	3.70	0.00	1.00	1.38	1.52	1.57	1.48	1.39	1.30	1.22	1.13
Hunt	1.31	0.83	0.91	1.00	1.10	1.25	1.33	1.35	1.38	1.40	1.42	1.44
Hutchinson	0.39	0.08	0.18	1.00	1.17	0.97	0.70	0.63	0.56	0.50	0.43	0.36
Jack	0.00	4.65	0.00	1.00	1.30	1.31	1.28	1.13	0.98	0.83	0.68	0.53
Jackson	2.26	3.82	0.47	1.00	1.46	1.77	1.83	1.82	1.81	1.81	1.80	1.79
Jasper	0.08	1.23	0.00	1.00	0.83	0.99	1.08	1.13	1.19	1.24	1.29	1.35
Jeff Davis	1.09	0.00	4.42	1.00	1.81	1.88	1.79	1.60	1.42	1.23	1.04	0.85
Jefferson	0.75	0.95	0.45	1.00	1.45	1.62	1.74	1.78	1.83	1.87	1.92	1.96
Jim Hogg	0.88	0.28	1.50	1.00	2.06	3.01	3.66	3.88	4.10	4.32	4.54	4.76
Jim Wells	0.46	2.58	0.43	1.00	1.60	1.94	2.17	2.22	2.27	2.33	2.38	2.43
Johnson	0.92	0.90	1.01	1.00	1.72	1.81	1.97	2.07	2.18	2.28	2.39	2.49
Jones	2.33	1.31	0.00	1.00	2.72	2.69	2.37	2.45	2.53	2.61	2.69	2.77
Karnes	2.32	1.59	0.04	1.00	1.69	2.21	2.50	2.55	2.60	2.65	2.70	2.75
Kaufman	1.86	1.71	0.54	1.00	1.38	1.27	1.22	1.16	1.11	1.06	1.01	0.95
Kendall	0.64	1.60	0.62	1.00	1.27	1.45	1.56	1.57	1.58	1.60	1.61	1.62
Kerr	1.32	0.71	0.42	1.00	1.80	1.64	1.41	1.42	1.43	1.44	1.45	1.46
Kimble	0.00	2.69	0.00	1.00	1.14	1.16	1.16	1.08	0.99	0.91	0.82	0.73
Kinney	0.00	3.29	0.44	1.00	1.74	2.21	2.59	2.62	2.66	2.69	2.72	2.76
Kleberg	0.06	1.98	1.20	1.00	1.35	1.47	1.49	1.46	1.43	1.40	1.38	1.35
La Salle	0.00	2.15	0.00	1.00	2.11	2.87	3.39	3.70	4.01	4.32	4.63	4.94
Lamar	1.63	1.13	1.37	1.00	1.57	1.84	2.00	2.05	2.10	2.14	2.19	2.24
Lamb	1.64	0.15	1.27	1.00	1.79	2.37	2.75	2.89	3.02	3.16	3.30	3.43
Lampasas	0.77	1.98	1.28	1.00	1.40	1.25	1.29	1.28	1.26	1.25	1.24	1.23
Lavaca	0.30	2.25	1.04	1.00	1.54	1.31	1.15	1.09	1.03	0.97	0.91	0.86
Lee	2.23	1.33	0.64	1.00	1.78	2.14	2.38	2.43	2.49	2.55	2.61	2.66
Leon	1.11	0.19	1.90	1.00	1.27	1.44	1.47	1.49	1.51	1.53	1.55	1.56
Liberty	0.95	1.28	2.34	1.00	1.35	1.55	1.55	1.48	1.41	1.34	1.28	1.21
Limestone	0.46	0.03	0.08	1.00	0.51	0.58	0.63	0.64	0.66	0.67	0.68	0.70
Lipscomb	0.00	0.00	0.00	1.00	0.28	0.33	0.36	0.38	0.40	0.42	0.43	0.45
Llano	0.00	2.02	0.00	1.00	1.33	1.31	1.16	1.08	1.01	0.93	0.85	0.77
Lubbock	0.79	0.75	0.66	1.00	0.99	1.04	1.09	1.06	1.04	1.02	1.00	0.98
Lynn	0.31	0.00	2.36	1.00	2.09	2.86	3.39	3.66	3.93	4.20	4.48	4.75
Madison	0.27	4.03	0.00	1.00	1.48	1.84	1.93	1.92	1.92	1.91	1.90	1.89
Marion	0.05	0.00	3.30	1.00	1.13	1.08	1.03	0.99	0.94	0.90	0.86	0.82
Mason	0.00	0.00	0.01	1.00	3.34	5.50	7.16	7.88	8.59	9.30	10.02	10.73

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Matagorda	0.45	0.62	1.19	1.00	2.27	2.50	2.53	2.61	2.69	2.77	2.85	2.93
Maverick	0.25	0.16	1.71	1.00	0.78	0.83	0.86	0.83	0.80	0.77	0.74	0.71
Mcculloch	0.00	2.78	0.00	1.00	2.14	3.26	3.84	4.10	4.37	4.64	4.91	5.18
Mclennan	1.19	1.13	0.35	1.00	1.31	1.40	1.49	1.50	1.51	1.52	1.53	1.55
Mcmullen	11.37	1.17	1.15	1.00	1.57	1.82	1.89	1.91	1.93	1.95	1.96	1.98
Medina	0.92	0.41	3.13	1.00	1.43	1.69	1.77	1.78	1.79	1.79	1.80	1.81
Menard	0.00	0.00	0.20	1.00	0.26	0.27	0.27	0.26	0.24	0.23	0.22	0.20
Midland	0.40	0.69	1.28	1.00	0.93	0.98	0.98	0.95	0.92	0.90	0.87	0.84
Milam	0.20	0.98	0.46	1.00	0.67	0.72	0.73	0.69	0.66	0.62	0.58	0.55
Mills	3.81	0.00	0.00	1.00	1.56	2.00	2.17	2.19	2.21	2.23	2.26	2.28
Mitchell	0.33	0.17	0.80	1.00	2.52	3.72	4.69	5.05	5.41	5.77	6.13	6.49
Montague	0.90	0.63	2.51	1.00	1.43	1.49	1.55	1.53	1.51	1.49	1.48	1.46
Montgomery	0.76	1.63	0.94	1.00	1.09	1.17	1.18	1.17	1.16	1.15	1.14	1.13
Moore	0.48	2.97	0.56	1.00	1.44	1.48	1.54	1.54	1.53	1.53	1.53	1.52
Morris	6.29	0.41	0.32	1.00	2.13	2.92	3.37	3.67	3.97	4.27	4.57	4.87
Nacogdoches	1.66	0.95	0.60	1.00	1.23	1.27	1.31	1.28	1.24	1.21	1.17	1.14
Navarro	0.21	0.44	0.43	1.00	0.70	0.55	0.52	0.51	0.50	0.50	0.49	0.48
Newton	0.00	4.60	0.00	1.00	1.39	1.69	1.72	1.66	1.61	1.55	1.50	1.45
Nolan	0.66	1.50	2.05	1.00	1.35	1.38	1.40	1.37	1.35	1.32	1.29	1.26
Nueces	0.59	1.70	0.95	1.00	1.38	1.35	1.37	1.35	1.33	1.32	1.30	1.28
Ochiltree	0.56	0.00	1.62	1.00	2.07	2.83	3.10	3.15	3.20	3.26	3.31	3.36
Orange	0.27	1.08	0.80	1.00	0.86	0.92	0.97	0.97	0.98	0.98	0.99	0.99
Palo Pinto	0.27	0.91	1.65	1.00	1.21	1.40	1.52	1.56	1.60	1.64	1.68	1.72
Panola	1.58	0.00	0.00	1.00	2.59	3.80	4.44	4.80	5.15	5.50	5.86	6.21
Parker	1.08	0.61	0.86	1.00	1.45	1.27	1.35	1.40	1.45	1.50	1.55	1.60
Parmer	0.00	4.39	0.00	1.00	1.41	1.47	1.51	1.39	1.28	1.17	1.05	0.94
Pecos	4.73	0.00	0.88	1.00	1.65	2.18	2.53	2.60	2.67	2.74	2.82	2.89
Polk	0.04	0.66	0.10	1.00	0.58	0.66	0.71	0.71	0.71	0.70	0.70	0.70
Potter	0.46	0.94	1.00	1.00	0.95	1.00	1.03	1.01	0.99	0.97	0.95	0.94
Presidio	2.90	1.86	0.67	1.00	1.48	1.73	1.88	1.98	2.07	2.17	2.26	2.36
Rains	0.63	0.00	2.64	1.00	1.91	2.78	3.22	3.40	3.57	3.75	3.92	4.10
Randall	0.77	2.54	0.54	1.00	1.35	1.54	1.59	1.57	1.56	1.54	1.52	1.50
Reagan	0.00	4.63	0.00	1.00	1.30	1.29	1.26	1.10	0.95	0.80	0.64	0.49
Red River	6.92	0.21	0.13	1.00	1.66	2.18	2.45	2.56	2.67	2.78	2.89	3.00
Reeves	0.66	2.29	0.23	1.00	1.86	2.51	3.06	3.22	3.38	3.53	3.69	3.85
Refugio	0.00	0.00	0.46	1.00	0.63	0.80	0.93	1.00	1.07	1.14	1.20	1.27
Robertson	0.00	0.00	0.54	1.00	0.51	0.58	0.60	0.60	0.61	0.61	0.62	0.62
Rockwall	0.42	1.34	1.36	1.00	1.04	1.12	1.12	1.10	1.08	1.06	1.04	1.02
Rusk	1.18	0.00	1.61	1.00	1.86	1.80	1.95	2.08	2.20	2.32	2.44	2.56
Sabine	1.01	1.27	0.82	1.00	0.99	1.07	1.06	1.04	1.02	1.00	0.97	0.95
San Jacinto	2.26	0.00	0.00	1.00	2.59	3.88	4.70	5.29	5.87	6.45	7.04	7.62
San Patricio	1.91	0.31	0.94	1.00	5.75	5.53	2.16	1.68	1.19	0.71	0.22	-0.26
San Saba	0.14	0.00	1.59	1.00	0.95	1.05	1.13	1.23	1.33	1.43	1.53	1.63
Shackelford	0.00	1.85	0.00	1.00	1.95	2.81	3.37	3.67	3.97	4.27	4.57	4.87

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Shelby	0.16	0.11	3.47	1.00	1.64	1.91	2.13	2.22	2.31	2.40	2.49	2.57
Sherman	0.00	0.00	2.15	1.00	1.62	2.19	2.56	2.70	2.84	2.98	3.12	3.26
Smith	0.60	0.55	0.51	1.00	0.91	0.90	0.95	0.96	0.97	0.98	0.99	1.00
Somervell	2.39	0.00	1.20	1.00	2.06	2.27	2.59	2.70	2.81	2.92	3.03	3.14
Starr	0.67	1.52	0.51	1.00	1.06	1.33	1.43	1.44	1.45	1.46	1.46	1.47
Stephens	0.00	0.00	2.37	1.00	0.90	1.08	1.11	1.08	1.05	1.02	0.99	0.96
Sutton	0.00	2.25	1.90	1.00	1.22	1.17	1.14	1.07	1.00	0.94	0.87	0.81
Tarrant	0.96	1.01	0.91	1.00	1.08	1.18	1.19	1.19	1.20	1.20	1.20	1.21
Taylor	1.00	0.89	0.94	1.00	1.16	1.25	1.32	1.33	1.33	1.33	1.33	1.34
Terrell	0.00	0.00	4.82	1.00	1.24	1.19	1.12	0.94	0.77	0.59	0.41	0.24
Terry	1.48	0.12	0.07	1.00	0.59	0.61	0.58	0.54	0.49	0.45	0.40	0.36
Titus	2.15	2.23	0.07	1.00	1.22	1.36	1.36	1.32	1.28	1.24	1.20	1.16
Tom Green	0.71	0.91	1.03	1.00	1.09	1.14	1.19	1.17	1.16	1.14	1.13	1.11
Travis	1.05	0.97	0.86	1.00	1.15	1.30	1.35	1.35	1.35	1.36	1.36	1.36
Trinity	0.00	0.91	3.50	1.00	1.20	1.22	1.15	1.05	0.96	0.86	0.76	0.66
Tyler	0.37	0.97	2.42	1.00	1.53	1.65	1.72	1.74	1.77	1.80	1.82	1.85
Upshur	0.15	0.26	0.39	1.00	0.46	0.49	0.46	0.44	0.41	0.38	0.36	0.33
Upton	2.25	0.00	1.94	1.00	1.25	1.19	1.15	1.11	1.08	1.04	1.01	0.98
Uvalde	0.63	0.83	0.93	1.00	0.95	1.01	1.05	1.06	1.07	1.08	1.09	1.10
Val Verde	2.31	0.77	0.83	1.00	1.38	1.64	1.84	1.91	1.98	2.04	2.11	2.17
Van Zandt	1.54	2.32	0.56	1.00	1.37	1.61	1.64	1.59	1.54	1.49	1.45	1.40
Victoria	0.42	0.55	0.67	1.00	0.95	1.06	1.14	1.15	1.16	1.17	1.18	1.19
Walker	0.20	2.07	0.69	1.00	1.23	1.32	1.38	1.37	1.35	1.33	1.32	1.30
Waller	0.14	1.83	0.24	1.00	0.80	0.81	0.80	0.78	0.77	0.75	0.73	0.71
Washington	1.52	0.72	1.40	1.00	1.50	1.50	1.64	1.70	1.76	1.81	1.87	1.93
Webb	1.18	0.64	0.87	1.00	1.24	1.45	1.57	1.59	1.61	1.63	1.65	1.68
Wharton	0.40	1.19	0.76	1.00	1.27	0.86	0.72	0.69	0.65	0.62	0.58	0.55
Wichita	0.76	0.65	0.86	1.00	1.01	1.11	1.17	1.15	1.14	1.12	1.10	1.08
Wilbarger	0.34	0.51	1.84	1.00	2.24	2.94	3.43	3.61	3.79	3.97	4.15	4.33
Willacy	0.59	1.08	0.38	1.00	0.84	0.87	0.88	0.83	0.79	0.75	0.70	0.66
Williamson	0.93	0.93	0.87	1.00	1.13	1.12	1.18	1.19	1.19	1.20	1.21	1.21
Wilson	1.38	0.30	1.98	1.00	1.18	1.22	1.24	1.18	1.13	1.07	1.01	0.96
Wise	0.13	0.18	0.91	1.00	0.51	0.52	0.50	0.46	0.42	0.37	0.33	0.29
Wood	3.62	0.05	0.20	1.00	0.95	0.76	0.69	0.63	0.57	0.51	0.45	0.39
Young	0.00	0.65	0.03	1.00	0.43	0.43	0.43	0.42	0.41	0.40	0.39	0.38
Zapata	0.16	1.74	2.69	1.00	1.35	1.51	1.51	1.41	1.32	1.22	1.13	1.03
Zavala	0.71	2.39	0.00	1.00	1.27	1.45	1.49	1.44	1.38	1.33	1.28	1.23

Utility Sector County Level Geographic Allocation Factors (2004 Project Values)

County	Project Value	Allocation Factor
Anderson	$504,000	0.0004
Andrews	$1,000	0.000001
Angelina	$1,000,000	0.0008
Aransas	$1,000	0.0000
Archer	$142,000	0.0001
Armstrong	$0	0.0000
Atascosa	$956,000	0.0008
Austin	$1,000	0.0000
Bailey	$1,000	0.0000
Bandera	$288,000	0.0002
Bastrop	$1,529,000	0.0012
Baylor	$0	0.0000
Bee	$400,000	0.0003
Bell	$1,335,000	0.0011
Bexar	$62,764,000	0.0499
Blanco	$415,000	0.0003
Borden	$0	0.0000
Bosque	$100,000	0.0001
Bowie	$897,000	0.0007
Brazoria	$11,484,000	0.0091
Brazos	$2,600,000	0.0021
Brewster	$390,000	0.0003
Briscoe	$0	0.0000
Brooks	$0	0.0000
Brown	$2,638,000	0.0021
Burleson	$1,347,000	0.0011
Burnet	$2,842,000	0.0023
Caldwell	$4,686,000	0.0037
Calhoun	$500,000	0.0004
Callahan	$1,000	0.0000
Cameron	$23,764,000	0.0189
Camp	$1,000	0.0000
Carson	$1,000	0.0000
Cass	$322,000	0.0003
Castro	$1,000	0.0000
Chambers	$4,166,000	0.0033
Cherokee	$1,097,000	0.0009
Childress	$1,000	0.0000
Clay	$1,000	0.0000
Cochran	$0	0.0000
Coke	$1,000	0.0000
Coleman	$200,000	0.0002

County	Project Value	Allocation Factor
Collin	$99,046,000	0.0788
Collingsworth	$0	0.0000
Colorado	$1,382,000	0.0011
Comal	$37,669,000	0.0300
Comanche	$1,000	0.0000
Concho	$125,000	0.0001
Cooke	$684,000	0.0005
Coryell	$537,000	0.0004
Cottle	$0	0.0000
Crane	$0	0.0000
Crockett	$2,154,000	0.0017
Crosby	$359,000	0.0003
Culberson	$0	0.0000
Dallam	$1,000	0.0000
Dallas	$132,487,000	0.1054
Dawson	$1,000	0.0000
Deaf Smith	$1,000	0.0000
Delta	$1,000	0.0000
Denton	$71,993,000	0.0573
DeWitt	$0	0.0000
Dickens	$0	0.0000
Dimmit	$53,000	0.0000
Donley	$1,000	0.0000
Duval	$3,513,000	0.0028
Eastland	$197,000	0.0002
Ector	$259,000	0.0002
Edwards	$0	0.0000
Ellis	$8,424,000	0.0067
El Paso	$72,936,000	0.0580
Erath	$155,000	0.0001
Falls	$1,000	0.0000
Fannin	$1,068,000	0.0008
Fayette	$885,000	0.0007
Fisher	$1,000	0.0000
Floyd	$159,000	0.0001
Foard	$0	0.0000
Fort Bend	$15,874,000	0.0126
Franklin	$1,000	0.0000
Freestone	$1,000	0.0000
Frio	$230,000	0.0002
Gaines	$1,000	0.0000
Galveston	$21,410,000	0.0170
Garza	$0	0.0000
Gillespie	$1,000	0.0000

County	Project Value	Allocation Factor
Glasscock	$0	0.0000
Goliad	$160,000	0.0001
Gonzales	$1,230,000	0.0010
Gray	$425,000	0.0003
Grayson	$1,712,000	0.0014
Gregg	$6,538,000	0.0052
Grimes	$1,000	0.0000
Guadalupe	$1,604,000	0.0013
Hale	$1,000	0.0000
Hall	$1,000	0.0000
Hamilton	$0	0.0000
Hansford	$0	0.0000
Hardeman	$0	0.0000
Hardin	$175,000	0.0001
Harris	$179,616,000	0.1429
Harrison	$2,465,000	0.0020
Hartley	$0	0.0000
Haskell	$0	0.0000
Hays	$5,412,000	0.0043
Hemphill	$1,000	0.0000
Henderson	$2,527,000	0.0020
Hidalgo	$23,426,000	0.0186
Hill	$211,000	0.0002
Hockley	$1,000	0.0000
Hood	$1,083,000	0.0009
Hopkins	$1,000	0.0000
Houston	$1,000	0.0000
Howard	$1,000	0.0000
Hudspeth	$220,000	0.0002
Hunt	$1,918,000	0.0015
Hutchinson	$1,000	0.0000
Irion	$0	0.0000
Jack	$333,000	0.0003
Jackson	$1,000	0.0000
Jasper	$1,835,000	0.0015
Jeff Davis	$247,000	0.0002
Jefferson	$2,406,000	0.0019
Jim Hogg	$3,988,000	0.0032
Jim Wells	$3,570,000	0.0028
Johnson	$2,821,000	0.0022
Jones	$348,000	0.0003
Karnes	$156,000	0.0001
Kaufman	$2,340,000	0.0019
Kendall	$8,566,000	0.0068

County	Project Value	Allocation Factor
Kenedy	$0	0.0000
Kent	$0	0.0000
Kerr	$3,506,000	0.0028
Kimble	$1,000	0.0000
King	$0	0.0000
Kinney	$0	0.0000
Kleberg	$1,000	0.0000
Knox	$0	0.0000
Lamar	$547,000	0.0004
Lamb	$1,000	0.0000
Lampasas	$1,000	0.0000
La Salle	$1,000	0.0000
Lavaca	$107,000	0.0001
Lee	$4,165,000	0.0033
Leon	$1,000	0.0000
Liberty	$13,046,000	0.0104
Limestone	$1,557,000	0.0012
Lipscomb	$1,000	0.0000
Live Oak	$0	0.0000
Llano	$1,381,000	0.0011
Loving	$0	0.0000
Lubbock	$775,000	0.0006
Lynn	$1,000	0.0000
McCulloch	$4,395,000	0.0035
McLennan	$18,914,000	0.0151
McMullen	$1,000	0.0000
Madison	$1,000	0.0000
Marion	$1,000	0.0000
Martin	$0	0.0000
Mason	$1,000	0.0000
Matagorda	$500,000	0.0004
Maverick	$36,789,000	0.0293
Medina	$1,960,000	0.0016
Menard	$1,000	0.0000
Midland	$1,855,000	0.0015
Milam	$1,000	0.0000
Mills	$0	0.0000
Mitchell	$1,000	0.0000
Montague	$195,000	0.0002
Montgomery	$2,773,000	0.0022
Moore	$1,000	0.0000
Morris	$0	0.0000
Motley	$0	0.0000
Nacogdoches	$1,229,000	0.0010

County	Project Value	Allocation Factor
Navarro	$424,000	0.0003
Newton	$1,000	0.0000
Nolan	$143,000	0.0001
Nueces	$14,903,000	0.0119
Ochiltree	$1,000	0.0000
Oldham	$0	0.0000
Orange	$1,599,000	0.0013
Palo Pinto	$1,000	0.0000
Panola	$1,000	0.0000
Parker	$955,000	0.0008
Parmer	$1,000	0.0000
Pecos	$1,000	0.0000
Polk	$650,000	0.0005
Potter	$150,000	0.0001
Presidio	$1,000	0.0000
Rains	$1,828,000	0.0015
Randall	$1,000	0.0000
Reagan	$0	0.0000
Real	$0	0.0000
Red River	$1,020,000	0.0008
Reeves	$925,000	0.0007
Refugio	$1,000	0.0000
Roberts	$0	0.0000
Robertson	$1,000	0.0000
Rockwall	$3,467,000	0.0028
Runnels	$0	0.0000
Rusk	$1,000	0.0000
Sabine	$1,000	0.0000
San Augustine	$0	0.0000
San Jacinto	$252,000	0.0002
San Patricio	$4,256,000	0.0034
San Saba	$1,000	0.0000
Schleicher	$0	0.0000
Scurry	$0	0.0000
Shackelford	$0	0.0000
Shelby	$1,000	0.0000
Sherman	$1,000	0.0000
Smith	$4,640,000	0.0037
Somervell	$1,000	0.0000
Starr	$801,000	0.0006
Stephens	$0	0.0000
Sterling	$0	0.0000
Stonewall	$0	0.0000
Sutton	$1,000	0.0000

County	Project Value	Allocation Factor
Swisher	$0	0.0000
Tarrant	$81,190,000	0.0646
Taylor	$1,000	0.0000
Terrell	$0	0.0000
Terry	$315,000	0.0003
Throckmorton	$0	0.0000
Titus	$357,000	0.0003
Tom Green	$1,362,000	0.0011
Travis	$74,295,000	0.0591
Trinity	$1,000	0.0000
Tyler	$1,000	0.0000
Upshur	$268,000	0.0002
Upton	$1,000	0.0000
Uvalde	$1,000	0.0000
Val Verde	$1,000	0.0000
Van Zandt	$257,000	0.0002
Victoria	$1,571,000	0.0013
Walker	$5,360,000	0.0043
Waller	$1,000	0.0000
Ward	$0	0.0000
Washington	$1,246,000	0.0010
Webb	$15,157,000	0.0121
Wharton	$1,000	0.0000
Wheeler	$0	0.0000
Wichita	$35,186,000	0.0280
Wilbarger	$200,000	0.0002
Willacy	$8,090,000	0.0064
Williamson	$47,063,000	0.0374
Wilson	$432,000	0.0003
Winkler	$0	0.0000
Wise	$1,179,000	0.0009
Wood	$119,000	0.0001
Yoakum	$0	0.0000
Young	$1,000	0.0000
Zapata	$1,000	0.0000
Zavala	$1,000	0.0000
Total	1,256,728,000	

