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EXECUTIVE SUMMARY

Consistent with the Strategic Intermodal System (SIS) Policy Plan, the Florida Department of Transportation (FDOT) is in the process of exploring ways to designate a new SIS facility type that acknowledges freight activity areas. The purpose of this Polk County pilot project is to define freight activity areas, develop datasets that can be utilized for this analysis, identify a methodology that can be implemented at the statewide level, and formulate preliminary policy recommendations on potential designation criteria that can be further tested and refined during the subsequent statewide analysis.

Based on literature review and coordination with the Department, this report proposes the following definitions for Freight Activities Areas and Freight Access Facilities:

- A Freight Activity Area (FAA) is a cluster or group of freight facilities that generate, distribute or attract large amounts of freight activities and has a significant impact on Florida's transportation system and economy. A FAA cannot be an airport, seaport, spaceport, intermodal logistics center or freight rail terminal for SIS designation purposes, but can be in areas close to those types of facilities.
- A Freight Access Facility (FAF) is a roadway segment that connects a Freight Activity Area (FAA) to a SIS Corridor. It cannot be a roadway that is already designated as a SIS Connector.

The identification of freight activity areas essentially involved a geospatial analysis to locate a group of parcels with high concentrations of freight-related buildings, freight-related employment and truck traffic. The process, illustrated in the figure below, began by representing each of the original input data (freight-related building size data from the Florida Department of Revenue (DOR), freight-related employment data from the Florida Department of Economic Opportunity (DEO), and truck traffic data from the FDOT Transportation Data and Analytics (TDA) Office as points. Next, an "interpolation surface" or "hot spot" map for each of the three inputs was generated. A Weighted Overlay analysis combined the three hot-spot maps to produce a single map that averaged the three inputs. Areas with high values contributed from all three inputs showed as very high "hot spots" in the output map, while areas that had low values from all three layers showed as "cold" areas. Selecting out the highest value areas produced polygons ("freight clusters") for consideration as Freight Activity Areas. The following is a summary of the methodology:

- 1. Obtain freight-related building size data from the Department of Revenue, freight-related employment data from the Department of Economic Opportunity, and truck traffic from the FDOT TDA Office.
- 2. Validate and clean up input datasets, including removal of extraneous data records that do not contribute in the identification of potential FAAs.
- 3. Run a point interpolation analysis for each of the 3 datasets, independently.
- 4. Run a Weighted Overlay analysis combining the output of the three-point interpolation analyses.
- 5. Reclassify the final overlay analysis to produce freight clusters (potential FAAs).
- 6. Compute summary statistics for each cluster, including parcel Total Living Area and Total Employment.
- 7. Select top three potential FAAs for further analysis and verification.
- 8. Propose initial designation criteria for statewide analysis using the thresholds identified for the top potential FAA.





METHODOLOGY FLOWCHART

***Total Living area or usable area (TLA)** - This field reflects the total effective area of all improvements on the property, excluding improvements classified as special features. This is the total area of all floors on any multi-story building and the total area of all property record cards that share the same unique parcel number.





Legend



WEIGHTED OVERLAY RESULTS POLK COUNTY

This map is an outcome of the Weighted Overlay model with nearly equal weight between the inputs (i.e., DOR parcels at 34%, DEO employment at 33% and RCI Truck AADT at 33%). The final Weighted Overlay map rated the Polk County AOI from Low (1) to High (10) in terms of the coincident overlap of the DEO employment, DOR parcel and RCI truck traffic input layers.



The top ten cluster candidates were reviewed and compared for reasonableness. The top cluster (Cluster # 136) accounted for nearly 1% of all freight facility living area and 0.5% of all freight employment in Florida. The cluster, shown below, spans over 7.31 square miles, includes 14.5 million square feet of freight living area and houses 5,932 freight related employments. The cluster includes facilities like a Publix Distribution Center, Amazon Fulfillment Center, Rooms To Go Distribution Center, Stryker Sustainability Solutions (Medical Instrument Manufacturing), and WellDyne Inc. (Drug Wholesaler)¹.



TOP RANKED FREIGHT CLUSTER - POLK COUNTY

The following actions are recommended based on the findings of this study:

- Apply the proposed GIS-based FAA identification methodology statewide and reassess. Based on the results of the Polk County analysis, the analysis technique appears to be reasonable and appropriate for statewide application.
- The statistics for the top-rated freight cluster in Polk County (1% of all freight facility living area and 0.5% of all freight employment in Florida) provided the initial thresholds for determining potential FAAs. The threshold criteria may require further refinement after the summary statistics of the statewide freight cluster analysis become available.
- Limit the analysis to only the DEO and DOR data with the truck traffic data to be integrated as a separate ranking measure to view FAA or FAF.
- Employ truck traffic criterion after identifying potential FAAs using the freight facility size and employment data. Truck traffic data could be used in a post-processing step to identify the FAF(s) associated with an FAA. Criteria for functional classification and minimum truck traffic need to be determined during the statewide analysis.
- Identify one or more datasets to supplement truck traffic counts on transportation facilities that may potentially be considered for FAF designation. The existing truck traffic counts do not allow identifying trucks that are associated with the potential FAAs.
- Evaluate the potential changes in data pre-processing and cleanup procedures which can enhance statewide analysis.
- Codify the Freight Analysis Process developed in this study into a single ArcGIS Toolbox toolset of integrated scripts and models.

¹ Source: Florida Department of Revenue and Google Maps Imagery



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FDOT

CHAPTER 1: SETTING THE CONTEXT

Objectives

As the Western Hemisphere's commercial gateway, Florida is poised to be a global leader in freight and logistics. The Florida Department of Transportation (FDOT) is working diligently to improve freight planning; remove institutional, infrastructure, and funding bottlenecks; and make informed decisions that best serve the citizens, visitors and businesses of Florida. To complement this statewide initiative, the FDOT Transportation Data and Analytics (TDA) Office in conjunction with the Systems Implementation office has developed a comprehensive freight facilities dataset. The Polk County Pilot effort involves enhancing the dataset and exploring an application for the Strategic Intermodal System (SIS); a statewide program of the Systems Implementation office.

The SIS is a statewide network of high priority transportation facilities, which includes Florida's largest and most significant airports, spaceports, deep-water seaports, freight rail terminals, passenger rail and intercity bus terminals, rail corridors, waterways, highways, military access facilities, intermodal logistics centers, and fixed guideway transit corridors. These facilities represent the state's primary means for moving people and goods between Florida's diverse regions, as well as between Florida and other states and nations, and support major flows of interregional, interstate, and international travel and commerce.

Consistent with the Florida Transportation Plan, FDOT is in the process of exploring ways to designate a new SIS facility type that acknowledges freight activity areas. This effects the SIS policy plan. The purpose of this Polk County pilot project is to define freight activity areas, develop datasets that can be utilized for this analysis, identify a methodology that can be implemented at the statewide level, and formulate preliminary policy recommendations on potential designation criteria that can be further tested and refined during the subsequent statewide analysis.

Some of the unique features of the project include:

- Locating freight clusters: SIS ports, airports, seaports, intermodal rail terminals are wellknown locations. Where freight accumulates, however, data-driven and scientific analysis is necessary to identify the spatial location of freight activity areas.
- Well-defined concepts: Freight Activity Area (FAA) is a new concept and warrants defining it in a clear and a concise fashion while separating it from existing freight facilities designated on the SIS (i.e. SIS seaports, airports, intermodal logistic centers, rail terminals).
- **Quantifiable designation criteria:** Existing SIS designations have quantifiable and standardized designation criteria. Similarly, it is important to have quantifiable designation criteria for FAAs.
- **Real and disaggregate input datasets:** Identify disaggregate datasets that are real (as opposed to synthetic), verifiable, and easily accessible. Acquiring freight facility datasets is generally a challenge as private industry owns and operates a majority of freight facilities.
- Intelligible and repeatable process: Ensuring that the process is intelligible and repeatable is important from a statewide perspective.
- Synergy with other SIS designations: Appropriate reviews, revisions and modifications of the SIS designations are underway. This new designation needs to be consistent with other SIS hub designations.

Literature Review

Literature review was conducted to explore how the industry has defined freight facilities and understand the forces behind their agglomeration. The citations are included in Appendix E.

Freight Facility Definitions

Industry definitions of freight facilities and freight clusters are often vague or ambiguous in nature. The following definitions and concepts have been identified from a wide range of sources.

- Minnesota Department of Transportation (DOT) considered Agriculture, Forestry, Fishing, Hunting, Mining, Quarrying, Oil and Gas Extraction, Utilities, Construction, Manufacturing, Wholesale Trade, Retail Trade, Transportation and Warehousing as Freight Facilities [1].
- Different state agencies and private industries have implemented different taxonomy and classifications schemas. North American Industry Classification System (NAICS) is an industry classification system that groups establishments into industries based on the similarity of their production processes. It is a comprehensive system covering all economic activities. Department of Homeland Security (DHS) utilizes an infrastructure taxonomy to define the mutually exclusive categories within a given sector. The taxonomy has inherently developed a bridge between DHS codes and NAICS codes. National Cooperative Highway Research Program (NCHRP) case studies confirm the superiority of economic classification systems over standard land use classification systems as the foundation for estimating freight trip generation [2]. Figure 1 illustrates a generic classification for freight facility types [3].



