A FEASIBILITY ASSESSMENT OF TRUCK-BARGE INTERMODAL FREIGHT TRANSPORTATION

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This report examines the feasibility of truck-barge intermodal freight transportation, along with the feasibility of rail-barge and single modal barge transportation. The report includes the enhancement of an existing software package that determines the cheapest mode combination between an origin and destination. The enhanced software calculates the cost of the shipment including transportation cost, transfer cost, inventory-carrying cost, and dra cost. A detailed user's manual is presented. The project examines a network of thirteen cities along the United States inland waterways. The project also developed a set of tables that determies the mileage where a mode of transportation becomes the cheapest alternative. In addition, the report addresses the commodities that could benefit by utilizing barge transportation and examines the seasonal delays resulting in barge transportation.

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16. Abstract

This report examines the feasibility of truck-barge intermodal freight transportation, along with the feasibility of rail-barge and single modal barge transportation. The report includes the enhancement of an existing software package that determines the cheapest mode combination between an origin and destination city given shipment characteristics. The enhanced software calculates the cost of the shipment including transportation cost, transfer cost, inventory-carrying cost, and dray cost. A detailed user's manual is presented. The project examines a network of thirteen port cities along the United States inland waterways and details the routes in which barge single or intermodal transportation is cost feasible for shippers. The project also developed a set of tables that determines the mileage where a mode of transportation becomes the cheapest alternative. In addition, the report addresses the commodities that could benefit by utilizing barge transportation and examines the seasonal delays resulting in barge transportation.

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I. STATEMENT OF PROBLEM

A. MOTIVATION

In current years the United States rail industry has experienced a significant number of mergers and consolidations. Currently there are only two major rail service providers east of the Mississippi River. Indications for the future are consistent with this trend. It is conceivable that the United States may be served by only two or three major rail carriers in future years. Some large geographical areas may only be served by one rail carrier. Due to this possibility, it is likely that users of rail transportation may be subjected to rate increases due to lack of competition among rail transportation providers.

It is important to find an alternative means of transportation that can provide shippers with cheaper transportation options if rail rates do in fact increase as expected. At the same time, it is necessary to include intermodal choices due to its increasing popularity. This thesis examines the potential for barge transportation as a competing mode of transportation. It includes analysis of truck-barge transportation as an intermodal option that can possibly compete with rail or truck-rail alternatives. It also includes analysis of barge transportation in any manner (barge single modal, rail-barge, truck-barge, container-on-barge) in order to evaluate where barge transportation in any manner is a feasible option.

Figure 1.1 shows the trends in freight rate pricing over the past thirty years. Indications show dramatic increases for truck rates over the past thirty years with a more stabilizing pattern over the past five years. Trends in the rail industry show fairly consistent rates with moderate increases over the past five years. Barge rates indicate that little or no increases have taken place over the past thirty years. These trends support the theory that rail rates are indeed experiencing moderate increases, with possibilities for more significant increases in the future.

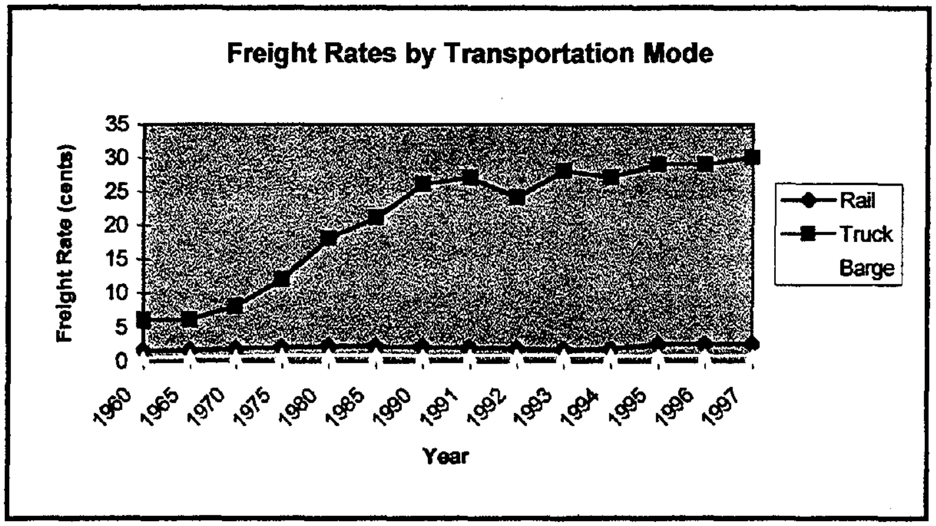

Figure 1.1: Freight Rates by Transportation Mode
From Haulk [22]

B. Background

This thesis is an extension of a research project funded by the Mack-Blackwell Transportation Center. The research project began August 15, and was requested by J.B. Hunt Transport and the Arkansas Waterways Commission. The project led to the establishment of COCITE, the Council on Cooperative Intermodal Transportation Enhancement. To date, three formal meetings of the council have taken place. The first was in Fayetteville, Arkansas and included port authorities. The second was in Memphis, Tennessee and included port authorities and prospective shippers. The third was in Pittsburgh, Pennsylvania and included port authorities, transportation providers, and logistics consultants. The research was aided by water and truck transportation providers, prospective shippers, and port authorities from around the country.

C. Environment

Current users of intermodal transportation are likely to be using truck-rail transportation. Due to the increased use of truck-rail transportation over the years, several inventions have made the transfer process more efficient. Detachable trailer chassis permit trailer containers to be transferred to railcars for long hauls. The chassis and containers are removed from the tractor portion of a truck where the trailer containers are then loaded by crane onto flat railcars. The trailer containers are reloaded onto empty chassis frames at the end of the rail link and then transported to their final destination once reattached to the tractor portion of a truck.

With the possible increase in rail rates, truck-rail rates are certain to experience increases in transportation costs as well. As an alternative, the feasibility of truck-barge transportation is examined. A process similar to loading trailer chassis onto railcars, Lift-on/Lift-off, is examined for barges.

D. Specific Objectives

The objectives of this project have involved identifying a shipping network appropriate for barge, truck-barge (or container-on-barge), or rail-barge transportation. The network that has been identified specifies transfer locations where loads can be transferred from one mode of transportation to another. These locations are points where truck containers can be loaded onto barges by crane or transferred from railcars. The appropriate commodities that can be shipped via the identified truck-barge network are identified and described as part of this project.

The total costs associated with different transportation modes are determined. These costs include transfer costs, dray costs, and inventory carrying costs. The transfer costs for truck-barge and for truck-rail encompasses the cost of transferring truck containers by crane. Transportation rates for truck, barge, and rail are identified. Dray costs (cost to transport shipments to/from barge terminals and rail terminals from the shippers factory, warehouse, etc.) are determined as well. The individual costs are standardized into units per container, whereas the total costs are quoted in dollars per specific shipment.

Having defined and standardized network transportation costs, a feasibility assessment utilizing enhanced existing software was performed. This has involved developing a model that can be transferred to an existing software package developed by Boardman [8]. Software enhancements have been made due to some minor inconsistencies and inaccuracies in the previous software that relate to price structure of transportation industries. Costs were compared to current rates of other transportation modes. The software facilitates the determination of the feasible portions of the defined network that are cheaper for barge transportation or a combination of barge and truck or barge and rail.

E. Summary

The goals and objectives of this project may be summarized as shown below.

- Software Goals
  - ✓ Update Node Array in database to reflect defined modes of transportation and cities included in analysis.
  - ✓ Update Arc Array in database to reflect available paths between cities, including alteration of distances between cities.
  - ✓ Update Transfer Cost/Time Array to be consistent with information provided by transportation providers and port authorities.
  - ✓ Update Transportation Rates and Average Speeds Array to reflect information provided by transportation providers and port authorities.
  - ✓ Add Ocean-going vessels and Barge navigation along the coastal waterways as modes of transportation to account for shipments transferred for international shipments and for shipments navigating on coastal waters requiring a load line by the United States Coast Guard.
  - ✓ Modify calculations of transportation costs to consider rate quotations in dollars per container.
  - ✓ Add inventory cost calculations to the total cost formulations to reflect the cost of time during transportation shipments.
  - ✓ Add the cost of transporting from the factory, warehouse, etc., (or the dray cost) to/from rail and barge terminals, considering an average length of dray.
  - ✓ Consider the Department of Transportation time limits placed on truck drivers in total time calculations.
- Operational Goals
  - ✓ Define a preliminary network of analysis.
  - ✓ Formulate the Operations Research model including node and arc descriptions.
  - ✓ Collect data concerning transportation costs in dollars per container, average transportation speeds, transfer costs and times (per container), and dray costs.
  - ✓ Formulate inventory cost equations.
  - ✓ Identify seasonal information related to water transportation.

- ✓ Identify appropriate commodities and shippers that could benefit from barge transportation.

- ✓ Examine available and necessary equipment required for container transport.

- Strategic Goals
  - ✓ Enhance existing software to meet project needs.

  - ✓ Identify portions of the preliminary network that are cost feasible.

  - ✓ Create liaison between Waterway Officials and Shippers and within the Waterway Industry utilizing the Council on Cooperative Intermodal Transportation Enhancement.

  - ✓ Distribute software to interested parties as a tool for marketing the waterways and enhancing waterway utilization.

This chapter has overviewed the problem that has been analyzed in this thesis and the related goals associated with the project. An extensive literature search has been performed and is presented in the following chapter.

II. Review of Literature

A. Introduction

Transportation on the waterways is not a new concept. However, recent years have seen developments in waterway transportation, specifically the linking of other modes of transportation to waterway transportation systems. The use of more than one mode of transportation to move goods and services between an origin and a destination is referred to as intermodal transportation [50]. Intermodal transportation has become more popular among shippers and transportation providers because of the increase in efficiency and service, as well as, the reduction in cost that intermodal transportation provides. Shippers have been utilizing truck-rail intermodal transportation for several years. However, the utilization of truck-barge intermodal transportation has been limited due to questions and concerns surrounding single modal barge transportation. Consequently, there have been several research efforts to evaluate the feasibility of waterway transportation.

B. Recent Trends

The increase in railway mergers such as those between the Union Pacific Corporation, Union Pacific Rail Company, and Missouri Pacific Rail; Southern Pacific Rail Corporation, Southern Pacific Transportation Company, St. Louis Southwest Rail, and SPCSL Corporation; Denver and Rio Grande Western Railroad Company; and the Burlington-Northern and Santa Fe Railways [4] have led to increased concern among shippers. It is possible that more mergers and consolidations will lead to increased rail rates and decreased competition among railway service providers [27]. This is why it is important to develop efficient alternative modes of transportation, such as barge transportation, that can compete with rail and keep prices at a reasonable level. If, in fact, rail rates do increase as expected, intermodal users will suffer increased rates as well. This is specifically true of truck-rail users. Alternative intermodal techniques, such as truck-barge, may be able to offer shippers an efficient means of transportation at a cheaper price, while still utilizing multiple modes.

Intermodal transportation has increased drastically in the late 1980's and early 1990's [10]. Many factors have contributed to the increase in popularity [11]. Some of these include improved rail scheduling, growth in the economy, shortage of truck drivers, lower accident rates, ability to handle cargo imbalances, and improved service. The future of intermodal transportation is optimistic due to improved technology, better terminal facilities, and improved equipment [21]. Whether or not barge transportation will benefit due to the increased utilization of intermodal transportation remains to be seen.

A recent issue of *Traffic Management* published an article about the cost effectiveness of barges, stating that shippers are just not aware of the cost savings and improved on-line tracking services that barges provide [26]. This lack of knowledge is of major concern to waterway officials [49]. It is evident that barge transportation is being underutilized. In fact, as of 1990, only 16 percent of intercity freight was moved by water [53].

Although the utilization of the waterways is no where near capacity, growth in the use of containerization on the waterways has been rapid, averaging twelve to fourteen percent over the past two decades [48]. Unfortunately, this growth has been limited to the waterways of other nations and to the Columbia-Snake River System in the United States

[48]. This is not to say that attempts have not been made to operate container-on-barge transportation on the Mississippi River System. In fact, multiple attempts to organize container-on-barge transportation have been made by various businesses and ports. Disappointingly, none of them have been successful [49]. The reasons for their failure are somewhat unrelated, yet indicative of all the efforts [49]. Some of the reasons leading to the demise include:

- Operations dependent on international exports that disappeared as the foreign countries' economy worsened.
- No repeat business. Customers were, in essence, random.
- Inadequate equipment at up-river terminals, specifically the lack of heavy-lift cranes.
- Inability to handle containers at terminals, resulting in the necessity for shippers to leave their chassis at terminals, sometimes leading to double charges for switching.
- Barge lines not properly caring for cargo, sometimes resulting in damaged or ruined cargo.
- Competitive rates from Illinois Central-Gulf Railroad that tended to become even more competitive when the threat of new shipping lines emerged.
- Failure to organize cooperative efforts including the barge lines, the port terminals, the tow operators, and other involved modes of transportation (rail and truck).
- Non-regular scheduled commitments to ship cargo by barge lines.
- Development and inclusion of smaller ports for shipping has not been addressed.
- Lack of required volume, especially non-time sensitive, to sustain container-on-barge services.
- Barge line insurance that only covers a maximum of five hundred dollars per net ton. Higher levels of insurance must be attached to bills of lading, resulting in higher costs to shippers.

- Uncontrollable factors such as wind, fog, high water, low water, and ice that lead to seasonable shipments or time delays on certain parts of certain rivers.
- Reduction in rail rates to attract possible customers of the waterway industry back to railways.
- Lack of marketing to potential customers leading to a lack of understanding and lack of knowledge about the waterway system.
- Increased time to ship cargo, even with a decrease in price, when compared to rail and truck transportation.

Even with all the negative experiences listed above, industry and waterway authorities are still interested in developing a cost-effective, high service, waterway transportation system. Recent studies have been performed to assess the feasibility of waterway transportation; however, most are not studies dealing with intermodal transportation. Nevertheless, it is only practical to investigate the previous findings that are related to waterway transportation in any manner.

C. Successful Barge Operations

There are two extremely successful barge operations in the world—The Columbia-Snake River System in the Western portion of the United States and The Rhine River in Europe. The Mississippi River System has tried on occasions to model both successful river systems, but has not been successful in past attempts. The following section will discuss the two barge operations of these two locations. The two are discussed extensively in *Container Transport* [48] and are summarized in the sections below.

1. Rhine River

The Rhine River System serves West Germany, France, and Switzerland. Navigable for 500 miles, it links inland terminals with the ocean ports of Rotterdam and Antwerp. As of 1987, the Rhine was moving 225,000 TEU's (twenty-foot equivalent units) annually. Volume levels are expected to reach the 400,000 TEU point at the turn of the century.

In the early 1970's the European Waterways Transport (EWT) began a regularly scheduled service to attract interested shippers and steamship lines. In the early stages, it was not out of the ordinary for barges to sail with two or three containers. However, the service eventually convinced shippers and steamship lines that it was seriously committed to providing a regular scheduled service. It was also able to show that container-on-barge services could be used effectively as an intermodal system.

The Combined Container Services (CSS) is another major operator on the Rhine River. It began operation shortly after the successful operations of EWT. CSS also follows a regular schedule. Together with EWT, the two operations contain about 70 percent of the container-on-barge market on the Rhine.

The Rhine waterway is typically traveled by self-propelled barges. Sizes range from 60 TEU's to 220 TEU's. As volume expands in the coming years, it is expected that push barge systems will become the norm for the river. There are a total of thirty-two terminals along the river system. The major facilities have at least weekly service; several have almost daily services.

The transit times on the Rhine are as fast or faster than comparable rail service. Truck transit times are increased due to road and border restrictions, making barge transit times fairly comparable. The short length-of-haul, coupled with the fast transit times, allows scheduled service on a frequent basis.

Since the container-on-barge service on the Rhine also serves as an intermodal service, pricing reflects this. Container-on-barge tariffs include linehaul costs, transfer charges, and trucking costs. This pricing eliminates potential for hidden charges and is becoming a demand from shippers.

2. Columbia Snake River

The Columbia-Snake River system provides service for Oregon, Washington, and Idaho. The river system was completed in 1975.

In 1975, Raz Inland Navigation, Inc. was granted operating rights by the Interstate Commerce Commission. Initial service was provided by conventional barge and tug operations. The first year, approximately 130 TEU's were transported by barge, although not fully loaded. By the second year, 6,300 TEU's were transported on the system. The increase is partially due to the Interstate Commerce Commissions granting of rights to other operating services.

The majority of movements are through the Port of Portland. Current movements are largely lift-on/lift-off. Container-on-barge services are provided on a twice-weekly basis.

Along the Columbia-Snake River System, some places experience shorter waterway mileage than road mileage. The pricing structure is similar to truck services. The two of these factors together allow the container-on-barge service to be competitive as an intermodal operation with scheduled services that attract shippers.

The implementation process on the Columbia-Snake River was a cooperative effort of the ports, the towing industry, and the steamship lines. This allowed each of the major economic agents an awareness of the total costs associated with container-on-barge, which allowed them to structure their tariffs accordingly.

Other factors that contributed to the success include high productivity levels, types of equipment utilized, and relatively high tow speeds. These, however, reinforce the basic requirements of intermodal transportation, competitive rates, and the availability of a regularly scheduled service.

D. Transportation Costs

A large part of intermodal costs is the transportation cost of the individual types of transportation utilized. These costs can be fixed or variable. Some costs are a combination of fixed costs and variable costs. Fixed costs usually consist of fuel costs, crew costs, overhead costs, and general administrative costs. Variable costs depend upon weight, distance, and/or volume. The modes of transportation relevant to this project are highway, waterway, and railway. These modes of transportation and their related costs are discussed in the subsections below.

1. Highway Transportation

A detailed description of this mode of transportation is discussed in Reference [13]. This material is summarized in the section below.

Nearly 45 million trucks were registered in the United States in 1987. This number reflects a combination of privately owned and commercially owned vehicles. In

1992 alone, trucks traveled over 629 billion vehicle-miles on the United States roadways [56]. A vehicle-mile is the product of total mileage traveled by all trucks. The use of trucks for importing and exporting goods to Mexico in 1991 was 46.5 million tons of cargo, representing 35% of all United States-Mexico trade [38]. These numbers are evidence that trucks are a major source of transportation in the United States.