Utility Sector County Level Growth Factors (2004 Base Year)

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Anderson	0.35	0.98	1.00	2.07	1.71	2.13	2.50	2.65	2.80	2.94	3.09	3.24
Andrews	594.00	0.00	1.00	45.82	115.38	165.56	197.54	221.15	244.76	268.37	291.97	315.58
Angelina	2.75	0.95	1.00	0.34	0.87	1.25	1.50	1.68	1.85	2.03	2.21	2.38
Aransas	392.00	1,884.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Archer	0.00	0.00	1.00	0.30	0.77	1.10	1.31	1.47	1.62	1.78	1.94	2.09
Atascosa	0.00	0.00	1.00	0.89	1.43	1.78	2.00	2.16	2.32	2.48	2.65	2.81
Austin	447.00	987.00	1.00	123.40	310.77	445.92	532.06	595.65	659.24	722.82	786.41	850.00
Bailey	0.00	0.00	1.00	16.46	41.45	59.47	70.96	79.44	87.92	96.40	104.88	113.36
Bandera	3.03	0.69	1.00	0.45	1.13	1.62	1.93	2.16	2.40	2.63	2.86	3.09
Bastrop	1.97	0.28	1.00	2.23	4.32	5.66	8.06	8.06	8.06	8.05	8.05	8.05
Bee	0.60	1.46	1.00	1.11	1.27	1.33	1.35	1.36	1.38	1.40	1.41	1.43
Bell	20.50	3.23	1.00	4.14	4.20	5.66	6.64	7.27	7.91	8.54	9.17	9.80
Bexar	2.20	1.07	1.00	1.19	1.12	1.11	1.10	1.08	1.06	1.04	1.02	1.00
Blanco	0.49	3.93	1.00	0.08	0.19	0.28	0.33	0.37	0.41	0.45	0.49	0.53
Bosque	0.00	0.00	1.00	4.83	19.81	30.17	45.97	47.28	48.59	49.91	51.22	52.54
Bowie	2.68	0.30	1.00	0.79	0.93	0.97	0.99	0.99	0.99	0.99	0.99	0.99
Brazoria	0.69	0.32	1.00	13.66	5.10	2.30	1.71	1.66	1.61	1.56	1.51	1.46
Brazos	2.26	2.95	1.00	4.44	2.94	2.67	2.49	2.42	2.35	2.28	2.20	2.13
Brewster	1.77	1.24	1.00	1.91	1.20	1.13	1.07	1.03	0.99	0.95	0.91	0.86
Brown	5.79	0.09	1.00	1.29	2.11	0.64	0.64	0.70	0.77	0.83	0.90	0.96
Burleson	0.28	0.13	1.00	0.03	0.08	0.12	0.14	0.16	0.18	0.20	0.21	0.23
Burnet	0.12	1.26	1.00	0.74	0.72	0.66	0.60	0.57	0.53	0.49	0.45	0.42
Caldwell	0.21	0.08	1.00	0.72	0.65	0.62	0.60	0.58	0.57	0.55	0.53	0.52
Calhoun	0.00	4.50	1.00	2.48	12.82	7.68	2.01	1.76	1.52	1.28	1.04	0.80
Callahan	137.00	0.00	1.00	209.03	382.57	502.45	577.14	632.57	688.01	743.44	798.87	854.30
Cameron	0.74	0.74	1.00	1.04	0.98	0.85	0.75	0.68	0.62	0.55	0.49	0.42
Camp	0.00	0.00	1.00	22.43	56.48	81.04	96.69	108.25	119.80	131.36	142.91	154.47
Carson	288.00	0.00	1.00	449.67	1,132.42	1,624.86	1,938.76	2,170.47	2,402.17	2,633.88	2,865.58	3,097.28
Cass	2.16	0.00	1.00	1.91	4.81	6.91	8.24	9.23	10.21	11.20	12.18	13.16
Castro	0.00	0.00	1.00	11.82	29.76	42.70	50.94	57.03	63.12	69.21	75.30	81.39
Chambers	1.05	1.49	1.00	1.08	0.85	0.72	0.61	0.54	0.47	0.39	0.32	0.24
Cherokee	0.31	0.25	1.00	0.22	0.59	0.86	1.08	1.19	1.29	1.40	1.51	1.61
Childress	1,409.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Clay	0.00	0.00	1.00	104.72	263.71	378.39	451.49	505.44	559.40	613.36	667.32	721.27
Coke	8,583.00	73.00	1.00	19.84	102.27	158.66	257.40	259.60	261.81	264.02	266.22	268.43

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Coleman	66.50	0.00	1.00	0.76	1.26	1.56	2.21	2.17	2.12	2.07	2.02	1.97
Collin	0.16	0.40	1.00	0.68	0.62	0.60	0.59	0.57	0.56	0.55	0.54	0.53
Colorado	0.12	0.00	1.00	0.23	0.27	0.28	0.28	0.29	0.29	0.30	0.30	0.30
Comal	0.01	0.22	1.00	0.74	0.63	0.55	0.48	0.43	0.38	0.34	0.29	0.24
Comanche	11,921.00	691.00	1.00	481.36	550.53	804.43	1,042.60	1,132.49	1,222.38	1,312.27	1,402.16	1,492.05
Concho	89.18	0.00	1.00	13.76	39.78	18.60	5.22	2.84	0.47	-1.90	-4.28	-6.65
Cooke	0.61	3.74	1.00	0.86	0.97	1.00	1.01	1.02	1.02	1.03	1.04	1.04
Coryell	8.69	1.64	1.00	0.45	0.64	0.75	0.81	0.86	0.90	0.94	0.99	1.03
Crockett	0.46	0.08	1.00	0.18	0.19	0.19	0.19	0.19	0.19	0.18	0.18	0.18
Crosby	0.00	0.74	1.00	0.59	0.71	0.77	0.80	0.82	0.84	0.87	0.89	0.91
Dallam	289.00	0.00	1.00	187.93	169.87	145.67	126.62	113.18	99.75	86.31	72.87	59.44
Dallas	1.03	1.10	1.00	0.45	0.47	0.56	0.61	0.65	0.69	0.72	0.76	0.80
Dawson	0.00	233.00	1.00	148.69	129.86	107.26	89.93	77.65	65.36	53.07	40.79	28.50
De Witt	0.00	0.67	1.00	0.01	0.02	0.03	0.04	0.04	0.05	0.05	0.06	0.06
Deaf Smith	750.00	240.00	1.00	682.19	678.68	637.84	599.41	573.17	546.94	520.71	494.48	468.24
Delta	0.00	0.00	1.00	1,826.74	385.82	345.57	312.24	288.95	265.67	242.39	219.10	195.82
Denton	0.90	0.38	1.00	0.68	0.79	0.88	0.93	0.96	1.00	1.04	1.08	1.11
Dimmit	8.75	0.00	1.00	0.43	1.07	1.54	1.84	2.06	2.28	2.50	2.72	2.94
Donley	2,298.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Duval	0.00	0.00	1.00	0.64	0.57	0.48	0.41	0.36	0.31	0.26	0.21	0.16
Eastland	0.00	2.55	1.00	2.57	0.39	0.56	0.66	0.74	0.82	0.90	0.98	1.06
Ector	101.16	4.24	1.00	30.46	24.42	29.93	41.67	40.84	40.01	39.18	38.35	37.52
El Paso	0.27	0.49	1.00	0.98	0.91	0.88	0.85	0.83	0.81	0.79	0.76	0.74
Ellis	0.88	3.31	1.00	2.13	2.67	2.93	3.52	3.44	3.36	3.28	3.21	3.13
Erath	0.50	18.17	1.00	0.03	0.13	0.20	0.30	0.31	0.32	0.33	0.34	0.35
Falls	0.00	219.00	1.00	82.92	208.91	299.77	357.79	400.50	443.22	485.93	528.64	571.36
Fannin	0.45	0.00	1.00	0.36	0.37	0.36	0.34	0.33	0.32	0.31	0.30	0.29
Fayette	2.61	0.00	1.00	1.48	1.67	1.73	1.90	1.84	1.79	1.73	1.68	1.63
Fisher	0.00	106.00	1.00	17.18	43.27	62.08	74.08	82.93	91.78	100.64	109.49	118.34
Floyd	0.00	0.00	1.00	0.24	0.60	0.86	1.03	1.15	1.27	1.40	1.52	1.64
Fort Bend	1.29	0.74	1.00	0.56	1.16	1.68	2.15	2.34	2.54	2.74	2.94	3.13
Franklin	281.00	0.00	1.00	325.42	819.52	1,175.90	1,403.06	1,570.74	1,738.43	1,906.11	2,073.79	2,241.47
Freestone	275.00	0.00	1.00	667.96	3,510.05	5,453.16	8,886.36	8,950.31	9,014.25	9,078.19	9,142.13	9,206.07
Frio	0.00	0.00	1.00	0.12	0.31	0.45	0.53	0.60	0.66	0.72	0.79	0.85
Gaines	188.00	466.00	1.00	81.78	126.16	155.23	172.81	185.95	199.09	212.23	225.37	238.51
Galveston	0.45	0.46	1.00	0.14	0.33	0.47	0.56	0.63	0.69	0.76	0.82	0.89
Gillespie	0.00	0.00	1.00	133.41	336.71	483.30	577.63	646.26	714.88	783.51	852.14	920.76

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Goliad	2.08	0.00	1.00	0.40	0.35	0.29	0.24	0.21	0.18	0.14	0.11	0.08
Gonzales	0.00	3.16	1.00	0.34	0.24	0.27	0.29	0.31	0.32	0.34	0.35	0.37
Gray	0.00	0.00	1.00	1.86	4.68	6.71	8.01	8.97	9.92	10.88	11.84	12.80
Grayson	1.40	0.88	1.00	0.59	0.98	1.24	1.40	1.52	1.64	1.76	1.88	1.99
Gregg	0.56	0.87	1.00	0.35	0.81	1.13	1.34	1.49	1.64	1.80	1.95	2.10
Grimes	64.00	267.00	1.00	659.47	3,486.31	5,413.28	8,838.63	8,892.99	8,947.35	9,001.71	9,056.07	9,110.43
Guadalupe	3.31	2.62	1.00	4.74	5.79	7.32	11.16	11.16	11.16	11.16	11.16	11.16
Hale	0.00	0.00	1.00	280.02	705.20	1,011.86	1,207.34	1,351.63	1,495.92	1,640.21	1,784.50	1,928.80
Hall	0.00	0.00	1.00	22.18	55.87	80.16	95.65	107.08	118.51	129.95	141.38	152.81
Hamilton	1.07	13.24	1.00	0.46	1.16	1.67	1.99	2.23	2.47	2.71	2.94	3.18
Hardin	1.51	0.62	1.00	0.89	0.76	0.95	1.12	1.19	1.26	1.33	1.40	1.47
Harris	0.00	0.16	1.00	1.43	0.64	0.84	0.96	1.05	1.13	1.22	1.31	1.40
Harrison	0.38	0.33	1.00	1.98	1.85	2.34	3.12	3.16	3.20	3.23	3.27	3.31
Hays	0.00	0.00	1.00	0.24	1.34	2.09	3.46	3.47	3.47	3.48	3.49	3.50
Hemphill	0.18	1.45	1.00	0.66	0.83	0.91	0.96	0.99	1.03	1.06	1.10	1.13
Henderson	0.91	0.64	1.00	1.25	1.53	1.67	1.88	1.89	1.89	1.89	1.90	1.90
Hidalgo	1.54	1.26	1.00	0.07	0.19	0.27	0.33	0.37	0.40	0.44	0.47	0.51
Hill	0.00	230.00	1.00	57.86	63.82	65.10	64.94	64.98	65.03	65.08	65.13	65.18
Hockley	0.55	0.32	1.00	2.45	7.53	11.09	15.37	16.26	17.14	18.03	18.91	19.79
Hood	956.00	0.00	1.00	1,585.67	3,432.69	4,744.20	5,573.51	6,186.82	6,800.13	7,413.44	8,026.74	8,640.05
Hopkins	0.00	0.00	1.00	209.73	580.45	844.79	1,076.04	1,176.10	1,276.15	1,376.21	1,476.27	1,576.32
Houston	1,907.00	0.00	1.00	26.22	66.04	94.76	113.07	126.58	140.09	153.60	167.12	180.63
Howard	0.00	0.00	1.00	0.58	1.47	2.11	2.51	2.81	3.12	3.42	3.72	4.02
Hudspeth	0.99	0.65	1.00	0.87	0.71	0.96	1.12	1.23	1.35	1.47	1.58	1.70
Hunt	0.00	756.00	1.00	1,345.98	3,648.36	5,254.65	7,078.33	7,519.56	7,960.78	8,402.01	8,843.23	9,284.46
Hutchinson	0.00	0.00	1.00	0.64	0.56	0.46	0.39	0.33	0.28	0.23	0.18	0.12
Jack	79.00	0.00	1.00	1,230.80	2,344.09	3,363.44	4,013.21	4,492.83	4,972.45	5,452.08	5,931.70	6,411.32
Jackson	0.38	0.97	1.00	0.14	0.22	0.28	0.31	0.34	0.36	0.39	0.41	0.44
Jasper	0.18	0.00	1.00	0.66	0.60	0.52	0.46	0.42	0.37	0.33	0.29	0.24
Jeff Davis	2.02	7.99	1.00	1.75	2.54	4.77	2.86	2.73	2.60	2.47	2.34	2.21
Jefferson	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jim Hogg	0.38	0.27	1.00	0.09	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.09
Jim Wells	2.62	0.74	1.00	0.84	2.19	3.18	4.31	4.58	4.85	5.13	5.40	5.67
Johnson	3.86	0.56	1.00	24.54	6.01	5.08	4.36	3.85	3.34	2.83	2.31	1.80
Jones	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Karnes	2.44	0.81	1.00	2.00	3.63	5.02	7.57	7.57	7.56	7.56	7.55	7.55
Kaufman	0.05	0.08	1.00	0.95	0.67	0.55	0.47	0.40	0.34	0.28	0.22	0.15

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Kendall	0.58	0.03	1.00	0.53	0.51	0.45	0.41	0.38	0.34	0.31	0.27	0.24
Kerr	1,000.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kimble	261.00	572.00	1.00	254.79	656.17	944.82	1,146.25	1,275.31	1,404.37	1,533.43	1,662.49	1,791.55
Kinney	0.00	0.00	1.00	15.19	38.26	54.90	65.50	73.33	81.16	88.98	96.81	104.64
Kleberg	7.75	5.97	1.00	4.45	9.08	12.02	17.84	17.63	17.42	17.22	17.01	16.80
La Salle	116.00	0.00	1.00	144.24	260.95	339.51	411.54	438.61	465.68	492.75	519.82	546.89
Lamar	3,991.00	0.00	1.00	1,353.42	2,751.25	585.22	195.02	217.92	240.83	263.73	286.63	309.53
Lamb	8.41	1.17	1.00	5.37	6.14	6.42	6.51	6.59	6.67	6.75	6.83	6.91
Lampasas	0.95	1.11	1.00	0.38	0.33	0.28	0.23	0.20	0.17	0.14	0.11	0.07
Lavaca	0.00	928.00	1.00	617.31	580.36	517.80	466.31	430.30	394.29	358.28	322.27	286.26
Lee	0.00	0.04	1.00	0.05	0.09	0.43	2.13	1.68	1.22	0.77	0.31	-0.14
Leon	1.31	0.00	1.00	0.01	0.01	0.02	0.03	0.03	0.03	0.03	0.04	0.04
Liberty	0.00	0.00	1.00	1.93	4.86	6.97	8.32	9.31	10.31	11.30	12.29	13.29
Limestone	0.08	0.85	1.00	1.63	1.28	0.69	0.74	0.77	0.81	0.84	0.88	0.91
Lipscomb	3.02	9.03	1.00	5.81	5.68	5.22	4.93	4.61	4.29	3.97	3.65	3.33
Llano	0.00	184.00	1.00	124.78	121.07	111.28	102.73	96.82	90.90	84.99	79.08	73.17
Lubbock	35,000.00	681.00	1.00	1,126.41	1,813.70	1,608.43	1,788.04	1,426.60	1,065.16	703.72	342.28	-19.16
Lynn	0.00	0.00	1.00	121.90	306.98	440.47	525.56	588.37	651.19	714.00	776.81	839.62
Madison	0.00	0.00	1.00	7.42	18.67	26.79	31.97	35.79	39.61	43.43	47.25	51.07
Marion	0.30	1.20	1.00	0.26	0.90	1.35	1.92	2.02	2.12	2.21	2.31	2.41
Mason	0.00	0.02	1.00	0.39	0.34	0.28	0.24	0.20	0.17	0.14	0.11	0.07
Matagorda	0.08	0.57	1.00	0.76	0.66	0.55	0.46	0.40	0.34	0.28	0.22	0.16
Maverick	0.14	0.09	1.00	0.07	0.08	0.10	0.11	0.12	0.13	0.13	0.14	0.15
Mcculloch	260.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mclennan	0.14	0.37	1.00	0.34	0.31	0.27	0.23	0.21	0.18	0.16	0.13	0.11
Mcmullen	310.00	0.00	1.00	36.17	91.09	130.70	155.95	174.59	193.23	211.87	230.51	249.14
Medina	1.28	2.86	1.00	0.50	0.49	0.46	0.44	0.42	0.40	0.38	0.36	0.34
Menard	209.00	1,365.00	1.00	64.81	272.08	1,402.19	2,300.67	312.81	-1,675.05	-3,662.91	-5,650.77	-7,638.63
Midland	9,207.00	406.00	1.00	38.83	153.89	233.60	351.77	363.17	374.58	385.99	397.40	408.81
Milam	0.00	7.69	1.00	5.02	4.56	3.93	3.44	3.09	2.74	2.39	2.04	1.69
Mills	2.53	4.31	1.00	1.88	3.78	5.22	6.12	6.79	7.46	8.13	8.80	9.47
Mitchell	686.00	0.00	1.00	63.66	160.32	230.04	274.48	307.28	340.08	372.89	405.69	438.49
Montague	15.57	0.59	1.00	9.01	7.96	6.67	5.67	4.97	4.26	3.55	2.84	2.13
Montgomery	3.93	2.00	1.00	0.59	1.48	2.13	2.54	2.84	3.15	3.45	3.75	4.06
Moore	0.00	2,312.00	1.00	192.68	169.73	140.35	118.45	102.03	85.62	69.20	52.79	36.37
Morris	55.08	0.00	1.00	32.32	28.58	23.93	20.33	17.79	15.24	12.70	10.15	7.61
Nacogdoches	1.82	2.39	1.00	1.29	2.80	1.66	1.54	1.50	1.47	1.43	1.39	1.35

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Navarro	143.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Newton	0.46	0.00	1.00	0.23	0.59	0.84	1.01	1.13	1.25	1.37	1.49	1.61
Nolan	18,279.00	184.00	1.00	9,922.95	8,917.84	7,600.42	6,569.01	5,840.69	5,112.37	4,384.05	3,655.73	2,927.41
Nueces	0.00	0.00	1.00	197.45	497.85	714.48	853.30	954.95	1,056.60	1,158.24	1,259.89	1,361.54
Ochiltree	2.61	4.62	1.00	4.32	5.20	5.80	6.13	6.38	6.62	6.87	7.12	7.37
Orange	117.00	3,132.00	1.00	56.49	142.25	204.12	243.55	272.65	301.76	330.87	359.97	389.08
Palo Pinto	0.00	0.00	1.00	169.28	426.31	611.69	729.86	817.09	904.32	991.54	1,078.77	1,166.00
Panola	1.33	1.13	1.00	0.14	0.34	0.49	0.59	0.66	0.73	0.80	0.87	0.94
Parker	47.39	0.00	1.00	23.87	23.84	22.47	21.19	20.30	19.41	18.51	17.62	16.73
Parmer	0.00	129.00	1.00	57.21	144.08	206.73	246.67	276.15	305.63	335.10	364.58	394.06
Pecos	0.00	0.00	1.00	0.76	0.61	0.53	0.47	0.43	0.39	0.34	0.30	0.26
Polk	0.00	149.00	1.00	184.35	464.26	666.15	794.84	889.84	984.83	1,079.82	1,174.81	1,269.81
Potter	0.05	0.34	1.00	0.13	0.33	0.48	0.57	0.64	0.71	0.77	0.84	0.91
Presidio	2.47	2.55	1.00	2.45	2.16	1.80	1.52	1.32	1.13	0.93	0.73	0.54
Rains	255.00	0.00	1.00	408.43	1,028.58	1,475.86	1,760.98	1,971.43	2,181.89	2,392.35	2,602.80	2,813.26
Randall	0.00	0.00	1.00	37.92	95.49	137.02	163.49	183.03	202.57	222.11	241.65	261.19
Reagan	0.93	2.17	1.00	0.25	0.28	0.30	0.30	0.30	0.30	0.31	0.31	0.31
Red River	2,670.00	0.00	1.00	1,400.74	4,462.91	6,560.88	9,720.02	9,994.58	10,269.14	10,543.70	10,818.26	11,092.81
Reeves	0.00	0.00	1.00	48.53	122.21	175.36	209.24	234.24	259.25	284.26	309.26	334.27
Refugio	0.92	1.75	1.00	3.42	0.63	0.91	1.09	1.22	1.35	1.48	1.61	1.74
Robertson	0.25	0.31	1.00	0.53	0.77	1.13	1.54	1.64	1.74	1.85	1.95	2.05
Rockwall	0.00	0.00	1.00	17.78	44.79	64.26	76.68	85.84	95.00	104.17	113.33	122.50
Rusk	275.00	0.00	1.00	350.51	594.00	758.98	860.70	936.37	1,012.05	1,087.73	1,163.41	1,239.08
Sabine	0.00	0.00	1.00	12.06	30.36	43.57	51.98	58.20	64.41	70.62	76.84	83.05
San Jacinto	2.76	0.61	1.00	1.75	2.34	2.90	3.26	3.51	3.76	4.01	4.26	4.52
San Patricio	0.00	0.00	1.00	3.68	9.26	13.29	15.86	17.75	19.65	21.54	23.43	25.33
San Saba	5.22	2.00	1.00	3.00	7.96	14.89	8.74	5.18	1.63	-1.92	-5.47	-9.02
Shackelford	263.00	0.00	1.00	146.76	29.60	42.48	50.68	56.74	62.80	68.86	74.91	80.97
Shelby	0.99	1.04	1.00	0.94	0.91	0.93	0.94	0.94	0.94	0.94	0.95	0.95
Sherman	16,894.00	1,714.00	1.00	10,735.87	8,112.27	10,563.23	12,116.43	13,235.12	14,353.80	15,472.48	16,591.17	17,709.85
Smith	0.00	4.54	1.00	2.92	2.58	2.16	1.84	1.61	1.38	1.15	0.92	0.69
Somervell	0.00	0.00	1.00	0.28	0.71	1.02	1.21	1.36	1.50	1.65	1.79	1.94
Starr	19.91	0.00	1.00	2.05	1.26	1.54	1.88	1.93	1.97	2.02	2.07	2.12
Stephens	1.84	1.93	1.00	1.25	1.29	1.26	1.26	1.21	1.17	1.12	1.08	1.03
Sutton	498.00	163.00	1.00	26.22	66.04	94.76	113.07	126.58	140.09	153.60	167.12	180.63
Tarrant	162.00	63.00	1.00	59.82	150.10	214.00	255.30	284.90	314.50	344.10	373.69	403.29
Taylor	6.71	0.00	1.00	0.31	0.77	1.11	1.32	1.48	1.64	1.79	1.95	2.11