Figure 1 Generic Classification for Freight Facility Types

- Literature defined Urban Freight Consolidation Centers as logistics facilities that are situated in relatively close proximity to the geographic area that it serves, from which consolidated deliveries are carried out within that area [4].
- Hillsborough Metropolitan Planning Organization conducted a Freight Logistic Zone Strategic Plan, which included a study to identify Freight Activity Centers (FAC) using two sets of data sources. Direct sources included Hillsborough competitive sites with industrial entitlements or designation, industrially designated areas in local future land use plans and potential sites identified by a working group. Indirect sources included ATRI origin-destination data, long range transportation plans, MPO, Freight Mobility and Trade Plan, truck and rail volumes, and the regional freight network [5]. This study identified logistics clusters illustrated in Figure 2 [5].



Figure 2. Logistics Clusters

- While freight generating activity is generally prevalent throughout the region, the majority occurs concentrated in large and small industrial and mixed-use areas known as Freight Activity Centers (FACs). FACs are the "economic engines" of the region. Freight Activity Centers are manufacturing and distribution clusters, seaports, airports and railroad hubs [6].
- FACs are major contributors to the region's base employment and a key component of a regional economic development plan. Generally, the major generators of industry located within a FAC has significant ties to areas outside of the region [7]. A freight village is a defined area within which all activities relating to transport, logistics and the distribution of goods, both for national and international transit, are carried out by various operators. Freight Villages are generally located on the fringe of large urban areas, near the major trade corridors, and with access to major port, airport, and intermodal rail facilities. The Freight Villages can be either single or multi-modal [7].



Phenomenon of Freight Agglomeration

Similarly, the following excerpts have been identified from a wide range of sources regarding agglomeration of freight facilities.

- Freight activities tend to agglomerate at specific locations that can depend on accessibility, land availability and the benefits of proximity [3].
- Studies show that that there is a tendency for both spatial concentration and dispersion while historically warehouses have located close to the central business district (CBDs), there is a tendency of suburbanization of the warehousing industry In North America [8] [9].
- On the other hand, the function of warehousing establishments has changed from warehouse goods to transfer goods between vehicles. Hence, warehouses act as generators and attractors of freight activity [8]. The study determined that growth in the significantly large distribution centers drove the growth observed in warehousing [8]. The analysis further shows that while many large distribution centers locate in or in close proximity to major population centers; the new breed of these distribution centers prefers centralized locations that optimize access to multiple markets [8] [9]. Hence, agglomeration effects and trends have transformed recently.
- The potential wildcard factors include the exponential growth in technology sector, trucking industry and supply chain management. These agglomerated areas go by different names in literature, including logistics village, freight village, logistics center, logistics site, distribution hubs and logistic parks. Freight villages are the agglomerated areas that provide the flow of goods from suppliers to manufacturers and manufacturers to end users [10]. Freight villages allow the interaction between highways and railways and by using railways at long-distance, highways at short-distances, thicken railway traffic provide reducing noise and environmental pollution and allow easing highways freight traffic [10].
- "Inland Hubs" are primarily locations where freight from road and air are consolidated and are mainly affiliated with the interstate network and air cargo facilities [11].
- Logistics hubs are typically Metropolitan Statistical Areas (MSAs) that strategically connected by various popular freight corridors and with infrastructure to accommodate large volumes of freight traffic. These hubs have several positive attributes that attract both manufacturing and warehouse distribution projects [12].

Freight Activity Area and Freight Access Facility Definitions

Based on the literature review and coordination with the Department, this report proposes the following definitions for Freight Activities Areas and Freight Access Facilities:

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A Freight Access Facility (FAF) is a roadway segment that connects a Freight Activity Area (FAA) to a SIS Corridor. It cannot be a roadway that is already designated as a SIS Connector.

Overview of Freight Activity Area Identification Methodology

The identification of freight activity areas essentially involved a geospatial analysis to locate a group of parcels with high concentrations of freight-related buildings, freight-related employment and truck traffic. The process, illustrated in Figure 3, began by representing each of the original input data



(i.e., freight-related building size, freight-related employment, and truck traffic) as points. Next, an "interpolation surface" or "hot spot" map was generated for each of the three inputs. A Weighted Overlay analysis combined the three hot-spot maps to produce a single map that averaged the three inputs. Areas with high values contributed from all three inputs showed as very high "hot spots" in the output map, while areas that had low values from all three layers showed as "cold" areas. Selecting out the highest value areas produced polygons ("freight clusters") for consideration as Freight Activity Areas. The following is a summary of the methodology:

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- 7. Select top three potential FAAs for further analysis and verification.
- 8. Propose initial designation criteria for statewide analysis using the thresholds identified for the top potential FAA.



Figure 3. Simplified Diagram of GIS Workflow for Generating Candidate Freight Activity Areas



CHAPTER 2: DATA DEVELOPMENT

This study relied on three statewide datasets to develop the freight cluster analysis: parcel data from the Florida Department of Revenue (DOR), employment data from the Florida Department of Economic Opportunity (DEO), and Annual Average Daily Truck Traffic from the FDOT Transportation and Data Analytics Office's (TDA) - Traffic Monitoring Program. The following section details how each data set was prepared.

Florida DOR Parcel Data

The DOR provided parcel data for each of Florida's 67 counties in Esri geodatabase format. The county data was merged into a single polygon feature class called Florida_Parcels that contained 9,974,645 individual parcels. The DOR_UC field in the Florida_Parcels layer contained the two-digit DOR Land Use Code for each parcel. A database Join performed between the table of freight-related DOR_UC codes (Table 1) and the Florida_Parcels layer generated the Florida_Parcels_Freight layer containing only the 113,060 parcels with those land use codes. Many of those freight-related parcels did not support any buildings, and were therefore unsuitable for inclusion in our efforts to locate freight activity clusters. To eliminate parcels without buildings only those parcels with a non-zero value for the TOT_LVG_AR (i.e., Total Living Area) field, which resulted in a new polygon layer containing 72,403 parcels statewide. Selecting only those parcels within Polk County (i.e., CountyCode = "105") produced 2,319 freight related parcels (refer to Figure 4) were selected.

Table 1. Freight-Related DOR Land Use Codes

LU	
Code	DOR Land Use Description
20	Airports (private or commercial), bus terminals, marine terminals, piers, marinas
29	Wholesale outlets, produce houses, manufacturing outlets
41	Light manufacturing, small equipment manufacturing plants, small machine shops, instrument manufacturing, printing plants
42	Heavy industrial, heavy equipment manufacturing, large machine shops, foundries, steel fabricating plants, auto or aircraft plants
43	Lumber yards, sawmills, planing mills
44	Packing plants, fruit and vegetable packing plants, meat packing plants
45	Canneries, fruit and vegetable, bottlers and brewers, distilleries, wineries
46	Other food processing, candy factories, bakeries, potato chip factories
47	Mineral processing, phosphate processing, cement plants, refineries, clay plants, rock and gravel plants
48	Warehousing, distribution terminals, trucking terminals, van and storage warehousing
49	Open storage, new and used building supplies, junk yards, auto wrecking, fuel storage, equipment and material storage
68	Dairies, feed lots
91	Utility, gas and electricity, telephone and telegraph, locally assessed railroads, water and sewer service, pipelines, canals, radio/television communication
92	Mining lands, petroleum lands, or gas lands
96	Sewage disposal, solid waste, borrow pits, drainage reservoirs, waste land, marsh, sand dunes, swamps





Figure 4. DOR Parcel Land Use - Polk County



Florida DEO Employment Data

The DEO releases establishment data for employment and wages every quarter. A Data Sharing Agreement between DEO, FDOT and the consulting firm was needed due to the sensitive and confidential nature of the employment based data received for this study. Steps were taken to ensure that no product, map or report generated from the data would compromise the confidentiality of any business entity. This includes data related to specific establishments such as employment, total wages, and various identification information.

The DEO delivered employment data as CSV files, one for each quarter of the year. The preliminary task involved pre-processing and cleaning the raw data to create a single annual DEO dataset with 12 monthly employment and wage variables. The cleanup exercise was conducted in IBM SPSS as a tabular method due to the magnitude of the raw data. The first challenge was to create a unique identifier associated for each establishment, which could be used to merge the quarterly raw data files. The Employer Identification Number (EIN) could not be used to create the unique identifier due to the large number of records missing EIN information (refer to Table 2). Instead, a unique ID number was established through concatenation of the UI number, unique to each establishment, and the Reporting Unit Number (RUN), unique to each physical location of a particular group of establishments.

Time Period	Status	Number of Records	Percentage of Records
Quarter 1	Valid	12,758	92%
	Missing	1,042	8%
	Total	13,800	100%
Quarter 2	Valid	12,940	93%
	Missing	1,035	7%
	Total	13,975	100%
Quarter 3	Valid	13,034	92%
	Missing	1,084	8%
	Total	14,118	100%
Quarter 4	Valid	13,161	92%
	Missing	1,112	8%
	Total	14,273	100%

Table 2. Number of Records with missing Employer Identification Number (EIN)

Four quarters of DEO data were merged together using the new identifier to create a full year of data. However, this dataset also included a multitude of repetitive (one for each quarter) attributes that required additional processing to remove the repetitive variables for the whole dataset.