With the move toward deregulation in the late 1970's, trucking industries have seen more freedom. The Motor Carrier Act of 1980 relaxed requirements for entry into the trucking business. Restrictions on truck routes, types of traffic carried, and areas served were eliminated [37].

Recent years have seen the development of federal and state allocation studies that emphasize the sharing of highway costs among its users [55]. The studies divide vehicles into class types, with each class resulting in a different highway cost [25]. However, the structure of the highway still lacks a single authority that can establish a complete user-charge configuration; thus, the federal government has assumed this responsibility [6].

Two parameters of highway cost allocation are vehicle mileage and vehicle weight. The allocation of costs common to all vehicles are distributed according to the mileage [6]. Vehicle weight is taken into account due to the highway damage that results from increasing vehicle weight. The recent Federal Highway Cost Allocation Study indicates that average passenger vehicle costs are approximately $3.27 per thousand miles while the larger trucks (defined as weighing over 75,000 pounds) cost $47.14 per thousand miles [6]. These numbers were compiled using a uniform removal technique [57].

In addition, new trucks over 10,000 pounds gross vehicle weight are assessed an excise tax. All trucks are charged a truck parts and accessories tax. For trucks over

26,000 pounds, a flat rate of $3.00 per thousand pounds of gross vehicle weight is incurred.

The Surface Transportation Assistance Act of 1982 charged the trucking industry with a $0.05 per gallon fuel tax increase. The current user-charge structure shows a decrease in payments for automobiles and an increase for trucks. This is mainly because the rate depends on fuel tax, which is more efficient for automobiles than it is for trucks [57].

2. Waterway Transportation

A detailed description of this mode of transportation is discussed in Reference [13]. This material is summarized in the section below.

The Inland Waterway System consists of 170 major ports totaling 25,543 miles [7]. For the most part, the U.S. port system is developed by and maintained by port authorities, local governments, and federal governments. In the past, general revenues have funded U.S. waterway operations, development, and maintenance. However, Congress imposed an inland waterways fuel excise tax in 1978 that provides for construction and maintenance on specific waterways listed in the Inland Waterways Revenue Act of 1978 [56].

Proposed user charges levied on the towing industry consist of fuel taxes, lockage fees, segment tolls, and licensing and floating fees [32]. The fuel tax is imposed on commercial cargo vessels using liquid fuels. It does not include ocean-going vessels, noncargo vessels, or recreational vessels. The rate, as of October 1, 1985, is ten cents per gallon [56]. The purpose of establishing user charges is similar to the reason why user charges are levied on highway transportation. The fees intend to charge only those that actually use the waterway system, instead of charging general taxpayers for something they do not use [32].

3. Railway Transportation

A detailed description of this mode of transportation is discussed in Reference [13]. This material is summarized in the section below.

The United States railway system consists of around 167,000 miles. The network of rail miles is operated by 18 Class I railroads and includes approximately 481 regional and local railroads. The federal government regulates interstate railroad activities while intrastate activities are regulated by the state government. The railways are owned and operated by many different corporations. The railways in use today are APL Stacktrain Services, Amtrak, Santa Fe, Burlington Northern, Canadian National, U.S. Lines, Canadian Pacific, CSX Transportation, Chicago and North Western, Conrail, Florida East Coast, Illinois Central, Kansas City Southern, Norfolk Southern, Southern Pacific, and Union Pacific [29].

Railway rates are determined by several different factors. First, railroads are subject to federal regulation because they are a public utility. Second, rail rates are subject to fixed costs and variable costs. Fixed costs are those that are charged regardless of the volume or weight of the cargo. They account for about forty to fifty percent of the total cost. Variable costs depend upon volume and utilization. Increases in volume reduce per unit costs because costs are spread over a larger number of units [9]. Variable costs include things such as labor costs, fuel costs, maintenance costs, and cost of lubricants.

Railroads have been in operation for many years in the United States. In the early days of operation, large investments were required. These costs were spread out over a long period of time, making the fixed costs per unit time lower. This factor has created a very competitive cost structure [51]. At times, rate wars between railway transportation providers and between railways and other means of transportation are encouraged by the competitive cost structure of the railways [20].

E. Transfer Costs

Another consideration in intermodal movements is transfer costs. These costs are those that are incurred when switching from one mode of transportation to another. The transfer costs can be the costs of unloading and loading of cargo from one mode to another or the transfer of a trailer from one mode to the other (as in the use of detachable trailer containers). Transfer costs may depend upon the transfer location, the type and volume of commodity, equipment needs, and the types of transportation modes that are being used. These costs may also be a fixed cost per unit, per volume, or per weight basis.

F. Deregulation and Intermodal Transportation

One significant change in the transportation industry has been deregulation. Prior to1940, the United States regulated transportation industries. The regulations imposed favored single-modal transportation [27]. A major breaking point in favor of intermodal transportation occurred with the establishment of the Department of Transportation in 1967 [37].

Beginning in the late 1970's and continuing into the 1980's, deregulation began throughout the United States through acts such as The Motor Carrier Act of 1980, The Staggers Rail Act of 1980, and the Shipping Act of 1984 [4]. In 1983 the Interstate Commerce Commission legislated acts that allowed carriers of one mode of transportation to own other modes of transportation [16]. This allowed shippers to utilize intermodal transportation while only contacting a single carrier. This also allowed more freedom for railways to merge together. Since the passing of The Staggers Act, Norfolk and Western/Southern, Union Pacific/Missouri Pacific/Western Pacific, Soo Line/Milwaukee Road, Union Pacific/M-K-T, Denver Rio Grande and Western/Southern Pacific, and Santa Fe and Burlington Northern have merged and consolidated [17].

Piggyback traffic on the railways was deregulated around 1980 as well. Prior to this time trucking industries were able to price their service below rail piggyback [27]. The deregulation effects may see a move toward intermodal transportation with trucks providing the initial and final portions of the transport. The Interstate Commerce Commission also deregulated container movements between the U.S. mainland and Puerto Rico, Alaska, and Hawaii [37].

The result of government deregulation is increased intermodal activity [37]. The United States is trying to adjust their regulations to cope with the increased popularity of intermodal transportation. This should result in more efficient and cost-effective means of transportation.

G. A Methodology for Comparative True Cost Assessment of Transportation Models

A Methodology for Comparative True Cost Assessment of Transportation Models, a master's thesis completed by Sze Chew [13], addresses the problem of comparing the transportation costs of various modes of transportation, focusing on the societal costs of providing transportation services. The modes of transportation analyzed in this analysis include air, barge, rail, and truck. The model developed by Chew [13] considers the costs incurred by all activities associated with each transportation mode. The costs are then amortized resulting in the societal weight/volume per unit distance cost for each mode.

1. Network Description

The network of analysis includes a five-state area. These states are Alabama, Arkansas, Mississippi, Louisiana, and Tennessee. The roadway network considers only interstate highways within the five-state region. The river systems in this analysis include the Lower Mississippi River, the McClellan-Kerr Arkansas River, the Black-Warrior Tombigee Rivers, the Tennessee River, and the Alabama-Coosa Rivers. The railroads considered are Burlington Northern Railroad, CSX Rail Transport, Kansas City Southern Line, Norfolk Southern Corporation, and the Union Pacific Railroad. The airports examined in the study include those that are classified as primary and commercial under the National Plan of Integrated Airport Systems.

2. Transportation Service Cost Model

The cost of transportation services is equal to the sum of capital costs and operating costs. Capital costs include facilities costs and equipment costs, whereas operating costs include facilities maintenance costs, equipment maintenance costs, transport costs, traffic costs, and general costs.

3. Cost Elements

The cost elements associated with different transportation modes include routes, terminals, and vehicles. A route is the path over which the carrier operates and includes the right of way (land area being used) plus any roadbed and tracks or other physical facilities that are needed on the right of way. Terminals are places where vehicles load and unload goods, make connections between points, make connections between routes within their own system and with other carriers, and where vehicles are dispatched. Vehicles serve as carrying units and are usually provided by the operator.

The costs associated with providing transportation services include fixed costs, variable costs, attributable costs, and non-attributable costs. Fixed costs do not vary with output. Variable costs depend upon volume of traffic. Attributable costs are related to vehicle characteristics, but are not functions of travel distances. Non-attributable costs are those costs that result from nontraffic related causes (such as weather, aging effects, etc.).

4. Cost Allocation Methods

The method of cost allocation is different for each mode of transportation. Thus, Chew [13] discusses four allocation methods—one for air, barge, truck, and rail.

Truck transportation costs are divided into attributable and non-attributable costs. Attributable costs are associated with vehicle weight, while non-attributable costs are associated with vehicle mileage. Cost components in truck transportation include federal, state, and truck operating costs. Other factors considered in the cost allocation model include: percent of attributable cost responsibilities for trucks, percent of interstate truck miles on the total highway system, percent of interstate highway bridges on total federal-aid highway system, percent of non-attributable cost responsibilities for trucks, percent of interstate vehicle miles on federal-aid highway system, percent of interstate vehicle miles on all road systems, and percent of trucking costs allocated per state. These factors are calculated and appropriately summed. The total cost is then determined and divided by the total ton-miles traveled per year to obtain the societal cost of transportation per ton-mile.

Barge transportation is divided into operating costs and capital costs as discussed above. The allocation factors separate the commercial navigation users' costs from that of other users. The true cost is determined by adding facilities costs, equipment costs, facilities maintenance costs, equipment maintenance costs, transport costs, traffic costs, and general costs.

The construction and maintenance of the railroads are the responsibility of the operators. The true cost is found in a similar manner as to that of barge transportation, except both operating costs and capital costs must be multiplied by the percent of track miles per state.

The cost responsibilities for airfreight are distributed to cargo carriers and combination carriers. The allocation factor is equal to the number of revenue ton-miles of freight divided by the number of total revenue ton-miles. The cost model for air transportation is equal to the capital costs plus the operating costs. Other factors in determining the costs are percent of freight revenue ton-miles over total revenue ton-miles, percent of aircraft activity per state, percent of carrier traffic at FAA facilities, and percent of freight activity per state.

5. True Allocation Costs

Chew [13] found the true costs for each mode of transportation in each of the five states. These are summarized in Table 2.1.

STATE	TRUCK	BARGE	RAIL	AIR
Alabama	$0.215/ ton-mile	$0.015/ ton-mile	$0.0115/ ton-mile	$1.813/ ton-mile
Arkansas	$0.177/ ton-mile	$0.015/ ton-mile	$0.0115/ ton-mile	$4.812/ ton-mile
Louisiana	$0.278/ ton-mile	$0.015/ ton-mile	$0.0115/ ton-mile	$1.785/ ton-mile
Mississippi	$0.183/ ton-mile	$0.015/ ton-mile	$0.0115/ ton-mile	$6.712/ ton-mile
Tennessee	$0.211/ ton-mile	$0.015/ ton-mile	$0.0115 /ton-mile	$1.367/ ton-mile

Table 2.1: True Transportation Costs of Transportation Modes

H. SOFTWARE ENGINEERING ASPECTS OF THE COMPUTER ASSISTED COST ASSESSMENT OF INTERMODAL TRANSPORTATION LINKAGES PROJECT

Software Engineering Aspects of the Computer Assisted Cost Assessment of Intermodal Transportation Linkages Project, a master's thesis by Lynn Moore [36], is directly related to Chew's [13] work. The two authors worked together on this project. Chew's [13] thesis discussed the methodology, while Moore's [36] thesis implemented Chew's [13] work in software. The software objectives are distance calculation, time of travel, total societal cost, and cost for each linkage of transportation.

1. Network Description

The network of analysis includes a five-state area. These states are Alabama, Arkansas, Mississippi, Louisiana, and Tennessee. The roadway network considers only interstate highways within the five-state region. The river systems in this analysis include the Lower Mississippi River, the McClellan-Kerr Arkansas River, the Black-Warrior Tombigee Rivers, the Tennessee River, and the Alabama-Coosa Rivers. The railroads considered are Burlington Northern Railroad, CSX Rail Transport, Kansas City Southern Line, Norfolk Southern Corporation, and the Union Pacific Railroad. The airports examined in the study include those that are classified as primary and commercial under the National Plan of Integrated Airport Systems.

2. CAITL Software

CAITL, Cost Assessment of Intermodal Transportation Linkages, software was written by Moore [36] in a Windows environment. It was developed in Microsoft Visual Basic. It was somewhat tied to MapInfo® [30], a commercial software program that serves as the graphical representation of the transportation network and as a tool for extracting distances between two cities or places. CAITL allows the user to determine both the societal and the published cost of the transportation modes. The software includes air, barge, truck, and rail as transportation modes. The goal of CAITL is to allow the user the option of combining and evaluating different combinations of transportation modes to determine the minimum cost of transportation between two cities.

CAITL utilizes two separate data files. The time constraints data file contains the time constraints associated with each mode of transportation. The file contains four fields.

These include transportation mode, time traveled per day, average velocity, and distance traveled per day. The user enters the time traveled per day and the average velocity. The program calculates the distance traveled per day. The transportation rates data file contains the published and societal cost data. The file contains an identification field and four numbers. The identification field is the name of the state and the word "published" for the published cost data. The numerical values correspond to the four transportation modes.

The author suggests that the distance calculation be performed by using MapInfo® [30]. The distance is then transferred manually by the user to the CAITL software. The cost calculation takes information from both data files and from the distance obtained.

3. Software Execution

The user is responsible for entering the percentage of travel to be performed in each state (Alabama, Arkansas, Louisiana, Mississippi, and Tennessee), the transportation mode, and the travel distance. The user is also responsible for entering whether he or she wishes to use single or multiple modes of transportation. If the user wishes to use more than one mode of transportation he or she simply does so by clicking on the add link button, which combines the old information entered before the add link button was clicked to the new information entered after the add link button was clicked.

The societal cost is calculated by retrieving the rate from the transportation rates data file and looping through the states until all the costs have been added to the societal cost. The internal cost calculation procedure multiplies the transportation rate times the weight of the commodity times the transportation distance times the state percentage. This is then added to a societal cost accumulator.

Once all the states have been considered, the published cost is then calculated. The published cost is calculated by retrieving the published cost rate and multiplying it by the distance traveled and the weight of the commodity.

The time is calculated from the time constraints data file associated with the specific mode of transportation. The program verifies that a time constant exists. If a constant exists the procedure adds to the time associated with the transportation mode.

A summary screen is presented to the user. It lists the distance traveled in miles, the time to travel in days, the published cost, and the societal cost.

I. Real-Time Routing of Shipments Considering Transfer Costs and Shipment Characteristics

Real-Time Routing of Shipments Considering Transfer Costs and Shipment Characteristics, a doctoral dissertation completed by Bonnie Boardman [8], discusses the development of a computerized decision support system that aids in selecting the best methods of transporting shipments from an origin to a destination. The support system allows the user to minimize the cost of transportation or to minimize the time of transportation. Boardman examines both the cost incurred when multiple modes of transportation are used and the type of commodity being shipped. The doctoral dissertation is an extension of earlier work by Moore [36] and utilizes the work by Chew [13] in its analysis.

1. General Description

The software uses the multiple node technique of modeling. An example of this type of modeling can be seen in Figure 2.1. Each city in the network is represented by more than one node. The city is represented once for each type of transportation that can enter the city. Routes are represented by links between nodes. The distance of the link is equal to either the transportation cost or the throughput time. Transfer costs are imposed if a link leaving one node designated as one type of transportation enters a node that is designated as another type of transportation.

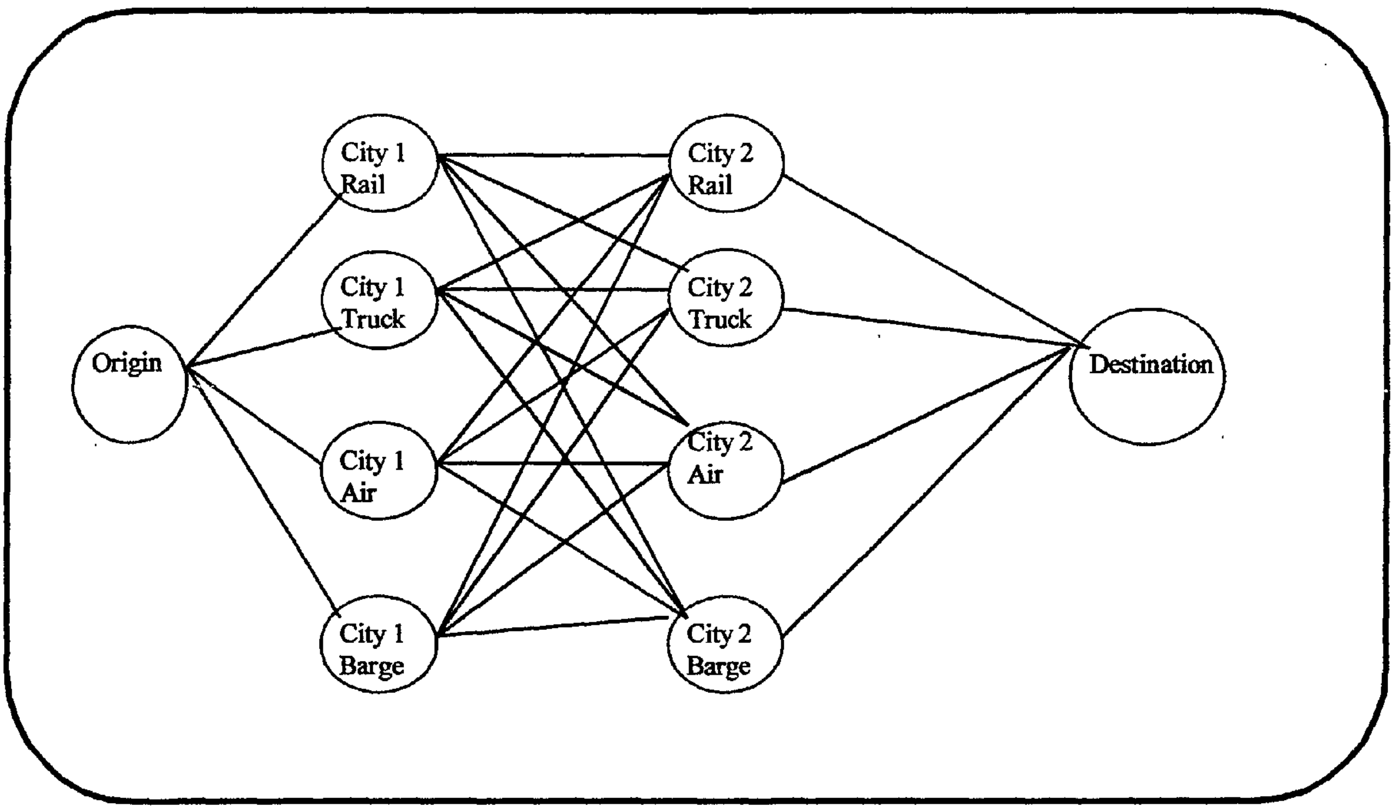

Figure 2.1: Multiple Node Method

Once costs are determined, the least-cost path is calculated by using the double-sweep method. This method examines a number of nodes that each have a vector with estimates of the K-shortest path lengths from a source node. The double-sweep method reduces the estimates until the optimum vector is obtained. Each iteration of the double-sweep method consists of a forward pass and a backward pass. The forward pass examines the nodes in increasing numerical order while the backward pass examines the nodes in decreasing numerical order.