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Terrell	0.00	0.00	1.00	232.02	1,193.60	1,851.56	3,002.50	3,028.64	3,054.77	3,080.91	3,107.05	3,133.19
Terry	396.00	400.00	1.00	39.67	99.90	143.34	171.03	191.47	211.91	232.35	252.79	273.23
Titus	857.00	2,422.00	1.00	2,757.99	4,402.95	5,495.66	6,161.86	6,658.85	7,155.83	7,652.81	8,149.79	8,646.77
Tom Green	4.07	4.95	1.00	4.56	5.19	6.10	6.84	7.15	7.46	7.78	8.09	8.40
Travis	89.47	0.48	1.00	2.99	6.76	7.75	9.20	9.01	8.81	8.62	8.43	8.23
Trinity	0.30	0.07	1.00	0.31	0.58	0.48	0.56	0.62	0.69	0.75	0.81	0.87
Tyler	898.00	155.00	1.00	279.43	571.81	777.39	912.29	1,005.97	1,099.66	1,193.34	1,287.02	1,380.70
Upshur	1.70	0.21	1.00	0.09	0.12	0.14	0.15	0.16	0.17	0.18	0.19	0.19
Upton	0.25	0.16	1.00	0.81	0.64	0.57	0.52	0.48	0.44	0.40	0.36	0.32
Uvalde	284.00	0.00	1.00	3,949.85	834.79	711.49	614.96	546.79	478.62	410.46	342.29	274.12
Val Verde	0.14	0.52	1.00	0.68	0.34	0.15	0.14	0.13	0.11	0.10	0.09	0.08
Van Zandt	0.00	28.33	1.00	0.30	0.77	1.10	1.32	1.47	1.63	1.79	1.94	2.10
Victoria	0.10	0.00	1.00	0.72	0.75	0.74	0.72	0.71	0.70	0.68	0.67	0.66
Walker	0.61	0.47	1.00	0.65	0.70	0.72	0.71	0.71	0.71	0.71	0.71	0.71
Waller	1.16	0.00	1.00	0.70	1.12	1.40	1.57	1.70	1.83	1.95	2.08	2.21
Washington	2.11	2.24	1.00	1.09	4.12	6.18	9.66	9.79	9.91	10.04	10.16	10.29
Webb	11.19	3.21	1.00	2.15	3.72	4.79	5.45	5.94	6.43	6.93	7.42	7.91
Wharton	1,806.00	0.00	1.00	266.70	671.65	963.72	1,149.90	1,287.32	1,424.75	1,562.18	1,699.60	1,837.03
Wichita	0.00	0.00	1.00	14.17	35.68	51.19	61.08	68.38	75.68	82.98	90.28	97.58
Wilbarger	172.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Willacy	0.35	0.98	1.00	2.07	1.71	2.13	2.50	2.65	2.80	2.94	3.09	3.24
Williamson	594.00	0.00	1.00	45.82	115.38	165.56	197.54	221.15	244.76	268.37	291.97	315.58
Wilson	2.75	0.95	1.00	0.34	0.87	1.25	1.50	1.68	1.85	2.03	2.21	2.38
Wise	392.00	1,884.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood	0.00	0.00	1.00	0.30	0.77	1.10	1.31	1.47	1.62	1.78	1.94	2.09
Young	0.00	0.00	1.00	0.89	1.43	1.78	2.00	2.16	2.32	2.48	2.65	2.81
Zapata	447.00	987.00	1.00	123.40	310.77	445.92	532.06	595.65	659.24	722.82	786.41	850.00
Zavala	0.00	0.00	1.00	16.46	41.45	59.47	70.96	79.44	87.92	96.40	104.88	113.36

Residential Sector County Allocation Factors (from 2004 Permit Data)

County	Number of Units
Anderson	17
Andrews	12
Angelina	107
Aransas	220
Archer	10
Armstrong	4
Atascosa	64
Austin	28
Bailey	2
Bandera	0
Bastrop	280
Baylor	0
Bee	16
Bell	2,351
Bexar	8,987
Blanco	22
Borden	0
Bosque	2
Bowie	154
Brazoria	3,288
Brazos	859
Brewster	15
Briscoe	0
Brooks	2
Brown	20
Burleson	18
Burnet	447
Caldwell	103
Calhoun	135
Callahan	15
Cameron	3,070
Camp	17
Carson	7
Cass	18
Castro	0
Chambers	571
Cherokee	27
Childress	0
Clay	0
Cochran	0
Coke	0
Coleman	6

County	Number of Units
Collin	11,079
Collingsworth	0
Colorado	9
Comal	1,589
Comanche	4
Concho	0
Cooke	109
Coryell	173
Cottle	0
Crane	0
Crockett	0
Crosby	2
Culberson	1
Dallam	2
Dallas	10,046
Dawson	1
Deaf Smith	6
Delta	7
Denton	6,461
Dewitt	5
Dickens	0
Dimmit	15
Donley	3
Duval	0
Eastland	0
Ector	194
Edwards	0
El Paso	3,407
Ellis	1,798
Erath	46
Falls	9
Fannin	58
Fayette	37
Fisher	0
Floyd	2
Foard	0
Fort Bend	3,858
Franklin	4
Freestone	27
Frio	81
Gaines	13
Galveston	2,995
Garza	0
Gillespie	79

County	Number of Units
Glasscock	0
Goliad	0
Gonzales	4
Gray	1
Grayson	411
Gregg	298
Grimes	7
Guadalupe	1,303
Hale	19
Hall	0
Hamilton	2
Hansford	0
Hardeman	0
Hardin	115
Harris	28,020
Harrison	44
Hartley	0
Haskell	0
Hays	1,960
Hemphill	0
Henderson	139
Hidalgo	6,744
Hill	24
Hockley	13
Hood	92
Hopkins	93
Houston	7
Howard	0
Hudspeth	0
Hunt	191
Hutchinson	3
Irion	0
Jack	3
Jackson	20
Jasper	7
Jeff Davis	0
Jefferson	711
Jim Hogg	0
Jim Wells	45
Johnson	913
Jones	3
Karnes	26
Kaufman	789
Kendall	539

County	Number of Units
Kenedy	0
Kent	0
Kerr	104
Kimble	5
King	0
Kinney	2
Kleberg	6
Knox	0
La Salle	2
Lamar	77
Lamb	0
Lampasas	10
Lavaca	10
Lee	15
Leon	0
Liberty	263
Limestone	23
Lipscomb	0
Live Oak	1
Llano	201
Loving	0
Lubbock	1,392
Lynn	3
Madison	11
Marion	1
Martin	3
Mason	14
Matagorda	137
Maverick	203
Mcculloch	4
Mclennan	788
Mcmullen	0
Medina	111
Menard	-
Midland	289
Milam	13
Mills	0
Mitchell	0
Montague	3
Montgomery	6,023
Moore	33
Morris	4
Motley	0
Nacogdoches	69

County	Number of Units
Navarro	41
Newton	0
Nolan	3
Nueces	1,448
Ochiltree	6
Oldham	4
Orange	251
Palo Pinto	7
Panola	7
Parker	357
Parmer	4
Pecos	1
Polk	187
Potter	697
Presidio	89
Rains	8
Randall	29
Reagan	1
Real	8
Red River	4
Reeves	1
Refugio	12
Roberts	0
Robertson	15
Rockwall	1,598
Runnels	0
Rusk	13
Sabine	1
San Augustine	0
San Jacinto	11
San Patricio	301
San Saba	5
Schleicher	1
Scurry	4
Shackelford	0
Shelby	20
Sherman	19
Smith	608
Somervell	18
Starr	0
Stephens	2
Sterling	0
Stonewall	0
Sutton	0

County	Number of Units
Swisher	0
Tarrant	14,705
Taylor	265
Terrell	0
Terry	0
Throckmorton	0
Titus	51
Tom Green	231
Travis	7,757
Trinity	0
Tyler	4
Upshur	9
Upton	0
Uvalde	20
Val Verde	127
Van Zandt	51
Victoria	138
Walker	193
Waller	46
Ward	4
Washington	39
Webb	1,617
Wharton	105
Wheeler	0
Wichita	309
Wilbarger	63
Willacy	33
Williamson	4,209
Wilson	41
Winkler	6
Wise	173
Wood	17
Yoakum	0
Young	7
Zapata	0
Zavala	3
Total	151,384

TxDOT Equipment County Level Allocation (2004)

County	Equipment Count
Anderson	50
Andrews	20
Angelina	52
Aransas	19
Archer	18
Armstrong	23
Atascosa	25
Austin	34
Bailey	18
Bandera	18
Bastrop	20
Baylor	20
Bee	21
Bell	55
Bexar	183
Blanco	15
Borden	15
Bosque	29
Bowie	49
Brazoria	42
Brazos	86
Brewster	30
Briscoe	15
Brown	68
Burleson	22
Burnet	22
Caldwell	18
Calhoun	26
Callahan	18
Cameron	36
Carson	44
Cass	67
Castro	19
Chambers	23
Cherokee	43
Childress	73
Clay	24
Cochran	17
Coke	30
Coleman	26
Collin	36
Collingswor	17

County	Equipment Count
Colorado	30
Comal	22
Comanche	28
Concho	21
Cooke	27
Coryell	26
Cottle	13
Crane	16
Crockett	27
Crosby	18
Culberson	38
Dallam	22
Dallas	189
Dawson	19
Deaf Smith	24
Delta	19
Denton	42
De Witt	92
Dickens	15
Dimmit	20
Donley	15
Duval	15
Eastland	42
Ector	70
Edwards	20
Ellis	51
El Paso	102
Erath	33
Falls	30
Fannin	23
Fayette	43
Fisher	19
Floyd	20
Foard	13
Fort Bend	71
Franklin	22
Freestone	27
Frio	21
Gaines	19
Galveston	34
Garza	21
Gillespie	17
Glasscock	6
Goliad	21

County	Equipment Count
Gonzales	40
Gray	23
Grayson	45
Gregg	25
Grimes	24
Guadalupe	21
Hale	33
Hall	19
Hamilton	29
Hansford	22
Hardeman	15
Hardin	20
Harris	256
Harrison	25
Hartley	19
Haskell	23
Hays	24
Hemphill	21
Henderson	32
Hidalgo	106
Hill	37
Hockley	23
Hopkins	28
Houston	24
Howard	22
Hudspeth	19
Hunt	28
Hutchinson	24
Jack	26
Jackson	28
Jasper	18
Jeff Davis	26
Jefferson	78
Jim Hogg	24
Jim Wells	21
Johnson	33
Jones	29
Karnes	24
Kaufman	38
Kendall	21
Kent	15
Kerr	19
Kimble	30
King	4

County	Equipment Count
Kinney	17
Kleberg	24
Knox	17
Lamar	72
Lamb	19
Lampasas	28
La Salle	20
Lavaca	29
Lee	19
Leon	25
Liberty	38
Limestone	26
Lipscomb	12
Live Oak	21
Llano	19
Loving	4
Lubbock	149
Lynn	18
Mcculloch	26
Mclennan	99
Mcmullen	20
Madison	22
Marion	19
Martin	20
Mason	16
Matagorda	36
Maverick	20
Medina	31
Menard	11
Midland	23
Milam	24
Mills	20
Mitchell	20
Montague	39
Montgomery	38
Moore	22
Morris	21
Motley	16
Nacogdoches	29
Navarro	34
Newton	13
Nolan	19
Nueces	140
Ochiltree	18

County	Equipment Count
Oldham	20
Orange	26
Palo Pinto	37
Panola	23
Parker	32
Parmer	24
Pecos	43
Polk	28
Potter	23
Presidio	21
Rains	20
Randall	117
Reagan	27
Real	24
Red River	22
Reeves	42
Refugio	22
Roberts	10
Robertson	20
Rockwall	31
Runnels	28
Rusk	21
Sabine	21
San Augustine	25
San Jacinto	25
San Patricio	26
San Saba	22
Schleicher	4
Scurry	22
Shackelford	14
Shelby	25
Sherman	20
Smith	101
Somervell	35
Starr	23
Stephens	24
Sterling	21
Stonewall	17
Sutton	24
Swisher	26
Tarrant	217
Taylor	105
Terrell	16
Terry	20

County	Equipment Count
Throckmorton	16
Titus	25
Tom Green	66
Travis	230
Trinity	26
Tyler	16
Upshur	23
Upton	17
Uvalde	19
Val Verde	38
Van Zandt	24
Victoria	43
Walker	23
Waller	33
Ward	21
Washington	25
Webb	35
Wharton	39
Wheeler	21
Wichita	104
Wilbarger	21
Willacy	17
Williamson	44
Wilson	25
Winkler	13
Wise	33
Wood	34
Yoakum	16
Young	36
Zavala	18

Municipal and County Equipment Geographic Allocation

County	Allocation Factor
Anderson	0.00250
Andrews	0.00057
Angelina	0.00362
Aransas	0.00107
Archer	0.00041
Armstrong	0.00010
Atascosa	0.00190
Austin	0.00115
Bailey	0.00030
Bandera	0.00088
Bastrop	0.00305
Baylor	0.00017
Bee	0.00147
Bell	0.01113
Bexar	0.06643
Blanco	0.00040
Borden	0.00003
Bosque	0.00080
Bowie	0.00401
Brazoria	0.01206
Brazos	0.00695
Brewster	0.00041
Briscoe	0.00008
Brooks	0.00034
Brown	0.00170
Burleson	0.00076
Burnet	0.00179
Caldwell	0.00162
Calhoun	0.00091
Callahan	0.00059
Cameron	0.01653
Camp	0.00053
Carson	0.00029
Cass	0.00133
Castro	0.00034
Chambers	0.00126
Cherokee	0.00214
Childress	0.00034
Clay	0.00050
Cochran	0.00015
Coke	0.00017
Coleman	0.00039

County	Allocation Factor
Collin	0.02792
Collingsworth	0.00014
Colorado	0.00092
Comal	0.00408
Comanche	0.00061
Concho	0.00017
Cooke	0.00172
Coryell	0.00334
Cottle	0.00008
Crane	0.00017
Crockett	0.00018
Crosby	0.00030
Culberson	0.00012
Dallam	0.00027
Dallas	0.10203
Dawson	0.00064
Deaf Smith	0.00082
Delta	0.00024
Denton	0.02359
DeWitt	0.00091
Dickens	0.00012
Dimmit	0.00045
Donley	0.00018
Duval	0.00056
Eastland	0.00082
Ector	0.00554
Edwards	0.00009
Ellis	0.00572
El Paso	0.03171
Erath	0.00150
Falls	0.00079
Fannin	0.00145
Fayette	0.00100
Fisher	0.00018
Floyd	0.00033
Foard	0.00007
Fort Bend	0.01968
Franklin	0.00045
Freestone	0.00083
Frio	0.00073
Gaines	0.00065
Galveston	0.01208
Garza	0.00023
Gillespie	0.00100

County	Allocation Factor
Glasscock	0.00006
Goliad	0.00032
Gonzales	0.00086
Gray	0.00095
Grayson	0.00515
Gregg	0.00511
Grimes	0.00112
Guadalupe	0.00443
Hale	0.00160
Hall	0.00017
Hamilton	0.00036
Hansford	0.00023
Hardeman	0.00019
Hardin	0.00224
Harris	0.16204
Harrison	0.00279
Hartley	0.00024
Haskell	0.00025
Hays	0.00531
Hemphill	0.00015
Henderson	0.00352
Hidalgo	0.02927
Hill	0.00156
Hockley	0.00101
Hood	0.00207
Hopkins	0.00148
Houston	0.00104
Howard	0.00146
Hudspeth	0.00015
Hunt	0.00364
Hutchinson	0.00101
Irion	0.00008
Jack	0.00040
Jackson	0.00064
Jasper	0.00158
Jeff Davis	0.00010
Jefferson	0.01104
Jim Hogg	0.00023
Jim Wells	0.00181
Johnson	0.00638
Jones	0.00089
Karnes	0.00069
Kaufman	0.00380
Kendall	0.00121

County	Allocation Factor
Kenedy	0.00002
Kent	0.00003
Kerr	0.00203
Kimble	0.00020
King	0.00001
Kinney	0.00015
Kleberg	0.00139
Knox	0.00017
Lamar	0.00221
Lamb	0.00065
Lampasas	0.00092
La Salle	0.00026
Lavaca	0.00084
Lee	0.00074
Leon	0.00072
Liberty	0.00333
Limestone	0.00101
Lipscomb	0.00014
Live Oak	0.00052
Llano	0.00081
Loving	0.00000
Lubbock	0.01116
Lynn	0.00027
McCulloch	0.00036
McLennan	0.00989
McMullen	0.00004
Madison	0.00059
Marion	0.00049
Martin	0.00020
Mason	0.00017
Matagorda	0.00169
Maverick	0.00224
Medina	0.00188
Menard	0.00010
Midland	0.00535
Milam	0.00112
Mills	0.00023
Mitchell	0.00042
Montague	0.00087
Montgomery	0.01611
Moore	0.00090
Morris	0.00058
Motley	0.00006
Nacogdoches	0.00268

County	Allocation Factor
Navarro	0.00215
Newton	0.00064
Nolan	0.00067
Nueces	0.01412
Ochiltree	0.00041
Oldham	0.00010
Orange	0.00377
Palo Pinto	0.00121
Panola	0.00102
Parker	0.00446
Parmer	0.00044
Pecos	0.00071
Polk	0.00206
Potter	0.00527
Presidio	0.00034
Rains	0.00049
Randall	0.00485
Reagan	0.00014
Real	0.00013
Red River	0.00061
Reeves	0.00053
Refugio	0.00034
Roberts	0.00004
Robertson	0.00072
Rockwall	0.00259
Runnels	0.00049
Rusk	0.00213
Sabine	0.00046
San Augustine	0.00040
San Jacinto	0.00110
San Patricio	0.00303
San Saba	0.00027
Schleicher	0.00012
Scurry	0.00072
Shackelford	0.00014
Shelby	0.00116
Sherman	0.00014
Smith	0.00829
Somervell	0.00033
Starr	0.00266
Stephens	0.00042
Sterling	0.00006
Stonewall	0.00006
Sutton	0.00018

County	Allocation Factor
Swisher	0.00035
Tarrant	0.07061
Taylor	0.00556
Terrell	0.00004
Terry	0.00056
Throckmorton	0.00007
Titus	0.00130
Tom Green	0.00461
Travis	0.03868
Trinity	0.00064
Tyler	0.00093
Upshur	0.00166
Upton	0.00014
Uvalde	0.00118
Val Verde	0.00211
Van Zandt	0.00231
Victoria	0.00381
Walker	0.00277
Waller	0.00155
Ward	0.00046
Washington	0.00139
Webb	0.00976
Wharton	0.00185
Wheeler	0.00021
Wichita	0.00566
Wilbarger	0.00063
Willacy	0.00090
Williamson	0.01414
Wilson	0.00163
Winkler	0.00030
Wise	0.00247
Wood	0.00179
Yoakum	0.00033
Young	0.00080
Zapata	0.00058
Zavala	0.00052

Tx-REMI Model Dollar Value Outputs by SIC Group and County (2004)

County	Agriculture	Landscaping	Construction	Manufacturing	Concrete	Brick/Stone	Scrap	Other
Anderson	0.0125	0.0072	0.1407	0.7676	0.0061	0.1060	0.0071	1.2116
Andrews	0.0051	0.0051	0.0397	0.1224	0.0010	0.0380	0.0012	0.3675
Angelina	0.0185	0.0056	0.1637	1.0473	0.0052	0.1098	0.0142	1.5978
Aransas	0.0069	0.0055	0.1025	0.4366	0.0054	0.0522	0.0030	0.7460
Archer	0.0035	0.0034	0.0254	0.1120	0.0033	0.0216	0.0005	0.2518
Armstrong	0.0012	0.0012	0.0061	0.0303	0.0001	0.0077	0.0001	0.0714
Atascosa	0.0106	0.0104	0.1082	0.3964	0.0114	0.0525	0.0030	0.7087
Austin	0.0167	0.0140	0.0922	0.2816	0.0225	0.0632	0.0015	0.6851
Bailey	0.0037	0.0037	0.0189	0.0934	0.0004	0.0237	0.0002	0.2198
Bandera	0.0049	0.0048	0.0501	0.1834	0.0053	0.0243	0.0014	0.3279
Bastrop	0.0145	0.0125	0.1527	0.2210	0.0042	0.0577	0.0192	0.9209
Baylor	0.0015	0.0015	0.0108	0.0475	0.0014	0.0092	0.0002	0.1068
Bee	0.0123	0.0123	0.0454	0.1514	0.0019	0.0624	0.0028	0.6177
Bell	0.0545	0.0521	0.6691	2.9128	0.0442	0.5856	0.0265	6.4761
Bexar	0.2292	0.2279	5.1158	10.8534	0.2008	4.6095	0.0666	54.2456
Blanco	0.0021	0.0020	0.0262	0.0308	0.0009	0.0100	0.0010	0.1639
Borden	0.0003	0.0003	0.0021	0.0065	0.0001	0.0020	0.0001	0.0195
Bosque	0.0042	0.0040	0.0519	0.0610	0.0018	0.0198	0.0019	0.3241
Bowie	0.0201	0.0117	0.2263	1.2345	0.0097	0.1705	0.0114	1.9484
Brazoria	0.0597	0.0541	1.2208	6.1217	0.0293	0.4226	0.0532	4.7280
Brazos	0.0340	0.0325	0.4177	1.8185	0.0276	0.3656	0.0165	4.0430
Brewster	0.0049	0.0049	0.0181	0.0233	0.0019	0.0161	0.0078	0.2147
Briscoe	0.0010	0.0010	0.0049	0.0241	0.0001	0.0061	0.0001	0.0566
Brooks	0.0013	0.0451	0.1468	0.0142	0.0068	0.0902	0.0017	0.1728
Brown	0.0144	0.0141	0.1047	0.4611	0.0135	0.0889	0.0020	1.0365
Burleson	0.0037	0.0036	0.0456	0.1985	0.0030	0.0399	0.0018	0.4413
Burnet	0.0094	0.0090	0.1162	0.1365	0.0041	0.0443	0.0042	0.7253
Caldwell	0.0077	0.0066	0.0812	0.1175	0.0022	0.0307	0.0102	0.4899
Calhoun	0.0115	0.0115	0.1108	0.7790	0.0016	0.0365	0.0003	0.4254
Callahan	0.0050	0.0049	0.0365	0.1608	0.0047	0.0310	0.0007	0.3614
Cameron	0.1374	0.1112	0.7971	2.1505	0.0381	0.6523	0.0229	6.9587
Camp	0.0027	0.0016	0.0301	0.1643	0.0013	0.0227	0.0015	0.2593
Carson	0.0036	0.0036	0.0183	0.0908	0.0004	0.0230	0.0002	0.2137
Cass	0.0067	0.0039	0.0753	0.4105	0.0032	0.0567	0.0038	0.6480
Castro	0.0043	0.0043	0.0218	0.1077	0.0005	0.0273	0.0002	0.2536
Chambers	0.0112	0.0008	0.0757	0.6203	0.0004	0.0453	0.0237	0.3843
Cherokee	0.0107	0.0062	0.1206	0.6578	0.0052	0.0908	0.0061	1.0383
Childress	0.0043	0.0043	0.0215	0.1067	0.0005	0.0271	0.0002	0.2511
Clay	0.0042	0.0042	0.0308	0.1356	0.0040	0.0261	0.0006	0.3049
Cochran	0.0019	0.0019	0.0095	0.0468	0.0002	0.0119	0.0001	0.1102
Coke	0.0015	0.0015	0.0115	0.0354	0.0003	0.0110	0.0003	0.1063
Coleman	0.0033	0.0032	0.0240	0.1055	0.0031	0.0203	0.0005	0.2372
Collin	0.1335	0.1229	1.3177	6.7661	0.0755	1.2354	0.0161	14.2196
Collingsworth	0.0017	0.0017	0.0086	0.0427	0.0002	0.0108	0.0001	0.1005
Colorado	0.0134	0.0113	0.0742	0.2266	0.0181	0.0509	0.0012	0.5515