The next challenge was to remove the aggregated data records for each employer. For example, FDOT has eight establishments, with an employment record for each establishment. Additionally, there is an aggregated record with the summation of all employees and wages at the eight establishments. The identification of aggregated records was performed in two steps. First, all records with multiple establishments were identified by looking for records with the same UI number but different RUN

numbers. The record with a RUN number of zero was identified as the aggregate record and was removed from the dataset.

Next, DEO records that represented employers in a freight-related industry needed to be identified. The NAICS industry codes were used to identify freight facilities (refer to Appendix A) and the records for all establishments not identified as freight facilities were removed. To address seasonal employment, an employment index for each establishment was created and calculated as the maximum monthly employment recorded at that establishment for any quarter during the year. The employment index therefore reflected the maximum freight/economic activity associated with each establishment. The complete data dictionary listing all data fields in the final DEO dataset is documented in Appendix B.

The DEO employment data could not be fused with the Florida Department of Revenue (DOR) parcel records to produce a single dataset containing both employment and parcel information, because the DEO and DOR data sets did not share any common fields that would allow the merging of those datasets. As a solution GIS-based street address geocoding was used to place each DEO employment center to a point location based on address information. To begin the geocoding process all records with a County Code of "105" was selected to be extracted for Polk County. This produced 2,178 records; of those records, 237 (11%) lacked street address information and XY (i.e., Longitude, Latitude) coordinate, making it impossible to geocode their location (refer to Table 3). Upon review, it was discovered that nearly all 237 records represented personnel management firms and not true freightrelated business employers. Out of the remaining 1,941 DEO records with street address information, 1,723 (89%) geocoded to street locations within Polk County, while 92 records (5%) matched to the centroid of the zip code. Zip code centroids could have been matched to a more accurate street location using match tied record techniques. However, the location information was sufficient for this pilot study. The 39 records (2%) were tied to two candidate addresses that request further analysis to resolve. Each tied record was inspected for spelling errors or other inaccuracies when corrected, resulted in a match. A desktop analysis using Google Maps was used to locate the correct address for tied matches. The search was performed through the business name search feature for all remaining records to match them with a location in Polk county.

Geocoding Outcomes for Polk County	Count	Percent
Geocoding Matched to Address Inside County	1,723	89%
Geocoding Matched to Zip Code Inside County	92	5%
Geocoding Matched Outside County	87	4%
Geocoding Tied and Resolved Inside County	39	2%
Total Geocoding Matched	1,941	89%
No Address or XY Coordinate	237	11%
Total DEO Records for Polk County	2,178	100%

Table 3. Address Geocoding Results for DEO Employment Data in Polk County

RCI Truck Traffic Data

In theory, the volume of truck traffic on roadways should be higher near a freight activity cluster. The Truck_Volume feature class from the 2017 Roadway Characteristics Inventory (RCI) database was

FDOT

obtained to provide truck traffic information. The TruckAADT field provided a count of annual average trucks per day for each roadway segment in the network. The statewide Truck_Volume layer was reduced to the limits of Polk County in ArcGIS using a county boundary derived from data obtained from the Florida Geographic Data Library (FGDL). To limit the analysis to truck traffic on local roads (only to eliminate skew of truck traffic simply passing through the area), roadways with a functional class (FUNCLASS) that excluded Principal Arterials like Interstate highways was selected (refer to Table 4). A map of the remaining local roadways classified by their Truck AADT appears in Figure 5.

FUNCLASS	Functional Class Description	Selected Roadways
01	RURAL – Principal Arterial – Interstate	No
02	RURAL – Principal Arterial – Freeways and Expressways	No
04	RURAL – Principal Arterial – Other	No
06	RURAL - Minor Arterial	Yes
07	RURAL - Major Collector	Yes
08	RURAL - Minor Collector	Yes
09	RURAL - Local	Yes
11	URBAN – Principal Arterial – Interstate	No
12	URBAN – Principal Arterial – Freeways and Expressways	No
14	URBAN – Principal Arterial – Other	No
16	URBAN - Minor Arterial	Yes
17	URBAN - Major Collector	Yes
18	URBAN - Minor Collector	Yes
19	URBAN - Local	Yes

Table 4. Functional Classifications of Roadways Selected from the RCI Truck AADT Network





Figure 5. Truck Traffic AADT - Polk County



Data Preparation Issues

The DEO employment data offered the greatest challenge during the pilot study from preparing the datasets for use in the freight cluster analysis to the sheer magnitude of the DEO dataset. In an effort to reduce computing time and resources steps were taken to "clean" the Polk County data and keep only the variables needed. For further implementation efforts, outside of this pilot study, the challenge will be cleaning the data to keep only variables needed on a statewide scale. Some business establishments in the DEO data recorded zero employment. In order to understand associated establishments and employment numbers, further analysis on a statewide level is needed to determine whether this information can be safely removed.

Another challenge arose in geocoding the tabular DEO data to a correct geographic location. The combined DEO 2016 dataset for Florida contained 86,116 records. Table 5 shows the geocoding results expected for the statewide dataset assuming that the geocoding results in Polk County were representative of the state as a whole.

Geocoding Outcomes for Florida	Count	Percent
Geocoding Matched to Address Inside County	68,126	89%
Geocoding Matched to Zip Code Inside County	3,638	5%
Geocoding Matched Outside Counties	3,440	4%
Geocoding Tied and Resolved Inside Counties	1,542	2%
Total Geocoding Matched	76,745	89%
No Address or XY Coordinate	9,371	11%
Total DEO Records for Florida	86,116	100%

Table 5. Estimated DEO Address Geocoding Results for the Entire State of Floridabased on the Distribution Observed in Polk County

The lack of a clear spatial relationship between the DEO address data and the DOR parcel data for each business represented another hurdle. The geocoded DEO employment points snapped to the roadway centerline. Often the geocoded DEO point lay adjacent to the DOR parcel that represented the location of the employer. Just as frequently, the geocoded DEO point fell closer to some other parcel than the one to which it should have been associated. The lack of a reliable spatial relationship between the DOR parcels and the geocoded DEO employer points averted any approach to join the two datasets based on spatial proximity. Although challenging, the technique developed for locating freight activity hotspots for this pilot study did not require a perfect spatial correspondence between the DOR and DEO datasets.

In addition, the DEO data used the North American Industry Classification System (NAICS) scheme to identify activities for each establishment. Of the 1,065 industries identified in NAICS (2012), nearly 160 industry types related to freight activity were identified. However, a number of discrepancies in the data that lead to the belief that the list of NAICS codes to be included in the statewide cluster analysis would need to be revised.



CHAPTER 3: FREIGHT ACTIVITY AREA ANALYSIS

Freight Activity Area Development Process

As noted in Chapter 1, the identification of freight activity areas essentially involved a geospatial analysis to locate a group of parcels with high concentrations of freight-related buildings, freight-related employment and truck traffic. The process developed to identify freight clusters relied heavily on two well-established and powerful GIS techniques. First, a point-interpolation process to transform the data on freight-related buildings, freight employment and truck traffic into raster surfaces to identify "hot spots" for each of those metrics was used, then a raster overlay process began to find where the hot spots from each input layer overlapped. Extracting areas of strong overlap between the three input layers resulted in polygons that represented potential freight clusters. Those polygons, in turn, identified the individual businesses in the original employment and parcel data that contributed to the freight clusters. Finally, the clusters with highest composite scores were selected as candidate Freight Activity Areas. The following sections explain each of these steps in detail.

Inverse Distance Weighted Interpolation

Inverse Distance Weighting (IDW) analysis is a GIS-based point interpolation technique within the ArcGIS Geostatistical Analyst Toolset. Point interpolation techniques resemble a three-dimensional equivalent to the familiar 2D linear regression curve fitting analysis. Linear regression calculates the equation of a "best fit" line that minimizes the errors between the line and the individual input data points in a scattergram plot, to three-dimensional scattergram. Each point's geographic coordinate represent the X (easting) and Y (northing) dimensions, while the magnitude of the numeric value provides the Z (vertical) coordinate. IDW and the other point interpolation techniques attempt to "best fit" a 3D raster surface to those XYZ points. The IDW process interpolates values for the space between the input points based on the proximity of other points and their numeric values. In IDW the influence of any given point to calculating the interpolated value for a cell in the raster surface falls off with distance. Put another way, the weight of each input point to calculating the value of a cell in the output raster is inversely proportional to its distance from that cell. The IDW process generates "hot spots" and "cold spots" in the output raster where the input point values were high or low, respectively.

Several point interpolation techniques available in ArcGIS in addition to IDW were evaluated. Ordinary Kriging is a powerful "stochastic" interpolation technique that provides geostatistical analysis advantages not available when using IDW or similar "deterministic" interpolation techniques. However, Kriging ran much less efficiently than IDW, taking an hour or more to perform an interpolation that IDW performed in minutes. Furthermore, performing a <u>cross-validation comparison</u> showed that the IDW and Kriging results achieved similar fits to the input point data as measured by the root-mean square error (RMSE) between the point values and the raster surface values. IDW was compared to other deterministic interpolation techniques including Local Polynomial and Global Polynomial. In each case, the IDW provided a better fit to the input point data as measured by the RMSE. Consequently, IDW came out on top as the point interpolation technique used for the freight cluster analysis.