2. Network Description

Each city in the network is represented by one node for each mode of transportation that is available. In addition, each city is represented by a starting node and an ending node. The starting node is the node in which the double-sweep method will begin while the ending node is the node in which the method will end. The arc lengths entering and leaving these nodes are all zero.

The cities included in this research are Atlanta, Georgia; Fort Worth, Texas; Memphis, Tennessee; Mobile, Alabama; and New Orleans, Louisiana. The cities were selected to take advantage of the research that Chew [13] has done and to include multiple modes of transportation. The modes of transportation include truck, barge, air, and rail. The combination of cities and modes of transportation results in a network of 26 nodes and 200 arcs.

3. The Decision Support System

The decision support system consists of four components. They include: a database, the K-shortest path model, the user, and a user interface. These components interact with one another. The database, created in Microsoft Access, contains all of the data that the model needs to base its decisions. The K-shortest path algorithm was written in Microsoft Visual Basic. The interface is also written in Microsoft Visual Basic. The interface prompts the user for inputs, controls the database and k-shortest path interactions and reports them back to the user.

The software has the ability to process up to 1000 nodes and 5000 arcs. The user interface allows the user to specify the number of nodes, the number of arcs, the number of shortest paths, the weight of the shipments, the source node, and the destination node.

The database can be easily updated by the user through use of the user interface. The database consists of an arcs array that describes all the arcs in the network. This array is used to calculate the transportation time or transportation cost. The input array is used to store information provided by the user. The nodes array matches each node number with its city and transportation mode. The xfer array includes transfer costs and times for transferring a shipment from one mode of transportation to another mode. The numbers are used in the calculation of the arc lengths. The rates array gives the transportation cost and travel speed for each mode of transportation. The rates used in this array are from Chew's work [13]. The trace array is where the results of the k-shortest path algorithm are stored.

The database also includes queries. A query is a set of instructions that are used to pick certain records out of a database array. The Getxfer query is used when the user wants to edit transfer costs or times. The NodeNF and NodeNS queries are used to find node numbers that match the city and mode entered by the user.

4. System Operation

The user of the decision support system will enter the origin, destination, weight of the shipment, and objective (to minimize cost or time). The system will then display the k alternatives that best meet the objectives for the origin-destination pair. The alternatives are listed in order of increasing cost or increasing time. The user will then compare the alternatives to his or her shipment's requirements (such as service level, commodity type, etc.) and choose the alternative that best meets the shipments characteristics.

J. Previous Work in Waterway Transportation Assessment

This section describes previous work in the assessment of the feasibility of waterway transportation. Some of the issues and problems encountered in establishing waterway transportation systems are addressed, and various cost rate comparisons are made.

1. Container Transport by Inland Waterways

The Ports and Waterways Institute [48] performed a cost analysis of container transportation on the Mississippi River Valley, with an emphasis on the Port of New Orleans. The study evaluated economic and operational factors of container-on-barge operations. A costing analysis was conducted to determine the competitive position of various inland areas with respect to routing cargo through various coastal ports. Combining cost information and data on general cargo flow, estimates of market size at major inland cities were made.

a. Cost Differentials

The focus of concern of this study is the Port of New Orleans. The study's focus is to ascertain if a successful container-on-barge service can be implemented in New Orleans. In order to do this, researchers examined the cost differentials between New Orleans and competing ports. The inland/water transportation costs between the inland cities (domestic ports) and world trade ports through the Port of New Orleans were compared to those with routings through other U.S. ports.

The cost differentials are shown in Table 2.2. The negative numbers indicate that containers can be moved to and from the city at a cost per box lower than the cost to move the box through New Orleans. The study indicates that New Orleans has a relative cost advantage over some cities, such as Memphis, in cost differentials of land/water freight. This is also true for the cities of St. Louis, Omaha, Peoria, and Kansas City. However, other U.S. cities such as Cincinnati, Louisville, and Chattanooga have relative advantages over New Orleans. This means that in order to divert volumes of containers using these cities, New Orleans would have to offer substantial savings, some exceeding $200 per box. Unless New Orleans can offer very low rates for low value/neobulk commodities, the competitive advantage of the port over Mid-Western cities seems very weak. This means that it is almost definite that no containers will be diverted from the Mid-Western cities to New Orleans.

b. Market Agents

Opinions of the viability of container-on-barge service vary depending upon the market agent involved. Steamship lines seem very skeptical about the service because they feel transit times are too long and too variable, even considering the potential cost savings. Towing companies are enthusiastic about container-on-barge, however, the consensus attitude is hesitant in accepting responsibility for cargo damage and line-haul costs. Port and terminal operators are concerned about the loading and unloading of containers, along with availability and supply of chassis. These operators quote loading and unloading fees from $100 at coastal ports to $75 at inland ports, indicating that traditional methods of loading and unloading would not be feasible for container-on-barge cost savings.

Port	St.Thomas	Kingston	Santo	Callao	Rotterdam	Leghorn	Singapore	Wellington	Dakar	Durban
Domestic Port										
St. Paul	68	24	-20	48	-66	-68	-94	82	-48	2
Chicago	68	24	-20	48	-66	-68	-94	82	-48	2
Peoria	100	78	50	110	35	34	-10	98	48	77
St. Louis	110	88	60	120	44	42	-2	106	56	84
Cincinnati	-54	-82	-112	-50	-146	-128	-176	-64	-116	-88
Louisville	46	18	-10	50	-46	-48	-74	36	-28	14
Omaha	0	2	22	18	50	54	-6	68	38	88
Kansas City	30	32	52	48	74	84	44	68	68	118
Chattanooga	-54	-82	-110	-50	-124	-124	-172	-64	-114	-86
Memphis	136	108	80	140	66	66	18	126	76	104

Table 2.2: Cost Differentials

c. Container-on-barge Costs

Most barge transportation is provided in mixed tows, consisting of barges owned by towing companies. However, operators will move barges for other companies on a regular basis or will move third-party barges on demand. Towing charges in this study reflect tariffs, tow costs developed by the Ports and Waterways Institute, tow operator interviews, and rate quotations. Costs also reflect general towing as opposed to dedicated towing.

This study used tariffs published by the Waterway Freight Bureau and the Ohio River Company Local Freight Tariff, neither varies by direction. The tariff rates in dollars per mile for loaded and empty barges, minimum shipment sizes, and point-to-point for iron, steel, and scrap were reported. The rates for St. Paul, Chicago, St. Louis, Cincinnati, Memphis, and Houston en route to New Orleans were reported. The rates for loaded barges (in dollars per barge-mile) ranged from \$5.95 at Memphis-New Orleans to \$9.67 at Houston-New Orleans. Empty barges ranged from \$5.13 at Memphis-New Orleans to \$7.34 at Houston-New Orleans. These rates, however, are no longer considered applicable due to regulatory charges.

Estimated towing charges and tariff barge rates per mile at the previous listed cities were also cited. The estimated towing costs (in dollars per barge-mile) for a round trip ranged between \$5.72 at Memphis-New Orleans to \$12.12 at Houston-New Orleans. Round trip tariff towing costs ranged from \$11.08 at Memphis-New Orleans to \$17.01 at Houston-New Orleans.

Interviews indicate that towing rates vary by river segment and depend on tow size, direction, and speed. Towing rates can be quoted in mils per ton-mile, dollars per barge-mile, dollars per ton, or flat rates. Rates differ for empty and loaded barges. Generally, empty barges are handled at 70 to 80 percent of loaded barge rates. Weight can be a variable cost depending upon the waterway, but most charge a flat rate independent of weight. Flat rates are quoted in terms of hourly towing rates. Interviewees also stated that tariff rates were insignificant or unrealistically high.

Because of this, the study developed another rate structure based on quotations. These rates are based on a 195' x 35' jumbo barge. However, it is noted that barges with a length of 200 to 250 feet would have rates that are 50 percent higher, and barges exceeding 250 feet would be 200 percent higher. These rates range from 2.0 mils per ton-mile on the Lower Mississippi to 58.5 mils per ton-mile on the Omaha-Sioux City River segment for a loaded barge going down river. For a loaded barge going up river, the rates range from 3.0 mils per ton-mile on the Lower Mississippi to 88.9 mils per ton-mile on the Omaha-Sioux City River segment.

For empty barges traveling down river, the range is $2.25 (dollars per barge-mile) on the Lower Mississippi to $11.75 on the Omaha-Sioux City River segment. Up river, the rate for an empty barge ranges from $2.50 (dollars per barge-mile) on the Lower Mississippi to $11.75 (dollars per barge-mile) on the Omaha-Sioux City River segment.

Average linehaul towing costs per container, determined by the number of boxes loaded on each barge, were computed for full capacity (72 containers), three-quarter capacity (54 containers), and half capacity (36 containers). The rates for St. Paul, Chicago, St. Louis, Cincinnati, Memphis, and Houston en route to New Orleans were reported. The rates for full capacity ranged from $139 per box at St. Paul-New Orleans to $42 per box at Memphis-New Orleans. Three-quarter and half-capacity resulted in increased costs per box, with the highest cost being St. Paul-New Orleans and the lowest Memphis-New Orleans.

d. Comparative Rates

Intermodal rates are usually quoted including loading, unloading, and line-haul charges. Most modes of transportation quote their rates in dollars per box. Therefore, the figures represented earlier were converted to dollars per box so that the numbers can be compared. To compare container-on-barge, loading and unloading costs must be added to the line-haul costs. Unfortunately, terminal costs are variable depending upon labor rates, rules, and productivity. The study, therefore, increased the linehaul costs to reflect three levels of container loading and unloading costs (low, moderate, and high).

The container-on-barge costs were then compared to three levels of rail intermodal rates (retail rates from circulars, volume incentive mini-bridge and micro-bridge rates, and estimated double-stack rates). Container-on-barge costs were subtracted from the rail rates to indicate the advantage of water over rail. The numbers indicate that substantial savings are obtained using barges loaded to at least half capacity from distant interior points (St. Paul and Cincinnati).

However, since these points are distant, travel times increase and it is possible that inventory costs will be incurred. If inventory costs are above $10 (per box) per day, the savings are negated. Also, volume of containerized cargo between these cities and New Orleans is very limited and would not be sufficient to support a container-on-barge service. As the number of boxes per barge expand, cities closer to New Orleans, such as Chicago and St. Louis, experience substantial savings over rail.

e. Costs of Dedicated Towing

Dedicated towing provides a higher level of service quality and tighter scheduling when compared to general towing. With dedicated towing it is possible to use higher speeds because larger towboats can be used. However, there are still speed restrictions on the waterways to which the dedicated tow must adhere. This study developed costs for dedicated towing for two routes: Memphis-New Orleans and Houston-New Orleans. For a full capacity (288 boxes) dedicated tow between Memphis and New Orleans with a 1,000 horsepower towboat, linehaul costs per box are $59.89. If the horsepower is increased to 3,000, the cost per box is $92.50. The costs are based on a two-barge tow using one trip per week and a new boat. Using a used towboat decreases costs. As capacity decreases and trips per week are increased, the cost per box are considerably higher. The linehaul costs per box between Houston and New Orleans for full capacity (72 boxes per barge) using a two barge tow and a 1,000 horsepower towboat is $58.00 per box. A set of three barges at full capacity and a 1,000 horsepower towboat is $70.00 per box. The higher prices could be justified if volume is sufficient to need multiple barges of containers in one tow.

f. Additional Costs and Break-even Analysis

The costs above do not include inventory and overhead costs. Taking overhead into consideration (using an estimate from one port service), the cost is $6,000 per week, assuming a manager, a port captain, an assistant, and clerical officials. Adding these costs to other operating costs, this study computed the number of boxes required per week minus $110 per box (in order to attract customers). The rates for St. Paul, Chicago, St.

Louis, Cincinnati, Memphis, and Houston en route to New Orleans were reported. The range of boxes is between 35 boxes at St. Paul-New Orleans to 101 at Houston-New Orleans.

The costs also do not include the time value of the cargo. To include this, the study computed the break-even number of boxes using a $10 and $20 carrying costs (per box). At $10 per box the range is from 52 boxes per week at St. Paul-New Orleans to 118 boxes per week at Houston-New Orleans. At this cost, Chicago-New Orleans is not feasible. At $20 per box the range is 120 at Cincinnati-New Orleans to 142 at Houston-New Orleans. St. Paul, Chicago, St. Louis, and Memphis are not feasible using this cost. At $30 per box, none of the cities are feasible. These break-even numbers are based on low terminal costs.

g. Study Conclusions

The study indicates that container-on-barge is economically feasible if sufficient volume is obtained. The volume is dependent on the distance between ports with the requirements decreasing as the distance increases. However, with increasing distance, the service becomes unsuitable because of transit times and closure of the river segments during wintry conditions. Although the numbers indicate that the quantity of containers to break-even is relatively small, they are substantial when comparing them to current volumes of containerized material moving by truck or rail. It is appropriate to say that volume would have to be diverted from other modes of transportation to obtain a successful service. Also, due to the variable costs of labor and the fixed costs associated with container-on-barge services, the service is considered somewhat speculative, unless commitments from shippers and steamship lines are obtained.

2. Inland Waterways and Intermodalism

The Arkansas Basin Development Association [53] performed an evaluation of a successful container operation in the United States that could be used as a model for a similar operation on the Arkansas River. The Columbia-Snake River, the only successful container handling service in the United States, was examined.

a. Literature Review

As a portion of the study, a literature review was completed, detailing the projections of intermodal usage. Projections indicate that between 64 and 69 percent of shippers expect truckload motor carriers to provide intermodal service within the next three to six years. The shippers also indicate that a growth of about 12 percent in intermodal transportation usage is expected in the next six years. For the waterways, this is good news if, in fact, truckload carriers utilize waterways as one of the linking modes. However, the new partnerships between rail and truck companies seem to indicate that the waterways may be left out of this intermodal growth rate.

Indications, however, could prove to be wrong. The increase in intermodal transportation strictly between rail and truck is causing problems. The terminals are becoming more congested because of the increased demand. In addition, wear on the roads created by trucks trying to reach the terminals has created the need to build new terminals. This may mean an increase in costs for shippers using truck/rail intermodal transportation.

b. Columbia-Snake River System

The Columbia-Snake River System is the only successful container handling service in the United States. The study researchers interviewed port personnel on the river system, who said that a key to their successful operation was the participation of a deep-water port. For the Columbia-Snake River System this port is the Port of Portland. Personnel also indicated that including a ship line as part of the service is a good idea. The other thing that is essential is an anchor industry that will commit to moving large shipments on a regular basis.

Researchers also interviewed personnel at ELCO Freight International, Inc. They stressed that their main concerns include the length of time it takes their containers to reach its destination and return to its origin and the one way traffic that might exist if people are not working at the inbound and outbound ends. One way that researchers felt that both of these could be prevented is by setting up container pools.

c. Required Equipment

Deep-water ports and terminals require bigger, more expensive equipment to handle cargo than inland ports and terminals. The reason for this is the increased size of the vessels. Cranes required to move equipment are typically rail mounted and electrically operated, many dependent on shuttle trucks to move containers to loading areas.

Inland ports and terminals require a fixed or mobile crane with a capacity of at least 25 tons. Usually a forklift or crane is used to unload trucks. Forklifts are also used to pick up containers. This requires a container attachment. Container pools and chassis are also required at these terminals.

d. The McClellan-Kerr System and Oklahoma Transportation

This study details the importance of the recent mergers of the railways to the water system. It states that waterway transportation may be the only means of keeping a competitive check on the rail rates. However, it may be possible that the McClellan-Kerr System cannot remain operational if volumes do not increase. Due to federal budget constraints, this river segment may be abandoned due to the low volume that it transports. For this reason, it is important to try and raise the levels of transportation on this river.

e. Interviews with Container Operators

The study team interviewed individuals, asking them why they do not currently use the river as a means of transportation. The reasons include the following:

- It is too slow.
- No service offers scheduled services.
- No substantial customer has provided enough volume to justify a container service.
- There is little knowledge of the river system and container services.

3. Intermodal Freight Afloat

A similar study in 1977 [58] also evaluated the Arkansas River. It focused on the potential of a container-on-barge service from Catoosa, Oklahoma to Little Rock, Arkansas and from Catoosa, Oklahoma to New Orleans, Louisiana. The results of this study indicate that container-on-barge service is feasible when a savings of 20-25% over truck and rail throughput charges is obtained. The study determined that refrigerated cargo was too time sensitive to travel by barge. On an international level, the study revealed that there is enough containerized cargo moving from the Arkansas River to Northern Europe to develop an open water container-on-barge service.