County	Agriculture	Landscaping	Construction	Manufacturing	Concrete	Brick/Stone	Scrap	Other
Comal	0.0190	0.0190	0.3292	1.1506	0.0307	0.1898	0.0078	2.5282
Comanche	0.0051	0.0050	0.0373	0.1644	0.0048	0.0317	0.0007	0.3696
Concho	0.0015	0.0015	0.0116	0.0357	0.0003	0.0111	0.0003	0.1071
Cooke	0.0078	0.0078	0.1290	0.8789	0.0010	0.0634	0.0041	0.9509
Coryell	0.0176	0.0168	0.2165	0.2543	0.0076	0.0825	0.0079	1.3516
Cottle	0.0010	0.0010	0.0049	0.0245	0.0001	0.0062	0.0001	0.0577
Crane	0.0015	0.0015	0.0119	0.0367	0.0003	0.0114	0.0003	0.1102
Crockett	0.0016	0.0016	0.0122	0.0377	0.0003	0.0117	0.0004	0.1130
Crosby	0.0037	0.0037	0.0188	0.0931	0.0004	0.0236	0.0002	0.2192
Culberson	0.0015	0.0015	0.0053	0.0069	0.0006	0.0047	0.0023	0.0635
Dallam	0.0035	0.0035	0.0175	0.0866	0.0004	0.0220	0.0002	0.2037
Dallas	0.4710	0.4631	9.5410	52.2031	0.3814	18.7180	0.0964	138.0138
Dawson	0.0057	0.0057	0.0445	0.1371	0.0011	0.0425	0.0013	0.4116
Deaf Smith	0.0104	0.0104	0.0524	0.2594	0.0012	0.0658	0.0006	0.6106
Delta	0.0012	0.0007	0.0138	0.0753	0.0006	0.0104	0.0007	0.1189
Denton	0.1081	0.1073	1.2213	4.1120	0.1414	1.0204	0.1106	9.5842
De Witt	0.0081	0.0081	0.0775	0.5447	0.0012	0.0255	0.0002	0.2975
Dickens	0.0015	0.0015	0.0077	0.0380	0.0002	0.0096	0.0001	0.0894
Dimmit	0.0037	0.0036	0.0260	0.0533	0.0020	0.0159	0.0005	0.2276
Donley	0.0022	0.0022	0.0111	0.0552	0.0003	0.0140	0.0001	0.1299
Duval	0.0046	0.0045	0.0322	0.0661	0.0025	0.0197	0.0006	0.2821
Eastland	0.0069	0.0068	0.0504	0.2220	0.0065	0.0428	0.0010	0.4989
Ector	0.0494	0.0491	0.3854	1.1866	0.0094	0.3681	0.0113	3.5626
Edwards	0.0007	0.0007	0.0051	0.0105	0.0004	0.0031	0.0001	0.0448
Ellis	0.0906	0.0729	1.1907	5.6646	0.1003	0.6837	0.0624	8.1061
El Paso	0.0785	0.0785	1.7537	9.5832	0.1920	1.9639	0.0124	18.2897
Erath	0.0043	0.0034	0.0563	0.2677	0.0047	0.0323	0.0030	0.3831
Falls	0.0039	0.0037	0.0475	0.2067	0.0031	0.0416	0.0019	0.4596
Fannin	0.0073	0.0042	0.0818	0.4462	0.0035	0.0616	0.0041	0.7043
Fayette	0.0049	0.0047	0.0602	0.2620	0.0040	0.0527	0.0024	0.5824
Fisher	0.0015	0.0015	0.0112	0.0495	0.0014	0.0095	0.0002	0.1112
Floyd	0.0041	0.0041	0.0207	0.1027	0.0005	0.0261	0.0002	0.2418
Foard	0.0006	0.0006	0.0043	0.0187	0.0005	0.0036	0.0001	0.0421
Fort Bend	0.0904	0.0898	0.9540	3.3398	0.0751	0.6264	0.1744	8.5139
Franklin	0.0022	0.0013	0.0252	0.1377	0.0011	0.0190	0.0013	0.2173
Freestone	0.0041	0.0039	0.0497	0.2164	0.0033	0.0435	0.0020	0.4811
Frio	0.0060	0.0058	0.0417	0.0855	0.0032	0.0255	0.0008	0.3649
Gaines	0.0058	0.0057	0.0451	0.1388	0.0011	0.0431	0.0013	0.4168
Galveston	0.0580	0.0232	0.5087	5.4525	0.0213	0.3222	0.0356	5.9312
Garza	0.0029	0.0029	0.0144	0.0714	0.0003	0.0181	0.0002	0.1680
Gillespie	0.0082	0.0080	0.0572	0.1174	0.0044	0.0350	0.0011	0.5010
Glasscock	0.0005	0.0005	0.0041	0.0127	0.0001	0.0039	0.0001	0.0382
Goliad	0.0040	0.0040	0.0383	0.2690	0.0006	0.0126	0.0001	0.1469
Gonzales	0.0072	0.0072	0.0265	0.0884	0.0011	0.0364	0.0016	0.3604
Gray	0.0120	0.0120	0.0606	0.3001	0.0014	0.0761	0.0007	0.7062
Grayson	0.0235	0.0235	0.3872	2.6380	0.0029	0.1903	0.0124	2.8541
Gregg	0.0254	0.0254	0.4504	2.8769	0.0148	0.4935	0.0339	4.8307

County	Agriculture	Landscaping	Construction	Manufacturing	Concrete	Brick/Stone	Scrap	Other
Grimes	0.0055	0.0053	0.0675	0.2937	0.0045	0.0590	0.0027	0.6530
Guadalupe	0.0247	0.0243	0.2525	0.9248	0.0266	0.1226	0.0069	1.6535
Hale	0.0203	0.0203	0.1020	0.5050	0.0024	0.1281	0.0011	1.1885
Hall	0.0021	0.0021	0.0106	0.0524	0.0002	0.0133	0.0001	0.1232
Hamilton	0.0019	0.0018	0.0234	0.0275	0.0008	0.0089	0.0009	0.1461
Hansford	0.0029	0.0029	0.0147	0.0730	0.0003	0.0185	0.0002	0.1718
Hardeman	0.0016	0.0016	0.0120	0.0528	0.0015	0.0102	0.0002	0.1187
Hardin	0.0089	0.0012	0.1788	0.2549	0.0000	0.0386	0.0022	0.6747
Harris	0.6725	0.6342	16.5725	64.1596	0.5636	16.8940	0.6506	150.5191
Harrison	0.0111	0.0025	0.1740	0.9915	0.0108	0.0731	0.0096	1.1843
Hartley	0.0030	0.0030	0.0153	0.0760	0.0004	0.0193	0.0002	0.1789
Haskell	0.0021	0.0021	0.0153	0.0675	0.0020	0.0130	0.0003	0.1518
Hays	0.0209	0.0209	0.3372	1.0915	0.0060	0.1278	0.0156	2.7112
Hemphill	0.0019	0.0019	0.0094	0.0468	0.0002	0.0119	0.0001	0.1100
Henderson	0.0176	0.0102	0.1985	1.0831	0.0085	0.1496	0.0100	1.7096
Hidalgo	0.2433	0.1969	1.4111	3.8071	0.0674	1.1549	0.0406	12.3191
Hill	0.0077	0.0073	0.0940	0.4091	0.0062	0.0822	0.0037	0.9095
Hockley	0.0128	0.0128	0.0645	0.3193	0.0015	0.0810	0.0007	0.7515
Hood	0.0059	0.0048	0.0776	0.3693	0.0065	0.0446	0.0041	0.5285
Hopkins	0.0074	0.0043	0.0832	0.4541	0.0036	0.0627	0.0042	0.7168
Houston	0.0053	0.0016	0.0468	0.2995	0.0015	0.0314	0.0041	0.4569
Howard	0.0131	0.0130	0.1018	0.3134	0.0025	0.0972	0.0030	0.9409
Hudspeth	0.0018	0.0018	0.0065	0.0083	0.0007	0.0057	0.0028	0.0768
Hunt	0.0104	0.0084	0.1365	0.6496	0.0115	0.0784	0.0072	0.9296
Hutchinson	0.0127	0.0127	0.0640	0.3170	0.0015	0.0804	0.0007	0.7461
Irion	0.0007	0.0007	0.0054	0.0166	0.0001	0.0051	0.0002	0.0497
Jack	0.0034	0.0033	0.0246	0.1085	0.0032	0.0209	0.0005	0.2438
Jackson	0.0081	0.0081	0.0776	0.5453	0.0012	0.0256	0.0002	0.2978
Jasper	0.0081	0.0025	0.0715	0.4577	0.0023	0.0480	0.0062	0.6982
Jeff Davis	0.0012	0.0012	0.0044	0.0057	0.0005	0.0039	0.0019	0.0524
Jefferson	0.0605	0.0583	1.2370	9.9319	0.0358	0.5770	0.0751	7.4414
Jim Hogg	0.0009	0.0295	0.0959	0.0093	0.0045	0.0589	0.0011	0.1129
Jim Wells	0.0149	0.0145	0.1038	0.2129	0.0080	0.0634	0.0021	0.9086
Johnson	0.0182	0.0147	0.2395	1.1392	0.0202	0.1375	0.0126	1.6302
Jones	0.0076	0.0074	0.0551	0.2427	0.0071	0.0468	0.0010	0.5455
Karnes	0.0057	0.0057	0.0212	0.0708	0.0009	0.0292	0.0013	0.2889
Kaufman	0.0109	0.0087	0.1426	0.6782	0.0120	0.0819	0.0075	0.9705
Kendall	0.0068	0.0067	0.0690	0.2526	0.0073	0.0335	0.0019	0.4517
Kenedy	0.0001	0.0001	0.0010	0.0021	0.0001	0.0006	0.0000	0.0091
Kent	0.0003	0.0003	0.0020	0.0090	0.0003	0.0017	0.0000	0.0202
Kerr	0.0167	0.0162	0.1162	0.2383	0.0090	0.0710	0.0023	1.0170
Kimble	0.0018	0.0018	0.0141	0.0435	0.0003	0.0135	0.0004	0.1306
King	0.0002	0.0002	0.0009	0.0045	0.0000	0.0011	0.0000	0.0107
Kinney	0.0012	0.0012	0.0085	0.0174	0.0007	0.0052	0.0002	0.0743
Kleberg	0.0114	0.0111	0.0798	0.1636	0.0062	0.0487	0.0016	0.6982
Knox	0.0015	0.0014	0.0107	0.0470	0.0014	0.0091	0.0002	0.1057
Lamar	0.0111	0.0064	0.1246	0.6800	0.0054	0.0939	0.0063	1.0732

County	Agriculture	Landscaping	Construction	Manufacturing	Concrete	Brick/Stone	Scrap	Other
Lamb	0.0082	0.0082	0.0411	0.2035	0.0010	0.0516	0.0005	0.4790
Lampasas	0.0049	0.0046	0.0598	0.0702	0.0021	0.0228	0.0022	0.3730
La Salle	0.0022	0.0021	0.0151	0.0310	0.0012	0.0092	0.0003	0.1324
Lavaca	0.0106	0.0106	0.1021	0.7175	0.0015	0.0336	0.0002	0.3918
Lee	0.0036	0.0034	0.0442	0.1924	0.0029	0.0387	0.0017	0.4278
Leon	0.0035	0.0034	0.0431	0.1874	0.0028	0.0377	0.0017	0.4167
Liberty	0.0121	0.0048	0.1901	0.5909	0.0755	0.0964	0.0068	1.1547
Limestone	0.0050	0.0047	0.0608	0.2649	0.0040	0.0533	0.0024	0.5889
Lipscomb	0.0017	0.0017	0.0087	0.0431	0.0002	0.0109	0.0001	0.1014
Live Oak	0.0043	0.0041	0.0297	0.0610	0.0023	0.0182	0.0006	0.2604
Llano	0.0043	0.0041	0.0523	0.0615	0.0018	0.0199	0.0019	0.3266
Loving	0.0000	0.0000	0.0002	0.0005	0.0000	0.0002	0.0000	0.0015
Lubbock	0.1412	0.1412	0.7104	3.5184	0.0166	0.8924	0.0078	8.2806
Lynn	0.0035	0.0035	0.0174	0.0863	0.0004	0.0219	0.0002	0.2031
McCulloch	0.0032	0.0032	0.0251	0.0773	0.0006	0.0240	0.0007	0.2320
McLennan	0.0484	0.0463	0.5946	2.5884	0.0393	0.5204	0.0235	5.7547
McMullen	0.0003	0.0003	0.0022	0.0045	0.0002	0.0013	0.0000	0.0190
Madison	0.0013	0.0013	0.0165	0.0716	0.0011	0.0144	0.0007	0.1593
Marion	0.0025	0.0014	0.0279	0.1520	0.0012	0.0210	0.0014	0.2400
Martin	0.0018	0.0018	0.0138	0.0424	0.0003	0.0132	0.0004	0.1273
Mason	0.0015	0.0015	0.0119	0.0366	0.0003	0.0114	0.0003	0.1100
Matagorda	0.0246	0.0207	0.1361	0.4157	0.0332	0.0934	0.0022	1.0116
Maverick	0.0184	0.0179	0.1283	0.2632	0.0099	0.0784	0.0026	1.1230
Medina	0.0105	0.0103	0.1071	0.3924	0.0113	0.0520	0.0029	0.7016
Menard	0.0009	0.0009	0.0071	0.0218	0.0002	0.0068	0.0002	0.0654
Midland	0.0478	0.0475	0.3726	1.1471	0.0091	0.3559	0.0109	3.4440
Milam	0.0055	0.0052	0.0674	0.2933	0.0044	0.0590	0.0027	0.6521
Mills	0.0012	0.0011	0.0148	0.0174	0.0005	0.0056	0.0005	0.0924
Mitchell	0.0035	0.0035	0.0258	0.1136	0.0033	0.0219	0.0005	0.2552
Montague	0.0073	0.0072	0.0535	0.2355	0.0069	0.0454	0.0010	0.5294
Montgomery	0.0758	0.0732	0.9095	2.0453	0.0351	0.6361	0.0199	7.5484
Moore	0.0114	0.0114	0.0575	0.2850	0.0013	0.0723	0.0006	0.6707
Morris	0.0029	0.0017	0.0328	0.1789	0.0014	0.0247	0.0017	0.2824
Motley	0.0007	0.0007	0.0037	0.0183	0.0001	0.0046	0.0000	0.0431
Nacogdoches	0.0137	0.0042	0.1210	0.7743	0.0039	0.0812	0.0105	1.1813
Navarro	0.0061	0.0049	0.0806	0.3832	0.0068	0.0463	0.0042	0.5484
Newton	0.0033	0.0010	0.0288	0.1844	0.0009	0.0193	0.0025	0.2813
Nolan	0.0057	0.0056	0.0415	0.1827	0.0053	0.0352	0.0008	0.4107
Nueces	0.0908	0.0724	1.3538	5.7662	0.0708	0.6888	0.0396	9.8526
Ochiltree	0.0051	0.0051	0.0259	0.1282	0.0006	0.0325	0.0003	0.3016
Oldham	0.0012	0.0012	0.0061	0.0300	0.0001	0.0076	0.0001	0.0706
Orange	0.0132	0.0132	0.2413	1.8174	0.0148	0.0773	0.0005	1.4132
Palo Pinto	0.0035	0.0028	0.0456	0.2171	0.0038	0.0262	0.0024	0.3106
Panola	0.0052	0.0016	0.0459	0.2939	0.0015	0.0308	0.0040	0.4483
Parker	0.0128	0.0103	0.1675	0.7970	0.0141	0.0962	0.0088	1.1405
Parmer	0.0056	0.0056	0.0281	0.1392	0.0007	0.0353	0.0003	0.3277
Pecos	0.0063	0.0063	0.0494	0.1520	0.0012	0.0472	0.0014	0.4564

County	Agriculture	Landscaping	Construction	Manufacturing	Concrete	Brick/Stone	Scrap	Other
Polk	0.0105	0.0032	0.0932	0.5963	0.0030	0.0625	0.0081	0.9097
Potter	0.0666	0.0666	0.3351	1.6597	0.0078	0.4209	0.0037	3.9061
Presidio	0.0041	0.0041	0.0150	0.0193	0.0016	0.0133	0.0065	0.1778
Rains	0.0025	0.0014	0.0277	0.1514	0.0012	0.0209	0.0014	0.2389
Randall	0.0613	0.0613	0.3087	1.5287	0.0072	0.3877	0.0034	3.5977
Reagan	0.0012	0.0012	0.0095	0.0292	0.0002	0.0091	0.0003	0.0877
Real	0.0011	0.0011	0.0076	0.0156	0.0006	0.0047	0.0002	0.0667
Red River	0.0030	0.0018	0.0342	0.1867	0.0015	0.0258	0.0017	0.2947
Reeves	0.0047	0.0047	0.0367	0.1129	0.0009	0.0350	0.0011	0.3389
Refugio	0.0043	0.0043	0.0412	0.2893	0.0006	0.0136	0.0001	0.1580
Roberts	0.0005	0.0005	0.0024	0.0121	0.0001	0.0031	0.0000	0.0285
Robertson	0.0035	0.0034	0.0431	0.1878	0.0028	0.0377	0.0017	0.4175
Rockwall	0.0074	0.0060	0.0973	0.4628	0.0082	0.0559	0.0051	0.6622
Runnels	0.0041	0.0040	0.0300	0.1322	0.0039	0.0255	0.0006	0.2971
Rusk	0.0085	0.0019	0.1331	0.7583	0.0082	0.0559	0.0074	0.9057
Sabine	0.0024	0.0007	0.0209	0.1338	0.0007	0.0140	0.0018	0.2041
San Augustine	0.0020	0.0006	0.0179	0.1147	0.0006	0.0120	0.0016	0.1750
San Jacinto	0.0056	0.0017	0.0496	0.3172	0.0016	0.0333	0.0043	0.4839
San Patricio	0.0195	0.0155	0.2907	1.2383	0.0152	0.1479	0.0085	2.1159
San Saba	0.0014	0.0014	0.0176	0.0206	0.0006	0.0067	0.0006	0.1096
Schleicher	0.0011	0.0011	0.0086	0.0265	0.0002	0.0082	0.0003	0.0795
Scurry	0.0060	0.0059	0.0441	0.1943	0.0057	0.0374	0.0008	0.4366
Shackelford	0.0012	0.0012	0.0089	0.0390	0.0011	0.0075	0.0002	0.0877
Shelby	0.0059	0.0018	0.0525	0.3362	0.0017	0.0353	0.0046	0.5128
Sherman	0.0017	0.0017	0.0088	0.0434	0.0002	0.0110	0.0001	0.1021
Smith	0.0540	0.0504	0.5236	3.7235	0.0190	0.6119	0.0396	6.6170
Somervell	0.0009	0.0008	0.0124	0.0592	0.0010	0.0071	0.0007	0.0847
Starr	0.0104	0.3482	1.1332	0.1097	0.0527	0.6959	0.0134	1.3339
Stephens	0.0036	0.0035	0.0261	0.1150	0.0034	0.0222	0.0005	0.2585
Sterling	0.0005	0.0005	0.0040	0.0124	0.0001	0.0039	0.0001	0.0373
Stonewall	0.0005	0.0005	0.0039	0.0170	0.0005	0.0033	0.0001	0.0381
Sutton	0.0016	0.0016	0.0127	0.0391	0.0003	0.0121	0.0004	0.1172
Swisher	0.0044	0.0044	0.0222	0.1101	0.0005	0.0279	0.0002	0.2591
Tarrant	0.2717	0.2665	5.0766	27.6510	0.3772	5.8520	0.0676	53.8735
Taylor	0.0471	0.0463	0.3431	1.5110	0.0442	0.2912	0.0065	3.3962
Terrell	0.0004	0.0004	0.0030	0.0091	0.0001	0.0028	0.0001	0.0274
Terry	0.0071	0.0071	0.0356	0.1763	0.0008	0.0447	0.0004	0.4149
Throckmorton	0.0006	0.0006	0.0045	0.0197	0.0006	0.0038	0.0001	0.0443
Titus	0.0065	0.0038	0.0733	0.3997	0.0032	0.0552	0.0037	0.6309
Tom Green	0.0412	0.0409	0.3213	0.9891	0.0079	0.3069	0.0094	2.9697
Travis	0.1717	0.1674	3.0571	25.5682	0.1503	3.4092	0.0848	37.9519
Trinity	0.0033	0.0010	0.0288	0.1844	0.0009	0.0193	0.0025	0.2813
Tyler	0.0047	0.0014	0.0418	0.2674	0.0013	0.0280	0.0036	0.4079
Upshur	0.0066	0.0015	0.1037	0.5911	0.0064	0.0436	0.0057	0.7061
Upton	0.0012	0.0012	0.0097	0.0300	0.0002	0.0093	0.0003	0.0901
Uvalde	0.0097	0.0094	0.0677	0.1389	0.0052	0.0414	0.0014	0.5926
Val Verde	0.0173	0.0168	0.1206	0.2474	0.0093	0.0737	0.0024	1.0556

County	Agriculture	Landscaping	Construction	Manufacturing	Concrete	Brick/Stone	Scrap	Other
Van Zandt	0.0116	0.0067	0.1304	0.7112	0.0056	0.0982	0.0066	1.1226
Victoria	0.0174	0.0167	0.3282	0.9969	0.0606	0.2579	0.0004	2.5967
Walker	0.0141	0.0043	0.1250	0.7996	0.0040	0.0839	0.0109	1.2199
Waller	0.0117	0.0117	0.0540	0.6833	0.0655	0.0432	0.0048	0.5069
Ward	0.0041	0.0041	0.0321	0.0987	0.0008	0.0306	0.0009	0.2964
Washington	0.0068	0.0065	0.0835	0.3636	0.0055	0.0731	0.0033	0.8084
Webb	0.0380	1.2770	4.1567	0.4023	0.1932	2.5525	0.0491	4.8928
Wharton	0.0269	0.0226	0.1487	0.4539	0.0362	0.1020	0.0024	1.1046
Wheeler	0.0027	0.0027	0.0135	0.0671	0.0003	0.0170	0.0001	0.1579
Wichita	0.0479	0.0471	0.3492	1.5377	0.0449	0.2964	0.0066	3.4563
Wilbarger	0.0053	0.0052	0.0389	0.1713	0.0050	0.0330	0.0007	0.3850
Willacy	0.0075	0.0061	0.0434	0.1170	0.0021	0.0355	0.0012	0.3786
Williamson	0.0503	0.0503	0.8235	2.5502	0.1395	1.3358	0.0143	5.4357
Wilson	0.0091	0.0090	0.0931	0.3410	0.0098	0.0452	0.0026	0.6096
Winkler	0.0027	0.0026	0.0208	0.0640	0.0005	0.0199	0.0006	0.1921
Wise	0.0071	0.0057	0.0927	0.4412	0.0078	0.0533	0.0049	0.6313
Wood	0.0090	0.0052	0.1012	0.5520	0.0044	0.0762	0.0051	0.8713
Yoakum	0.0041	0.0041	0.0208	0.1030	0.0005	0.0261	0.0002	0.2424
Young	0.0067	0.0066	0.0492	0.2166	0.0063	0.0418	0.0009	0.4870
Zapata	0.0023	0.0765	0.2491	0.0241	0.0116	0.1530	0.0029	0.2933
Zavala	0.0043	0.0041	0.0298	0.0611	0.0023	0.0182	0.0006	0.2605
Tx Ttl	5.239	6.500	78.677	332.740	4.227	78.962	2.433	726.716
9-County Ttl	1.124	1.072	18.994	99.474	1.130	27.881	0.387	228.201
Ratios	4.661	6.062	4.142	3.345	3.740	2.832	6.286	3.185

Allocation Factors for Specialty Equipment (2004 Tx-REMI Output basis)

County	Skid Steer Loaders	Cranes	Bore/Drill	RTFs	Trenchers
Anderson	0.00150	0.001814	0.001791	0.001811	0.00168
Andrews	0.00065	0.000499	0.000512	0.00052	0.000553
Angelina	0.00163	0.002168	0.002144	0.002188	0.001903
Aransas	0.00107	0.001288	0.001263	0.001257	0.001214
Archer	0.00043	0.000329	0.000337	0.000346	0.000362
Armstrong	0.00014	7.86E-05	8.43E-05	8.9E-05	9.84E-05
Atascosa	0.00149	0.001368	0.001335	0.001357	0.0014
Austin	0.00171	0.001199	0.001198	0.001246	0.001342
Bailey	0.00042	0.000242	0.00026	0.000274	0.000303
Bandera	0.00069	0.000633	0.000618	0.000628	0.000648
Bastrop	0.00201	0.001951	0.001837	0.00186	0.001899
Baylor	0.00018	0.00014	0.000143	0.000147	0.000153
Bee	0.00128	0.0006	0.000655	0.000706	0.000822
Bell	0.00841	0.008585	0.00862	0.008632	0.008458
Bexar	0.04951	0.063311	0.065314	0.06172	0.059818
Blanco	0.00032	0.000321	0.000315	0.000308	0.000323
Borden	0.00003	2.66E-05	2.73E-05	2.77E-05	2.94E-05
Bosque	0.00063	0.000634	0.000624	0.00061	0.000639
Bowie	0.00242	0.002917	0.002881	0.002912	0.002701
Brazoria	0.01160	0.015233	0.01413	0.014387	0.013917
Brazos	0.00525	0.00536	0.005381	0.005389	0.00528
Brewster	0.00056	0.000277	0.000254	0.000294	0.000325
Briscoe	0.00011	6.24E-05	6.69E-05	7.06E-05	7.8E-05
Brooks	0.00410	0.001729	0.001564	0.001704	0.002621
Brown	0.00178	0.001355	0.001386	0.001425	0.001489
Burleson	0.00057	0.000585	0.000587	0.000588	0.000576
Burnet	0.00141	0.00142	0.001395	0.001365	0.00143
Caldwell	0.00107	0.001038	0.000977	0.000989	0.00101
Calhoun	0.00155	0.001381	0.001319	0.001406	0.001452
Callahan	0.00062	0.000473	0.000483	0.000497	0.000519
Cameron	0.01392	0.010036	0.010353	0.010602	0.011357
Camp	0.00032	0.000388	0.000383	0.000388	0.000359
Carson	0.00040	0.000235	0.000252	0.000267	0.000295
Cass	0.00080	0.00097	0.000958	0.000968	0.000898
Castro	0.00048	0.000279	0.0003	0.000316	0.00035
Chambers	0.00073	0.001101	0.000937	0.001051	0.00082
Cherokee	0.00129	0.001555	0.001535	0.001552	0.001439
Childress	0.00048	0.000277	0.000297	0.000313	0.000346
Clay	0.00052	0.000399	0.000408	0.000419	0.000438
Cochran	0.00021	0.000121	0.00013	0.000137	0.000152
Coke	0.00019	0.000145	0.000148	0.00015	0.00016
Coleman	0.00041	0.00031	0.000317	0.000326	0.000341