The geocoded points for the DEO employment data provided ideal input for the IDW process. Employment at each point was set as the Z-field in the IDW dialog box. The output cell size for the IDW raster was set to 100 meters. (Metric units for the raster resolution was used because of the underlying



projection was the Florida Geographic Data Library Albers projection, which uses metric horizontal units.) The defaults for the remainder of the IDW settings were set at: Search Neighborhood Standard, Maximum Neighbors 15, Minimum Neighbors 10, Angle 0.0 and Sector Type 1. Alternative settings were experimented for the Search Neighborhood and for Maximum and Minimum Neighbors but found no improvement in the results that warranted altering the default settings. The resulting settings IDW raster surface revealed obvious hot spots of freight related employment when symbolized with a 10-class quantile classification scheme (Figure 6).

The DOR freight parcels were converted to parcel centroid points using the ArcGIS Feature-to-Point tool. Initially the generated IDW surfaces used the Total Living Area (TLA) for each freight parcel as the numeric input value. After some testing, it was determined that using the Floor Area Ratio (i.e., the TLA in square feet divided by the total parcel Land Surface Area in square feet) as the numeric value produced better results. The distribution of the input parcel data rendered as points appears in Figure 7, which shows the freight parcel point centroids symbolized according to the Floor Area Ratio. The IDW parameters for the DOR parcel data mirrored those used for the DEO employment data, as listed above. Figure 8 shows the IDW analysis output raster symbolized with a 10-class quantile classification scheme. In contrast to the employment IDW surface in Figure 6, the parcel data showed much tighter clustering of the high-value areas, while much of the county showed very low values. That pattern conforms to the expectation that many freight related businesses will be co-located in areas that provide good accessibility to the transportation network, or convenient access to customers.

Preparing the RCI truck traffic data for input to the IDW analysis constituted a special challenge. Since the IDW process only operates on points, Truck AADT network data had to be converted into point data. Using the ArcGIS Feature-to-Point tool, the roadway network was sampled every 100 meters to generate a point with a Truck AADT value equal to that of the roadway segment at that point. As was previously explained in Chapter 2, only those local roadways with a functional class (FUNCLASS) that excluded Principal Arterials were selected (Table 5). The resulting point data appears in Figure 9. The best IDW settings for the truck traffic data was found to be a Search Neighborhood set to Smooth, with a Smoothing Factor of 0.2. The output raster surface for predicted truck per day symbolized with a 10-class quantile classification scheme appears in Figure 10 and illustrates high-value bands of higher-volume truck traffic along key roadways, particularly within the urban areas of Bartow, Lake Wales, Lakeland and Haines City.





Figure 6. DEO Employment IDW Surface - Polk County





Figure 7. DOR Parcel Size Centroid Points - Polk County





Figure 8. DOR Parcel Size IDW Surface - Polk County





Figure 9. RCI Truck AADT Points - Polk County





Figure 10. RCI Truck AADT IDW Surface - Polk County



Weighted Overlay Process

The <u>raster overlay process</u> is a powerful GIS technique for conducting multi-criteria spatial modeling. In general, an analyst using this technique creates multiple input raster layers, each of which rates the landscape of the Area of Interest (AOI) from low to high on an evaluation factor. The analyst specifies how the layers will be brought together (e.g. as the mean of the values from the input layers). The GIS computes the value of each output raster cell by applying the mathematical operation (e.g., the mean) on the values of the corresponding cells from each of the input rasters. The resulting output raster effectively rates the AOI from low to high on the combined input criteria.

The <u>ArcGIS Weighted Overlay tool</u> provides an easy means to conduct a weighted average for two or more input raster layers. Each input layer receives a weight from zero to 100% such that the combined weight adds up to 100%. The output values are the product of the weight multiplied by the original numeric cell values for each raster added together for all input rasters. Altering the weights applied to each input raster allows rapid evaluation of the effect of alternative weighting schemes on the output raster results. Before using the Weighted Overlay tool, the analyst must reclassify each of the input raster layers to the same numeric suitability scale (e.g., a 1 to 5 scale, or a 1 – 10 scale).

For the purpose of this study the Weighted Overlay tool was used to reclassify each of the three input layers to a scale of 1 to 10 based on the 10-class quantile break points calculated for the IDW output rasters. For example, the top division of the quantile classification of the DEO freight employment IDW raster (i.e., the 90th to 100th percentile class) ranged from 47 – 647 employees (Figure 6). For the Weighted Overlay, all cells with values between 47 and 647 from the DEO IDW raster were reclassified to a value of 10. Likewise, all cells in the lowest quantile division (the < 10th percentile class) were assigned a value of 1. The reclassified input layer for DEO freight employment based on the ten percentile classes appears in Figure 11. A similar reclassification was performed on the DOR freight parcel floor area ratio IDW layer (Figure 12) and the RCI truck traffic IDW layer (Figure 13).

The Weighted Overlay was tested with a range of weights from 20% to 80% for the DEO employment and DOR parcel input layers, and 0% to 33% for the RCI Truck AADT layer, and evaluated the efficacy of the results. In each case, locations that had previously been identified as likely freight cluster areas based on the predominance of DEO freight employment locations and DOR freight parcels with high Floor Area Ratio values were evaluated. As an outcome the Weighted Overlay model nearly equal weight between the inputs (i.e., DOR parcels at 34%, DEO employment at 33% and RCI Truck AADT at 33%), produced the most reasonable results (Figure 14). The final Weighted Overlay map rated the Polk County AOI from Low (1) to High (10) in terms of the coincident overlap of the DEO employment, DOR parcel and RCI truck traffic input layers.





Figure 11. DEO Employment Quantiles - Polk County





Figure 12. DOR Parcel Size Quantiles - Polk County





Figure 13. RCI Truck AADT Quantiles - Polk County





Figure 14. Weighted Overlay Results - Polk County



Freight Cluster Candidate Identification Process

The Weighted Overlay process rated the Polk County AOI from Low (1) to High (10) in terms of the coincident overlap of the DEO employment, DOR parcel and RCI truck traffic input layers (Figure 14). To identify geographic areas for possible designation as a Freight Activity Areas, the cutoff ranking for freight cluster candidates needed to be determined. Clearly, any areas ranked 9 or 10 on the Weighted Overlay Results map (Figure 14) formed a potential freight cluster. But what value should mark the bottom of the range for freight cluster candidates? Visually, areas of Polk County were inspected that were suspected to be good freight cluster areas and found that while the areas designated with a weighted average rank of 6 generally conformed to expectations, areas with a rank of 5 included large areas that did not appear to represent possible freight clusters. Consequently, the Weighted Overlay Results were reclassified by assigning all values of 6 or greater to 1, and values of 5 or less to No Data, to create the Weighted Overlay Clusters raster (Figure 15).

In order to identify those DOR parcels and DEO employment locations that fell within the candidate freight cluster areas, the Weighted Overlay Clusters were converted to vector polygons using the Raster to Polygon tool in ArcGIS. Next, each polygon was assigned a unique Cluster ID number based on its arbitrary Object ID in its ArcGIS feature attribute table. A Spatial Join was performed to assign the Cluster ID number from each cluster polygon to all the DEO employment points and DOR parcels within the polygon. The ArcGIS Frequency tool was used to generate summary statistics of employment and parcel data for each Cluster ID number as follows:

- DEO Employment Summarize TotalWages_Q4, TaxableWages_Q4, MAX_Employment and AVG_Employment by Cluster ID # and NAICSCode
- DOR Parcels Summarize LND_SQFOOT (i.e., parcel size) and Freight_TLA (i.e., Total Living Area) by Cluster ID # and DOR_UC (i.e., land use code)

This data was used to analyze the freight clusters and identify those that appeared to be good candidates for FAA designation as discussed in Chapter 4. Detail freight cluster analysis instructions are included in Appendix D.





Figure 15. Weighted Overlay Clusters - Polk County

CHAPTER 4: RESULTS AND RECOMMENDATIONS

Results

The pilot study extracted and analyzed descriptive statistics of the DEO and DOR data for all freight cluster candidates. The top ten cluster candidates were reviewed for reasonableness and compared to verify the top three clusters. The summary statistics illustrate how thresholds could be developed for statewide analysis. The statistics for the top cluster in Polk County could be used as the benchmark for the initial statewide cluster analysis to determine the potential FAAs statewide. Additional adjustments may be needed to determine the statewide FAAs.

Tables 6 and 7 provide summary statistics for the DOR and DEO data within the potential freight clusters identified in Polk County. Tables 8 and 9 provide summary statistics for the top 10 identified clusters. From that list, the top three clusters (Tables 10, 11 and 12 and Appendix C) were identified as the potential candidates for FAA designation. Table 10 shows the top cluster (Candidate No. 1, Cluster ID No. 136) accounted for nearly 1% of all freight facility Total Living Area (TLA) in the state of Florida. It also accounted for over 0.5% of all freight employment in Florida. As these are similar thresholds for determining existing SIS Hubs, the methodology proves to be consistent with the current designation process.