4. Maritime System of the Americas: River/Ocean Operation

Another study by the Ports and Waterways Commission [38] evaluated the feasibility of river and ocean vessels carrying bulk shipments between the central portions of the United States to portions of Mexico, Central America, the Caribbean countries, and the northern rim of South America. The study compares the costs of these alternatives to that of rail unit trains. The focus of this study is the trade between United States River ports and Mexican Gulf ports. Specifically, the study looks at the Mississippi River/Great Lakes waterways and the Alabama/Tombigee river system.

a. Trade Flow

The United States-Mexico exports consist of grains, steel products, automotive parts, transportation vehicles and equipment, heavy equipment, consumer goods, farm equipment and supplies, dairy products, petrochemicals, coal, paper products, steel scrap, and waste paper. Currently, a majority of these exports are transported by truck and rail. The potential for competitive rates when compared to rail rates does not exist throughout all of Mexico. As a result, this study only focused on the areas that might be competitive. These are the ports of Altamira, Tampico, Tuxpan, Veracruz, and Cosatzacoalos.

Mexico-United States exports consist of food and live animals, beverages and tobacco, crude materials, mineral fuels, animal and vegetable oils, chemicals, machinery, and other manufacturing equipment. A large percentage of these are being shipped by water. The items that are utilizing truck and rail do so because of the relatively small lots that are shipped.

b. Vessel Technologies and Costs

Research was performed on five principal maritime systems. These include coastal, transshipment, Float on/Float off small river barges, Lift on/Lift off small river barges, and River/Ocean Vessels. Results indicate that the most cost effective for shallow and protected water is the large river tow. However, for deep-sea transport, the 50,000-dwt (tons deadweight) foreign flag bulker is the most effective vessel. Consequently, a combination of river barges and the flag bulker (called the transshipment system) was analyzed for bulk cargo. The coastal system has similar costs to that of the transshipment system for the Inland Waterways. This system is also analyzed in detail. The River/Ocean vessel system is analyzed for general cargo.

The freight rates quoted for river barge shipment are specific to the river segment being traveled. Components of the rates include towing of full barge ($/ ton), towing of empty barges ($/ mile), and use of the barge ($/ day). The rates range from $0.80 ($/segment) at Port Allen-Morgan City (a distance of 65 miles) to $7.01 ($/segment) at Morgan City-Brownsville (a distance of 575 miles). This rate is for a two-way trip and also reflects the length of the river segment. In other words, it is expected to cost more for longer distances than shorter ones. In order to arrive at the total cost from origin to destination, the costs for each segment must be added according to the selected route. Rates analyzed are only for the Inland waterways, not the Coastal system. This is because there are no published rates for this system. However, it assumed that the Gulf segments would be about twice the inland rates.

The transshipment system rates are quoted for bulk cargo. The market rate is about $15 per ton-mile. This rate is an average, however, because the rates are extremely unstable.

The river/ocean system used to carry general cargo requires frequently scheduled services. The costs for this system are calculated using a theoretical model. These services include a large amount of overhead cost. The study estimated about $1 million per year. The total freight rate for a short service is $47 per ton-mile and for a longer service $68 per ton-mile.

c. *Comparison to Rail Rates and Truck Rates*

There are no published rail rates for trips from the United States to Mexico or vice versa. Rates are billed on domestic rates to the border and then re-billed to destinations to Mexico. However, there is no data available for the Mexican rates. United States rates include fixed costs and variable costs. Costs are also dependent on the type of commodity being shipped. For example, grain would be $4.00 per ton plus $0.015 per ton-mile. Mexican rates are generally higher on a distance unit basis (obtained from U.S. rail services). Grain in Mexico would cost $2.54 per ton plus $0.021 per ton-mile. However, the rates for the U.S. and for Mexico do not include a discount for high volume traffic.

This discount varies with the rail service being utilized. Transit times range from 7 to 33 days.

Trucking rates were found to vary by direction. Rates from Mexico-United States are generally lower than those from the United States-Mexico. For a round trip, the rates range from $1.44 per mile to $2.41 per mile for a truckload of goods. These rates exclude border-crossing fees, which depend on the location where the truck crosses the border. Transit times range from 4 to 15 days.

d. Results

The cost advantages for bulk cargo favor the use of water for transportation. However, river services across the Gulf of Mexico do not appear to be competitive. The major factor that will influence the feasibility of bulk commodities is the demand for United States commodities by Mexico. A market also exists for general cargo transported by river/ocean vessels. However, the lower the value of the cargo, the lower the river/ocean services in terms of competition, specifically as distance increases.

An advantage that river/ocean presents over the other means of water transportation is that it must only capture a small portion of the market of general cargo. Weekly service would necessitate 150,000 to 180,000 tons per year to sustain the service. This study indicates that river/ocean services are not viable for the Ohio River Segments. This river/ocean vessel is most cost effective on the Lower Mississippi River segment.

5. Other Relevant Literature

The economic impact of ports was estimated by Ryan [52]. The study focused on Louisiana. In 1994, total economic impact in direct spending was $21.9 billion. The ports and industries generated a total of $3.8 billion in total income for residents of Louisiana and 178,581 jobs. These numbers indicate positive results from obtaining a successful and active maritime industry. These numbers alone indicate the reasons why establishing such activity, as consistent with Louisiana ports, is attractive to other United States ports and waterways.

The Maritime Cargo Transportation Conference [31] study intended to provide a method of economic comparison of break-bulk, container, and pallet systems. This study did not compare different modes of transportation. It did provide different comparisons for truck linehauls and rail linehauls. The results of this study indicated that break-bulk systems cost more than unit load systems, pallet systems cost more than container systems, and twenty-foot container systems cost more than forty foot container systems.

In 1962, a study by Grunthener [19] discussed barge transportation on the Mississippi River System. He listed the commodities that were currently being shipped on the river. These included coal, petroleum, sand and gravel, grain, iron and steel, chemicals, seashells, limestone, sulfur, cement, iron ore, and nonmetallic commodities. At this time more than 62 billion total ton-miles were utilizing barge transportation. His work discussed the need to improve the waterways and the current transportation network if more utilization was going to occur.

Butler, Malstrom, Kasilingham, Raja, and Moore [35] performed an analysis to determine the societal cost of different transportation modes between specified origins and destinations. Cullom's [15] work involved simulating the Arkansas and McClellan River segments. Her computer simulation was used to find the capacity of the river segments along with the problems that would be associated with increased traffic on the river segments.

Mooney [34] discussed the competition between rail and barge on the Mississippi River. This study focused on the effect that regulation would have on rail and barge competition. Analyzing the barge industry alone indicates that barges are relatively cheaper than rail. The impact on regulation shows a high degree of non-competitiveness within the barge industry and between rail and barge. This study suggested that a reduction in rail rates would be the greatest where the barge traffic was the greatest.

Antle [2] described the demand for water transportation for differing commodities on the Ohio River and Arkansas River areas. This analysis included barge transportation, rail transportation, pipeline, highway transportation, and air transportation. The modes of transportation were treated separately and no reference to intermodal transportation was made.

Muller [37] and Mahoney [27] discuss the use of inland and coastal waterways in intermodal transportation. Muller [37] reveals that nearly 1,037 million tons of bulk cargo was transported on the waterways. Commodities represented in this number include petroleum, coal, logs and lumber, grains, chemicals, iron, and steel. Mahoney [27] indicates that barge lines are constantly facing competition from the railways. Many barge lines accuse rails of lowering rates to give shippers an incentive to avoid the use of waterway transportation.

Several studies have been performed on truck-barge transportation dealing with specific regions of the United States, specific commodities, or a combination of the two. Koo [24] researched the shipment patterns of wheat and barley in Montana comparing rail and truck-barge structures. Coyle [14] examined truck-barge and rail competition of grain for North Central Idaho. Casavant [12] analyzed grain transportation utilizing truck-barge transportation in the Pacific Northwest. Washington State University performed a study of the Pacific Northwest truck-barge transportation of wheat [1].

K. SUMMARY

This chapter has discussed related literature dealing with barge transportation, transportation costs, intermodal transportation, intermodal transfer costs, competition in the transportation industry, and recent trends in the transportation industry. It is evident that research has been performed on the subject of waterway transportation, but only as a single mode of transportation. None of the previously mentioned literature has examined the feasibility of strictly truck-barge transportation systems. Although some research has been performed dealing with competition between railways and waterways, none have included projections for future rail mergers and consolidations or competition between rail and truck-barge transportation.

A method of analysis to assess the cost feasibility and network definition of truck-barge transportation is the subject of the chapter that follows.

III. Method of Analysis

A. Network Definition

The Inland Waterway System of the United States is an immense network consisting of 170 major ports that span a distance of 25,543 miles [5]. The western part of the United States is currently being served by an operational and successful barge transportation system on the Columbia-Snake River, thus, it is not a candidate for this Truck-Barge Feasibility Study. As a result, the focus of this study concentrates on the Mississippi River System, the Gulf Coast, and international shipments to Mexico. For purposes of analysis, the Mississippi River System shall refer to the network of rivers consisting of the following : the Arkansas River, the Alabama River, the Ohio River, the Illinois River, and the Missouri River.

Due to the extreme number of ports and cities included in the analysis regions, it is necessary to define the network on a skeletal basis. The number of cities being analyzed is limited for manageability purposes. The number is also limited by software capabilities. In this feasibility study, Boardman's [8] software is utilized to determine what portions of the network are feasible. The software is limited in the number of cities it is capable of processing. The actual number is between ten and fifteen cities. When choosing the cities to examine, the accessibility to intermodal transportation was considered. Each port studied has terminals with intermodal facilities. Cities chosen also represent ports within potentially high volume areas of containerized freight. Cities chosen also reflect suggestions from port and waterway officials who are aiding in the study.

The entire domestic network is shown in Figure 3.1. However, the network is defined by the cities chosen for investigation. The skeletal network is discussed in the following subsections. The ports are discussed separately.

The Great Lakes/St. Lawrence River serves as the link to the Atlantic Ocean. Shipments travel up through the Mississippi River, through the Great Lakes and towards open water via the St. Lawerence River. This waterway portion is not analyzed in this study. This is because the throughput time to travel this distance would be so great that it would negate all cost savings. The same reasoning holds true for shipments from the midwest to the west coast and from the midwest to the east coast. Shipments flowing down the Mississippi River, through the Gulf of Mexico and the Panama Canal, towards the Pacific Ocean will also require substantial throughput time. The inventory and carrying costs in such a lengthy haul would negate the cost savings. Thus, this waterway condition is not evaluated.

Figure 3.1: Network of Analysis

1. Midwestern States

a. Mississippi River

The Mississippi River flows from Minneapolis, Minnesota, and along the borders of Iowa, Illinois, Missouri, Arkansas, Tennessee, Mississippi, Louisiana, and into the Gulf of Mexico. The river is approximately 2,348 miles long. The total navigable river distance in the river system is 16,100 miles. A system of storage reservoirs near the headwaters of the Mississippi and a series of flood-control dams along the river and its tributaries help maintain a relatively even flow of water throughout the year.

The principal cities on the river are Minneapolis, Saint Paul, La Crosse, Dubuque, Davenport, Keokuk, Quincy, Hannibal, Saint Louis, Memphis, Vicksburg, Baton Rouge, and New Orleans. Not all of these cities are included in this feasibility analysis for the reasons discussed above. The major cities included in this analysis are New Orleans, Memphis, St. Louis, and St. Paul.

b. Missouri River

The Missouri River is 2,466 miles long, flowing along the border of Nebraska and Kansas, and through the states of Montana, South Dakota, North Dakota, and Missouri before it converges with the Mississippi River near St. Louis. The chief cities on the river are Bismarck, Sioux City, Omaha, Council Bluffs, Saint Joseph, Atchison, Leavenworth, and Kansas City. The city of analysis for this study is Omaha.

c. *The Illinois River*

The Illinois River flows throughout the state of Illinois beginning at Chicago.

The river converges with the Mississippi River near St. Louis. The river is 423 miles long. The major city analyzed along this river is Chicago.

2. Northeastern States: The Ohio River

The main river of the northeast is the Ohio River. It is approximately 981 miles long. The Ohio River flows along the borders of Kentucky, Indiana, and Ohio, and through the states of Pennsylvania and West Virginia. Among the cities on the Ohio are Pittsburgh, Pennsylvania; Cincinnati, Ohio; Evansville, Indiana; Wheeling, West Virginia; and Louisville, Kentucky. The Ohio River is navigable throughout its course. Pittsburgh and Cincinnati are the cities of analysis along this river.

3. Southeastern States: The Alabama River

The Alabama River flows along the border of Alabama and up into the state. It is more than 310 miles long and is navigable for its entire length. The major city of Mobile is considered in this analysis.

4. Southern States: The Arkansas River

The Arkansas River flows through Arkansas, Oklahoma, Colorado, and Kansas. The river flows a distance of 1450 miles through the two states. Major ports are located at Pine Bluff, Little Rock, Fort Smith, Muskogee, and Catoosa. Along the two state span of Arkansas and Oklahoma are seventeen locks. The navigation system is referred to as the McClellan-Kerr Arkansas River Navigation System. The Arkansas River Navigation System, completed in the early 1970s, made the river navigable to Tulsa, Oklahoma. This analysis considers Little Rock, Arkansas.

5. Gulf Of Mexico

The outlet to the Gulf of Mexico is the Mississippi River. The river flows to New Orleans, which is the exit to the Gulf of Mexico and the entrance into the United States. This outlet will provide access to parts of Mexico. This provides United States shippers with an opportunity to ship by barge to portions of Mexico and Central America. The cities along the Coast that will be included in the study are Houston and Brownsville.

6. International Shipments

To represent the international shipments to Mexico, an international port is analyzed. Representing Mexico and Central America is Veracruz, Mexico.

Table 3.1 lists the cities that will be included in this feasibility study, the area of the country it is located in, and the river on which it is located.

City Name	Area of Location	River
Brownsville	Gulf Coast	Gulf Coast
Chicago	Midwest	Illinois
Cincinnati	Northeast	Ohio
Houston	Gulf Coast	Gulf Coast
Little Rock	South	Arkansas
Memphis	Midwest	Mississippi
Mobile	Southeast	Alabama
New Orleans	South	Mississippi
Omaha	Midwest	Missouri
Pittsburgh	Northeast	Ohio
St. Louis	Midwest	Mississippi
St. Paul	Midwest	Mississippi
Veracruz	Mexico/Central America	Ocean

Table 3.1: Cities of Analysis

B. Vessel Type

The type of barge used in this analysis is a standard river barge. River vessels are capable of navigating both the inland waterways and an extended area along the East Coast of Mexico. This type of barge, however, can not be used for ocean going travel. For these purposes, a river/ocean vessel could be used. The most common of the standard river barges is the jumbo barge. These have dimensions of 195 x 35 x 9 x 12 (length, beam, draft, depth) and a capacity of 1500 tons [25]. The jumbo barge can be covered or open-top. Typical tow sizes for jumbo barges are thirty barges on the river segment of the Mississippi River below St. Louis; fifteen on the Ohio and upper Mississippi River; and six barges along the Gulf Coast [25]. The horsepower of the towboat is 8,000 HP to 10,000 HP for tows greater than thirty, 4,000 HP for fifteen barge tows, and 2,000 HP for the six-barge tow [25].

River/Ocean vessels are not currently in use in the United States. However, they have been used in the past and are currently used in other countries. These vessels are suitable for open-water navigation and for navigation on the Inland Waterways. River/Ocean vessels are somewhat faster than standard river barges and hold about the same capacity as the standard river barge. They are often more expensive than standard barges and more difficult to maintain. This is because they are built for both the river and ocean travel and because the vessels house on-board cranes.

C. Commodity Types

It is evident that truck-barge transportation will not be appropriate for all types of commodities. It is necessary to identify commodities that are non-time sensitive due to the increased throughput time associated with barge transportation. These items include bulk commodities; heavy commodities, such as machinery; and commodities suitable for containerization, including those that are currently utilizing truck-rail containerization. Appropriate commodities will be high volume and presumably low value.

Possible candidates also include those commodities being shipped from the United States to Mexico or commodities being shipped from Mexico to the United States. Current commodities being transported to Mexico by rail or by truck are subject to unfavorable road conditions and high theft rates along the Mexican roads and train tracks. Shipment of commodities by barge can bypass both of these circumstances.

D. DATA REQUIREMENTS

For an accurate analysis, data of various types is required. This information helps to provide an accurate assessment of the feasibility of truck-barge intermodal transportation. The requirements discussed below include: (1) distances, (2) costs, (3) transfer locations, (4) necessary equipment, (5) seasonal information, (6) throughput times, and (7) detachable container details.

1. Distance

One of the most easily attainable data requirements is the distance between cities. This can be obtained by any Atlas or by using any one of several computer programs. For the network that is chosen, it is necessary to determine where the transfer between barge and truck will be made. Therefore, it is necessary to find the distance by water and the distance by land. The rail distances between cities are also needed.

2. Costs

Several costs make up the total cost for a single shipment. For barges, costs include towing costs, unloading/loading costs, staffing costs, fuel costs, linehaul costs, service costs, insurance costs, repair costs, and overhead costs are required. These costs can be added and then divided by the number of containers to obtain a cost per container. These costs vary by river segment and by type of vessel used. At some ports it will be necessary to add the additional cost of storing or warehousing. This information can be obtained by interviewing port authorities, barge and tow operators; from previous research, or from statistical references.

A published pamphlet from the Arkansas Waterway Commission [3] lists the costs per ton-mile (a ton of cargo moved one mile) for barge, rail and truck. These costs are listed in Table 3.2.

Mode of Transportation	Cost per Ton-Mile
Barge	0.97¢
Rail	2.53¢
Truck	5.35¢

Table 3.2: Cost Comparison for Different Modes of Transportation

However, the barge rate listed does not include the cost of intermodal transportation. To arrive at this figure, it would be necessary to add transfer costs. These figures were developed by the US Army Corps of Engineers, published by the Arkansas Waterways Commission [3] and are for general cargo. These rates are used in developing an average rate for the analysis.