County	Skid Steer Loaders	Cranes	Bore/Drill	RTFs	Trenchers
Collin	0.01806	0.016858	0.017418	0.017534	0.017337
Collingsworth	0.00019	0.000111	0.000119	0.000125	0.000139
Colorado	0.00138	0.000965	0.000965	0.001003	0.00108
Comal	0.00352	0.004143	0.004072	0.004008	0.003931
Comanche	0.00064	0.000483	0.000494	0.000508	0.000531
Concho	0.00019	0.000146	0.000149	0.000152	0.000161
Cooke	0.00141	0.001642	0.001599	0.00164	0.001562
Coryell	0.00263	0.002646	0.0026	0.002544	0.002665
Cottle	0.00011	6.35E-05	6.81E-05	7.2E-05	7.95E-05
Crane	0.00019	0.00015	0.000154	0.000156	0.000166
Crockett	0.00020	0.000154	0.000158	0.00016	0.00017
Crosby	0.00041	0.000242	0.000259	0.000274	0.000302
Culberson	0.00016	8.2E-05	7.5E-05	8.69E-05	9.6E-05
Dallam	0.00039	0.000224	0.000241	0.000254	0.000281
Dallas	0.09878	0.123547	0.130901	0.127068	0.11592
Dawson	0.00073	0.000559	0.000574	0.000582	0.00062
Deaf Smith	0.00116	0.000673	0.000721	0.000762	0.000842
Delta	0.00015	0.000178	0.000176	0.000178	0.000165
Denton	0.01662	0.015996	0.015333	0.015633	0.015602
De Witt	0.00108	0.000966	0.000922	0.000983	0.001015
Dickens	0.00017	9.86E-05	0.000106	0.000112	0.000123
Dimmit	0.00045	0.000325	0.000335	0.000338	0.000369
Donley	0.00025	0.000143	0.000154	0.000162	0.000179
Duval	0.00055	0.000403	0.000415	0.000419	0.000457
Eastland	0.00086	0.000652	0.000667	0.000686	0.000717
Ector	0.00629	0.004842	0.004968	0.00504	0.005362
Edwards	0.00009	6.41E-05	6.59E-05	6.66E-05	7.26E-05
Ellis	0.01338	0.015288	0.014679	0.014903	0.014347
El Paso	0.01723	0.02257	0.022751	0.022377	0.020728
Erath	0.00063	0.000723	0.000694	0.000704	0.000678
Falls	0.00060	0.000609	0.000612	0.000613	0.0006
Fannin	0.00087	0.001054	0.001041	0.001052	0.000976
Fayette	0.00076	0.000772	0.000775	0.000776	0.000761
Fisher	0.00019	0.000145	0.000149	0.000153	0.00016
Floyd	0.00046	0.000266	0.000286	0.000302	0.000333
Foard	0.00007	5.51E-05	5.63E-05	5.79E-05	6.05E-05
Fort Bend	0.01405	0.012998	0.012175	0.012691	0.012407
Franklin	0.00027	0.000325	0.000321	0.000325	0.000301
Freestone	0.00062	0.000638	0.00064	0.000641	0.000628
Frio	0.00072	0.000522	0.000536	0.000542	0.000591
Gaines	0.00074	0.000566	0.000581	0.00059	0.000627
Galveston	0.00552	0.006965	0.006971	0.00736	0.006196
Garza	0.00032	0.000185	0.000199	0.00021	0.000232
Gillespie	0.00098	0.000716	0.000737	0.000744	0.000812

County	Skid Steer Loaders	Cranes	Bore/Drill	RTFs	Trenchers
Glasscock	0.00007	5.19E-05	5.32E-05	5.4E-05	5.75E-05
Goliad	0.00054	0.000477	0.000455	0.000485	0.000501
Gonzales	0.00075	0.00035	0.000382	0.000412	0.000479
Gray	0.00134	0.000778	0.000834	0.000881	0.000974
Grayson	0.00423	0.004929	0.004798	0.004922	0.004687
Gregg	0.00502	0.005948	0.005875	0.005965	0.005483
Grimes	0.00085	0.000866	0.000869	0.00087	0.000853
Guadalupe	0.00347	0.003191	0.003116	0.003166	0.003268
Hale	0.00225	0.00131	0.001404	0.001483	0.001639
Hall	0.00023	0.000136	0.000146	0.000154	0.00017
Hamilton	0.00028	0.000286	0.000281	0.000275	0.000288
Hansford	0.00033	0.000189	0.000203	0.000214	0.000237
Hardeman	0.00020	0.000155	0.000159	0.000163	0.000171
Hardin	0.00115	0.002116	0.00203	0.001921	0.00184
Harris	0.15444	0.20938	0.207608	0.202498	0.190545
Harrison	0.00135	0.002238	0.002139	0.002146	0.001887
Hartley	0.00034	0.000197	0.000211	0.000223	0.000247
Haskell	0.00026	0.000198	0.000203	0.000209	0.000218
Hays	0.00374	0.004217	0.00417	0.004112	0.004065
Hemphill	0.00021	0.000121	0.00013	0.000137	0.000152
Henderson	0.00212	0.00256	0.002528	0.002555	0.00237
Hidalgo	0.02464	0.017766	0.018329	0.018769	0.020105
Hill	0.00118	0.001206	0.001211	0.001212	0.001188
Hockley	0.00142	0.000828	0.000888	0.000938	0.001036
Hood	0.00087	0.000997	0.000957	0.000972	0.000935
Hopkins	0.00089	0.001073	0.00106	0.001071	0.000994
Houston	0.00046	0.00062	0.000613	0.000626	0.000544
Howard	0.00166	0.001279	0.001312	0.001331	0.001416
Hudspeth	0.00020	9.92E-05	9.07E-05	0.000105	0.000116
Hunt	0.00153	0.001753	0.001683	0.001709	0.001645
Hutchinson	0.00141	0.000822	0.000881	0.000931	0.001029
Irion	0.00009	6.76E-05	6.94E-05	7.04E-05	7.49E-05
Jack	0.00042	0.000319	0.000326	0.000335	0.00035
Jackson	0.00108	0.000967	0.000923	0.000984	0.001016
Jasper	0.00071	0.000947	0.000937	0.000956	0.000832
Jeff Davis	0.00014	6.77E-05	6.19E-05	7.18E-05	7.93E-05
Jefferson	0.01241	0.016092	0.015034	0.015753	0.01448
Jim Hogg	0.00268	0.001129	0.001021	0.001113	0.001711
Jim Wells	0.00179	0.001299	0.001336	0.001349	0.001472
Johnson	0.00269	0.003075	0.002952	0.002997	0.002885
Jones	0.00094	0.000713	0.00073	0.00075	0.000784
Karnes	0.00060	0.000281	0.000306	0.00033	0.000384
Kaufman	0.00160	0.00183	0.001757	0.001784	0.001718
Kendall	0.00095	0.000872	0.000851	0.000865	0.000893

County	Skid Steer Loaders	Cranes	Bore/Drill	RTFs	Trenchers
Kenedy	0.00002	1.3E-05	1.33E-05	1.35E-05	1.47E-05
Kent	0.00003	2.64E-05	2.7E-05	2.78E-05	2.9E-05
Kerr	0.00200	0.001454	0.001495	0.00151	0.001648
Kimble	0.00023	0.000177	0.000182	0.000185	0.000197
King	0.00002	1.17E-05	1.26E-05	1.33E-05	1.47E-05
Kinney	0.00015	0.000106	0.000109	0.00011	0.00012
Kleberg	0.00137	0.000998	0.001026	0.001037	0.001131
Knox	0.00018	0.000138	0.000141	0.000145	0.000152
Lamar	0.00133	0.001607	0.001587	0.001604	0.001488
Lamb	0.00091	0.000528	0.000566	0.000598	0.00066
Lampasas	0.00073	0.00073	0.000718	0.000702	0.000735
La Salle	0.00026	0.000189	0.000195	0.000197	0.000215
Lavaca	0.00143	0.001272	0.001214	0.001295	0.001337
Lee	0.00056	0.000567	0.000569	0.00057	0.000559
Leon	0.00054	0.000552	0.000555	0.000555	0.000544
Liberty	0.00166	0.002535	0.002355	0.002315	0.0021
Limestone	0.00076	0.000781	0.000784	0.000785	0.000769
Lipscomb	0.00019	0.000112	0.00012	0.000127	0.00014
Live Oak	0.00051	0.000372	0.000383	0.000387	0.000422
Llano	0.00064	0.000639	0.000628	0.000615	0.000644
Loving	0.00000	2.02E-06	2.08E-06	2.11E-06	2.24E-06
Lubbock	0.01567	0.009125	0.009782	0.010332	0.011416
Lynn	0.00038	0.000224	0.00024	0.000253	0.00028
McCulloch	0.00041	0.000315	0.000324	0.000328	0.000349
McLennan	0.00747	0.007629	0.00766	0.007671	0.007516
McMullen	0.00004	2.72E-05	2.79E-05	2.82E-05	3.08E-05
Madison	0.00021	0.000211	0.000212	0.000212	0.000208
Marion	0.00030	0.000359	0.000355	0.000359	0.000333
Martin	0.00022	0.000173	0.000178	0.00018	0.000192
Mason	0.00019	0.00015	0.000153	0.000156	0.000166
Matagorda	0.00252	0.001771	0.001769	0.00184	0.001981
Maverick	0.00221	0.001606	0.001651	0.001668	0.00182
Medina	0.00147	0.001354	0.001322	0.001343	0.001386
Menard	0.00012	8.89E-05	9.12E-05	9.25E-05	9.84E-05
Midland	0.00608	0.004681	0.004803	0.004872	0.005184
Milam	0.00085	0.000864	0.000868	0.000869	0.000852
Mills	0.00018	0.000181	0.000178	0.000174	0.000182
Mitchell	0.00044	0.000334	0.000341	0.000351	0.000367
Montague	0.00091	0.000692	0.000708	0.000728	0.000761
Montgomery	0.01134	0.011245	0.011353	0.011127	0.011413
Moore	0.00127	0.000739	0.000792	0.000837	0.000925
Morris	0.00035	0.000423	0.000418	0.000422	0.000391
Motley	0.00008	4.75E-05	5.09E-05	5.38E-05	5.94E-05
Nacogdoches	0.00120	0.001603	0.001585	0.001618	0.001407

County	Skid Steer Loaders	Cranes	Bore/Drill	RTFs	Trenchers
Navarro	0.00091	0.001034	0.000993	0.001008	0.000971
Newton	0.00029	0.000382	0.000377	0.000385	0.000335
Nolan	0.00071	0.000537	0.000549	0.000565	0.00059
Nueces	0.01412	0.017017	0.016682	0.0166	0.016027
Ochiltree	0.00057	0.000332	0.000356	0.000376	0.000416
Oldham	0.00013	7.78E-05	8.34E-05	8.81E-05	9.73E-05
Orange	0.00247	0.003058	0.002933	0.003024	0.002868
Palo Pinto	0.00051	0.000586	0.000562	0.000571	0.00055
Panola	0.00046	0.000608	0.000602	0.000614	0.000534
Parker	0.00188	0.002151	0.002065	0.002097	0.002019
Parmer	0.00062	0.000361	0.000387	0.000409	0.000452
Pecos	0.00081	0.00062	0.000637	0.000646	0.000687
Polk	0.00093	0.001234	0.001221	0.001246	0.001084
Potter	0.00739	0.004305	0.004614	0.004874	0.005385
Presidio	0.00046	0.00023	0.00021	0.000243	0.000269
Rains	0.00030	0.000358	0.000353	0.000357	0.000331
Randall	0.00681	0.003965	0.00425	0.004489	0.00496
Reagan	0.00015	0.000119	0.000122	0.000124	0.000132
Real	0.00013	9.53E-05	9.8E-05	9.9E-05	0.000108
Red River	0.00037	0.000441	0.000436	0.00044	0.000409
Reeves	0.00060	0.000461	0.000473	0.000479	0.00051
Refugio	0.00058	0.000513	0.00049	0.000522	0.000539
Roberts	0.00005	3.14E-05	3.36E-05	3.55E-05	3.92E-05
Robertson	0.00054	0.000553	0.000556	0.000556	0.000545
Rockwall	0.00109	0.001249	0.001199	0.001218	0.001172
Runnels	0.00051	0.000388	0.000397	0.000408	0.000427
Rusk	0.00103	0.001711	0.001636	0.001641	0.001443
Sabine	0.00021	0.000277	0.000274	0.000279	0.000243
San Augustine	0.00018	0.000237	0.000235	0.00024	0.000208
San Jacinto	0.00049	0.000657	0.000649	0.000663	0.000576
San Patricio	0.00303	0.003655	0.003583	0.003565	0.003442
San Saba	0.00021	0.000214	0.000211	0.000206	0.000216
Schleicher	0.00014	0.000108	0.000111	0.000113	0.00012
Scurry	0.00075	0.000571	0.000584	0.0006	0.000627
Shackelford	0.00015	0.000115	0.000117	0.000121	0.000126
Shelby	0.00052	0.000696	0.000688	0.000702	0.000611
Sherman	0.00019	0.000113	0.000121	0.000127	0.000141
Smith	0.00760	0.007032	0.007157	0.007416	0.007024
Somervell	0.00014	0.00016	0.000153	0.000156	0.00015
Starr	0.03167	0.013347	0.012066	0.013153	0.020226
Stephens	0.00045	0.000338	0.000346	0.000355	0.000371
Sterling	0.00007	5.08E-05	5.21E-05	5.28E-05	5.62E-05
Stonewall	0.00007	4.99E-05	5.1E-05	5.24E-05	5.48E-05
Sutton	0.00021	0.000159	0.000164	0.000166	0.000176

County	Skid Steer Loaders	Cranes	Bore/Drill	RTFs	Trenchers
Swisher	0.00049	0.000286	0.000306	0.000323	0.000357
Tarrant	0.05308	0.06515	0.066039	0.065262	0.061106
Taylor	0.00585	0.004441	0.004542	0.00467	0.004879
Terrell	0.00005	3.72E-05	3.82E-05	3.87E-05	4.12E-05
Terry	0.00079	0.000457	0.00049	0.000518	0.000572
Throckmorton	0.00008	5.79E-05	5.93E-05	6.09E-05	6.36E-05
Titus	0.00078	0.000945	0.000933	0.000943	0.000875
Tom Green	0.00524	0.004036	0.004142	0.004201	0.00447
Travis	0.03325	0.04046	0.041254	0.041879	0.037611
Trinity	0.00029	0.000382	0.000377	0.000385	0.000335
Tyler	0.00041	0.000554	0.000547	0.000559	0.000486
Upshur	0.00080	0.001334	0.001275	0.001279	0.001125
Upton	0.00016	0.000122	0.000126	0.000127	0.000136
Uvalde	0.00116	0.000847	0.000871	0.00088	0.00096
Val Verde	0.00207	0.001509	0.001552	0.001568	0.001711
Van Zandt	0.00139	0.001681	0.00166	0.001678	0.001556
Victoria	0.00334	0.004154	0.004093	0.003972	0.003863
Walker	0.00124	0.001655	0.001637	0.001671	0.001453
Waller	0.00138	0.000925	0.000813	0.000956	0.000912
Ward	0.00052	0.000403	0.000413	0.000419	0.000446
Washington	0.00105	0.001072	0.001076	0.001078	0.001056
Webb	0.11616	0.048955	0.044259	0.048244	0.074191
Wharton	0.00275	0.001933	0.001932	0.002009	0.002164
Wheeler	0.00030	0.000174	0.000187	0.000197	0.000218
Wichita	0.00595	0.004519	0.004623	0.004752	0.004965
Wilbarger	0.00066	0.000503	0.000515	0.000529	0.000553
Willacy	0.00076	0.000546	0.000563	0.000577	0.000618
Williamson	0.00907	0.010479	0.010074	0.009979	0.009859
Wilson	0.00128	0.001176	0.001149	0.001167	0.001205
Winkler	0.00034	0.000261	0.000268	0.000272	0.000289
Wise	0.00104	0.001191	0.001143	0.001161	0.001117
Wood	0.00108	0.001305	0.001288	0.001302	0.001208
Yoakum	0.00046	0.000267	0.000286	0.000302	0.000334
Young	0.00084	0.000637	0.000651	0.00067	0.0007
Zapata	0.00696	0.002934	0.002653	0.002892	0.004447
Zavala	0.00051	0.000372	0.000383	0.000387	0.000422

Geographic Allocation Factors for Other Industry Groups

(based on Tx-REMI outputs, 2004)

County	Scrap/Recycling	Concrete	Brick/Stone	Landscaping	Agriculture	Special Trades	Manufacturing	Other
Anderson	0.002924	0.001433	0.001343	0.001115	0.002382	0.001788	0.002307	0.001667
Andrews	0.000478	0.000231	0.000481	0.000779	0.000973	0.000505	0.000368	0.000506
Angelina	0.005848	0.001236	0.001391	0.000869	0.003531	0.002081	0.003148	0.002199
Aransas	0.001232	0.001269	0.00066	0.000843	0.001312	0.001303	0.001312	0.001027
Archer	0.000198	0.000774	0.000273	0.000528	0.000666	0.000323	0.000337	0.000346
Armstrong	2.76E-05	3.38E-05	9.74E-05	0.000187	0.000232	7.78E-05	9.11E-05	9.82E-05
Atascosa	0.001221	0.002692	0.000665	0.001605	0.002024	0.001375	0.001191	0.000975
Austin	0.000612	0.005313	0.000801	0.002158	0.003179	0.001172	0.000846	0.000943
Bailey	8.51E-05	0.000104	0.0003	0.000576	0.000715	0.00024	0.000281	0.000302
Bandera	0.000565	0.001246	0.000308	0.000743	0.000937	0.000636	0.000551	0.000451
Bastrop	0.007898	0.000995	0.000731	0.00192	0.002774	0.001941	0.000664	0.001267
Baylor	8.41E-05	0.000328	0.000116	0.000224	0.000282	0.000137	0.000143	0.000147
Bee	0.001148	0.000457	0.000791	0.00189	0.002345	0.000577	0.000455	0.00085
Bell	0.010872	0.01045	0.007416	0.00802	0.010406	0.008505	0.008754	0.008911
Bexar	0.027368	0.04749	0.058376	0.035056	0.043755	0.065022	0.032618	0.074645
Blanco	0.000392	0.000219	0.000127	0.000313	0.000407	0.000334	9.26E-05	0.000225
Borden	2.55E-05	1.23E-05	2.56E-05	4.14E-05	5.18E-05	2.69E-05	1.96E-05	2.69E-05
Bosque	0.000775	0.000433	0.000251	0.000619	0.000805	0.00066	0.000183	0.000446
Bowie	0.004702	0.002304	0.002159	0.001793	0.003831	0.002876	0.00371	0.002681
Brazoria	0.021877	0.006936	0.005352	0.00832	0.011401	0.015517	0.018398	0.006506
Brazos	0.006787	0.006524	0.00463	0.005007	0.006496	0.00531	0.005465	0.005563
Brewster	0.003213	0.000457	0.000203	0.000756	0.000939	0.00023	6.99E-05	0.000295
Briscoe	2.19E-05	2.68E-05	7.73E-05	0.000148	0.000184	6.17E-05	7.23E-05	7.79E-05
Brooks	0.000713	0.001614	0.001142	0.00694	0.000256	0.001866	4.27E-05	0.000238
Brown	0.000817	0.003189	0.001126	0.002173	0.002741	0.001331	0.001386	0.001426
Burleson	0.000741	0.000712	0.000505	0.000546	0.000709	0.00058	0.000596	0.000607
Burnet	0.001735	0.000968	0.000561	0.001384	0.001803	0.001477	0.00041	0.000998
Caldwell	0.004201	0.000529	0.000389	0.001021	0.001476	0.001032	0.000353	0.000674
Calhoun	0.000104	0.00039	0.000462	0.001775	0.002202	0.001409	0.002341	0.000585
Callahan	0.000285	0.001112	0.000393	0.000758	0.000956	0.000464	0.000483	0.000497
Cameron	0.009414	0.009008	0.008262	0.017107	0.026228	0.010131	0.006463	0.009576
Camp	0.000626	0.000307	0.000287	0.000239	0.00051	0.000383	0.000494	0.000357
Carson	8.27E-05	0.000101	0.000292	0.00056	0.000695	0.000233	0.000273	0.000294
Cass	0.001564	0.000766	0.000718	0.000596	0.001274	0.000956	0.001234	0.000892
Castro	9.82E-05	0.00012	0.000346	0.000665	0.000825	0.000277	0.000324	0.000349
Chambers	0.009736	8.39E-05	0.000574	0.00012	0.002136	0.000962	0.001864	0.000529
Cherokee	0.002505	0.001228	0.001151	0.000956	0.002041	0.001533	0.001977	0.001429
Childress	9.72E-05	0.000119	0.000343	0.000659	0.000817	0.000274	0.000321	0.000346
Clay	0.00024	0.000938	0.000331	0.000639	0.000806	0.000391	0.000408	0.00042
Cochran	4.27E-05	5.22E-05	0.00015	0.000289	0.000358	0.00012	0.000141	0.000152
Coke	0.000138	6.67E-05	0.000139	0.000225	0.000282	0.000146	0.000106	0.000146
Coleman	0.000187	0.00073	0.000258	0.000497	0.000627	0.000305	0.000317	0.000326
Collin	0.006628	0.017853	0.015646	0.018904	0.025481	0.016748	0.020334	0.019567