DOR Land Use Code	Total Living Area	Number of Parcels
020-Ports	723,262	4
029-Wholesale	653,453	25
041-Light Manufacturing	15,369,183	576
042-Heavy Industrial	1,183,552	24
043-Lumber/Sawmill	688,978	32
044-Food Packing Plants	1,821,341	35
045-Canneries, Bottlers, etc.	4,291,275	31
o46-Other Food Processing	181,200	4
048-Warehouse, DC, etc.	42,965,169	1285
049-Open Storage	272,082	45
o68-Dairies, Feed Lots	37,058	119
091-Utilities	498,919	108
092-Mining	1,452,299	30
096-Sewage, Solid Waste	3,614	1
Total	70,141,385	2,319

Table 6. DOR Summary Statistics for Freight Clusters in Polk County



Table 7. DEO Summary Statistics for Freight Clusters in Polk County (2-digit NAICS scheme)

NAICS Code	Employment	Number of Establishments
11-Agriculture, Forestry	1,255	41
21-Mining	*	*
31-Manufacturing	3,367	37
32-Manufacturing	5,613	122
33-Manufacturing	3,952	122
42-Wholesale Trade	6,989	323
48-Trans. & Warehousing	4,855	106
49-Trans. & Warehousing	3,867	55
56-Administrative	745	21
Total	31,466	832

*Numbers scrubbed to prevent confidentiality issues

Table 8. Top 10 DEO Cluster Candidates Summary Statistics

Cluster ID	Total Wages 2016 Q4	Maximum Employment	Average Annual Employment
136	\$66,997,402	6,440	5,932
222	\$53,211,339	3,778	3,497
115	\$27,130,063	2,732	2,538
207	\$30,179,920	2,875	2,323
135	\$29,936,886	2,297	2,100
66	\$22,924,377	1,840	1,745
109	\$15,352,328	1,349	1,113
56	\$15,400,407	1,156	1,098
54	\$14,017,194	1,075	991
122	\$9,145,774	854	812

Table 9. Top 10 DOR Cluster Candidates Summary Statistics

Cluster ID	Land Square Feet (LSF)	Total Living Area (TLA)	Floor Area Ratio (TLA \ LSF)
136	64,399,906	14,508,089	22.5%
115	40,766,652	6,775,216	16.6%
222	163,128,983	4,992,055	3.1%
135	26,207,043	4,651,683	17.7%
207	22,893,303	3,283,494	14.3%
56	10,684,778	2,788,808	26.1%
66	8,763,057	2,471,126	28.2%
11	7,361,171	2,410,766	32.7%
62	12,355,822	2,117,977	17.1%
31	9,482,303	1,991,621	21.0%



Table 10. Cluster Candidate #1, Cluster ID 136

Value	Parameter	
7.31 sq. miles	Cluster Size	
14.5 M	Square feet of TLA in Polk County	
0.97%	Of Total Freight TLA in Florida	
5,932	Freight Employees in Polk County	
0.58%	Of Total Freight Employment in Florida	
\$66.9 M	Total Wages in Cluster (2016)	
Top 5 Major Freight Facilities: Publix DC, Amazon Fulfillment		
Center, Rooms To Go DC, Stryker Sustainability Solutions		
(Medical Instrument Manufacturing), WellDyne Inc. (Drug Wholesaler) ²		

Table 11. Cluster Candidate #2, Cluster ID 115

Value	Parameter	
5.15 sq. miles	Cluster Size	
6.78 M	Square feet of TLA in Polk County	
0.45%	Of Total Freight TLA in Florida	
2,732	Freight Employees in Polk County	
0.27%	Of Total Freight Employment in Florida	
\$27.1 M	Total Wages in Cluster (2016)	
Top 4 Major Freight Facilities: Cutrale Citrus Juices USA Inc.,		
Carpenter Contractors of America, Bynum Transport, Coca Cola ²		

Table 12. Cluster Candidate #3, Cluster ID 222

Value	Parameter	
38.0 sq. miles	Cluster Size	
4.99 M	Square feet of TLA in Polk County	
0.33%	Of Total Freight TLA in Florida	
3,778	Freight Employees in Polk County	
0.37%	Of Total Freight Employment in Florida	
\$53.2 M	Total Wages in Cluster (2016)	
Top 5 Major Freight Facilities: Mosaic Fertilizers, US Agri		
Chemicals Corp., PrecisionAire, Highland Distribution Service		
(Industrial Paper Wholesaler), Arr-Maz Products Limited (Farm		
Supply Wholesaler) ²		

² Source: Florida Department of Revenue and Google Maps Imagery



Recommendations

The following actions are recommended based on the findings of this study:

- Apply the proposed GIS-based FAA identification methodology to a statewide level. Based on the results of the Polk County analysis, the analysis technique appears to be reasonable and appropriate for statewide application.
- The statistics for the top-rated freight cluster in Polk County (1% of all freight facility living area and 0.5% of all freight employment in Florida) provided the initial thresholds for determining potential FAAs. The threshold criteria may require further refinement after the summary statistics of the statewide freight cluster analysis become available.
- Limit the composite overlay analysis to include only the DEO and DOR data. The truck traffic data tends to unnecessarily elongate the cluster polygons, causing them to include additional parcels that may not be relevant to the core of an identified freight cluster.
- Employ truck traffic criterion after identifying potential FAAs using the freight facility size and employment data. Truck traffic data could be used in a post-processing step to identify the FAF(s) associated with an FAA. Criteria for functional classification and minimum truck traffic need to be determined during the statewide analysis.
- Identify one or more datasets to supplement truck traffic counts on transportation facilities that may potentially be considered for FAF designation. The existing truck traffic counts don't allow identifying trucks that are associated with the potential FAAs.
- Evaluate the potential changes in data pre-processing and cleanup procedures which can enhance the statewide analysis.
- Codify the Freight Analysis Process developed in this study into a single ArcGIS Toolbox toolset of integrated scripts and models.



APPENDIX A: Freight Related NAICS Industry Codes

2012 NAICS Code	2012 NAICS Title
111110	Soybean Farming
111219	Other Vegetable (except Potato) and Melon Farming
111310	Orange Groves
111320	Citrus (except Orange) Groves
111333	Strawberry Farming
111334	Berry (except Strawberry) Farming
111920	Cotton Farming
111930	Sugarcane Farming
111992	Peanut Farming
112111	Beef Cattle Ranching and Farming
112112	Cattle Feedlots
112120	Dairy Cattle and Milk Production
112130	Dual-Purpose Cattle Ranching and Farming
112210	Hog and Pig Farming
112310	Chicken Egg Production
112340	Poultry Hatcheries
112512	Shellfish Farming
112920	Horses and Other Equine Production
115111	Cotton Ginning
115112	Soil Preparation, Planting, and Cultivating
115113	Crop Harvesting, Primarily by Machine
115114	Postharvest Crop Activities (except Cotton Ginning)
115115	Farm Labor Contractors and Crew Leaders
115116	Farm Management Services
115210	Support Activities for Animal Production
115310	Support Activities for Forestry
211111	Crude Petroleum and Natural Gas Extraction
211112	Natural Gas Liquid Extraction
212311	Dimension Stone Mining and Quarrying
212312	Crushed and Broken Limestone Mining and Quarrying
212313	Crushed and Broken Granite Mining and Quarrying
212319	Other Crushed and Broken Stone Mining and Quarrying
212321	Construction Sand and Gravel Mining
212322	Industrial Sand Mining
212324	Kaolin and Ball Clay Mining
212325	Clay and Ceramic and Refractory Minerals Mining
212391	Potash, Soda, and Borate Mineral Mining



2012 NAICS Code	2012 NAICS Title
212392	Phosphate Rock Mining
212393	Other Chemical and Fertilizer Mineral Mining
212399	All Other Nonmetallic Mineral Mining
213111	Drilling Oil and Gas Wells
213112	Support Activities for Oil and Gas Operations
213113	Support Activities for Coal Mining
213114	Support Activities for Metal Mining
213115	Support Activities for Nonmetallic Minerals (except Fuels) Mining
311111	Dog and Cat Food Manufacturing
311119	Other Animal Food Manufacturing
311211	Flour Milling
311212	Rice Milling
311213	Malt Manufacturing
311221	Wet Corn Milling
311224	Soybean and Other Oilseed Processing
311225	Fats and Oils Refining and Blending
311230	Breakfast Cereal Manufacturing
311313	Beet Sugar Manufacturing
311314	Cane Sugar Manufacturing
311340	Nonchocolate Confectionery Manufacturing
311351	Chocolate and Confectionery Manufacturing from Cacao Beans
311352	Confectionery Manufacturing from Purchased Chocolate
311411	Frozen Fruit, Juice, and Vegetable Manufacturing
311412	Frozen Specialty Food Manufacturing
311421	Fruit and Vegetable Canning
311422	Specialty Canning
311423	Dried and Dehydrated Food Manufacturing
311511	Fluid Milk Manufacturing
311512	Creamery Butter Manufacturing
311513	Cheese Manufacturing
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing
311520	Ice Cream and Frozen Dessert Manufacturing
311611	Animal (except Poultry) Slaughtering
311612	Meat Processed from Carcasses
311613	Rendering and Meat Byproduct Processing
311615	Poultry Processing
311710	Seafood Product Preparation and Packaging
311811	Retail Bakeries
311812	Commercial Bakeries
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing
311821	Cookie and Cracker Manufacturing