For trucks, costs include fuel costs, repair costs, manning costs, overhead costs, service costs, and unloading/loading costs. These costs, again, can be added and divided by the number of containers to obtain cost per container. These costs vary by the weight of the load and the distance traveled. This information can be attained by interviewing transportation providers, from previous research, or from statistical references.

For intermodal transportation, transfer costs need to be assessed. These costs can be fixed or variable. They may depend upon the transfer point and the modes of transportation utilized. The use of detachable trailers will require the use of cranes at transfer points.

Most costs listed in the literature do not have consistent units. Some are reported in dollars per box, some in dollars per ton-mile, some in mils. This presents a problem when trying to compare the figures from one research report to another. An attempt will be made to standardize the units in cost reporting. Boardman's [8] software requires costs in dollars per ton-mile. However, since this study focuses on container shipments, units of dollar per container-mile will be used for rates. The total cost will be reported in dollars for the entire shipment.

3. Transfer Locations

For a place to be considered a transfer location, it must have access to both barge and truck transportation. Most ports will be accessible by both means of transportation, but it is possible that some of the ports will not have the proper means to handle container transfers. Available transfer points can be determined by examining the ports at the various cities used in the network analysis. If a port does not have access to both truck and barge, the cost of developing such access can be determined.

4. Necessary Equipment

The equipment, such as forklifts, cranes, etc., will vary depending upon the type of vessel used and the method of loading the vessel. If detachable trailer containers are used, specialized cranes will be required to load the containers onto the barge. By examining the current methods railways use, equipment required for loading detachable trailer chassis can be assessed. Vessel size, along with the weight of the shipment, dictates the type of crane that will be necessary. The crane reach will need to exceed the width of the barge so positioning of the containers on the far side of the barge is possible.

Most ports are currently equipped with cranes and other specialized equipment. It is necessary to analyze the ports to determine the equipment capabilities. It is possible that no new equipment will have to be purchased to load/unload the trailer containers and chassis from the barges. Other ports without specialized equipment may need to purchase equipment so that they can appropriately and efficiently handle the containers. If equipment must be purchased, the cost of purchase will be added to the total cost and transportation costs will increase.

5. Seasonal Information

It is probable that weather will be a key issue in developing transportation schedules. High water, low water, ice, and cold will be variables that need to be considered. Some parts of river segments are not navigable during winter months when ice is prevalent. Other river segments are not navigable during spring months when flooding is possible and frequent. In summer months, low water occurs on some river segments due to drought. During these times, rivers are not navigable or weight limits are reduced.

6. Throughput Times

The throughput times of shipments will depend upon the length of the distance traveled, the specific river segments utilized, the type of vessel, the size of the tow, and the horsepower of the tow. Several of these parameters were discussed in subsections above. Only the average throughput times from a specific origin to a specific destination will be reported. This is found by adding the transfer time of the shipment to the transportation time of the shipment. The transportation time is found by dividing the distance in miles by the average speed of the transportation mode.

7. Detachable Container Details

The current detachable trailer containers used in truck-rail transportation are examined. The storage space available and the weight limits for the containers must be determined. This defines the amount of product that can fit in each detachable container. The dimensions of the containers will need to be known because it will determine how many containers will fit in the barge space available. The number of containers that can be stacked on top of one another is also an important factor. By determining how many containers can fit on a barge and how much can fit in a container, the volume that can be carried by a barge can be determined. The availability of containers at each transfer location is also of concern. If availability is limited, then more total containers are required.

The current method of truck-rail intermodal transportation uses a highway trailer that has been loaded by a shipper and driven to a rail terminal. Once at the terminal, it is loaded on a rail flatcar and moved to its destination where it is unloaded. The container is loaded by crane onto the rail flatcar and is unloaded in a similar manner.

E. Inventory Carrying Costs

Since the throughput time of barge transportation is increased, it is probable that a substantial inventory cost and a carrying cost will be assessed to shipments. There exists a tradeoff between the cost savings afforded by water transportation and the increased throughput time of the shipment. For example, suppose there is a high cost item ($/ton). This item is being shipped by barge and takes twice as long than it would by another mode of transportation. The greater throughput time increases the dollars tied up in inventory of the product being shipped. This study examines the inventory carrying cost of the commodities being shipped. It also computes the total cost including inventory carrying costs, transportation costs, dray costs, and transfer costs.

F. Dray Costs

Because shippers' factories, warehouses, etc., often do not lie directly along the river or rail terminals, there is an associated cost of transporting the shipment from the factory or warehouse to the river or rail terminal. This is almost always done by using truck to transport this portion of the haul. When shipments are containerized, the product is usually loaded in boxes and then loaded into the truck. It is then transported to the rail or barge terminal and unloaded, then subsequently loaded onto the barge or railcar. If a detachable trailer container is being used, the product can be loaded into the trailer container and transported to the rail or barge terminal. Once at the terminal, the container is detached from the chassis and tractor and then loaded by crane onto the railcar or barge. Because of the loading and unloading involved, an additional transfer cost is assessed as well. In essence, most all of rail or barge transportation is a type of intermodal movement because of the truck dray involved at the origin and destination cities. Thus, for any barge or rail intermodal movement, it is only necessary to identify the container as a truck container as opposed to a standard container.

G. Feasibility Assessment

Once all necessary data is collected, the cost feasibility can be determined. This is done by utilizing a computer software program that performs real-time routing of shipments considering transfer costs and shipment characteristics. This software was developed by Boardman [8]. A brief description of the software is presented in this section. Readers desiring more detailed information on the software should consult Reference [8].

The software developed by Boardman [8] analyzes the shortest time or the least cost to transport goods from an origin to a destination. The transportation modes of air, rail, truck, and barge are used in the analysis. The software is a decision support system that includes a database, the K-shortest path model, and a user interface. These components interact with one another and with the user.

The software uses a multiple node method. Each city is represented once for each mode of transportation that can enter the city. A start and end node will also represent the cities. There is only one link between each of the nodes. The links represent the transportation cost of the mode represented by the node. The model handles transfer costs by adding the cost to the transportation cost if the link leaving a node as one mode of transportation enters a node that is not designated as the same type of transportation.

The database contains information on the cities that are being analyzed, including distance and transportation rate data. Currently, the software contains information for five cities. However, the database can be revised to include the cities that are relevant to this study. The software is limited to 5000 arcs. This means that only ten to fifteen cities can be evaluated at one time. This is why this analysis restricts the number of cities chosen for its evaluation.

The K-shortest path model uses the double-sweep method. The method minimizes the cost as opposed to minimizing the distance. The user interface prompts the user for inputs, controls the database and k-shortest path algorithm, and reports the results to the user.

To use this software as written by Boardman, the user will indicate the origin and the destination, the weight of a shipment, and the objective (either least cost or shortest time). The system will then report a number of alternatives that best meets the two cities objectives. The alternatives are listed in order of increasing expense or increasing time.

As stated above, costs of transportation vary depending upon the segment of river that is being traveled. In order to utilize the software, an average cost is needed. Therefore, the cost entered into the software will be an average transportation cost among the rivers in the network.

H. Software Enhancements

As stated above, Boardman's [8] software will be used in the feasibility assessment. However, there are several modification, alterations, or additions that are necessary in order to perform an accurate assessment. The software is modified to calculate the least cost utilizing standard units as opposed to the current use of dollars per ton-mile. An additional inventory cost calculation and dray cost is added to the current software package, so that costs reflect transfer costs, transportation costs, dray costs and inventory carrying costs.

I. Summary

This chapter has discussed the method of analysis for this project. The next chapter will examine the data collected for use in the analysis.

IV. DATA COLLECTION AND FORMULATION

A. INTRODUCTION

As stated in Chapter III, there are a number of data items required in performing an accurate feasibility assessment of truck-barge transportation. This section discusses the collection of the data and explains how it is used in the analysis. The chapter presents inventory carrying cost equation formulations as well.

B. DISTANCES

In order for the software to calculate the shortest times or least cost alternatives, the distances between the nodes in the network must be inserted in the database 'Arcs'. When leaving a destination by barge and entering any city/mode combination, the distances must be in barge (water) miles. When leaving a destination by rail and entering any city/mode combination, the distances must be in rail miles. When leaving a destination by truck and entering any city/mode combination, the distances must be in truck (highway) miles. The distances between the nodes in the network were found by using References [18, 23, 29]. The distances reported can be found in the 'Arcs Array' column number three in Appendix B.

C. TRANSPORTATION RATES

In order to provide an accurate estimate for the transportation cost associated with barge transportation, estimates were accumulated from a number of sources. These estimates were then averaged. Because the software calculates the total transportation cost from an origin to a destination by multiplying the rate by mileage between nodes, rates were requested in dollars per container-mile. In order to convert the rates quoted into required units, it was necessary to make some underlying assumptions. It was necessary to assume the tonnage a container can hold. Because detachable trailer containers can hold fifteen tons [3], conversions from dollars per ton-mile to dollars per container-mile assumed a fifteen ton container. Thus, the standard unit encompasses a fifteen ton container (the detachable truck container) as a standard as well.

1. Barge Transportation

Individuals from the Pittsburgh Waterways Commission [41, 45] provided the following estimates. An estimate for a rate in dollars per ton-mile was given as $0.008 per ton-mile. Assuming that a container holds fifteen tons, the rate in dollars per container-mile would be equivalent to ($0.008 per ton-mile * 15 tons/container) or $0.12 per container-mile.

Estimates were also reported by The Arkansas Waterways Commission [3]. Again, the rates were quoted in dollars per ton-mile. The rate quoted was $0.0097 per ton-mile. Assuming a fifteen ton container, the average rate in dollars per container mile is ($0.0097 * 15) or $0.1455 per container-mile.

Estimates taken from Haulk [22] were $0.0073 per ton-mile. Again, assuming a fifteen ton container, the average rate is ($0.0073 * 15) or $0.1095 per container-mile.

The rate quoted by Chew [13] is also reported in dollars per ton-mile. Assuming a fifteen ton container, the average rate becomes ($0.0079 * 15) or $0.1185 per container-mile.

These rates are then averaged to obtain the average transportation rate utilized in the software. The rate in dollars per ton-mile is [($0.008 + $0.0097 + $0.0073 + $0.0079) / 4] or $0.008225 per ton-mile. However, because the focus of this study is container transport, the rate must be converted into dollars per container-mile by assuming a tonnage per container. Using the assumption of a fifteen ton container, as stated above, the average rate in dollars per container-mile becomes ($0.008225 * 15) or $0.123375, or approximately $0.1234

According to the Maritime Administration [38] the rate for barges traveling along the gulf coast can be assumed as twice that of regular barges traveling on the inland waterways. Thus, the rate for barges with load lines along the gulf coast becomes $0.2468 per container-mile. The rate of ocean going vessels is assumed to be about four times this rate [38] and becomes $0.4935 per container-mile.

2. Rail Transportation

Average rates for rail transportation were reported by the Arkansas Waterways Commission [3], Haulk [22], and Chew [13]. All three sources reported quotations in dollars per ton-mile. In order to convert rates into dollars per container-mile, assumptions for container tonnage were made. As stated above, the assumption of a fifteen ton container was made. The Arkansas Waterways Commission [3] reports the rate of $0.0253 per ton-mile. Converting the rate to dollars per container-mile, the rate becomes ($0.0253 * 15) or $0.3795 per container-mile. Haulk's [22] rate in dollars per ton-mile is $0.0249. Converting Haulk's [22] reported rate to dollars per container-mile, the rate becomes ($0.0249 * 15) or $0.3735 per container-mile. The rate reported by Chew in dollars per ton-mile is $0.020. Converting Chew's [13] rate quotation to dollars per container-mile, it becomes ($0.020 * 15) or $0.30 per container-mile. Averaging the rates in dollars per ton-mile, the average becomes [($0.0253 + $0.0249 + $0.02)/3] or $0.0234 per ton-mile. However, because the focus of this study is container transport, the rate must be converted into dollars per container-mile by assuming a tonnage per container. Again, assuming a fifteen ton container, the average becomes ($0.0234 * 15) or $0.3510 per container-mile.

3. Truck Transportation

The average rate for truck was provided by Howard [42]. The rate reported by Howard [42] was between $0.90 per mile for long hauls, $1.80 per mile for regional hauls, and $3.00 per mile for local hauls. These rates were reported independent of units. In other words, these rates are quoted regardless of tonnage. However, The Arkansas Waterways Commission [3] reports that a truck, on average, can haul fifteen tons in one trailer or removable trailer container. Therefore, these rates are equivalent to the assumption that a fifteen ton container is being used. Examining the distances between nodes, all the hauls are considered to be long hauls. Therefore, the average rate used is $0.90 per container-mile.

D. Dray Costs

Dray costs refer to the cost of transporting the shipment from the shipper's location (warehouse, company, factory, etc.) to the barge or rail terminal. Dray costs also exist for transporting shipments from the barge or rail terminal destination to the final location (warehouse, company, factory, store, etc.). For the purposes of this project, the dray cost is assumed to be an average cost. This cost is added at the origin and destination only. It is not added when transferring between modes or at intermediate cities. According to Howard [42], the cost for transporting by truck-rail combinations is around $50 per container for rail at each end, or a total of $100 per container for one shipment. For truck-barge combinations, an average was calculated. To do this, latitude and longitude numbers for barge terminals at each city were found from the US Army Corps of Engineers [54]. There were a large number of terminals at each of the cities' ports. Approximately 25 for each city were evaluated. Latitude and Longitude numbers for each of the city zip codes were then found by using freight density records provided by J.B. Hunt [43]. Each city has more than one zip code. The zip codes appropriate for each city were found by using the internet website of the United States Postal Service. The Euclidean distance was then determined between each terminal for the given city and each zip code at the given city. The formula used in determining the distance in miles is,

{SQRT[((latA-latB)^2) + ((longA - longB)^2)]} *69 * 1.17 (4.1)

Where, 69 is the conversion factor in miles/degree and 1.17 is the conversion to account for average circuitry with traveling on highways. 'A' refers to the specific barge terminal and 'B' refers to the specific zip code.

The calculations for barge dray can be found in Appendix F. The average dray length calculated was 14.67 miles. Since this length is considered to be a local haul, it must be multiplied by $3.00 per mile to get the total cost. The average dray cost becomes $44.03 per container at each end, or a total of $88.06 per container for one shipment.

There is an additional transfer cost associated with drays. Again, averages are used. At the destination barge or rail terminals, an original transfer cost from trucks bringing shipments will be incurred. The average associated with this is $100 per container for barge and $75 per container for rail. The additional dray cost and the additional transfer cost will be added to all barge and rail total transportation costs at origin and destination cities only.

E. Average Speeds

Average speeds are used to calculate throughput times. The distance between nodes and the average speeds for the different modes of transportation are found in the 'Arcs' and 'Rates' databases, respectively. The throughput times are then found by dividing the number of miles by the average speed in miles per hour. The throughput time also considers the transfer times.

1. Barge Transportation

The average speeds for barge, barges travelling along coastal waterways, and ocean going vessels were provided by McCarville [41], Christy [35], and the COCITE Memphis Meeting participants [47]. These speeds are 6 miles per hour for barge, 4 miles per hour for barges navigating along coastal waterways, and 10 miles per hour for ocean going vessels.

2. Rail Transportation

The average speed for rail was also provided by Howard [42] and is 37 miles per hour.

3. Truck Transportation

The average speed for trucks was provided by Howard [42]. It is 42 miles per hour.

F. Transfer Costs and Times

1. Barge Transportation

The transfer costs and times were obtained from a variety of sources. Transfers involving barge as a mode of transportation were estimated by McCarville [41], Christy [45], and the Pittsburgh COCITE workshop [46]. The transfer costs from barge to other modes of transportation and to barge from other modes of transportation is estimated at $100 per container. It takes approximately 0.17 hours to transfer each container. The transfer costs and times were averaged for the cities involved. In other words, the transfer costs and times were not city specific, but were an overall average for the cities involved based on the available equipment at the network cities. The costs related to transferring containers to ocean going vessels is approximately $100 per container and takes on average 0.17 hours per container. However, no cities in this network will require ocean going vessels. The estimates were provided by references [41, 45, 46].

2. Truck and Rail Transportation

The transfer costs and times utilizing truck or rail were provided by Howard [42]. The transfer costs and times estimated are city specific. The cost and time estimates provided are as follows:

- Brownsville $50 per container, and 0.1 hours per container
- Chicago $75 per container, and 0.1 hours per container
- Cincinnati $65 per container, and 0.1 hours per container
- Houston $75 per container, and 0.1 hours per container
- Little Rock $50 per container, and 0.1 hours per container
- Memphis $50 per container, and 0.1 hours per container
- Mobile $50 per container, and 0.1 hours per container
- New Orleans $60 per container, and 0.1 hours per container
- Omaha $50 per container, and 0.1 hours per container
- Pittsburgh $65 per container, and 0.1 hours per container
- St. Louis $65 per container, and 0.1 hours per container
- St. Paul $65 per container, and 0.1 hours per container
- Veracruz $35 per container, and 0.1 hours per container

G. INVENTORY CARRYING COST EQUATION FORMULATION

The software develop by Boardman [8] accounted for transportation and transfer costs. However, it did not consider inventory carrying costs. This section explains equations formulated to consider inventory carrying costs. Chapter V will explain the addition of the equations into the software and the complete mathematical model equations used in determining the least cost. The following terms apply relative to carrying cost.

Let:

u = unit cost of item to producer
Q = number of units shipped
t_m = shipment throughput time for mode *m*
CC_u = carrying cost per unit (\$/unit-year)
CC_m = carrying cost per order associated with mode *m*

$$CC_m = Q * CC_u * [t_m / (365 * 24)] \tag{4.2}$$

where $CC_u = u * x\%$ (x is a standard percentage used by a shipper)

H. Seasonal Information

Many shippers have said that one reason they do not use barge transportation is because of the lack of dependability the waterways provide. The waterways often experience lock closures due to high water, low water, or icy conditions. Sometimes closures are attributable to foggy conditions. These situations are beyond the control of the waterway officials. It is indeed possible that there are certain times of the year that barge transportation could be more risky than other modes of transportation. However, the same could be said for truck, air, and rail transportation. Icy conditions often affect the transporting of shipments by truck or by air. Delays are often experienced in both of these industries due to inclement weather conditions. This is why it is important to identify different alternatives available for commodity shipments. If one alternative becomes impossible due to bad weather conditions then it may be possible to choose another alternative.