County	Scrap/Recycling	Concrete	Brick/Stone	Landscaping	Agriculture	Special Trades	Manufacturing	Other
Collingsworth	3.89E-05	4.76E-05	0.000137	0.000263	0.000327	0.00011	0.000128	0.000138
Colorado	0.000492	0.004277	0.000645	0.001737	0.002559	0.000943	0.000681	0.000759
Comal	0.003213	0.00726	0.002403	0.002921	0.003624	0.004185	0.003458	0.003479
Comanche	0.000291	0.001137	0.000401	0.000775	0.000978	0.000475	0.000494	0.000509
Concho	0.00014	6.72E-05	0.00014	0.000227	0.000284	0.000147	0.000107	0.000147
Cooke	0.001698	0.000229	0.000803	0.001203	0.001493	0.00164	0.002641	0.001308
Coryell	0.003233	0.001804	0.001045	0.002579	0.003359	0.002752	0.000764	0.00186
Cottle	2.23E-05	2.73E-05	7.87E-05	0.000151	0.000188	6.29E-05	7.36E-05	7.93E-05
Crane	0.000143	6.91E-05	0.000144	0.000234	0.000292	0.000151	0.00011	0.000152
Crockett	0.000147	7.09E-05	0.000148	0.00024	0.000299	0.000155	0.000113	0.000156
Crosby	8.49E-05	0.000104	0.000299	0.000575	0.000713	0.000239	0.00028	0.000302
Culberson	0.00095	0.000135	6.01E-05	0.000224	0.000277	6.78E-05	2.07E-05	8.73E-05
Dallam	7.89E-05	9.65E-05	0.000278	0.000534	0.000663	0.000222	0.00026	0.00028
Dallas	0.03961	0.090215	0.237051	0.071236	0.089902	0.121268	0.156888	0.189914
Dawson	0.000536	0.000258	0.000539	0.000873	0.00109	0.000566	0.000412	0.000566
Deaf Smith	0.000236	0.000289	0.000833	0.001601	0.001987	0.000666	0.00078	0.00084
Delta	0.000287	0.000141	0.000132	0.000109	0.000234	0.000175	0.000226	0.000164
Denton	0.045443	0.03345	0.012923	0.01651	0.020629	0.015523	0.012358	0.013188
De Witt	7.3E-05	0.000273	0.000323	0.001241	0.00154	0.000985	0.001637	0.000409
Dickens	3.46E-05	4.23E-05	0.000122	0.000235	0.000291	9.75E-05	0.000114	0.000123
Dimmit	0.000214	0.000476	0.000201	0.000557	0.000712	0.00033	0.00016	0.000313
Donley	5.03E-05	6.15E-05	0.000177	0.000341	0.000423	0.000142	0.000166	0.000179
Duval	0.000265	0.00059	0.000249	0.00069	0.000883	0.00041	0.000199	0.000388
Eastland	0.000393	0.001535	0.000542	0.001046	0.001319	0.000641	0.000667	0.000687
Ector	0.004639	0.002235	0.004662	0.007555	0.009434	0.004898	0.003566	0.004902
Edwards	4.21E-05	9.37E-05	3.96E-05	0.00011	0.00014	6.51E-05	3.16E-05	6.17E-05
Ellis	0.025662	0.023727	0.008659	0.011216	0.0173	0.015134	0.017024	0.011154
El Paso	0.005091	0.045412	0.024871	0.012076	0.014983	0.02229	0.028801	0.025168
Erath	0.001213	0.001121	0.000409	0.00053	0.000818	0.000715	0.000805	0.000527
Falls	0.000772	0.000742	0.000526	0.000569	0.000738	0.000604	0.000621	0.000632
Fannin	0.001699	0.000833	0.00078	0.000648	0.001385	0.00104	0.001341	0.000969
Fayette	0.000978	0.00094	0.000667	0.000721	0.000936	0.000765	0.000787	0.000801
Fisher	8.76E-05	0.000342	0.000121	0.000233	0.000294	0.000143	0.000149	0.000153
Floyd	9.36E-05	0.000114	0.00033	0.000634	0.000787	0.000264	0.000309	0.000333
Foard	3.32E-05	0.00013	4.57E-05	8.83E-05	0.000111	5.41E-05	5.63E-05	5.79E-05
Fort Bend	0.071675	0.017775	0.007933	0.013808	0.017259	0.012125	0.010037	0.011716
Franklin	0.000524	0.000257	0.000241	0.0002	0.000427	0.000321	0.000414	0.000299
Freestone	0.000808	0.000776	0.000551	0.000596	0.000773	0.000632	0.00065	0.000662
Frio	0.000343	0.000763	0.000323	0.000893	0.001142	0.00053	0.000257	0.000502
Gaines	0.000543	0.000261	0.000545	0.000884	0.001104	0.000573	0.000417	0.000573
Galveston	0.014631	0.005043	0.004081	0.003562	0.011069	0.006465	0.016387	0.008162
Garza	6.51E-05	7.96E-05	0.000229	0.000441	0.000547	0.000183	0.000215	0.000231
Gillespie	0.000471	0.001047	0.000443	0.001226	0.001568	0.000728	0.000353	0.000689
Glasscock	4.97E-05	2.4E-05	5E-05	8.1E-05	0.000101	5.25E-05	3.82E-05	5.25E-05
Goliad	3.6E-05	0.000135	0.00016	0.000613	0.000761	0.000486	0.000809	0.000202
Gonzales	0.00067	0.000267	0.000461	0.001103	0.001368	0.000337	0.000266	0.000496
Gray	0.000273	0.000334	0.000964	0.001852	0.002298	0.00077	0.000902	0.000972

County	Scrap/Recycling	Concrete	Brick/Stone	Landscaping	Agriculture	Special Trades	Manufacturing	Other
Grayson	0.005095	0.000687	0.002411	0.003611	0.00448	0.004922	0.007928	0.003927
Gregg	0.013922	0.003495	0.00625	0.003905	0.004845	0.005725	0.008646	0.006647
Grimes	0.001096	0.001054	0.000748	0.000809	0.001049	0.000858	0.000883	0.000899
Guadalupe	0.002849	0.006281	0.001552	0.003745	0.004723	0.003209	0.002779	0.002275
Hale	0.00046	0.000563	0.001622	0.003117	0.003867	0.001296	0.001518	0.001635
Hall	4.77E-05	5.83E-05	0.000168	0.000323	0.000401	0.000134	0.000157	0.00017
Hamilton	0.000349	0.000195	0.000113	0.000279	0.000363	0.000297	8.26E-05	0.000201
Hansford	6.65E-05	8.13E-05	0.000234	0.00045	0.000559	0.000187	0.000219	0.000236
Hardeman	9.36E-05	0.000365	0.000129	0.000249	0.000314	0.000152	0.000159	0.000163
Hardin	0.000916	0	0.000489	0.00019	0.001698	0.002272	0.000766	0.000928
Harris	0.267364	0.133316	0.213951	0.09757	0.128367	0.210641	0.192822	0.207122
Harrison	0.003951	0.002549	0.000926	0.000385	0.00212	0.002211	0.00298	0.00163
Hartley	6.93E-05	8.47E-05	0.000244	0.000469	0.000582	0.000195	0.000228	0.000246
Haskell	0.00012	0.000467	0.000165	0.000318	0.000401	0.000195	0.000203	0.000209
Hays	0.006406	0.001418	0.001619	0.003214	0.003987	0.004287	0.00328	0.003731
Hemphill	4.26E-05	5.21E-05	0.00015	0.000289	0.000358	0.00012	0.000141	0.000151
Henderson	0.004125	0.002021	0.001894	0.001573	0.003361	0.002524	0.003255	0.002352
Hidalgo	0.016665	0.015947	0.014626	0.030284	0.046432	0.017935	0.011442	0.016952
Hill	0.001527	0.001468	0.001042	0.001126	0.001461	0.001194	0.001229	0.001252
Hockley	0.000291	0.000356	0.001026	0.001971	0.002445	0.000819	0.00096	0.001034
Hood	0.001673	0.001547	0.000565	0.000731	0.001128	0.000987	0.00111	0.000727
Hopkins	0.00173	0.000848	0.000794	0.00066	0.001409	0.001058	0.001365	0.000986
Houston	0.001672	0.000353	0.000398	0.000248	0.00101	0.000595	0.0009	0.000629
Howard	0.001225	0.00059	0.001231	0.001995	0.002492	0.001294	0.000942	0.001295
Hudspeth	0.001149	0.000164	7.27E-05	0.000271	0.000336	8.21E-05	2.5E-05	0.000106
Hunt	0.002943	0.002721	0.000993	0.001286	0.001984	0.001736	0.001952	0.001279
Hutchinson	0.000289	0.000353	0.001018	0.001956	0.002427	0.000814	0.000953	0.001027
Irion	6.48E-05	3.12E-05	6.51E-05	0.000105	0.000132	6.84E-05	4.98E-05	6.84E-05
Jack	0.000192	0.00075	0.000265	0.000511	0.000645	0.000313	0.000326	0.000335
Jackson	7.3E-05	0.000273	0.000324	0.001242	0.001542	0.000986	0.001639	0.00041
Jasper	0.002556	0.00054	0.000608	0.00038	0.001543	0.000909	0.001375	0.000961
Jeff Davis	0.000785	0.000112	4.96E-05	0.000185	0.000229	5.61E-05	1.71E-05	7.22E-05
Jefferson	0.030849	0.008458	0.007307	0.008964	0.011546	0.015722	0.029849	0.01024
Jim Hogg	0.000465	0.001054	0.000746	0.004531	0.000167	0.001219	2.79E-05	0.000155
Jim Wells	0.000853	0.001899	0.000803	0.002223	0.002844	0.00132	0.00064	0.00125
Johnson	0.005161	0.004772	0.001741	0.002256	0.003479	0.003044	0.003424	0.002243
Jones	0.00043	0.001678	0.000592	0.001143	0.001443	0.0007	0.000729	0.000751
Karnes	0.000537	0.000214	0.00037	0.000884	0.001097	0.00027	0.000213	0.000398
Kaufman	0.003072	0.002841	0.001037	0.001343	0.002071	0.001812	0.002038	0.001335
Kendall	0.000778	0.001716	0.000424	0.001023	0.00129	0.000877	0.000759	0.000622
Kenedy	8.51E-06	1.89E-05	8.01E-06	2.22E-05	2.84E-05	1.32E-05	6.38E-06	1.25E-05
Kent	1.59E-05	6.21E-05	2.19E-05	4.23E-05	5.34E-05	2.59E-05	2.7E-05	2.78E-05
Kerr	0.000955	0.002125	0.000899	0.002489	0.003183	0.001477	0.000716	0.001399
Kimble	0.00017	8.19E-05	0.000171	0.000277	0.000346	0.00018	0.000131	0.00018
King	4.13E-06	5.05E-06	1.45E-05	2.79E-05	3.47E-05	1.16E-05	1.36E-05	1.47E-05
Kinney	6.98E-05	0.000155	6.57E-05	0.000182	0.000233	0.000108	5.23E-05	0.000102
Kleberg	0.000656	0.001459	0.000617	0.001708	0.002185	0.001014	0.000492	0.000961

County	Scrap/Recycling	Concrete	Brick/Stone	Landscaping	Agriculture	Special Trades	Manufacturing	Other
Knox	8.33E-05	0.000325	0.000115	0.000222	0.000279	0.000136	0.000141	0.000145
Lamar	0.00259	0.001269	0.001189	0.000988	0.00211	0.001584	0.002044	0.001477
Lamb	0.000185	0.000227	0.000654	0.001256	0.001558	0.000522	0.000612	0.000659
Lampasas	0.000892	0.000498	0.000288	0.000712	0.000927	0.00076	0.000211	0.000513
La Salle	0.000124	0.000277	0.000117	0.000324	0.000414	0.000192	9.32E-05	0.000182
Lavaca	9.61E-05	0.000359	0.000426	0.001635	0.002028	0.001297	0.002156	0.000539
Lee	0.000718	0.00069	0.00049	0.00053	0.000687	0.000562	0.000578	0.000589
Leon	0.0007	0.000672	0.000477	0.000516	0.00067	0.000547	0.000563	0.000573
Liberty	0.002803	0.017853	0.001221	0.000741	0.002315	0.002416	0.001776	0.001589
Limestone	0.000989	0.00095	0.000674	0.000729	0.000946	0.000773	0.000796	0.00081
Lipscomb	3.93E-05	4.8E-05	0.000138	0.000266	0.00033	0.000111	0.000129	0.00014
Live Oak	0.000245	0.000544	0.00023	0.000637	0.000815	0.000378	0.000183	0.000358
Llano	0.000781	0.000436	0.000252	0.000623	0.000812	0.000665	0.000185	0.000449
Loving	1.94E-06	9.34E-07	1.95E-06	3.16E-06	3.94E-06	2.05E-06	1.49E-06	2.05E-06
Lubbock	0.003206	0.003921	0.011301	0.021714	0.026942	0.00903	0.010574	0.011395
Lynn	7.86E-05	9.62E-05	0.000277	0.000533	0.000661	0.000221	0.000259	0.000279
McCulloch	0.000302	0.000146	0.000304	0.000492	0.000614	0.000319	0.000232	0.000319
McLennan	0.009661	0.009286	0.00659	0.007126	0.009246	0.007557	0.007779	0.007919
McMullen	1.78E-05	3.97E-05	1.68E-05	4.65E-05	5.94E-05	2.76E-05	1.34E-05	2.61E-05
Madison	0.000267	0.000257	0.000182	0.000197	0.000256	0.000209	0.000215	0.000219
Marion	0.000579	0.000284	0.000266	0.000221	0.000472	0.000354	0.000457	0.00033
Martin	0.000166	7.99E-05	0.000167	0.00027	0.000337	0.000175	0.000127	0.000175
Mason	0.000143	6.9E-05	0.000144	0.000233	0.000291	0.000151	0.00011	0.000151
Matagorda	0.000903	0.007844	0.001182	0.003186	0.004694	0.00173	0.001249	0.001392
Maverick	0.001055	0.002347	0.000993	0.002748	0.003515	0.001631	0.000791	0.001545
Medina	0.001209	0.002665	0.000659	0.001589	0.002004	0.001362	0.001179	0.000965
Menard	8.52E-05	4.1E-05	8.56E-05	0.000139	0.000173	8.99E-05	6.55E-05	9E-05
Midland	0.004485	0.002161	0.004507	0.007303	0.00912	0.004735	0.003447	0.004739
Milam	0.001095	0.001052	0.000747	0.000807	0.001048	0.000856	0.000881	0.000897
Mills	0.000221	0.000123	7.14E-05	0.000176	0.00023	0.000188	5.22E-05	0.000127
Mitchell	0.000201	0.000785	0.000277	0.000535	0.000675	0.000328	0.000341	0.000351
Montague	0.000417	0.001629	0.000575	0.00111	0.0014	0.00068	0.000708	0.000729
Montgomery	0.008175	0.0083	0.008056	0.011255	0.014465	0.01156	0.006147	0.010387
Moore	0.00026	0.000318	0.000915	0.001759	0.002182	0.000731	0.000857	0.000923
Morris	0.000681	0.000334	0.000313	0.00026	0.000555	0.000417	0.000538	0.000389
Motley	1.67E-05	2.04E-05	5.88E-05	0.000113	0.00014	4.7E-05	5.51E-05	5.93E-05
Nacogdoches	0.004324	0.000914	0.001028	0.000642	0.002611	0.001538	0.002327	0.001626
Navarro	0.001736	0.001605	0.000586	0.000759	0.00117	0.001024	0.001152	0.000755
Newton	0.001029	0.000218	0.000245	0.000153	0.000622	0.000366	0.000554	0.000387
Nolan	0.000324	0.001263	0.000446	0.000861	0.001086	0.000527	0.000549	0.000565
Nueces	0.016274	0.01676	0.008723	0.011137	0.017325	0.017206	0.01733	0.013558
Ochiltree	0.000117	0.000143	0.000412	0.000791	0.000981	0.000329	0.000385	0.000415
Oldham	2.73E-05	3.34E-05	9.63E-05	0.000185	0.00023	7.7E-05	9.01E-05	9.71E-05
Orange	0.000226	0.003504	0.000979	0.00203	0.002519	0.003066	0.005462	0.001945
Palo Pinto	0.000983	0.000909	0.000332	0.00043	0.000663	0.00058	0.000652	0.000427
Panola	0.001641	0.000347	0.00039	0.000244	0.000991	0.000584	0.000883	0.000617
Parker	0.003611	0.003338	0.001218	0.001578	0.002434	0.002129	0.002395	0.001569

County	Scrap/Recycling	Concrete	Brick/Stone	Landscaping	Agriculture	Special Trades	Manufacturing	Other
Parmer	0.000127	0.000155	0.000447	0.000859	0.001066	0.000357	0.000418	0.000451
Pecos	0.000594	0.000286	0.000597	0.000968	0.001209	0.000628	0.000457	0.000628
Polk	0.00333	0.000704	0.000792	0.000495	0.002011	0.001185	0.001792	0.001252
Potter	0.001512	0.00185	0.005331	0.010243	0.012709	0.00426	0.004988	0.005375
Presidio	0.002661	0.000379	0.000168	0.000626	0.000777	0.00019	5.79E-05	0.000245
Rains	0.000577	0.000282	0.000265	0.00022	0.00047	0.000353	0.000455	0.000329
Randall	0.001393	0.001704	0.00491	0.009434	0.011706	0.003923	0.004594	0.004951
Reagan	0.000114	5.5E-05	0.000115	0.000186	0.000232	0.000121	8.78E-05	0.000121
Real	6.26E-05	0.000139	5.9E-05	0.000163	0.000209	9.68E-05	4.7E-05	9.18E-05
Red River	0.000711	0.000348	0.000327	0.000271	0.000579	0.000435	0.000561	0.000406
Reeves	0.000441	0.000213	0.000443	0.000719	0.000897	0.000466	0.000339	0.000466
Refugio	3.88E-05	0.000145	0.000172	0.000659	0.000818	0.000523	0.00087	0.000217
Roberts	1.1E-05	1.35E-05	3.89E-05	7.47E-05	9.26E-05	3.1E-05	3.64E-05	3.92E-05
Robertson	0.000701	0.000674	0.000478	0.000517	0.000671	0.000548	0.000564	0.000574
Rockwall	0.002097	0.001938	0.000707	0.000916	0.001413	0.001236	0.001391	0.000911
Runnels	0.000234	0.000914	0.000323	0.000623	0.000786	0.000381	0.000397	0.000409
Rusk	0.003022	0.00195	0.000708	0.000294	0.001621	0.001691	0.002279	0.001246
Sabine	0.000747	0.000158	0.000178	0.000111	0.000451	0.000266	0.000402	0.000281
San Augustine	0.00064	0.000135	0.000152	9.51E-05	0.000387	0.000228	0.000345	0.000241
San Jacinto	0.001771	0.000374	0.000421	0.000263	0.001069	0.00063	0.000953	0.000666
San Patricio	0.003495	0.003599	0.001873	0.002392	0.003721	0.003695	0.003722	0.002912
San Saba	0.000262	0.000146	8.47E-05	0.000209	0.000272	0.000223	6.2E-05	0.000151
Schleicher	0.000104	4.99E-05	0.000104	0.000169	0.000211	0.000109	7.96E-05	0.000109
Scurry	0.000344	0.001343	0.000474	0.000915	0.001155	0.000561	0.000584	0.000601
Shackelford	6.91E-05	0.00027	9.53E-05	0.000184	0.000232	0.000113	0.000117	0.000121
Shelby	0.001877	0.000397	0.000446	0.000279	0.001133	0.000668	0.00101	0.000706
Sherman	3.95E-05	4.83E-05	0.000139	0.000268	0.000332	0.000111	0.00013	0.00014
Smith	0.016258	0.004502	0.00775	0.007759	0.010314	0.006655	0.01119	0.009105
Somervell	0.000268	0.000248	9.05E-05	0.000117	0.000181	0.000158	0.000178	0.000117
Starr	0.005502	0.012458	0.008813	0.053558	0.001977	0.014404	0.00033	0.001836
Stephens	0.000204	0.000795	0.000281	0.000542	0.000684	0.000332	0.000346	0.000356
Sterling	4.86E-05	2.34E-05	4.89E-05	7.92E-05	9.89E-05	5.13E-05	3.74E-05	5.14E-05
Stonewall	3.01E-05	0.000117	4.14E-05	7.99E-05	0.000101	4.9E-05	5.1E-05	5.25E-05
Sutton	0.000153	7.36E-05	0.000153	0.000249	0.00031	0.000161	0.000117	0.000161
Swisher	0.0001	0.000123	0.000354	0.000679	0.000843	0.000283	0.000331	0.000357
Tarrant	0.027792	0.089226	0.074111	0.041004	0.051858	0.064524	0.083101	0.074133
Taylor	0.002676	0.010447	0.003688	0.007119	0.008982	0.004361	0.004541	0.004673
Terrell	3.57E-05	1.72E-05	3.58E-05	5.81E-05	7.25E-05	3.77E-05	2.74E-05	3.77E-05
Terry	0.000161	0.000196	0.000566	0.001088	0.00135	0.000452	0.00053	0.000571
Throckmorton	3.49E-05	0.000136	4.81E-05	9.29E-05	0.000117	5.69E-05	5.92E-05	6.1E-05
Titus	0.001522	0.000746	0.000699	0.000581	0.001241	0.000931	0.001201	0.000868
Tom Green	0.003867	0.001863	0.003886	0.006298	0.007864	0.004083	0.002973	0.004087
Travis	0.034828	0.035561	0.043176	0.025747	0.032778	0.038856	0.076841	0.052224
Trinity	0.001029	0.000218	0.000245	0.000153	0.000622	0.000366	0.000554	0.000387
Tyler	0.001493	0.000316	0.000355	0.000222	0.000902	0.000531	0.000804	0.000561
Upshur	0.002356	0.00152	0.000552	0.000229	0.001264	0.001318	0.001777	0.000972
Upton	0.000117	5.65E-05	0.000118	0.000191	0.000238	0.000124	9.01E-05	0.000124

County	Scrap/Recycling	Concrete	Brick/Stone	Landscaping	Agriculture	Special Trades	Manufacturing	Other
Uvalde	0.000557	0.001239	0.000524	0.00145	0.001855	0.000861	0.000417	0.000815
Val Verde	0.000991	0.002206	0.000933	0.002583	0.003304	0.001533	0.000743	0.001453
Van Zandt	0.002709	0.001327	0.001244	0.001033	0.002207	0.001657	0.002138	0.001545
Victoria	0.000163	0.01433	0.003267	0.002575	0.003317	0.004171	0.002996	0.003573
Walker	0.004465	0.000944	0.001062	0.000663	0.002696	0.001588	0.002403	0.001679
Waller	0.001964	0.015492	0.000548	0.001796	0.002229	0.000686	0.002053	0.000698
Ward	0.000386	0.000186	0.000388	0.000629	0.000785	0.000408	0.000297	0.000408
Washington	0.001357	0.001305	0.000926	0.001001	0.001299	0.001062	0.001093	0.001112
Webb	0.02018	0.045695	0.032326	0.196452	0.007253	0.052833	0.001209	0.006733
Wharton	0.000986	0.008565	0.001291	0.003479	0.005125	0.001889	0.001364	0.00152
Wheeler	6.11E-05	7.48E-05	0.000216	0.000414	0.000514	0.000172	0.000202	0.000217
Wichita	0.002723	0.010632	0.003753	0.007245	0.009141	0.004438	0.004621	0.004756
Wilbarger	0.000303	0.001184	0.000418	0.000807	0.001018	0.000494	0.000515	0.00053
Willacy	0.000512	0.00049	0.00045	0.000931	0.001427	0.000551	0.000352	0.000521
Williamson	0.005874	0.032991	0.016917	0.007742	0.009606	0.010467	0.007664	0.00748
Wilson	0.00105	0.002316	0.000572	0.001381	0.001741	0.001183	0.001025	0.000839
Winkler	0.00025	0.000121	0.000251	0.000407	0.000509	0.000264	0.000192	0.000264
Wise	0.001999	0.001848	0.000674	0.000874	0.001347	0.001179	0.001326	0.000869
Wood	0.002102	0.00103	0.000965	0.000802	0.001713	0.001286	0.001659	0.001199
Yoakum	9.39E-05	0.000115	0.000331	0.000636	0.000789	0.000264	0.00031	0.000334
Young	0.000384	0.001498	0.000529	0.001021	0.001288	0.000625	0.000651	0.00067
Zapata	0.00121	0.002739	0.001938	0.011775	0.000435	0.003167	7.25E-05	0.000404
Zavala	0.000245	0.000544	0.00023	0.000637	0.000815	0.000378	0.000183	0.000358

Appendix B – Construction Cost Management Company (CCMC) Estimator Profiles

(provided in electronic format – cost estimator data model.xls)

Appendix C – Texas Department of Transportation (TxDOT) Equipment Survey Form

CONSTRUCTION EQUIPMENT DATA QUESTIONNAIRE

Name of interviewer: _____ _____

Date:

Name of Company/Organization: **Texas Department of Transportation**

Address:

Contact Name and Phone:

Equipment types of interest:

Please provide the information shown in the table below for each piece of equipment operated by your company/organization meeting the following criteria:

- Diesel powered
- Greater than or equal to 25 hp
- Operated during the 2004-2005 calendar years in the District
- For these equipment categories --

Asphalt Pavers	Excavators	
Aerial Lifts	Graders	Rubber Tire Loaders
Bore/Drill Rigs	Off-Highway Tractors	Scrapers
Cement and Mortar Mixers	Off-highway Trucks	Signal Boards
Concrete/Industrial Saws	Other Construction	Skid Steer Loaders
Concrete Pavers	Equipment	Surfacing Equipment
Cranes	Paving Equipment	Tractors/Loaders/Backhoes
Crawler Tractors	Rollers	Trenchers
Crushing/Proc. Equipment	Rough Terrain Forklifts	On-highway trucks (dump,
Dumpers/Tenders	Rubber Tire Dozers	water, fuel)

(NOTE: If this information is already available in some other format such as an electronic file, please feel free to supply that in place of the following table.)

(make additional copies as needed)

Equipment Type	**#**	**HP**	**Engine Yr**	**Hrs/Yr**	**Basis for hrs estimate***	**TERP? (if so, please describe control measure)**

* Provide basis for hours/yr estimate (clock hours, employee hours, other – specify)
Bold headings denote mandatory data fields for emissions calculations.

ADDITIONAL INFORMATION

1. What is the time period the data in the table above is reported for (start date/end date)?

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2. If available, please provide an estimate of total off-road (high-sulfur) diesel use for the target period.

3. Is 2004 through the present representative for your organization's/company's activity in the area? If not, how could your estimates be adjusted to be more representative?