2012 NAICS	2012 NAICS Title
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour
311830	Tortilla Manufacturing
311911	Roasted Nuts and Peanut Butter Manufacturing
311919	Other Snack Food Manufacturing
311920	Coffee and Tea Manufacturing
311930	Flavoring Syrup and Concentrate Manufacturing
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing
311942	Spice and Extract Manufacturing
311991	Perishable Prepared Food Manufacturing
311999	All Other Miscellaneous Food Manufacturing
312111	Soft Drink Manufacturing
312112	Bottled Water Manufacturing
312113	Ice Manufacturing
312120	Breweries
312130	Wineries
312140	Distilleries
312230	Tobacco Manufacturing
313110	Fiber, Yarn, and Thread Mills
313210	Broadwoven Fabric Mills
313220	Narrow Fabric Mills and Schiffli Machine Embroidery
313230	Nonwoven Fabric Mills
313240	Knit Fabric Mills
313310	Textile and Fabric Finishing Mills
313320	Fabric Coating Mills
314110	Carpet and Rug Mills
314120	Curtain and Linen Mills
314910	Textile Bag and Canvas Mills
314994	Rope, Cordage, Twine, Tire Cord, and Tire Fabric Mills
314999	All Other Miscellaneous Textile Product Mills
315110	Hosiery and Sock Mills
315190	Other Apparel Knitting Mills
315210	Cut and Sew Apparel Contractors
315220	Men's and Boys' Cut and Sew Apparel Manufacturing
315240	Women's, Girls', and Infants' Cut and Sew Apparel Manufacturing
315280	Other Cut and Sew Apparel Manufacturing
315990	Apparel Accessories and Other Apparel Manufacturing
316110	Leather and Hide Tanning and Finishing
316210	Footwear Manufacturing
316992	Women's Handbag and Purse Manufacturing
316998	All Other Leather Good and Allied Product Manufacturing
321113	Sawmills



2012 NAICS	2012 NAICS Title
321114	Wood Preservation
321211	Hardwood Veneer and Plywood Manufacturing
321212	Softwood Veneer and Plywood Manufacturing
321213	Engineered Wood Member (except Truss) Manufacturing
321214	Truss Manufacturing
321219	Reconstituted Wood Product Manufacturing
321911	Wood Window and Door Manufacturing
321912	Cut Stock, Resawing Lumber, and Planing
321918	Other Millwork (including Flooring)
321920	Wood Container and Pallet Manufacturing
321991	Manufactured Home (Mobile Home) Manufacturing
321992	Prefabricated Wood Building Manufacturing
321999	All Other Miscellaneous Wood Product Manufacturing
322110	Pulp Mills
322121	Paper (except Newsprint) Mills
322122	Newsprint Mills
322130	Paperboard Mills
322211	Corrugated and Solid Fiber Box Manufacturing
322212	Folding Paperboard Box Manufacturing
322219	Other Paperboard Container Manufacturing
322220	Paper Bag and Coated and Treated Paper Manufacturing
322230	Stationery Product Manufacturing
322291	Sanitary Paper Product Manufacturing
322299	All Other Converted Paper Product Manufacturing
323111	Commercial Printing (except Screen and Books)
323113	Commercial Screen Printing
323117	Books Printing
323120	Support Activities for Printing
324110	Petroleum Refineries
324121	Asphalt Paving Mixture and Block Manufacturing
324122	Asphalt Shingle and Coating Materials Manufacturing
324191	Petroleum Lubricating Oil and Grease Manufacturing
324199	All Other Petroleum and Coal Products Manufacturing
325110	Petrochemical Manufacturing
325120	Industrial Gas Manufacturing
325130	Synthetic Dye and Pigment Manufacturing
325180	Other Basic Inorganic Chemical Manufacturing
325193	Ethyl Alcohol Manufacturing
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325211	Plastics Material and Resin Manufacturing



2012 NAICS Code	2012 NAICS Title
325212	Synthetic Rubber Manufacturing
325220	Artificial and Synthetic Fibers and Filaments Manufacturing
325311	Nitrogenous Fertilizer Manufacturing
325312	Phosphatic Fertilizer Manufacturing
325314	Fertilizer (Mixing Only) Manufacturing
325320	Pesticide and Other Agricultural Chemical Manufacturing
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325413	In-Vitro Diagnostic Substance Manufacturing
325414	Biological Product (except Diagnostic) Manufacturing
325510	Paint and Coating Manufacturing
325520	Adhesive Manufacturing
325611	Soap and Other Detergent Manufacturing
325612	Polish and Other Sanitation Good Manufacturing
325613	Surface Active Agent Manufacturing
325620	Toilet Preparation Manufacturing
325910	Printing Ink Manufacturing
325920	Explosives Manufacturing
325991	Custom Compounding of Purchased Resins
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing
326111	Plastics Bag and Pouch Manufacturing
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
326121	Unlaminated Plastics Profile Shape Manufacturing
326122	Plastics Pipe and Pipe Fitting Manufacturing
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing
326140	Polystyrene Foam Product Manufacturing
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing
326160	Plastics Bottle Manufacturing
326191	Plastics Plumbing Fixture Manufacturing
326199	All Other Plastics Product Manufacturing
326211	Tire Manufacturing (except Retreading)
326212	Tire Retreading
326220	Rubber and Plastics Hoses and Belting Manufacturing
326291	Rubber Product Manufacturing for Mechanical Use
326299	All Other Rubber Product Manufacturing
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing
327120	Clay Building Material and Refractories Manufacturing
327211	Flat Glass Manufacturing
327212	Other Pressed and Blown Glass and Glassware Manufacturing



2012 NAICS	2012 NAICS Title
Code	
327213	Glass Container Manufacturing
327215	Glass Product Manufacturing Made of Purchased Glass
327310	Cement Manufacturing
327320	Ready-Mix Concrete Manufacturing
327331	Concrete Block and Brick Manufacturing
327332	Concrete Pipe Manufacturing
327390	Other Concrete Product Manufacturing
327410	Lime Manufacturing
327420	Gypsum Product Manufacturing
327910	Abrasive Product Manufacturing
327991	Cut Stone and Stone Product Manufacturing
327992	Ground or Treated Mineral and Earth Manufacturing
327993	Mineral Wool Manufacturing
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing
331110	Iron and Steel Mills and Ferroalloy Manufacturing
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel
331221	Rolled Steel Shape Manufacturing
331222	Steel Wire Drawing
331313	Alumina Refining and Primary Aluminum Production
331314	Secondary Smelting and Alloying of Aluminum
331315	Aluminum Sheet, Plate, and Foil Manufacturing
331318	Other Aluminum Rolling, Drawing, and Extruding
331410	Nonferrous Metal (except Aluminum) Smelting and Refining
331420	Copper Rolling, Drawing, Extruding, and Alloying
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)
331511	Iron Foundries
331512	Steel Investment Foundries
331513	Steel Foundries (except Investment)
331523	Nonferrous Metal Die-Casting Foundries
331524	Aluminum Foundries (except Die-Casting)
331529	Other Nonferrous Metal Foundries (except Die-Casting)
332111	Iron and Steel Forging
332112	Nonferrous Forging
332114	Custom Roll Forming
332117	Powder Metallurgy Part Manufacturing
332119	Metal Crown, Closure, and Other Metal Stamping (except Automotive)
332215	Metal Kitchen Cookware, Utensil, Cutlery, and Flatware (except Precious) Manufacturing
332216	Saw Blade and Handtool Manufacturing



2012 NAICS	2012 NAICS Title
332311	Prefabricated Metal Building and Component Manufacturing
332312	Fabricated Structural Metal Manufacturing
332313	Plate Work Manufacturing
332321	Metal Window and Door Manufacturing
332322	Sheet Metal Work Manufacturing
332323	Ornamental and Architectural Metal Work Manufacturing
332410	Power Boiler and Heat Exchanger Manufacturing
332420	Metal Tank (Heavy Gauge) Manufacturing
332431	Metal Can Manufacturing
332439	Other Metal Container Manufacturing
332510	Hardware Manufacturing
332613	Spring Manufacturing
332618	Other Fabricated Wire Product Manufacturing
332710	Machine Shops
332721	Precision Turned Product Manufacturing
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing
332811	Metal Heat Treating
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring
332911	Industrial Valve Manufacturing
332912	Fluid Power Valve and Hose Fitting Manufacturing
332913	Plumbing Fixture Fitting and Trim Manufacturing
332919	Other Metal Valve and Pipe Fitting Manufacturing
332991	Ball and Roller Bearing Manufacturing
332992	Small Arms Ammunition Manufacturing
332993	Ammunition (except Small Arms) Manufacturing
332994	Small Arms, Ordnance, and Ordnance Accessories Manufacturing
332996	Fabricated Pipe and Pipe Fitting Manufacturing
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing
333111	Farm Machinery and Equipment Manufacturing
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing
333120	Construction Machinery Manufacturing
333131	Mining Machinery and Equipment Manufacturing
333132	Oil and Gas Field Machinery and Equipment Manufacturing
333241	Food Product Machinery Manufacturing
333242	Semiconductor Machinery Manufacturing
333243	Sawmill, Woodworking, and Paper Machinery Manufacturing
333244	Printing Machinery and Equipment Manufacturing
333249	Other Industrial Machinery Manufacturing
333314	Optical Instrument and Lens Manufacturing