The United States Army Corps of Engineers [54] has provided information on how many times locks on a certain river are closed and for what length of time. This section will discuss the closures of locks on rivers relevant to this study. These times represent all locks on the rivers. It is possible that some locks were open at times that others were closed.

1. Alabama River

Locks on the Alabama River closed two times in 1996. This led to a total closure time of approximately 536 hours [54]. This means that some access to the Port of Mobile would be limited during the year.

2. Arkansas River

Closures on locks along the Arkansas River amounted to 1212.3 hours in 1996. Locks were closed a total of 961 times [54]. This river provides access to Little Rock, meaning that access was limited at some times during the year. Closures along the Arkansas river are usually not due to icy conditions. The river remains ice-free throughout the year.

3. Illinois River

Locks on the Illinois River leading to the Port of Chicago were closed 254 times in 1996. The total closure time of the locks for 1996 was 2150.6 hours [54].

4. Mississippi River

Locks on the Mississippi River were closed 989 times. The total closure time for the locks in 1996 was 8949.35 hours [54]. There are 29 locks and dams on the Upper

Mississippi River allowing navigation from St. Louis to St. Paul. The locks and dams maintain a minimum water depth of nine feet, allowing for navigation even in dry years. Floods along the upper basin occur from March to June when rivers swell due to melting ice and snow. There are no locks and dams on the Mississippi below St. Louis, meaning that the lower part of the river can not be closed due to lock and dam closures. Access to St.Paul, can become very limited during the winter months due to icy conditions. The Mississippi River is navigable to Minneapolis, Minnesota [33].

5. Ohio River

Locks on the Ohio River were closed 1384 times in 1996. The total closure time for all locks along the Ohio River was 18019.08 hours [54]. This limits access to Cincinnati and Pittsburgh at times during the year. The Ohio River is navigable throughout its entire course [33].

I. Equipment Needs

According to sources at port facilities [41, 45, 46, 47], most ports have the appropriate cranes to lift containers. Since conventional containers transported on barges are either 20 foot or 40 foot and can hold 10 to 20 tons, the maximum 43 foot, 15 ton trailer container should require the same types of equipment that the conventional containers require. However, the current truck-rail intermodal alternative utilizes a specialized type of crane that removes the detachable truck container. The section below on Transfer Locations details some of the terminals, berths, piers, docks, and wharves that possess the equipment necessary for making the required transfers by lift-on/lift-off.

J. Container Details

The availability of detachable truck containers and detachable chassis is not of real concern. According to Howard [42], nearly 85 percent of J.B. Hunt's trailers are detachable containers. Other truck transportation providers also own detachable containers and chassis. As far as other containers are concerned (twenty foot and forty foot), there are numerous companies who produce, sell, and lease these containers [46]. There are even companies that are currently selling used containers because of the large loads of new replacement containers being made. Many of the used containers have ten to fifteen years of life left. The main problem associated with containers is the management, distribution, and hauling of empty containers. This problem, however, is not within the scope of this project.

Trailer containers are either 48 feet long or 53 feet long depending upon the type of trailer container used. Each can hold about 15 tons of commodities. A barge can carry approximately 70 forty-foot containers for a full load. Thus, for a 48 or 53 foot container, the number a barge could carry would be slightly less than 70.

K. Transfer Locations

The following section discusses the individual ports being analyzed in this study. Information was obtained from the United States Army Corps of Engineers [54]. Although there is no specific information detailing the links to highways and roads, it is assumed that most ports have access to several roads and highways, meaning that most can transport goods intermodally by truck-barge if the appropriate lifting equipment is available.

1. Port of Mobile, Alabama

According to the United States Army Corps of Engineers [54], the port of Mobile consists of 153 docks, terminals, piers, berths, and wharves that are publicly or privately owned. Some of these have intermodal connections. Terminals connect to Southern Railway, Burlington Northern Railroad, Illinois Central Gulf Railroad, and the Seaboard System Railroad.

At the present time the terminals at the Port of Mobile are used to ship or receive the following commodities:

- lumber
- liquid caustic soda
- bulk salt
- coal
- pulpwood
- crude oil
- fuel oil
- coke
- bauxite
- gravel
- iron ore
- oyster shell
- livestock feed
- sand
- seafood
- potash
- manganese
- molasses
- steel
- vegetable oil
- kerosene
- asphalt
- diesel fuel
- limestone
- cement
- wood chips
- gypsum
- containerized paper products

Currently, the Chickasaw Terminal Corp.Wharf, the Mobile-Chickasaw Port Facility Pier A, and Alabama State Docks Berth 2 is used to transport containerized cargo. Because these facilities currently ship containers, it is assumed that they have the necessary equipment needed to transfer containers. The Scott Paper Company Mobile

Plant Container Dock is used to transport containerized paper products, meaning that they have the capability of transporting containers as well. Information regarding Alabama State Docks, Berths 2, 3, 4, 5, 6, 7, 8, and Pier A states that trucks have access to these docks. However, Berths 6, 7, and 8 are for roll-on/roll-off only. The Burlington Northern East and West Side Terminals are used specifically for transporting rail containers by barge. Meaning that these terminals have the capability of handling rail-barge transportation.

2. Port of New Orleans, Louisiana

According to the United States Army Corps of Engineers [54], the Port of New Orleans consists of 581 terminals, docks, piers, berths, and wharves that are publicly or privately owned. Some terminals have rail connections with Union Pacific, Norfolk Southern, Southern Railway System, CSX Railroad, New Orleans Public Belt, Southern Pacific Transportation Company, Louisville and Nashville Railroad, Illinois Central Railroad, and Kansas City Southern.

Currently, the Port of New Orleans ships and receives the following commodities:

- seafood
- drilling mud
- liquid sulfur
- diesel fuel
- drummed lubricants
- crude oil
- lubricating oil
- coal
- phosphate rock
- coke
- urea
- salt ore
- grain
- butane
- crushed stone
- waste oil
- caustic soda
- sulfuric acid
- natural gas
- bulk cement
- packaged chemicals
- hydrochloric acid
- raw and refined sugar
- lumber
- shell
- precast concrete pilings
- aluminum
- steel beams

- sand
- limestone
- vegetable oil
- abrasives
- scrap metal
- ammonia
- molasses
- coal slag
- acetone
- phosphoric acid
- tallow
- chlorine

The Jensen Seafood Wharf, Seafresh Seafood Company Wharf, and the Maritime Oil Recovery Dock, have access to trucks. Chalmette Slip Dock 2, Jourdan Road Terminal Berths 4 and 5, France Road Terminal Berth 4, Glavez Street Wharf, Louisa Street Open Wharf, Perry Street Wharf, Harmony Street Wharf, Louisiana Street Wharves G, F, E, Napoleon Avenue Open Wharf, Henry Clay Avenue Open Wharf, and the Nashville Avenue Wharf transport containerized cargo and have access to trucks, meaning they would have the required container transfer equipment to handle truck-barge transportation.

3. Port of Houston, Texas

According to the United States Corps of Engineers [54], the Port of Houston consists of 267 terminals, piers, berths, docks, and wharves that are publicly or privately owned. Some of the intermodal connections with rail include: Southern Pacific Transportation Company, Port Terminal Railroad, Houston Belt and Terminal Railway, Union Pacific Railway, and Missouri Pacific Railroad.

Currently, the Port of Houston ships and receives the following commodities:

- petrochemicals
- petroleum products
- sand
- gravel
- caustic soda
- scrap metal
- steel
- methyl alcohol
- heavy equipment
- grain
- potash
- fertilizer

- lead
- zinc ores
- liquid refinery waste
- synthetic rubber
- coal tar
- crushed stone
- ferroalloys
- molasses
- crude oil
- fuel oil
- vegetable oils
- bulk cement
- animal fats
- aragonite
- sulfuric acid
- granite
- gypsum
- lubricating oil
- caliche
- acetic acid
- feed stock
- vinyl acetate
- natural gasoline
- butane
- oats
- rice
- clay
- asphalt
- methanol
- sludge
- phosphate rock
- liquid wax
- tallow
- molasses

The Care Shipping Terminal, Greens Bayou Terminal Wharf D, Inbeas American Ship Dock, International Terminal Corporation Berths 1, 2, 3, TXTX Barge Marine Dock, TXTX Marine Lower Wharf, Barbours Cut Terminal Berths 1, 2, 3, 4, Manchester Terminal Corporation, and Public Wharves 16, 17, 23, 26, 29, ship containerized cargo. Each of these have access to trucks. Any of these terminals would have appropriate equipment for container handling.

4. Port of Brownsville, Texas

According to the United States Army Corps of Engineers [54], the Port of Brownsville consists of 43 terminals, berths, docks, piers, and wharves. Some of the rail connections at the Port of Brownsville are with Brownsville and Rio Grande International Railroad.

Current commodities shipped or received by the Port of Brownsville include:

- scrap metal
- ores
- steel
- sodium sulfate
- lubricating oil
- crude oil
- petroleum products
- ammonia
- grain
- seafood

The Brownsville Navigation District Docks 1, 2, 3, 4, 7, 8, 10, 11, 12, 13 have access to trucks.

5. Port of Chicago, Illinois

According to the United States Army Corps of Engineers [54], the Port of Chicago consists of 190 terminals, berths, docks, piers, and wharves. Some of the rail intermodal connections include: Indiana Harbor Belt Railroad, CSX Transportation, Chicago Rail Link, Norfolk Southern Railway, Consolidated Rail Corporation, Santa Fe Rail, Illinois Central Railroad, Belt Railway Company of Chicago, Elgin, Joilet, and Eastern Railroad, Burlington Northern, Chicago and Northwestern Railway, CP Rail System, Chicago Short Line Railway, and West Pullman and Southern Railroad.

Currently the Port of Chicago ships or receives the following commodities:

- liquid fertilizer
- molasses
- aluminum
- salt
- lumber
- iron ore
- scrap metal
- coal
- limestone
- steel
- cement
- potash
- grain
- slag
- bauxite
- coke
- sand
- ethylene glycol
- crude oil
- acetone
- fish
- scrap metal
- paper commodities
- gravel
- crushed stone
- asphalt
- mulch
- caustic soda

- alcohol
- tallow
- tar
- sugar
- lubricating oil
- iron

Federal Marine Terminals North and South Wharves and Ceres Terminals Iroquis Wharf ship containerized cargo, meaning that they have the necessary equipment for handling containers.

6. Port of Pittsburgh, Pennsylvania

According to the United States Army Corps of Engineers [54], the Port of Pittsburgh consists of 262 terminals, docks, berths, wharves and piers. Some rail intermodal connections that the Port of Pittsburgh has include: Consolidated Rail Corporation, Lake Erie Rail Corporation, Alquippa and Southern Railroad, Pittsburgh Railroad, Ohio Valley Railroad, CSX Rail Corporation, Monongahela Railroad, Monessen Southwestern Railway, Union Railroad, and Norfolk and Southern.

Current commodities being shipped or received by the Port of Pittsburgh include the following:

- sand
- gravel
- lubricating oils
- petroleum products
- asphalt
- coal
- stone
- slag
- gravel
- ethylene glycol
- fuel oil
- iron ore
- scrap metal
- crushed stone
- coal tar
- light oil
- steel
- salt
- feed stock
- pelletized pitch
- liquid caustic soda
- ammonia
- sulfuric acid
- crushed limestone
- lime
- pig iron
- aviation fuel
- ore

- petrochemicals

7. Port of Cincinnati, Ohio

According to the United States Army Corps of Engineers [54], The Port of Cincinnati has 35 terminals, docks, berths, piers, and wharves. Some of these have intermodal rail connections. Some of these include: CSX Transport and Consolidated Rail Corporation.

Current commodities being shipped or received by the Port of Cincinnati include the following:

- grain
- concrete
- liquid fertilizer
- fuel oil
- caustic soda
- methanol
- lumber
- steel
- sand
- limestone
- coal
- coke
- gravel
- petroleum
- scrap metal
- vegetable oil
- jet fuel
- diesel fuel
- phosphate
- asphalt
- salt
- molasses
- iron ore
- manganese
- pig iron

Queen City Wharf and Hilltop Basic Resources Cincinnati Terminal Wharf have access to trucks. Cohen Terminal Lower Dock ships products directly from truck to barge.

8. Port of Little Rock, Arkansas

According to the United States Army Corps of Engineers [54], the Port of Little Rock consists of 14 terminals, docks, berths, piers, and wharves. Some of the intermodal rail connections include: Union Pacific Railway, St. Louis Southwestern Railroad, and Little Rock Port Terminal Railroad.

Some of the commodities currently shipped or received by the Port of Little Rock include:

- cement
- fuel oil
- jet fuel
- grain
- molasses
- paper products
- steel
- quarried rock
- fertilizer
- sand
- gravel
- caustic soda

9. Port of Omaha, Nebraska

According to the United States Army Corps of Engineers [54], the Port of Omaha consists of 12 terminals, docks, berths, piers, and wharves. Intermodal rail connections are made with Burlington Northern and Union Pacific Railroad.

Some of the commodities shipped or received by the Port of Omaha include:

- livestock feed
- molasses
- fertilizer
- steel
- paper products
- bale twine
- grain
- alfalfa pellets
- salt
- cement

10. Port of St. Paul, Minnesota

According to the United States Army Corps of Engineers [54], the Port of St. Paul consists of 35 terminals, docks, berths, piers, and wharves. Some of these have intermodal connections with railroads. Some of the rail connections include: CP Rail System, Chicago and North Western Transportation Company, and Burlington Northern Railway.

Some of the commodities shipped or received by the Port of St. Paul include:

- asphalt
- cement
- grain
- fertilizer
- coal
- coke
- phosphates
- caustic soda
- potash
- salt
- slag
- gravel
- fly ash
- molasses
- vegetable oils
- liquid fish soluble

11. Port of St. Louis, Missouri

According to the United States Army Corps of Engineers [54], the Port of St. Louis consists of 70 terminals, piers, berths, docks, and wharves. Some of these have intermodal connections with rail. The rail connections are with Burlington Northern, Terminal Railroad Association of St. Louis, Norfolk Southern, Manufactures Railway, and Union Pacific Railroad.

Some of the commodities shipped or received at the Port of St. Louis include the following:

- salt
- sand
- petroleum products
- grain
- petrochemicals
- raw sugar
- lubricating oil
- steel
- coal
- diesel fuel
- asphalt
- fuel oil
- coke
- scrap metal
- ores
- cement

The Davis Street Sand Company Dock has access to trucks and presumably has container transfer capability.

12. Port of Memphis, Tennessee

According to the United States Army Corps of Engineers [54], the Port of Memphis consists of 60 terminals, piers, berths, docks, and wharves. Some of these have intermodal connections with rail. The rail connections are with Illinois Central Railroad, Union Pacific, Burlington Northern, and Southern Pacific Railroad.

Some of the commodities shipped or received at the Port of St. Louis include the following:

- grain
- vegetable oil
- ethanol
- soybean oil
- asphalt
- petroleum products
- propane
- caustic soda
- fuel oil
- coal tar
- cottonseed oil
- sunflower oil
- cement

Mid-South Terminal Company ships containerized cargo, inferring that this terminal has the necessary equipment to transport containerized cargo.

13. Veracruz, Mexico

According to the Maritime Administration [38]. The following commodities are being shipped or could be shipped out of Veracruz:

- Steel
- Ferroalloys
- None-ferrous metal
- Various Perishables
- Cocoa Beans
- crude oil
- natural gas
- petroleum products

- rice
- grains
- machinery
- plastics
- coffee

L. Commodity Types

Several commodities that are appropriate for barge, or a combination of barge and another mode of transportation, have been listed in the sections above. However, the focus of this section is to discuss possible items that could be shipped by barge but are not at this time.

Some possible commodities offered by McCarville and Christy [41, 45] include waste paper, old cardboard, mini steel beams, dylark dilite, and various chemicals. Suggestions from Sims [44] and Cummings [40] include ammonium nitrate, clay, fertilizers, aluminum ingots, roofing granules, alumina, various paper products, wood pulp, dimensional lumber, and cotton seed pellets. Other commodities such as cotton and rice are not being shipped by barge very heavily. It is quite possible that a bigger market for barge transportation of rice could exist if and when the Cuban market opens for trade with the United States. Another alternative commodity that is considering shipping by barge is Windmere products. Windmere makes hair styling products (hair dryers and curling irons) and is extremely interested in utilizing barge transportation. Paper and wood products of any type are also suitable for shipping by barge. The same can be said about grains and livestock feeds. Other general possibilities include items that are shipped by containerized truck-rail intermodal. The main concern is that the item is not perishable and is not time sensitive.

M. SUMMARY

This chapter has detailed the data collected for the feasibility assessment. It has discussed the formulation of inventory carrying cost equations. The chapter has specified any relevant information needed in performing the feasibility assessment and discussed the references involved in providing the information. The next chapter will explain the software model that has been enhanced including all changes to databases and to the hard-code. It will also describe the complete mathematical model used to determine the least cost alternatives, including inventory, transportation, dray, and transfer costs. It will also include a section on installation procedures and a user's guide.

V. SOFTWARE MODEL SPECIFICATION

This research has required modification of software developed by Boardman [8]. The network must be configured in a manner consistent to the software requirements. This chapter discusses the network model configuration employed in this research and the methodology used to define the specifications.