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4. For equipment used in your activities, please describe their use profile –

   i) Daily (e.g., an hour of down time early mornings and late afternoons);
   ii) Weekly (e.g., only four hours of engine use on Saturdays, none on Sundays);
   iii) Seasonal (e.g., 12 hours in summer, nine in winter months).

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5. Questions regarding your fleet purchase and resale patterns:

   i) What percentage of the equipment listed was purchased/leased outside the none county area?
   ii) In general, what percentage of your purchases are for new equipment?
   iii) In general, how long do you retain a piece of equipment? Does this vary with equipment type, age, clock hours, and/or fleet expansion needs?
   iv) Who are the likely buyers of your used equipment?

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6. Please provide contact information for all primary contractors that used heavy diesel equipment in the area on any contract executed since January 2004.

7. Please provide an estimate of fleet activity by county. (Example: 20% of the total fleet operates 40 hrs/wk in Dallas County. 10% of the fleet operates 20 hrs/wk in Tarrant County and 20 hrs/wk in Dallas County.)

Please call Rick Baker at (512) 407-1823 with any questions or comments.

Thank you for your participation.

Appendix D – Productivity Adjustment Factors

County Altitude and Productivity Reduction Factors

County	County Seat	Elevation (feet)	Productivity Reduction
Anderson	Palestine	470	0.47%
Andrews	Andrews	3,169	3.17%
Angelina	Lufkin	299	0.30%
Aransas	Rockport	4	0.00%
Archer	Archer City	1,055	1.06%
Armstrong	Claude	3,392	3.39%
Atascosa	Jourdanton	446	0.45%
Austin	Bellville	243	0.24%
Bailey	Muleshoe	3,786	3.79%
Bandera	Bandera	1,185	1.19%
Bastrop	Bastrop	460	0.46%
Baylor	Seymour	1,289	1.29%
Bee	Beeville	205	0.21%
Bell	Belton	528	0.53%
Bexar	San Antonio	640	0.64%
Blanco	Johnson City	1,132	1.13%
Borden	Gail	2,589	2.59%
Bosque	Meridian	830	0.83%
Bowie	Boston	366	0.37%
Brazoria	Angleton	26	0.03%
Brazos	Bryan	361	0.36%
Brewster	Alpine	4,493	4.49%
Briscoe	Silverton	3,308	3.31%
Brooks	Falfurrias	108	0.11%
Brown	Brownwood	1,356	1.36%
Burleson	Caldwell	417	0.42%
Burnet	Burnet	1,470	1.47%
Caldwell	Lockhart	518	0.52%
Calhoun	Port Lavaca	15	0.02%
Callahan	Baird	1,702	1.70%
Cameron	Brownsville	26	0.03%
Camp	Pittsburg	373	0.37%
Carson	Panhandle	3,460	3.46%
Cass	Linden	360	0.36%
Castro	Dimmitt	3,858	3.86%
Chambers	Anahuac	23	0.02%
Cherokee	Rusk	688	0.69%
Childress	Childress	1,897	1.90%
Clay	Henrietta	850	0.85%
Cochran	Morton	3,777	3.78%

County	County Seat	Elevation (feet)	Productivity Reduction
Coke	Robert Lee	1,805	1.81%
Coleman	Coleman	1,701	1.70%
Collin	Mc Kinney	620	0.62%
Collingsworth	Wellington	2,047	2.05%
Colorado	Columbus	195	0.20%
Comal	New Braunfels	623	0.62%
Comanche	Comanche	1,421	1.42%
Concho	Paint Rock	1,630	1.63%
Cooke	Gainesville	744	0.74%
Coryell	Gatesville	810	0.81%
Cottle	Paducah	1,880	1.88%
Crane	Crane	2,584	2.58%
Crockett	Ozona	2,396	2.40%
Crosby	Crosbyton	3,025	3.03%
Culberson	Van Horn	4,063	4.06%
Dallam	Dalhart	3,986	3.99%
Dallas	Dallas	443	0.44%
Dawson	Lamesa	2,981	2.98%
De Witt	Cuero	186	0.19%
Deaf Smith	Hereford	3,845	3.85%
Delta	Cooper	415	0.42%
Denton	Denton	642	0.64%
Dickens	Dickens	2,451	2.45%
Dimmit	Carrizo Springs	618	0.62%
Donley	Clarendon	2,743	2.74%
Duval	San Diego	300	0.30%
Eastland	Eastland	1,421	1.42%
Ector	Odessa	2,900	2.90%
Edwards	Rocksprings	2,365	2.37%
El Paso	El Paso	3,714	3.71%
Ellis	Waxahachie	551	0.55%
Erath	Stephenville	1,269	1.27%
Falls	Marlin	386	0.39%
Fannin	Bonham	618	0.62%
Fayette	La Grange	245	0.25%
Fisher	Roby	1,990	1.99%
Floyd	Floydada	3,174	3.17%
Foard	Crowell	1,445	1.45%
Fort Bend	Port Lavaca	15	0.02%
Franklin	Mount Vernon	492	0.49%
Freestone	Fairfield	428	0.43%
Frio	Pearsall	627	0.63%
Gaines	Seminole	3,343	3.34%
Galveston	Galveston	3	0.00%

County	County Seat	Elevation (feet)	Productivity Reduction
Garza	Post	2,638	2.64%
Gillespie	Fredericksburg	1,726	1.73%
Glasscock	Garden City	2,663	2.66%
Goliad	Goliad	166	0.17%
Gonzales	Gonzales	290	0.29%
Gray	Pampa	3,232	3.23%
Grayson	Sherman	726	0.73%
Gregg	Longview	367	0.37%
Grimes	Anderson	347	0.35%
Guadalupe	Seguin	519	0.52%
Hale	Plainview	3,360	3.36%
Hall	Memphis	2,007	2.01%
Hamilton	Hamilton	1,252	1.25%
Hansford	Spearman	3,100	3.10%
Hardeman	Quanah	1,568	1.57%
Hardin	Kountze	59	0.06%
Harris	Houston	32	0.03%
Harrison	Marshall	399	0.40%
Hartley	Channing	3,902	3.90%
Haskell	Haskell	1,587	1.59%
Hays	San Marcos	607	0.61%
Hemphill	Canadian	2,478	2.48%
Henderson	Athens	482	0.48%
Hidalgo	Edinburg	95	0.10%
Hill	Hillsboro	621	0.62%
Hockley	Levelland	3,514	3.51%
Hood	Granbury	728	0.73%
Hopkins	Sulphur Springs	490	0.49%
Houston	Crockett	348	0.35%
Howard	Big Spring	2,552	2.55%
Hudspeth	Sierra Blanca	4,450	4.45%
Hunt	Greenville	551	0.55%
Hutchinson	Stinnett	3,240	3.24%
Irion	Mertzon	2,204	2.20%
Jack	Jacksboro	1,056	1.06%
Jackson	Edna	59	0.06%
Jasper	Jasper	197	0.20%
Jeff Davis	Fort Davis	5,499	5.50%
Jefferson	Beaumont	16	0.02%
Jim Hogg	Hebbronville	552	0.55%
Jim Wells	Alice	197	0.20%
Johnson	Cleburne	756	0.76%
Jones	Anson	1,715	1.72%
Karnes	Karnes City	378	0.38%

County	County Seat	Elevation (feet)	Productivity Reduction
Kaufman	Kaufman	414	0.41%
Kendall	Boerne	1,406	1.41%
Kenedy	Sarita	48	0.05%
Kent	Jayton	2,005	2.01%
Kerr	Kerrville	1,634	1.63%
Kimble	Junction	1,953	1.95%
King	Guthrie	1,736	1.74%
Kinney	Brackettville	1,101	1.10%
Kleberg	Kingsville	56	0.06%
Knox	Benjamin	1,498	1.50%
La Salle	Cotulla	401	0.40%
Lamar	Paris	600	0.60%
Lamb	Littlefield	3,550	3.55%
Lampasas	Lampasas	1,026	1.03%
Lavaca	Hallettsville	247	0.25%
Lee	Giddings	467	0.47%
Leon	Centerville	301	0.30%
Liberty	Liberty	39	0.04%
Limestone	Groesbeck	438	0.44%
Lipscomb	Lipscomb	2,440	2.44%
Live Oak	George West	152	0.15%
Llano	Llano	1,077	1.08%
Loving	Mentone	2,812	2.81%
Lubbock	Lubbock	3,199	3.20%
Lynn	Tahoka	3,138	3.14%
Madison	Madisonville	289	0.29%
Marion	Jefferson	205	0.21%
Martin	Stanton	2,698	2.70%
Mason	Mason	1,528	1.53%
Matagorda	Bay City	49	0.05%
Maverick	Eagle Pass	728	0.73%
Mcculloch	Brady	1,726	1.73%
Mclennan	Waco	464	0.46%
Mcmullen	Tilden	277	0.28%
Medina	Hondo	896	0.90%
Menard	Menard	1,886	1.89%
Midland	Midland	2,772	2.77%
Milam	Cameron	400	0.40%
Mills	Goldthwaite	1,554	1.55%
Mitchell	Colorado City	2,114	2.11%
Montague	Montague	1,025	1.03%
Montgomery	Conroe	208	0.21%
Moore	Dumas	3,652	3.65%
Morris	Daingerfield	406	0.41%

County	County Seat	Elevation (feet)	Productivity Reduction
Motley	Matador	2,385	2.39%
Nacogdoches	Nacogdoches	299	0.30%
Navarro	Corsicana	434	0.43%
Newton	Newton	172	0.17%
Nolan	Sweetwater	2,143	2.14%
Nueces	Corpus Christi	9	0.01%
Ochiltree	Perryton	2,930	2.93%
Oldham	Vega	3,652	3.65%
Orange	Orange	1	0.00%
Palo Pinto	Palo Pinto	810	0.81%
Panola	Carthage	316	0.32%
Parker	Weatherford	1,041	1.04%
Parmer	Farwell	4,092	4.09%
Pecos	Fort Stockton	2,969	2.97%
Polk	Livingston	160	0.16%
Potter	Amarillo	3,664	3.66%
Presidio	Marfa	4,705	4.71%
Rains	Emory	489	0.49%
Randall	Canyon	3,537	3.54%
Reagan	Big Lake	2,670	2.67%
Real	Leakey	1,884	1.88%
Red River	Clarksville	421	0.42%
Reeves	Pecos	2,591	2.59%
Refugio	Refugio	45	0.05%
Roberts	Miami	2,955	2.96%
Robertson	Franklin	443	0.44%
Rockwall	Rockwall	581	0.58%
Runnels	Ballinger	1,670	1.67%
Rusk	Rusk	685	0.69%
Sabine	Hemphill	187	0.19%
San Augustine	San Augustine	335	0.34%
San Jacinto	Coldspring	213	0.21%
San Patricio	Sinton	46	0.05%
San Saba	San Saba	1,344	1.34%
Schleicher	Eldorado	2,411	2.41%
Scurry	Snyder	2,316	2.32%
Shackelford	Albany	1,557	1.56%
Shelby	Center	352	0.35%
Sherman	Stratford	3,608	3.61%
Smith	Tyler	526	0.53%
Somervell	Glen Rose	649	0.65%
Starr	Rio Grande City	162	0.16%
Stephens	Breckenridge	1,189	1.19%
Sterling	Sterling City	2,389	2.39%

County	County Seat	Elevation (feet)	Productivity Reduction
Stonewall	Aspermont	1,760	1.76%
Sutton	Sonora	2,245	2.25%
Swisher	Tulia	3,448	3.45%
Tarrant	Fort Worth	611	0.61%
Taylor	Abilene	1,731	1.73%
Terrell	Sanderson	2,885	2.89%
Terry	Brownfield	3,269	3.27%
Throckmorton	Throckmorton	1,278	1.28%
Titus	Mount Pleasant	392	0.39%
Tom Green	San Angelo	1,808	1.81%
Travis	Austin	536	0.54%
Trinity	Groveton	237	0.24%
Tyler	Woodville	288	0.29%
Upshur	Gilmer	340	0.34%
Upton	Rankin	2,510	2.51%
Uvalde	Uvalde	902	0.90%
Val Verde	Del Rio	962	0.96%
Van Zandt	Canton	449	0.45%
Victoria	Victoria	90	0.09%
Walker	Huntsville	385	0.39%
Waller	Hempstead	182	0.18%
Ward	Monahans	2,607	2.61%
Washington	Brenham	307	0.31%
Webb	Laredo	434	0.43%
Wharton	Wharton	55	0.06%
Wheeler	Wheeler	2,542	2.54%
Wichita	Wichita Falls	931	0.93%
Wilbarger	Vernon	1,228	1.23%
Willacy	Raymondville	25	0.03%
Williamson	Georgetown	736	0.74%
Wilson	Floresville	429	0.43%
Winkler	Kermit	2,852	2.85%
Wise	Decatur	1,070	1.07%
Wood	Quitman	391	0.39%
Yoakum	Plains	3,654	3.65%
Young	Graham	1,062	1.06%
Zapata	Zapata	345	0.35%
Zavala	Crystal City	543	0.54%

Weighted Average Ground Cover Adjustments

County	Grass/Weeds	Mixed	Wooded	Wtd Avg Activity Adjustment
Anderson	0.392	0.000	0.608	1.304
Andrews	0.266	0.734	0.000	1.220
Angelina	0.154	0.000	0.845	1.423
Aransas	0.366	0.225	0.409	1.272
Archer	0.244	0.751	0.005	1.228
Armstrong	0.591	0.408	0.002	1.123
Atascosa	0.486	0.414	0.100	1.174
Austin	0.831	0.016	0.154	1.082
Bailey	0.795	0.205	0.000	1.062
Bandera	0.078	0.121	0.801	1.437
Bastrop	0.392	0.233	0.376	1.258
Baylor	0.320	0.676	0.005	1.205
Bee	0.443	0.138	0.420	1.251
Bell	0.684	0.128	0.188	1.133
Bexar	0.493	0.102	0.405	1.233
Blanco	0.088	0.172	0.740	1.421
Borden	0.181	0.819	0.000	1.246
Bosque	0.607	0.248	0.146	1.147
Bowie	0.492	0.000	0.507	1.254
Brazoria	0.735	0.005	0.261	1.132
Brazos	0.413	0.299	0.288	1.234
Brewster	0.003	0.995	0.002	1.300
Briscoe	0.469	0.531	0.000	1.159
Brooks	0.102	0.727	0.171	1.304
Brown	0.335	0.509	0.155	1.230
Burleson	0.545	0.175	0.279	1.192
Burnet	0.264	0.299	0.438	1.308
Caldwell	0.624	0.172	0.204	1.154
Calhoun	0.522	0.330	0.148	1.173
Callahan	0.311	0.641	0.048	1.216
Cameron	0.945	0.054	0.000	1.017
Camp	0.515	0.002	0.484	1.242
Carson	1.000	0.000	0.000	1.000
Cass	0.208	0.000	0.792	1.396
Castro	0.997	0.003	0.000	1.001
Chambers	0.890	0.000	0.110	1.055
Cherokee	0.338	0.000	0.662	1.331
Childress	0.529	0.471	0.000	1.141
Clay	0.448	0.524	0.028	1.171
Cochran	0.653	0.347	0.000	1.104
Coke	0.117	0.805	0.078	1.280
Coleman	0.407	0.542	0.052	1.188

County	Grass/Weeds	Mixed	Wooded	Wtd Avg Activity Adjustment
Collin	0.954	0.000	0.046	1.023
Collingsworth	0.586	0.413	0.001	1.124
Colorado	0.651	0.048	0.301	1.165
Comal	0.155	0.046	0.799	1.413
Comanche	0.569	0.341	0.089	1.147
Concho	0.300	0.594	0.106	1.231
Cooke	0.758	0.102	0.141	1.101
Coryell	0.574	0.187	0.238	1.175
Cottle	0.349	0.651	0.000	1.195
Crane	0.022	0.978	0.000	1.293
Crockett	0.003	0.974	0.023	1.304
Crosby	0.640	0.359	0.000	1.108
Culberson	0.018	0.971	0.011	1.297
Dallam	0.983	0.017	0.000	1.005
Dallas	0.793	0.086	0.121	1.086
Dawson	0.880	0.120	0.000	1.036
De Witt	0.572	0.062	0.365	1.201
Deaf Smith	0.953	0.045	0.002	1.014
Delta	0.917	0.000	0.083	1.042
Denton	0.832	0.075	0.092	1.069
Dickens	0.375	0.625	0.000	1.188
Dimmit	0.208	0.781	0.011	1.240
Donley	0.708	0.290	0.001	1.088
Duval	0.154	0.840	0.006	1.255
Eastland	0.453	0.439	0.108	1.186
Ector	0.072	0.928	0.000	1.279
Edwards	0.014	0.396	0.590	1.414
El Paso	0.127	0.871	0.001	1.262
Ellis	0.964	0.014	0.022	1.015
Erath	0.465	0.479	0.055	1.171
Falls	0.895	0.043	0.062	1.044
Fannin	0.879	0.001	0.119	1.060
Fayette	0.726	0.071	0.202	1.123
Fisher	0.559	0.437	0.004	1.133
Floyd	0.884	0.116	0.000	1.035
Foard	0.342	0.658	0.001	1.198
Fort Bend	0.867	0.003	0.130	1.066
Franklin	0.689	0.001	0.310	1.155
Freestone	0.500	0.139	0.361	1.222
Frio	0.365	0.619	0.015	1.193
Gaines	0.748	0.252	0.000	1.076
Galveston	0.986	0.000	0.014	1.007
Garza	0.213	0.787	0.000	1.236
Gillespie	0.156	0.111	0.733	1.400

County	Grass/Weeds	Mixed	Wooded	Wtd Avg Activity Adjustment
Glasscock	0.301	0.699	0.000	1.210
Goliad	0.289	0.218	0.493	1.312
Gonzales	0.475	0.086	0.439	1.245
Gray	0.874	0.116	0.010	1.040
Grayson	0.834	0.038	0.128	1.075
Gregg	0.259	0.016	0.725	1.367
Grimes	0.470	0.146	0.384	1.236
Guadalupe	0.710	0.041	0.248	1.137
Hale	0.993	0.007	0.000	1.002
Hall	0.480	0.520	0.000	1.156
Hamilton	0.603	0.277	0.120	1.143
Hansford	0.984	0.016	0.000	1.005
Hardeman	0.576	0.422	0.002	1.128
Hardin	0.040	0.000	0.959	1.480
Harris	0.686	0.001	0.313	1.157
Harrison	0.219	0.004	0.777	1.390
Hartley	0.592	0.406	0.001	1.123
Haskell	0.668	0.322	0.010	1.101
Hays	0.239	0.145	0.616	1.352
Hemphill	0.920	0.060	0.020	1.028
Henderson	0.616	0.002	0.383	1.192
Hidalgo	0.628	0.366	0.006	1.113
Hill	0.888	0.075	0.037	1.041
Hockley	0.890	0.110	0.000	1.033
Hood	0.619	0.300	0.081	1.131
Hopkins	0.835	0.000	0.165	1.083
Houston	0.450	0.000	0.550	1.275
Howard	0.522	0.478	0.000	1.144
Hudspeth	0.025	0.974	0.000	1.292
Hunt	0.885	0.001	0.114	1.057
Hutchinson	0.625	0.361	0.013	1.115
Irion	0.021	0.936	0.043	1.302
Jack	0.153	0.627	0.220	1.298
Jackson	0.721	0.041	0.238	1.131
Jasper	0.076	0.004	0.920	1.461
Jeff Davis	0.010	0.835	0.156	1.328
Jefferson	0.877	0.001	0.122	1.061
Jim Hogg	0.074	0.926	0.000	1.278
Jim Wells	0.563	0.415	0.023	1.136
Johnson	0.904	0.041	0.055	1.040
Jones	0.755	0.229	0.017	1.077
Karnes	0.671	0.078	0.251	1.149
Kaufman	0.912	0.009	0.079	1.042
Kendall	0.092	0.051	0.857	1.444

County	Grass/Weeds	Mixed	Wooded	Wtd Avg Activity Adjustment
Kenedy	0.675	0.166	0.159	1.129
Kent	0.167	0.833	0.000	1.250
Kerr	0.061	0.183	0.756	1.433
Kimble	0.042	0.178	0.780	1.443
King	0.113	0.887	0.000	1.266
Kinney	0.039	0.775	0.186	1.326
Kleberg	0.782	0.218	0.000	1.065
Knox	0.462	0.534	0.004	1.162
La Salle	0.190	0.805	0.004	1.244
Lamar	0.837	0.001	0.163	1.082
Lamb	0.880	0.120	0.000	1.036
Lampasas	0.414	0.252	0.334	1.242
Lavaca	0.629	0.067	0.304	1.172
Lee	0.507	0.216	0.277	1.203
Leon	0.428	0.019	0.553	1.282
Liberty	0.334	0.000	0.666	1.333
Limestone	0.729	0.131	0.140	1.109
Lipscomb	0.996	0.001	0.003	1.002
Live Oak	0.449	0.445	0.106	1.186
Llano	0.069	0.588	0.343	1.348
Loving	0.001	0.999	0.000	1.300
Lubbock	0.968	0.032	0.000	1.010
Lynn	0.856	0.144	0.000	1.043
Madison	0.640	0.075	0.285	1.165
Marion	0.116	0.002	0.882	1.442
Martin	0.635	0.365	0.000	1.110
Mason	0.149	0.484	0.366	1.329
Matagorda	0.807	0.041	0.152	1.088
Maverick	0.100	0.893	0.007	1.271
Mcculloch	0.290	0.573	0.137	1.240
Mclennan	0.875	0.069	0.056	1.049
Mcmullen	0.127	0.871	0.002	1.262
Medina	0.300	0.362	0.339	1.278
Menard	0.083	0.273	0.644	1.404
Midland	0.215	0.785	0.000	1.235
Milam	0.641	0.178	0.181	1.144
Mills	0.329	0.429	0.242	1.250
Mitchell	0.426	0.574	0.000	1.172
Montague	0.632	0.177	0.191	1.149
Montgomery	0.088	0.000	0.912	1.456
Moore	0.824	0.175	0.000	1.053
Morris	0.423	0.003	0.574	1.288
Motley	0.237	0.763	0.000	1.229
Nacogdoches	0.260	0.000	0.740	1.370

County	Grass/Weeds	Mixed	Wooded	Wtd Avg Activity Adjustment
Navarro	0.840	0.078	0.082	1.064
Newton	0.048	0.003	0.949	1.475
Nolan	0.314	0.580	0.106	1.227
Nueces	0.924	0.066	0.010	1.025
Ochiltree	0.997	0.002	0.001	1.001
Oldham	0.284	0.715	0.000	1.215
Orange	0.325	0.008	0.667	1.336
Palo Pinto	0.202	0.651	0.147	1.269
Panola	0.317	0.004	0.678	1.340
Parker	0.712	0.172	0.116	1.110
Parmer	1.000	0.000	0.000	1.000
Pecos	0.036	0.962	0.002	1.290
Polk	0.073	0.000	0.927	1.463
Potter	0.400	0.599	0.001	1.180
Presidio	0.011	0.989	0.000	1.297
Rains	0.753	0.000	0.247	1.123
Randall	0.924	0.076	0.000	1.023
Reagan	0.094	0.906	0.000	1.272
Real	0.050	0.230	0.721	1.429
Red River	0.602	0.003	0.396	1.199
Reeves	0.092	0.908	0.001	1.273
Refugio	0.296	0.462	0.242	1.260
Roberts	0.878	0.106	0.016	1.040
Robertson	0.605	0.097	0.298	1.178
Rockwall	0.993	0.005	0.002	1.003
Runnels	0.586	0.398	0.016	1.127
Rusk	0.404	0.002	0.594	1.297
Sabine	0.100	0.000	0.900	1.450
San Augustine	0.129	0.004	0.868	1.435
San Jacinto	0.072	0.000	0.928	1.464
San Patricio	0.814	0.099	0.087	1.073
San Saba	0.186	0.562	0.252	1.295
Schleicher	0.073	0.564	0.363	1.351
Scurry	0.486	0.514	0.000	1.154
Shackelford	0.130	0.857	0.013	1.264
Shelby	0.269	0.001	0.730	1.365
Sherman	0.977	0.023	0.000	1.007
Smith	0.433	0.002	0.566	1.283
Somervell	0.452	0.363	0.185	1.202
Starr	0.262	0.733	0.005	1.222
Stephens	0.128	0.782	0.091	1.280
Sterling	0.045	0.955	0.000	1.286
Stonewall	0.360	0.640	0.000	1.192
Sutton	0.021	0.737	0.242	1.342