2012 NAICS Code	2012 NAICS Title
333316	Photographic and Photocopying Equipment Manufacturing
333318	Other Commercial and Service Industry Machinery Manufacturing
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333511	Industrial Mold Manufacturing
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing
333515	Cutting Tool and Machine Tool Accessory Manufacturing
333517	Machine Tool Manufacturing
333519	Rolling Mill and Other Metalworking Machinery Manufacturing
333611	Turbine and Turbine Generator Set Units Manufacturing
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing
333613	Mechanical Power Transmission Equipment Manufacturing
333618	Other Engine Equipment Manufacturing
333911	Pump and Pumping Equipment Manufacturing
333912	Air and Gas Compressor Manufacturing
333913	Measuring and Dispensing Pump Manufacturing
333921	Elevator and Moving Stairway Manufacturing
333922	Conveyor and Conveying Equipment Manufacturing
333923	Overhead Traveling Crane, Hoist, and Monorail System Manufacturing
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing
333991	Power-Driven Handtool Manufacturing
333992	Welding and Soldering Equipment Manufacturing
333993	Packaging Machinery Manufacturing
333994	Industrial Process Furnace and Oven Manufacturing
333995	Fluid Power Cylinder and Actuator Manufacturing
333996	Fluid Power Pump and Motor Manufacturing
333997	Scale and Balance Manufacturing
333999	All Other Miscellaneous General Purpose Machinery Manufacturing
334111	Electronic Computer Manufacturing
334112	Computer Storage Device Manufacturing
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334412	Bare Printed Circuit Board Manufacturing
334413	Semiconductor and Related Device Manufacturing
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing



2012 NAICS Code	2012 NAICS Title
334417	Electronic Connector Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334514	Totalizing Fluid Meter and Counting Device Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334516	Analytical Laboratory Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
334519	Other Measuring and Controlling Device Manufacturing
334613	Blank Magnetic and Optical Recording Media Manufacturing
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing
335110	Electric Lamp Bulb and Part Manufacturing
335121	Residential Electric Lighting Fixture Manufacturing
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing
335129	Other Lighting Equipment Manufacturing
335210	Small Electrical Appliance Manufacturing
335221	Household Cooking Appliance Manufacturing
335222	Household Refrigerator and Home Freezer Manufacturing
335224	Household Laundry Equipment Manufacturing
335228	Other Major Household Appliance Manufacturing
335311	Power, Distribution, and Specialty Transformer Manufacturing
335312	Motor and Generator Manufacturing
335313	Switchgear and Switchboard Apparatus Manufacturing
335314	Relay and Industrial Control Manufacturing
335911	Storage Battery Manufacturing
335912	Primary Battery Manufacturing
335921	Fiber Optic Cable Manufacturing
335929	Other Communication and Energy Wire Manufacturing
335931	Current-Carrying Wiring Device Manufacturing
335932	Noncurrent-Carrying Wiring Device Manufacturing
335991	Carbon and Graphite Product Manufacturing
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing
336111	Automobile Manufacturing
336112	Light Truck and Utility Vehicle Manufacturing
336120	Heavy Duty Truck Manufacturing



2012 NAICS	2012 NAICS Title
226211	Matar Vehicle Body Manufacturing
226212	
226212	Motor Home Manufacturing
336213	Travel Trailer and Comper Manufacturing
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing
330320	Motor Vehicle Steering and Suspension Components (except Spring)
336330	Manufacturing
336340	Motor Vehicle Brake System Manufacturing
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336360	Motor Vehicle Seating and Interior Trim Manufacturing
336370	Motor Vehicle Metal Stamping
336390	Other Motor Vehicle Parts Manufacturing
336411	Aircraft Manufacturing
336412	Aircraft Engine and Engine Parts Manufacturing
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing
336414	Guided Missile and Space Vehicle Manufacturing
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing
336510	Railroad Rolling Stock Manufacturing
336611	Ship Building and Repairing
336612	Boat Building
336991	Motorcycle, Bicycle, and Parts Manufacturing
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing
336999	All Other Transportation Equipment Manufacturing
337110	Wood Kitchen Cabinet and Countertop Manufacturing
337121	Upholstered Household Furniture Manufacturing
337122	Nonupholstered Wood Household Furniture Manufacturing
337124	Metal Household Furniture Manufacturing
337125	Household Furniture (except Wood and Metal) Manufacturing
337127	Institutional Furniture Manufacturing
337211	Wood Office Furniture Manufacturing
337212	Custom Architectural Woodwork and Millwork Manufacturing
337214	Office Furniture (except Wood) Manufacturing
337215	Showcase, Partition, Shelving, and Locker Manufacturing
337910	Mattress Manufacturing
337920	Blind and Shade Manufacturing
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339114	Dental Equipment and Supplies Manufacturing



2012 NAICS			
Code			
339115	Ophthalmic Goods Manufacturing		
339116	Dental Laboratories		
339910	Jewelry and Silverware Manufacturing		
339920	Sporting and Athletic Goods Manufacturing		
339930	Doll, Toy, and Game Manufacturing		
339940	Office Supplies (except Paper) Manufacturing		
339950	Sign Manufacturing		
339991	Gasket, Packing, and Sealing Device Manufacturing		
339992	Musical Instrument Manufacturing		
339993	Fastener, Button, Needle, and Pin Manufacturing		
339994	Broom, Brush, and Mop Manufacturing		
339995	Burial Casket Manufacturing		
339999	All Other Miscellaneous Manufacturing		
423110	Automobile and Other Motor Vehicle Merchant Wholesalers		
423120	Motor Vehicle Supplies and New Parts Merchant Wholesalers		
423130	Tire and Tube Merchant Wholesalers		
423140	Motor Vehicle Parts (Used) Merchant Wholesalers		
423210	Furniture Merchant Wholesalers		
423220	Home Furnishing Merchant Wholesalers		
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers		
423320	Brick, Stone, and Related Construction Material Merchant Wholesalers		
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers		
423390	Other Construction Material Merchant Wholesalers		
423420	Office Equipment Merchant Wholesalers		
423440	Other Commercial Equipment Merchant Wholesalers		
423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers		
423460	Ophthalmic Goods Merchant Wholesalers		
423490	Other Professional Equipment and Supplies Merchant Wholesalers		
423510	Metal Service Centers and Other Metal Merchant Wholesalers		
423520	Coal and Other Mineral and Ore Merchant Wholesalers		
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers		
423620	Household Appliances, Electric Housewares, and Consumer Electronics Merchant Wholesalers		
423690	Other Electronic Parts and Equipment Merchant Wholesalers		
423710	Hardware Merchant Wholesalers		
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers		
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers		
423740	Refrigeration Equipment and Supplies Merchant Wholesalers		
423810	Construction and Mining (except Oil Well) Machinery and Equipment Merchant Wholesalers		



2012 NAICS	2012 NAICS Title
423820	Farm and Garden Machinery and Equipment Merchant Wholesalers
423830	Industrial Machinery and Equipment Merchant Wholesalers
423840	Industrial Supplies Merchant Wholesalers
423850	Service Establishment Equinment and Supplies Merchant Wholesalers
423030	Transportation Equipment and Supplies (except Motor Vehicle) Merchant
423860	Wholesalers
423910	Sporting and Recreational Goods and Supplies Merchant Wholesalers
423920	Toy and Hobby Goods and Supplies Merchant Wholesalers
423930	Recyclable Material Merchant Wholesalers
423940	Jewelry, Watch, Precious Stone, and Precious Metal Merchant Wholesalers
423990	Other Miscellaneous Durable Goods Merchant Wholesalers
424110	Printing and Writing Paper Merchant Wholesalers
424120	Stationery and Office Supplies Merchant Wholesalers
424130	Industrial and Personal Service Paper Merchant Wholesalers
424210	Drugs and Druggists' Sundries Merchant Wholesalers
424310	Piece Goods, Notions, and Other Dry Goods Merchant Wholesalers
424320	Men's and Boys' Clothing and Furnishings Merchant Wholesalers
424330	Women's, Children's, and Infants' Clothing and Accessories Merchant Wholesalers
424340	Footwear Merchant Wholesalers
424410	General Line Grocery Merchant Wholesalers
424420	Packaged Frozen Food Merchant Wholesalers
424430	Dairy Product (except Dried or Canned) Merchant Wholesalers
424440	Poultry and Poultry Product Merchant Wholesalers
424450	Confectionery Merchant Wholesalers
424460	Fish and Seafood Merchant Wholesalers
424470	Meat and Meat Product Merchant Wholesalers
424480	Fresh Fruit and Vegetable Merchant Wholesalers
424490	Other Grocery and Related Products Merchant Wholesalers
424510	Grain and Field Bean Merchant Wholesalers
424520	Livestock Merchant Wholesalers
424590	Other Farm Product Raw Material Merchant Wholesalers
424610	Plastics Materials and Basic Forms and Shapes Merchant Wholesalers
424690	Other Chemical and Allied Products Merchant Wholesalers
424710	Petroleum Bulk Stations and Terminals
424720	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
424810	Beer and Ale Merchant Wholesalers
424820	Wine and Distilled Alcoholic Beverage Merchant Wholesalers
424910	Farm Supplies Merchant Wholesalers
424920	Book, Periodical, and Newspaper Merchant Wholesalers
424930	Flower, Nursery Stock, and Florists' Supplies Merchant Wholesalers