A. GENERAL DESCRIPTION

The software developed by Boardman [8] requires a operations research approach to modeling a network. The user defines a set of cities he/she wishes to analyze. For the purposes of this analysis, the thirteen cities discussed in Chapter III are used. These cities include: Brownsville, Chicago, Cincinnati, Houston, Little Rock, Memphis, Mobile, New Orleans, Omaha, Pittsburgh, St. Louis, St. Paul, and Veracruz. The cities must then be formulated as a system of nodes. The user then must decide what modes of transportation will be analyzed at each given city. For this assessment, truck, barge, and rail transportation are examined. The nodes are then defined using a multiple node approach, where each city is represented once for each mode of transportation that leaves that city and once for a start node and an end node. Figure 5.1 shows an example of how the cities are modeled. The one exception to this figure lies at Veracruz. Since Veracruz can only be reached by barge through the Gulf of Mexico, it is necessary for the barge to navigate through coastal waters.. As stated in previous chapters, this means that the barge must travel at reduced speeds which doubles the transportation cost. Since costs are defined as constant rates, it is necessary to include barge navigation along coastal waterways as a possible mode at Veracruz to account for the increase in rates along the gulf coast.

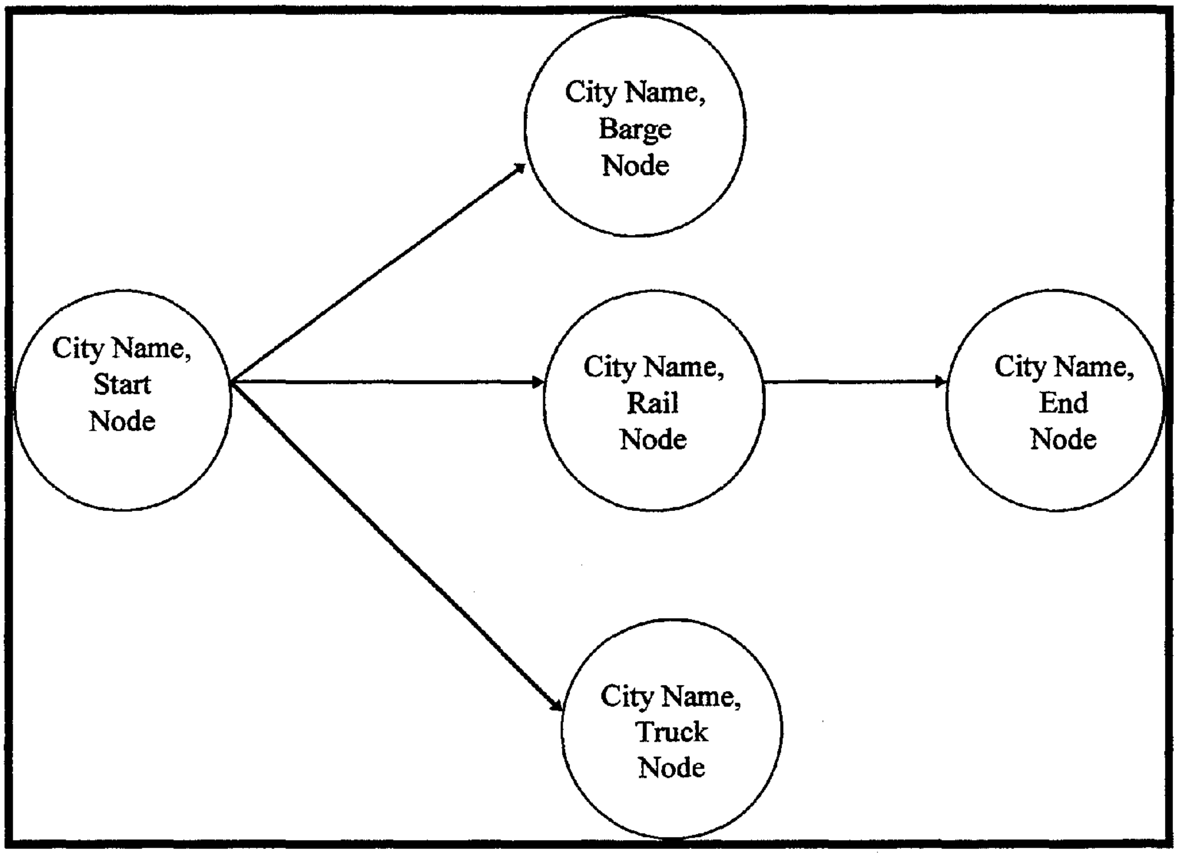

Figure 5.1: City Node Configuration

Once the nodes are defined, a system of arcs must be formulated. An arc (or a link) is added for each possible path between defined nodes. For example, if barge transportation at Cincinnati can reach Chicago, then an arc between Cincinnati and Chicago for this transportation mode would be added. Each possible path is added as an arc.

B. DATABASE ALTERATIONS

As stated in Chapter II, the model information is stored in databases. In order to make the database specific to this thirteen city network and to reflect the rates cited in Chapter IV, modification to the existing databases was necessary. The modifications were made to the 'Nodes Array', 'Arcs Array', 'Rates Array', and 'Xfer Array'. Changes were also made to the 'Input Array'; however, these changes due not reflect data alterations but are changes made to the program model itself and will be discussed later in this chapter.

1. Nodes Array

The nodes array describes the nodes in the network model. It lists the number of the node, the name of the city the node is associated with, and the mode of transportation the node is associated with or if it is a start or end node. Table 5.1 Lists a portion of the 'Nodes Array' that can be found in the database table. The database, in its entirety, is presented in Appendix A. To illustrate this array, the first row in Figure 5.1 will be used as an example. Row 1 describes Node Number 1. This node represents Chicago, barge transportation. Similarly, Row 2 represents rail transportation for Chicago. The remaining rows can be defined in a similar manner.

Node Number	City	Mode
1	Chicago	Barge
2	Chicago	Rail
3	Chicago	Truck
4	Chicago	Start
5	Chicago	End
6	Cincinnati	Barge
7	Cincinnati	Rail
8	Cincinnati	Truck
9	Cincinnati	Start
10	Cincinnati	End

Table 5.1: Nodes in the Network

2. Arcs Array

The arcs in the network are used to calculate the shortest routing path. The length of the arc is either the transportation cost or the transportation time. For the defined network, arcs connect the nodes if the origin city and its corresponding mode of transportation can enter the destination city and its corresponding mode of transportation. For example, a shipper can travel from Brownsville to Chicago facilities by truck, so there are arcs between the Brownsville-Truck node and the Chicago-Barge, Chicago-Rail, and Chicago-Truck nodes. The defined network for this research considering the thirteen cities and three modes of transportation results in a model including 65 nodes and 1,482 arcs.

Table 5.2 lists the arcs in the network. This table lists each node, the arcs that can enter each node, and the arcs that can leave each node. Table 5.2 does not depict the arcs as they appear in the software's database tables. The complete set of the Arcs Database Table, as it appears in the software, is presented in Appendix B. For explanation purposes, the first row in the table in Appendix B represents the start node in Chicago which connects to the Chicago barge node with a distance of zero miles. The distances are in miles and were discussed in Chapter IV. The remaining rows can be defined in a similar manner.

Table 5.2: Arcs in the Network

Node Number	Arcs Entering From Node Number	Arcs Exiting From Node Number
1 Chicago Barge Mode	4, 7, 6, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 57, 58, 61, 62, 63	5, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 57, 58, 61, 62, 63
2 Chicago Rail Mode	4, 7, 6, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	5, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
3 Chicago Truck Mode	4, 7, 6, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	5, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
4 Chicago-Start		1, 2, 3
5 Chicago-End	1, 2, 3	
6 Cincinnati Barge Mode	1, 2, 3, 9, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 57, 58, 61, 62, 63	1, 2, 3, 10, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43. 46, 47, 48, 51, 52, 53, 57, 58, 61, 62, 63
7 Cincinnati Rail Mode	1, 2, 3, 9, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 10, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43. 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
8 Cincinnati Truck Mode	1, 2, 3, 9, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 10, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43. 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
9 Cincinnati-Start		6, 7, 8

Table 5.2	Continued	
Node Number	Arcs Entering From Node Number	Arcs Exiting From Node Number
10 Cincinnati-End	6, 7, 8	
11 Houston Barge Mode	1, 2, 3, 6, 7, 8, 14, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 15, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
12 Houston Rail Mode	1, 2, 3, 6, 7, 8, 14, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 14, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
13 Houston Truck Mode	1, 2, 3, 6, 7, 8, 14, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 15, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
14 Houston-Start		11, 12, 13
15 Houston-End	11, 12, 13	
16 Little Rock Barge Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 19, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 20, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 57, 58, 61, 62, 63
17 Little Rock Rail Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 19, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 20, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
18 Little Rock Truck Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 19, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 20, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
19 Little Rock-Start		16, 17, 18
20 Little Rock-End	16, 17, 18	
21 Memphis Barge Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 24, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 25, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 57, 58, 61, 62, 63
22 Memphis Rail Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 24, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 25, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
23 Memphis Truck Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 24, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 25, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63

Table 5.2	Continued	
Node Number	Arcs Entering From Node Number	Arcs Exiting From Node Number
24 Memphis-Start		21, 22, 23
25 Memphis-End	21, 22, 23	
26 New Orleans Barge Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 29, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 30, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
27 New Orleans Rail Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 29, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 30, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
28 New Orleans Truck Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 29, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 30, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
29 New Orleans-Start		26, 27, 28
30 New Orleans-End	26, 27, 28	
31 Mobile Barge Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 34, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 35, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
32 Mobile Rail Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 34, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 35, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
33 Mobile Truck Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 34, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 35, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
34 Mobile-Start		31, 32, 33
35 Mobile-End	31, 32, 33	
36 Omaha Barge Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 39, 41, 42, 43, 46, 47, 48, 51, 52, 53, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 40, 41, 42, 43, 46, 47, 48, 51, 52, 53, 57, 58, 61, 62, 63
37 Omaha Rail Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 39, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 40, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
38 Omaha Truck Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 39, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 40, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63

Table 5.2	Continued	
Node Number	Arcs Entering From Node Number	Arcs Exiting From Node Number
39 Omaha-Start		36, 37, 38
40 Omaha-End	36, 37, 38	
41 Pittsburgh Barge Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 44, 46, 47, 48, 51, 52, 53, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 45, 46, 47, 48, 51, 52, 53, 57, 58, 61, 62, 63
42 Pittsburgh Rail Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 44, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 45, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
43 Pittsburgh Truck Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 44, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 45, 46, 47, 48, 51, 52, 53, 56, 57, 58, 61, 62, 63
44 Pittsburgh-Start		41, 42, 43
45 Pittsburgh-End	41, 42, 43	
46 St.Louis Barge Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 49, 51, 52, 53, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 50, 51, 52, 53, 57, 58, 61, 62, 63
47 St.Louis Rail Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 49, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 50. 51, 52, 53, 56, 57, 58, 61, 62, 63
48 St. Louis Truck Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 49, 51, 52, 53, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 50. 51, 52, 53, 56, 57, 58, 61, 62, 63
49 St.Louis-Start		46, 47, 48
50 St.Louis-End	46, 47, 48	
51 St.Paul Barge Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 54, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 55, 57, 58, 61, 62, 63
52 St.Paul Rail Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 54, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 55, 56. 57, 58, 61, 62, 63
53 St.Paul Truck Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 54, 56, 57, 58, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 55, 56, 57, 58, 61, 62, 63

Table 5.2	**Continued**	
Node Number	Arcs Entering From Node Number	Arcs Exiting From Node Number
54 St.Paul-Start		51, 52, 53
55 St.Paul-End	51, 52, 53	
56 Veracruz Barge Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 59, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 60, 61, 62, 63
57 Veracruz Rail Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 59, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 60, 61, 62, 63
58 Veracruz Truck Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 59, 61, 62, 63	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 60, 61, 62, 63
59 Veracruz-Start		56, 57, 58
60 Veracruz-End	56, 57, 58	
61 Brownsville Barge Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 64	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 65
62 Brownsville Rail Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 64	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 65
63 Brownsville Truck Mode	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 64	1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27, 28, 31, 32, 33, 36, 37, 38, 41, 42, 43, 46, 47, 48, 51, 52, 53, 56, 57, 58, 65
64 Brownsville-Start		61, 62, 63
65 Brownsville-End	61, 62, 63	

3. Rates Array

The ‘Rates Array’ stores information about the average rates of the different transportation modes and the average speeds of the transportation modes. The numbers listed in the array were discussed in Chapter IV. Table 5.3 below depicts the rates array as it appears in the database table. The database is also presented in Appendix C. The rate is in dollars per container-mile while the average speed is in miles per hour. Again, the start and end nodes are used for purposes of computing the shortest network path and have no costs or times associated with them. Consider Row 1 in Table 5.3. Row 1 represents the barge mode of transportation at a rate of $0.123 per container-mile at an average speed of 6 miles per hour.

Mode	Rate ($ per container-mile)	Speed (miles per hour)
Barge	0.1234	6
Barge (Coastal Navigation)	0.2468	4
Ocean going vessel	0.4935	10
Rail	0.3510	37
Truck	0.9000	42
Start	0	0
End	0	0

Table 5.3: Average Rates and Speeds

4. Xfer Array

The 'Xfer Array' stores information about the average time to transfer shipments from one mode of transportation to another, as well as the average cost involved. The figures listed in this database were discussed in Chapter IV. The transfer costs are in dollars per container, whereas the transfer times are in hours per container. Table 5.4 below represents a portion of the 'Xfer Array' that is listed in the database table. The complete database table is presented in Appendix D. Consider the first few rows of data in Table 5.4. Row 1 represents node number 1 as the destination node. When a transfer from barge is made to node 1, there is no cost and no time involved. This is because node 1 represents barge transportation as well. When the transfer takes place between two different modes, as in Row 2 (from rail to node 1), a transfer cost and transfer time other than zero is listed. In this case, it is $100 per container and takes 0.1667 hours to perform. Transfers from start and end nodes to other nodes are also zero cost and zero time.

Destnode	Modefrom	Cost ($/container)	Settime (hours/container)
1	Barge	0	0
1	Rail	100	0.1667
1	Truck	100	0.1667
2	Barge	100	0.1667
2	Rail	0	0

Table 5.4: Transfer Costs and Times

C. SOFTWARE ENHANCEMENT

Other enhancements to the program required alterations in the code. These changes were necessary so that a more accurate assessment involving the defined water transportation network could be performed. The following sections discuss these enhancements in detail. The complete Visual Basic Code is presented in Appendix E.

1. Mathematical Model

The total transportation cost of barge, rail, and truck includes four major components. These are transportation cost, transfer cost, dray cost, and inventory carrying cost. Boardman's [8] software includes only transportation and transfer costs.

Therefore, it was necessary to include dray and inventory carrying costs as part of the code. The cost components may be mathematically described in the following way.

Minimize total transportation cost = transportation cost + transfer cost + dray cost + inventory carrying cost

Where:

Transportation cost = number of containers * rate per container * distance traveled in miles

Transfer cost = number of containers * average rate to transfer container

Inventory carrying cost = unit cost of item to producer * standard percentage rate used to calculate inventory cost * [throughput time in hours / (24 hours per day * 365 days per year)] * number of units shipped

Dray Cost = number of containers * [initial cost to transfer each container + average dray rate per container]

note: dray cost is $0 for truck, $44.03 per container for barge, and $50 per container for rail; initial transfer cost is $0 per container for truck, $100 per container for barge, and $75 per container for rail

The following notation applies:

TC_m = transportation cost for mode m, $m = 1, 2, ..., j$

TS_{ma} = transfer cost from one mode to another, $a = 1, 2, ..., k$

CC_m = carrying cost of shipment associated with mode m, $m = 1, 2, ..., j$

DC_i = dray cost associated with initial transportation mode

DC_f = dray cost associated with final transportation mode

The objective of the model becomes:

$$\text{Minimization } (TC_1 + TC_2 + \ldots + TC_j + CC_1 + CC_2 + \ldots + CC_j + TS_1 + TS_2 + \ldots + TS_k + DC_i + DC_f) \quad (5.1)$$

where:

j is the number of modes utilized
k is the number of transfers made between modes

The objective is to minimize the total transportation cost including the transportation cost of each mode involved in transporting the shipment, the inventory carrying cost for each mode involved in transporting the shipment, the transfer cost between each mode of transportation involved in transporting the shipment, and the dray cost of the initial and final transportation modes involved.

2. Standardization of Units

Because this study focuses on container-on-barge, the units reported by all modes of transportation should address the use of containers. The arcs database is set up to evaluate each arc separately. The program calculates the cost along each arc each time an origin/destination pair is analyzed. The rates reported in the rates database are in dollars per container-mile. The transportation cost along each arc is then calculated by multiplying the rate in dollars per container-mile (for the appropriate mode of transportation) by the total miles traveled (by the appropriate mode of transportation). The result is multiplied by the number of containers used in the shipment. The total cost (transportation plus transfer plus inventory plus dray) is then reported in dollars.

Some minor alterations to the code were made in order to change the units from dollars per ton-mile to dollars per container-mile. First, the user is now required to enter the number of units he/she will be shipping and how many units fit in each container. The program then internally calculates the number of containers that the total shipment will require. Another simple change to the input array was made. The database stores the number of units and the number of containers that the total shipment will require, instead of storing the number of tons transported in the shipment.

3. Inclusion of Inventory Cost in the Mathematical Model

In order to add the additional cost of time, or the inventory carrying cost, equation (4.2) was included in the total cost calculation. This equation is restated below:

Let:

u = unit cost of item to producer
Q = number of units shipped
t_m = shipment throughput time for mode *m*
CC_u = carrying cost per unit (\$/unit-year)
CC_m = carrying cost per order associated with mode *m*

$$CC_m = Q * CC_u * [t_m / (365 * 24)]$$

where $CC_u = u * x\%$ (x is a standard percentage used by a shipper)

The inventory cost is dependent upon the information provided by the user (the number of units shipped, the number of containers, and the unit cost of the item, and the annual percentage the shipper uses in calculating the inventory cost). The time required to travel along each arc comprising a path is calculated first. This time is then used to calculate the inventory carrying cost along the arc. The total inventory carrying cost for the path is then found by summing the individual inventory carrying costs along the individual arcs.

This cost is then included in the total cost and is compared to other alternatives to determine the least cost path.