County	Grass/Weeds	Mixed	Wooded	Wtd Avg Activity Adjustment
Swisher	0.988	0.012	0.000	1.004
Tarrant	0.856	0.027	0.117	1.067
Taylor	0.482	0.360	0.158	1.187
Terrell	0.000	0.998	0.002	1.300
Terry	0.895	0.105	0.000	1.031
Throckmorton	0.198	0.796	0.007	1.242
Titus	0.600	0.003	0.397	1.199
Tom Green	0.269	0.635	0.095	1.238
Travis	0.397	0.201	0.402	1.261
Trinity	0.166	0.001	0.834	1.417
Tyler	0.041	0.000	0.959	1.479
Upshur	0.366	0.001	0.633	1.317
Upton	0.048	0.952	0.000	1.286
Uvalde	0.188	0.491	0.321	1.308
Val Verde	0.004	0.965	0.031	1.305
Van Zandt	0.809	0.001	0.190	1.095
Victoria	0.523	0.194	0.283	1.200
Walker	0.232	0.000	0.768	1.384
Waller	0.736	0.051	0.213	1.122
Ward	0.053	0.947	0.000	1.284
Washington	0.734	0.170	0.097	1.099
Webb	0.048	0.952	0.001	1.286
Wharton	0.881	0.008	0.111	1.058
Wheeler	0.760	0.236	0.003	1.073
Wichita	0.559	0.437	0.003	1.133
Wilbarger	0.527	0.470	0.003	1.142
Willacy	0.815	0.176	0.009	1.057
Williamson	0.684	0.204	0.112	1.117
Wilson	0.713	0.083	0.204	1.127
Winkler	0.073	0.927	0.000	1.278
Wise	0.527	0.328	0.145	1.171
Wood	0.494	0.001	0.505	1.253
Yoakum	0.655	0.345	0.000	1.104
Young	0.332	0.583	0.086	1.218
Zapata	0.069	0.930	0.001	1.279
Zavala	0.200	0.789	0.012	1.242

Weighted Average Soil Adjustments

County	Productivity Adjustment Factor
Anderson	0.893
Andrews	0.952
Angelina	0.789
Aransas	0.582
Archer	0.771
Armstrong	0.796
Atascosa	0.891
Austin	0.844
Bailey	0.924
Bandera	0.624
Bastrop	0.886
Baylor	0.788
Bee	0.875
Bell	0.737
Bexar	0.754
Blanco	0.734
Borden	0.811
Bosque	0.754
Bowie	0.823
Brazoria	0.764
Brazos	0.832
Brewster	0.681
Briscoe	0.728
Brooks	0.979
Brown	0.772
Burleson	0.843
Burnet	0.720
Caldwell	0.838
Calhoun	0.491
Callahan	0.795
Cameron	0.728
Camp	0.901
Carson	0.880
Cass	0.920
Castro	0.816
Chambers	0.585
Cherokee	0.861
Childress	0.774
Clay	0.810
Cochran	0.954
Coke	0.768
Coleman	0.742

County	Productivity Adjustment Factor
Collin	0.755
Collingsworth	0.791
Colorado	0.845
Comal	0.706
Comanche	0.816
Concho	0.706
Cooke	0.800
Coryell	0.742
Cottle	0.811
Crane	0.909
Crockett	0.623
Crosby	0.843
Culberson	0.672
Dallam	0.838
Dallas	0.771
Dawson	0.944
De Witt	0.887
Deaf Smith	0.808
Delta	0.804
Denton	0.764
Dickens	0.805
Dimmit	0.841
Donley	0.831
Duval	0.778
Eastland	0.838
Ector	0.821
Edwards	0.580
El Paso	0.868
Ellis	0.776
Erath	0.824
Falls	0.817
Fannin	0.817
Fayette	0.809
Fisher	0.783
Floyd	0.809
Foard	0.777
Fort Bend	0.807
Franklin	0.830
Freestone	0.894
Frio	0.870
Gaines	0.967
Galveston	0.433
Garza	0.839
Gillespie	0.716

County	Productivity Adjustment Factor
Glasscock	0.791
Goliad	0.890
Gonzales	0.840
Gray	0.880
Grayson	0.757
Gregg	0.923
Grimes	0.819
Guadalupe	0.834
Hale	0.809
Hall	0.782
Hamilton	0.762
Hansford	0.796
Hardeman	0.816
Hardin	0.883
Harris	0.818
Harrison	0.888
Hartley	0.859
Haskell	0.798
Hays	0.728
Hemphill	0.918
Henderson	0.843
Hidalgo	0.877
Hill	0.775
Hockley	0.935
Hood	0.799
Hopkins	0.828
Houston	0.866
Howard	0.852
Hudspeth	0.757
Hunt	0.779
Hutchinson	0.859
Irion	0.636
Jack	0.813
Jackson	0.808
Jasper	0.869
Jeff Davis	0.728
Jefferson	0.780
Jim Hogg	0.862
Jim Wells	0.915
Johnson	0.785
Jones	0.819
Karnes	0.853
Kaufman	0.808
Kendall	0.683

County	Productivity Adjustment Factor
Kenedy	0.921
Kent	0.792
Kerr	0.635
Kimble	0.639
King	0.748
Kinney	0.708
Kleberg	0.804
Knox	0.800
La Salle	0.853
Lamar	0.824
Lamb	0.927
Lampasas	0.780
Lavaca	0.849
Lee	0.870
Leon	0.928
Liberty	0.839
Limestone	0.829
Lipscomb	0.899
Live Oak	0.859
Llano	0.776
Loving	0.902
Lubbock	0.871
Lynn	0.902
Madison	0.848
Marion	0.851
Martin	0.891
Mason	0.758
Matagorda	0.672
Maverick	0.788
Mcculloch	0.719
Mclennan	0.766
Mcmullen	0.821
Medina	0.767
Menard	0.610
Midland	0.881
Milam	0.856
Mills	0.745
Mitchell	0.807
Montague	0.855
Montgomery	0.865
Moore	0.828
Morris	0.883
Motley	0.833
Nacogdoches	0.864

County	Productivity Adjustment Factor
Navarro	0.802
Newton	0.904
Nolan	0.709
Nueces	0.678
Ochiltree	0.822
Oldham	0.862
Orange	0.811
Palo Pinto	0.775
Panola	0.829
Parker	0.836
Parmer	0.836
Pecos	0.675
Polk	0.858
Potter	0.836
Presidio	0.741
Rains	0.775
Randall	0.804
Reagan	0.700
Real	0.614
Red River	0.839
Reeves	0.782
Refugio	0.797
Roberts	0.884
Robertson	0.904
Rockwall	0.699
Runnels	0.773
Rusk	0.909
Sabine	0.725
San Augustine	0.780
San Jacinto	0.818
San Patricio	0.814
San Saba	0.735
Schleicher	0.638
Scurry	0.795
Shackelford	0.754
Shelby	0.844
Sherman	0.805
Smith	0.919
Somervell	0.817
Starr	0.818
Stephens	0.775
Sterling	0.686
Stonewall	0.784
Sutton	0.613

County	Productivity Adjustment Factor
Swisher	0.805
Tarrant	0.768
Taylor	0.750
Terrell	0.581
Terry	0.980
Throckmorton	0.762
Titus	0.820
Tom Green	0.715
Travis	0.732
Trinity	0.813
Tyler	0.892
Upshur	0.931
Upton	0.755
Uvalde	0.715
Val Verde	0.565
Van Zandt	0.839
Victoria	0.824
Walker	0.824
Waller	0.858
Ward	0.904
Washington	0.793
Webb	0.818
Wharton	0.815
Wheeler	0.953
Wichita	0.822
Wilbarger	0.833
Willacy	0.846
Williamson	0.742
Wilson	0.880
Winkler	0.963
Wise	0.835
Wood	0.856
Yoakum	0.980
Young	0.798
Zapata	0.791
Zavala	0.835

Appendix E – Municipality and County Equipment Survey Responses

Dallas and Tarrant County Equipment

Equipment Type	HP	HP BIN	Engine Yr	Hrs/Yr
Other Construction Equipment	350	300-600	1992	150
Other Construction Equipment	425	300-600	2001	361
Other Construction Equipment	425	300-600	2004	158
Grader	135	100-175	1994	240
Grader	185	175-300	1998	569
Grader	152	100-175	1999	775
Tractor/Loader/Backhoe	33	25-40	1984	180
Tractor/Loader/Backhoe	76	75-100	1998	549
Tractor/Loader/Backhoe	98	75-100	2000	690
Crawler Tractor	174	100-175	1996	435
Rubber Tire Loader	185	175-300	1997	115
Skid Steer Loader	64	50-75	1997	124
Rubber Tire Loader	173	100-175	1999	494
Rubber Tire Loader	128	100-175	2003	252
Other Construction Equipment	68	50-75	1987	59
Other Construction Equipment	76	75-100	1998	83
Other Construction Equipment	82	75-100	2004	102
Rollers	115	100-175	1997	418
Rollers	135	100-175	1994	95
Rollers	127	100-175	2001	378
Rollers	150	100-175	1980	203
Rollers	35	25-40	1991	117
Rollers	100	100-175	1998	383
Rollers	35	25-40	1997	229
Rollers	82	75-100	1998	109
Rollers	84	75-100	2001	264
Rollers	84	75-100	2001	172
Rollers	84	75-100	2001	282
Rollers	127	100-175	2003	313
Rollers	82	75-100	2004	110
Excavator	200	175-300	1998	714
Asphalt Paver	125	100-175	1997	274
Paving Equipment	150	100-175	1987	32
Paving Equipment	215	175-300	1998	2
Concrete Saw	35	25-40	2002	8
Elgin Street Sweeper	175	175-300	1997	185
Elgin Street Sweeper	190	175-300	2002	408
John Deere Wheel Loader	115	100-175	1991	296
Fiatallis Wheel Loader	230	175-300	1986	0
Ingram 12 Ton Loader	85	75-100	1995	0
John Deere Motor Grader	135	100-175	1977	0
John Deere Motor Grader	155	100-175	2004	292
CAT Wide Track Dozer	160	100-175	1998	183
Wirtgen Milling Machine	167	100-175	1999	47

Equipment Type	HP	HP BIN	Engine Yr	Hrs/Yr
Wirtgen Pavement Profiler	533	300-600	2000	410
Compactor	79	75-100	2000	3355
Steel Wheel Asphalt Roller	35	25-40	1997	1219
Sweeper	76	75-100	1987	2262
Sweeper	76	75-100	1996	1878
Asphalt Paver	107	100-175	1993	4661
Grader	177	175-300	1999	3113
Grader	83	75-100	1999	725
Uniloader	60	50-75	1995	1142
Rubber Tire Loader	136.3	100-175	1989	1098
Koering Excavator	230	175-300	1987	1184
Mixer	335	300-600	1980	562
Gradall Excavator	200	175-300	1998	1100
Mixer	83.46	75-100	1981	2074
Three Wheel Steel Roller	49	40-50	1986	3934
Steel Wheel Asphalt Roller	112	100-175	1989	4658
Steel Wheel Asphalt Roller	100	100-175	1999	1100
Rubber Tire Roller	80	75-100	2000	690
Fiatallis Tractor Dozer	227	175-300	1988	36
Ferguson Pneumatic Roller	65	50-75	1998	200
Case Farm Tractor	75	75-100	1991	101
Ferguson Pneumatic Roller	65	50-75	1981	0
Caterpillar 815 Compactor	85	75-100	1986	64
Case Vibrator Compactor	75	75-100	1987	150
Broce Self Propelled Broom	52	50-75	1988	120
Ingram Roller 10-12 Ton	85	75-100	1986	163
Hamm GRW-15 Pneumatic Roller	65	50-75	1988	82
Etnyre Chip Spreader	118	100-175	1999	94
Romco Chip Spreader	152	100-175	1986	0
Broce Self Propelled Mixer	65	50-75	1987	57
Vermeer 1250A Brush Chipper	65	50-75	2002	240
Ferguson 46-A Roller	50	50-75	1986	5
Ferguson 46-A Roller	50	50-75	1999	207
Dresser Scrapper	500	300-600	1990	0
Ingram Roller	49	40-50	1987	23
Fiatallis Motor Grader	170	100-175	1997	395
Fiatallis Motor Grader	170	100-175	1997	589
Broce Hydro Broom	52	50-75	1997	151
Caterpillar Track Loader	160	100-175	1997	321
Case 821 Pneumatic Roller	65	50-75	1997	429
JCB Front End Loader	170	100-175	1999	226
Gradall XSL-5100 Excavator	175	175-300	1996	586
Gradall XSL-3100 Excavator	175	175-300	2002	661
Champion Motor Grader	148	100-175	1988	0
Sterling Asphalt Distributor	225	175-300	2001	243
Case Excavator Crawler	175	175-300	1990	10
Ingram Pneumatic Roller	65	50-75	1990	215

Equipment Type	HP	HP BIN	Engine Yr	Hrs/Yr
Case 752-B Asphalt Roller	50	50-75	1990	323
Case 5140 Tractor	40	40-50	1990	0
Case 1490 Tractor	49	40-50	1994	0
CEDARAPIDS Asphalt Paver	172	100-175	200	591
Case Skid Steer Loader	60	50-75	2003	141
CAT Track Loader	210	175-300	1993	199
Ferguson Roller	82	75-100	1982	73
Dynapac Roller	152	100-175	1993	285
Rosco Roller	52	50-75	1993	40
Michigan Rubber Tire Loader	145	100-175	1993	311
CAT Scraper	195	175-300	1983	1
Dynapac Roller	92	75-100	1993	158
CAT Surfacing Equipment	500	300-600	2001	239
Dynapac Roller	95	75-100	2000	346
Cimline Crack Sealer	25	25-40	1999	7
Gradall Backhoe	165	100-175	1998	96
Flaherty Chip Spreader	100	100-175	1976	0
Allis Dozer	227	175-300	1993	69
Rosco Chip Spreader	190	175-300	2000	2
Champion Grader	190	175-300	1991	193
Galion Grader	177	175-300	2001	508
Bros Mixer	250	175-300	1970	130
Galion Grader	177	175-300	2001	140
JD Rubber Tire Loader	38.8	25-40	1984	42
Allis Rubber Tire Loader	330	300-600	1985	92
Case Rubber Tire Loader	90	75-100	1993	116
JD Ruber Tire Loader	49.9	40-50	1984	45
Cat Roller	216	175-300	1988	201
Ford Mower Tractor	60	50-75	1971	54
Ford Mower Tractor	60	50-75	1971	363
B318/GRADER	144	100-175	1992	314
B319/JD GRADER	142	100-175	1993	235
B320/GALION GRADER	177	175-300	2000	619
B321/KOMATSU MOTORG	165	175-300	2004	214
D303/KOMATSU LOADER	160	100-175	1992	204
D318/CASE LOADER	198	175-300	1995	166
D320/KOMATSU SKID LOAD	84	75-100	2005	
D323/KOMATSU LOADER	144	100-175	1997	284
D324/DRESSER DOZER	70	50-75	1997	73
D325/CAT LOADER	158	100-175	1998	317
D326/KOMATSU LOADER	144	100-175	1998	342
K301/CAT COMPACTOR	254	175-300	1979	112
K303/FERGUSON ROLLER	80	75-100	1992	79
K312/INGERSOL ROLLER	190	175-300	1988	227
K313/BOMAG ROLLER	112	100-175	1993	60
K314/FERGUSON ROLLER	80	75-100	1994	99
K316/FERGUSON ROLLER	80	75-100	1996	250

Equipment Type	HP	HP BIN	Engine Yr	Hrs/Yr
K317/VIBROMAX COMP	78	75-100	1997	13
K318/DYNAPAC COMP	190	175-300	1999	356
K319/INGERSOL COMP	190	175-300	2000	279
K320/INGERSOL ROLLER	190	175-300	2001	280
R308/GRADALL EXCAV	190	175-300	1998	1504
R308A/GRAD UPPER UNIT	190	175-300	1998	488
R310/CMI RECLAIM/STAB	425	300-600	2003	513
R311/GRADALL XL4100	195	175-300	2005	
R312/CMI RECLAIM/STAB	425	300-600	2005	
S305/BLAW KNOX LAYDOWN	107	100-175	1995	451
MOTORGRADER	140	100-175	1998	808
MOTORGRADER	140	100-175	1997	600
MOTORGRADER	140	100-175	1993	420
MOTORGRADER	165	100-175	1987	466
CHIPPER	80	75-100	1998	176
TRACTOR	68	50-75	2002	237
TRACTOR	68	50-75	2002	252
TRACTOR	68	50-75	2002	280
TRACTOR	68	50-75	2002	220
TRACTOR	75	75-100	1992	209
SKID STEER LOADER	62	50-75	1994	100
SKID STEER LOADER	46	40-50	1998	232
TRACTOR	50	50-75	1966	120
WHEEL LOADER	140	100-175	2003	400
DOZER	120	100-175	1969	200
WHEEL LOADER	160	100-175	1995	260
WHEEL LOADER	120	100-175	1989	220
WHEEL LOADER	160	100-175	1999	250
WHEEL LOADER	140	100-175	2004	210
TRACK LOADER	150	100-175	1989	420
TRACK LOADER	160	100-175	1997	580
MOBILE BROOM	80	75-100	1988	75
MOBILE SWEEPER	175	175-300	2001	4200
PNEUMATIC ROLLER	100	100-175	2005	100
STEEL WHEEL ROLLER	131	100-175	2002	410
STEEL WHEEL ROLLER	131	100-175		349
STEEL WHEEL ROLLER	131	100-175	2005	30
PNEUMATIC ROLLER	80	75-100	1996	120
STEEL WHEEL ROLLER	80	75-100	1998	90
PNEUMATIC ROLLER	80	75-100	1999	25
PNEUMATIC ROLLER	105	100-175	2001	350
STEEL WHEEL ROLLER	131	100-175	2002	199
COMPACTOR	315	300-600	1985	125
SINGLE DRUM COMPACTOR	95	75-100	2000	20
RECLAIMER	335	300-600	1997	220
EXCAVATOR	190	175-300	1996	224
EXCAVATOR	190	175-300	2002	621
RECLAIMER	425	300-600	2003	220

Equipment Type	HP	HP BIN	Engine Yr	Hrs/Yr
RECLAIMER	425	300-600	2004	200
CRACK SEALER	25	25-40	2002	210
PATCHER	80	75-100	2002	90
CHIP SPREADER	210	175-300	1989	111
LAY DOWN MACHINE	152	100-175	2005	NEW

Municipal Equipment[14]

Equipment Type	QTY	HP	HP BIN	Hrs/Yr
Aerial Lifts	23	250	175-300	284,204.1
Bore/Drill Rigs	3	250	175-300	12,981.9
Concrete/Industrial Saws	5	65	50-75	1,081.3
Crawler Tractors	19	150	100-175	7,042.3
Excavators	13	35	25-40	7,297.3
Graders	19	150	100-175	7,832.8
Off-Highway Tractors	12	65	50-75	3,926.2
Rollers	21	50	50-75	2,564.0
Rough Terrain Forklifts	1	100	100-175	171.0
Rubber Tire Loaders	7			3,603.5
Skid Steer Loaders	14	60	50-75	2,298.3
Tractors/Loaders/Back-hoes	59	55	50-75	176,876.3
Trenchers	57	55	50-75	5,396.6
Loader	1	63	50-75	186.0
Backhoe	1	65	50-75	73.0
Tractor	2	45	40-50	138.0
Roller	1	29	25-40	92.0
Backhoe	1	98	75-100	515.0
Loader	1	62	50-75	16.0
Skid Steer Loader	1	67	50-75	124.0
Backhoe	1	81	75-100	465.0
Roller	1	32	25-40	1.0
Air Compressor	3	80	75-100	152.0
Paver	1	40	40-50	90.0
Roller	1	73	50-75	61.0
Chipper	1	113	100-175	39.0
Backhoe	1	65	50-75	317.0
Backhoe	1	63	50-75	100.0
Skid Steer Loader	1	81	75-100	154.0
Air Compressor	1	78	75-100	32.0
Badger	1			54.0
Grader	1			57.0
Skid Steer Loader	1			112.0
Asphalt Roller	1			15.0
Backhoe	1			340.0
Backhoe	1			370.0
Backhoe	1			325.0
Mini-Excavator	1			36.0
Tractor	1			140.0
Loader	1			16.0
Backhoe	1			307.0

[14] Municipalities include Fort Worth, Hurst, Duncanville, ManSField, Arlington, and Corsicana.

Equipment Type	QTY	HP	HP BIN	Hrs/Yr
Front Loader	1			356.0
Grader	1			60.0
Roller	1			120.0
Ford Backhoe	2			325.0
Komatsu Backhoe	1			500.0
Tractor/loader/backhoe	1	60	50-75	78.8
Tractor/loader/backhoe	1	63	50-75	135.3
Tractor/loader/backhoe	1	63	50-75	35.3
Tractor/loader/backhoe	1	60	50-75	357.3
Tractor/loader/backhoe	1	90	75-100	1742.2
Trencher	1	46	40-50	17.7
Tractor/loader/backhoe	1	135	100-175	2325.2
Tractor/loader/backhoe	1	60	50-75	334.6
Skid steer loader	1	36	25-40	102.9
Other Construction Equip	1	106	100-175	222.0
Other Construction Equip	1	78	75-100	0.0
Other Construction Equip	1	78	75-100	57.0
Tractor/loader/backhoe	1	250	175-300	90.2
Other Construction Equip	1	115	100-175	952.0
Tractor/loader/backhoe	1	65	50-75	0.0
Skid steer loader	1	42	40-50	451.5
Tractor/loader/backhoe	1	76	75-100	30.1
Tractor/loader/backhoe	1	76	75-100	1623.3
Tractor/loader/backhoe	1	76	75-100	1464.4
Other Construction Equip	1	115	100-175	666.0
Other Construction Equip	1	115	100-175	169.3
Other Construction Equip	1	115	100-175	217.5
Other Construction Equip	1	115	100-175	136.1
Other Construction Equip	1	115	100-175	163.9
Tractor/loader/backhoe	1	26	25-40	42.6
Tractor/loader/backhoe	1	26	25-40	0.0
Tractor/loader/backhoe	1	76	75-100	156.4
Tractor/loader/backhoe	1	76	75-100	267.6
Excavators	1	93	75-100	2146.4
Trencher	1	26	25-40	196.5
Rubber Tire Loader	1	116	100-175	1462.3
Skid steer loader	1	69	50-75	848.4
Excavators	1	230	175-300	918.1
Excavators	1	230	175-300	1042.0
Tractor/loader/backhoe	1	66	50-75	0.0
Other Construction Equip	1	44	40-50	210.3
Tractor/loader/backhoe	1	75	75-100	573.0
Tractor/loader/backhoe	1	75	75-100	361.0
Tractor/loader/backhoe	1	75	75-100	360.3
Tractor/loader/backhoe	1	75	75-100	379.3

Equipment Type	QTY	HP	HP BIN	Hrs/Yr
Tractor/loader/backhoe	1	75	75-100	370.8
Tractor/loader/backhoe	1	75	75-100	774.6
Concrete/Industrial Saws	1	31	25-40	119.0
Concrete/Industrial Saws	1	31	25-40	247.5
Concrete/Industrial Saws	1	31	25-40	117.3
Paving Equipment	1	33	25-40	987.7
Tractor/loader/backhoe	1	75	75-100	141.4
Skid steer loader	1	81	75-100	176.0
Paving Equipment	1	270	175-300	53.4
Other Construction Equip	1	200	175-300	663.8
Excavators	1	138	100-175	826.3
Tractor/loader/backhoe	1	87	75-100	0.0
Tractor/loader/backhoe	1	87	75-100	0.0
Tractor/loader/backhoe	1	87	75-100	0.0
Tractor/loader/backhoe	1	87	75-100	0.0
Grader	1	85	75-100	627.0
Roller	1	31	25-40	377.6
Roller	1	31	25-40	199.1
Roller	1	31	25-40	409.1
Roller	1	31	25-40	220.4
Roller	1	31	25-40	307.8
Roller	1	31	25-40	352.7
Other Construction Equip	1	76	75-100	113.0
Other Construction Equip	1	78	75-100	31.2
Other Construction Equip	1	78	75-100	123.8
Tractor/loader/backhoe	1	75	75-100	150.9
Aerial Lift	2	>100	100-175	801
Tractor/loader/backhoe	1	63	50-75	1345.8
826 C Compactor	1			780.0
Track Loader	1			468.0
Dozer	1			208.0
Dozer	1			728.0
Scraper	1			208.0
Scraper	1			208.0
Blade	1			208.0
Dozer	1			104.0
Track hoe	1			676.0
Dump Truck	1			676
Dump Truck	1			676.0