2012 NAICS Code	2012 NAICS Title
424940	Tobacco and Tobacco Product Merchant Wholesalers
424950	Paint, Varnish, and Supplies Merchant Wholesalers
424990	Other Miscellaneous Nondurable Goods Merchant Wholesalers
425110	Business to Business Electronic Markets
425120	Wholesale Trade Agents and Brokers
481111	Scheduled Passenger Air Transportation
481112	Scheduled Freight Air Transportation
481211	Nonscheduled Chartered Passenger Air Transportation
481212	Nonscheduled Chartered Freight Air Transportation
481219	Other Nonscheduled Air Transportation
482111	Line-Haul Railroads
482112	Short Line Railroads
483111	Deep Sea Freight Transportation
483112	Deep Sea Passenger Transportation
483113	Coastal and Great Lakes Freight Transportation
483114	Coastal and Great Lakes Passenger Transportation
483211	Inland Water Freight Transportation
483212	Inland Water Passenger Transportation
484110	General Freight Trucking, Local
484121	General Freight Trucking, Long-Distance, Truckload
484122	General Freight Trucking, Long-Distance, Less Than Truckload
484210	Used Household and Office Goods Moving
484220	Specialized Freight (except Used Goods) Trucking, Local
484230	Specialized Freight (except Used Goods) Trucking, Long-Distance
486110	Pipeline Transportation of Crude Oil
486210	Pipeline Transportation of Natural Gas
486910	Pipeline Transportation of Refined Petroleum Products
486990	All Other Pipeline Transportation
487110	Scenic and Sightseeing Transportation, Land
487210	Scenic and Sightseeing Transportation, Water
487990	Scenic and Sightseeing Transportation, Other
488111	Air Traffic Control
488119	Other Airport Operations
488190	Other Support Activities for Air Transportation
488210	Support Activities for Rail Transportation
488310	Port and Harbor Operations
488320	Marine Cargo Handling
488330	Navigational Services to Shipping
488390	Other Support Activities for Water Transportation
488410	Motor Vehicle Lowing
488490	Other Support Activities for Road Transportation



2012 NAICS Code	2012 NAICS Title
488510	Freight Transportation Arrangement
488991	Packing and Crating
488999	All Other Support Activities for Transportation
491110	Postal Service
492110	Couriers and Express Delivery Services
492210	Local Messengers and Local Delivery
493110	General Warehousing and Storage
493120	Refrigerated Warehousing and Storage
493130	Farm Product Warehousing and Storage
493190	Other Warehousing and Storage
562111	Solid Waste Collection
562112	Hazardous Waste Collection
562119	Other Waste Collection
562211	Hazardous Waste Treatment and Disposal
562212	Solid Waste Landfill
562213	Solid Waste Combustors and Incinerators
562219	Other Nonhazardous Waste Treatment and Disposal
562910	Remediation Services
562920	Materials Recovery Facilities
562991	Septic Tank and Related Services
562998	All Other Miscellaneous Waste Management Services
927110	Space Research and Technology

APPENDIX B: Data Fields In Quarterly Census of Employment & Wages Provided by Florida Department of Economic Opportunity (DEO)

Field Names	Field Names	Field Names	Field Names
Transaction Code	Mailing/Other (MOA) Address5-Digit ZIP Code	Data Source	UI Address Type Code
State FIPS Numeric Code	Mailing/Other (MOA) AddressZIP Code Extension	Special Indicator Code	Date PLA Changed
Year	Mailing/Other (MOA) Address Type	Agent Code	Geocoding Software (G)
Quarter	Reporting Unit Description	SIC Code	Geocoding Source (B)
UI Account Number	Area Code	NSTA Code	Match Code
Reporting Unit Number	Phone Prefix	NAICS Code	Location Code
EIN (Employer Identification Number)	Phone Suffix	Ownership Code	Latitude
Predecessor UI Account Number	Setup DateYear	Organization Type Code	Longitude
Predecessor Reporting Unit Number	Setup DateMonth	County Code	Year and Quarter of New Latitude and Longitude
Successor UI Account Number	Setup DateDay	Township Code	Place Code
Successor Reporting Unit Number	Initial Date of Liability Year	Auxiliary Code	Class Code
Legal/Corporate Name	Initial Date of Liability Month	First Month Employment	Census Block
Trade Name/DBA	Initial Date of Liability Day	First Month Employment Indicator	Census Tract
UI Street AddressLine 1	End of Liability Date Year	Second Month Employment	Address/Contact Source
UI Street AddressLine 2	End of Liability Date Month	Second Month Employment Indicator	P/S Partial/Full Indicator



Field Names	Field Names	Field Names	Field Names
UI AddressCity	End of Liability Date Day	Third Month Employment	P/S Transfer Year
UI AddressState	Reactivation Date Year	Third Month Employment Indicator	P/S Transfer Month
UI Address5-Digit ZIP Code	Reactivation Date Month	Total Wages	P/S Transfer Day
UI AddressZIP Code Extension	Reactivation DateDay	Total Wages Indicator	Multiple Successors
Physical Location (PLA) Street AddressLine 1	Status Code	Taxable Wages	Multiple Predecessors
Physical Location (PLA) Street AddressLine 2	CES Indicator	Contributions (Due)	Predecessor Source Code
Physical Location Address (PLA)City	ARS Response Code	Type of Coverage Code	Successor Source Code
Physical Location Address (PLA)State	ARS Refile Year	MEEI Code	First Supplemental Predecessor/Successor (Future Use)
Physical Location Address (PLA)5-Digit ZIP Code	Old County Code	Reporting Change Indicator	Second Supplemental Predecessor/Successor (Future Use)
Physical Location Address (PLA)ZIP Code Extension	Old Ownership Code	First Comment Code	ARS Third Party Agent
Mailing/Other (MOA) Street AddressLine 1	ARS Verification Year	Second Comment Code	Phone Extension
Mailing/Other (MOA) Street AddressLine 2	Old Township Code	Third Comment Code	ES-202 Contact (Attention Line)
Mailing/Other (MOA) AddressCity	Maximum Reporting Unit Number	Narrative Comment	ES-202 Contact Title
Mailing/Other (MOA) AddressState	MWR Mail Indicator	Collection Mode Indicator	ES-202 Contact e-mail Address
Future Use	Old NAICS Code	Economic Code Change Indicator	ES-202 Contact Fax
			Website Address

APPENDIX C: Freight Cluster Candidate Maps

Appendix C includes freight cluster candidate maps:

- C1: Freight Cluster Candidate 115 Freight Clusters with Land Use
- C2: Freight Cluster Candidate 115 Freight Clusters with Roads
- C3: Freight Cluster Candidate 136 Freight Clusters with Land Use
- C4: Freight Cluster Candidate 136 Freight Clusters with Roads
- C5: Freight Cluster Candidate 222 Freight Clusters with Land Use
- C6: Freight Cluster Candidate 222 Freight Clusters with Roads





Figure 16. Freight Clusters with Land Use - Freight Cluster Candidate 115 (C1)





Figure 17. Freight Clusters with Roads - Freight Cluster Candidate 115 (C2)





Figure 18. Freight Clusters with Land Use - Freight Cluster Candidate 136 (C3)





Figure 19. Freight Clusters with Roads - Freight Cluster Candidate 136 (C4)





Figure 20. Freight Clusters with Land Use - Freight Cluster Candidate 222 (C5)





Figure 21. Freight Clusters with Roads - Freight Cluster Candidate 222 (C6)



APPENDIX D: Freight Cluster Analysis Instructions



Figure 22. Freight Cluster Analysis Instructions

- 1. Obtain DOR Parcel GIS data
- 2. Select parcels by freight related DOR land use codes
- 3. Select parcels by County FIPS code for desired county
- 4. Use Polygon to Point Feature tool to generate centroid points for each parcel
- 5. DOR Freight Points ready for input to IDW interpolation analysis
- 6. Obtain DEO Employment CSV data
- 7. Load data to SPSS, create unique ID #s for each record, select freight NAICS records
- 8. Aggregate four quarters of data and calculate mean and max employment for year
- 9. Exported selected county to CSV format and perform address geocoding
- 10. DEO Employment Points ready for input to IDW interpolation analysis
- 11. Obtain RCI Truck AADT Road Network shapefile
- 12. Select roads for desired county
- 13. Select roads by FUNCLASS to exclude Principal Arterials
- 14. Use Line to Points tool to generate points every 100 meters



- 15. RCI TruckAADT Points ready for input to IDW interpolation analysis
- 16. Perform IDW Standard Interpolation on DOR and DEO point data
- 17. Perform IDW Smooth Interpolation on RCI TruckAADT point data
- 18. Output DOR IDW Surface
- 19. Output DEO IDW Surface
- 20. Output RCI IDW Surface
- 21. Reclassify DOR, DEO and RCI IDW Surface rasters to 10-Class Quantile
- 22. Output DOR raster rated on 1 10 scale for input to Weighted Overlay
- 23. Output DOE raster rated on 1-10 scale for input to Weighted Overlay
- 24. Output RCI raster rated on 1 10 scale for input to Weighted Overlay
- 25. Conduct Weighted Overlay analysis on DOR, DEO and RCI rasters
- 26. Assign weights of DOR 34%, DEO 33% and RCI 33%
- 27. Output Weighted Overlay Raster
- 28. Reclassify raster output values of 6 10 to 1 and 1 5 to NoData
- 29. Use Raster to Polygon tool to convert raster clusters to cluster polygons
- 30. Assign unique Cluster ID # to each cluster polygon
- 31. Perform Spatial Join between cluster polygons and DEO points, DOR parcel polygons
- 32. Use Frequency tool to generate summary statistics on DEO and DOR by Cluster ID #
- 33. Use Candidate Cluster Statistics to evaluate clusters as possible FAA designations

APPENDIX E: Literature Cited

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