4. Addition of Transportation Modes

In order to consider ocean going vessels and barges navigating along coastal waterways, some simple alterations to databases were made. This enhancement required the addition of both modes to the rates array, as well as adding the appropriate rates and average speeds. This allows the user to dedicate specific nodes to ocean going vessel or to barges navigating coastal waterways. Again, barges navigating along the coast are not different vessels than regular barges, therefore, there is no transfer cost associated between the barge and the barge navigating along the coast. Barges navigating along the coast were added as a transportation mode because the rate of the mode is twice that of barges navigating along inland waterways. This type of transportation mode is only utilized along gulf coast waterways.

5. Addition of Dray Costs

In order to consider the cost of transporting a shipment from a warehouse, factory, etc. to a barge or rail terminal, the individual nodes were examined. The node is examined to determine if it is a start or and end node. If it is a start or end node, then the mode of transportation at that specific node is then examined. If the mode is barge or rail and is a start or end node, then an additional cost is added. The additional dray cost is then added to the total transportation cost.

6. Consideration of Additional Time Requirements for Truck Transportation

Truck drivers are restricted by the Department of Transportation in the amount of time that they can drive at one time. This time restriction is ten hours of driving and eight hours off the road. To consider this restriction, the time between cities was examined. Each arc or segment is examined individually for travel time. If the time to travel a given segment is greater than ten hours, then an additional eight hours were added. This additional time is also included in the inventory carrying cost.

7. Removal of Reporting of Repeat Paths as Alternatives

At any given city, each node for each mode of transportation is connected to the end node. Since there is no additional transfer cost involved in going from the nodes at a specific city to that city's end node, the program would often report the same alternative more than once. For instance, if a destination city has rail, barge, and truck modes of transportation the program would report three alternatives for that city that actually had the exact same path, time, and cost. Currently, the program will process the double sweep method. The alternatives are then examined for repeats. The repeat alternatives are not reported back to the user.

8. Alteration of Update Database Feature

Previously, the program had hard-coded modes of transportation. All modes of transportation were listed for every city in the network, even if that transportation mode did not exist at that particular city. The user could change information about a mode of transportation at a particular city when that mode did not exist there. This could cause errors in the operation in the program and confusion in the database. To fix this problem, the program now reads the nodes array in the database to determine what particular modes are actually available at a given city. Only the modes that are actually available at a city are displayed. Thus, only actual mode-city pairs can be updated by the user. The instructions on how to update the databases are presented in the following chapter.

D. SUMMARY

This chapter has described the alterations made to the database in order to perform the analysis specific to the defined network. The chapter has also discussed the enhancements made to the hard-coded program. The next chapter presents an installation procedure and a general user's guide.

VI. USER'S GUIDE

This chapter presents instructions on how to install and use the enhanced software. Since only minor enhancements to the software have been made, portions of the software work identically to the software developed by Boardman [8]. As a result, parts of this chapter will summarize the user's guide presented in reference [8]. However, the user's guide presented in this chapter can be used complete set of instructions for use of the enhanced software.

A. INSTALLATION PROCEDURE

For best performance, the following system specifications are required:

- Pentium 90 MHz platform
- VGA or better resolution monitor
- Windows '95 operating system
- 4 MB of hard disk space
- 16 MB of RAM

Two installation disks have been created in order to make installation procedures more user friendly. These disks contain all files necessary to run the program with the exception of the database file. The database file should be completed in Microsoft Access. The file should be named 'routes" and saved in Microsoft Access format. This file should be saved in the 'My Documents' directory on the C drive (hard drive) of the computer. Instructions on how to create the database files are discussed in a following section. Additionally, the file 'Vb40032.dll' should be placed in the 'Windows' directory in the 'System' subdirectory.

To install the rest of the program insert the installation disk labeled 'Disk 1' into the 3.5" floppy drive (disk drive or A drive) of the computer. Computers running under a Windows '95 platform will require users to left click with the mouse on the 'Start button' in the lower left of the display screen. From there, select the 'Settings' option. Under this option choose the 'Control Panel' option by left clicking on it while it is highlighted. The user should then choose the option of 'Add/Remove Programs' by double left clicking on the option with the mouse. Once this has been done, the user should choose to left click on the 'Install button' on the 'Add/Remove Programs' screen. At the next screen, the user should insure that 'Disk 1' is in the floppy drive. The user should then left click on the 'Next button' on the bottom of the 'Install Program from Floppy Disk or CD-ROM' screen. The computer will automatically find the correct setup file. The user will then left click on the 'Finish button' at the bottom of the 'Run Installation Program' screen. The computer will install 'Disk 1' and then request the user to enter 'Disk 2'. The computer will install 'Disk 2' and then inform the user when the installation program is complete and whether or not it was successful. The program will make it's own icon on the Desktop of the user's computer. Additionally, the program can be run by choosing the 'Start button' in the lower left of the display screen. The option 'Programs' should be chosen. Here the user will find the program 'ShipCost'. To run the program, left click on 'ShipCost' while it is highlighted.

B. Example Creation of a Network

Instructions on how to create a network, including creation of database tables was presented in Boardman's [8] dissertation. The section summarizes these instructions.

In order to further explain the makeup and creation within Microsoft Access of the database tables which allow the entire program to run correctly, this section steps the reader through the entire process of creating each of the tables for a small network. For the purposes of this example, a network will be created which includes three cities each consisting of two modes of transportation. To avoid confusion with the network included in the program, the cities will be labeled simply City A, City B and City C. The two modes of transportation included in the example network will be truck and barge.

For the 3 cities to be included in the network, each consisting of two modes of transportation, 12 nodes will need to be created to describe the network. These 12 nodes include 3 starting nodes, one for each city; 3 ending nodes, again one for each city; and 6 city nodes two for each city, one for each mode of transportation per city. There are a total of 36 arcs in the network. The 36 arcs are broken down in the following manner: two arcs leaving each of the starting nodes and five arcs leaving each of the city nodes. There are two separate arcs between two city node pairs. For example, between the two nodes labeled City A - Barge and City B - Truck there are two nodes, one going from City A to City B and one pointing in the opposite direction. This allows the user flexibility in editing the network at a later time. A graphical representation of the nodes and arcs in the network is shown in Figure 6.1.

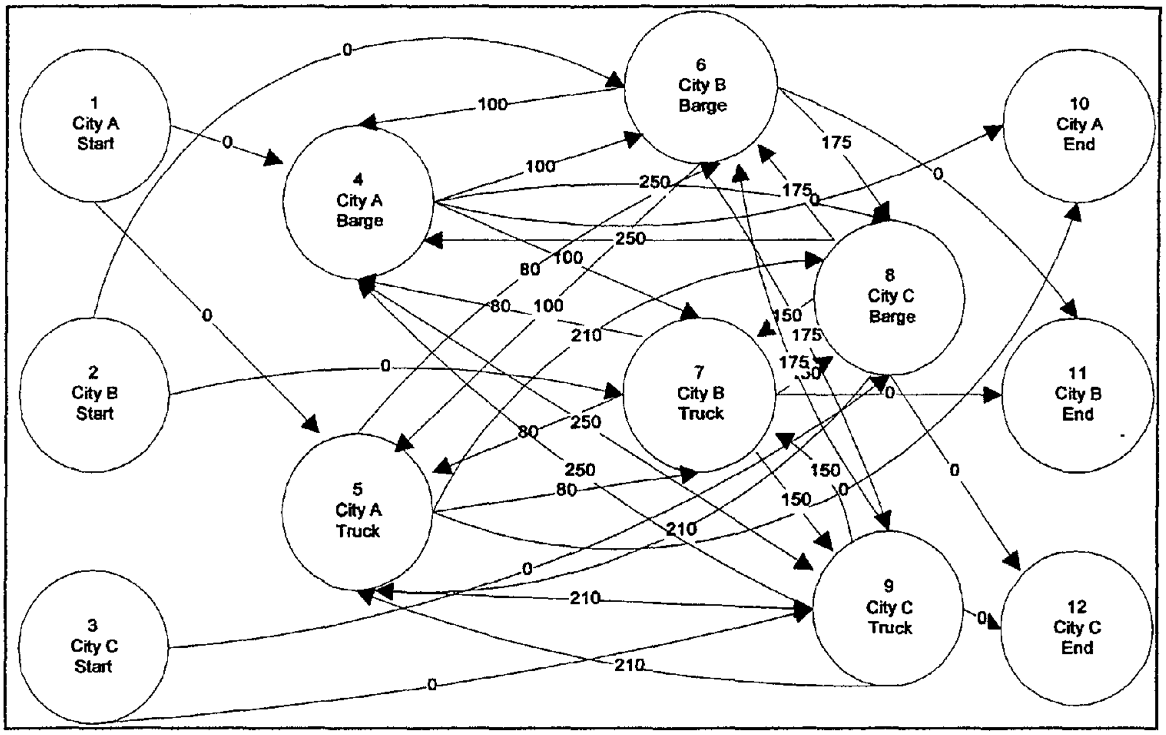

Figure 6.1: Graphical Representation of the Example Network

Before any of the individual database tables can be created, the database itself must be defined. In order to create a database, Microsoft Access is started and the New Database option is chosen from the File Menu. The database name, "routes", is entered into the File Name box and the Create button is chosen, as shown in Figure 6.2. After the database has been created, a dialog box appears requesting the type of database object to be created. In this case a table needs to be created, so the table tab is selected and the New option button is chosen, as shown in Figure 6.3.

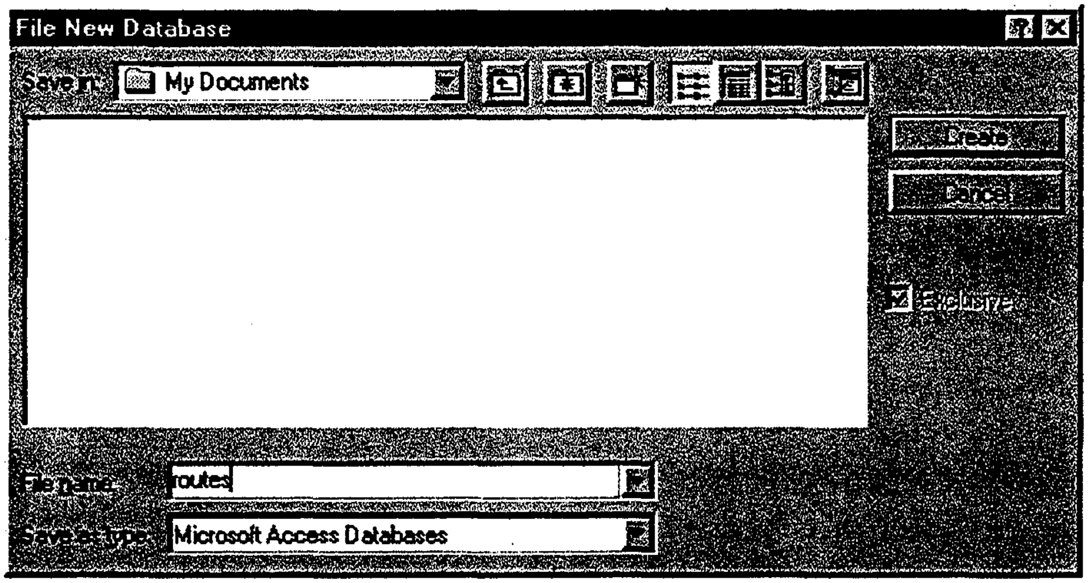

Figure 6.2: Access Create Database Screen

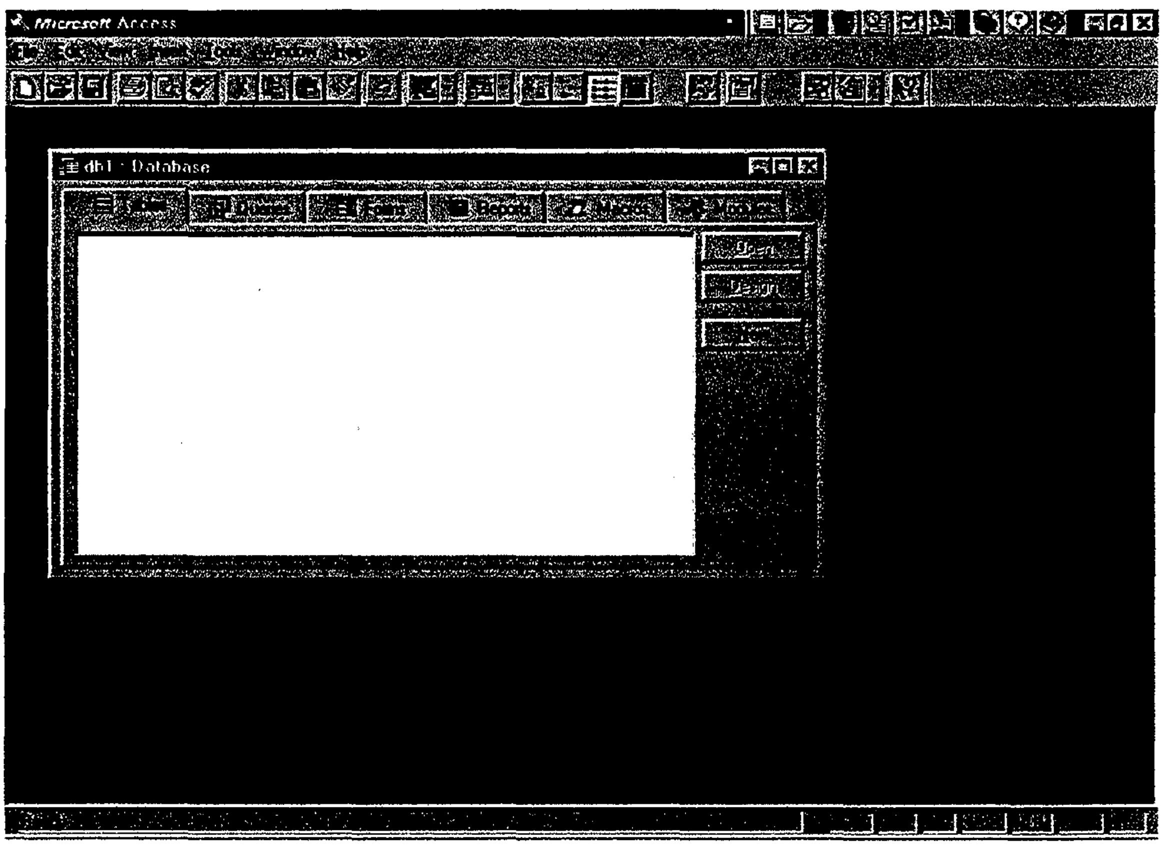

Figure 6.3: Access Create Table Window

The first database table that will need to be created is the "nodes" table, described earlier in Chapter V and illustrated in Table 5.1. After the New button is chosen in Figure 6.3, an option box appears asking the user to choose a viewing option for the new table, the user should choose the Design View option. This option allows the user to define the fields of the nodes table. The information which needs to be entered for the table includes the field name, data type and a description of the field. The information which needs to be entered to define the nodes table is illustrated in Figure 6.4. The table should then be saved with the name "nodes."

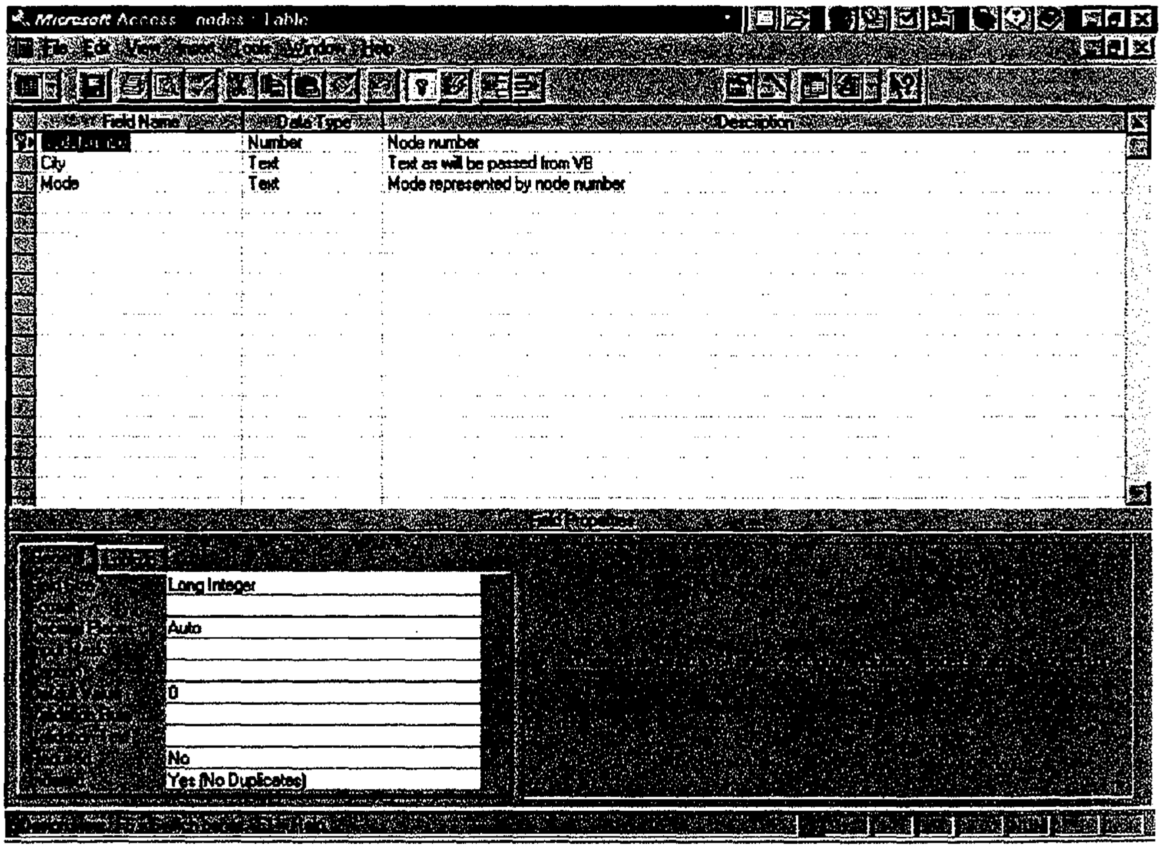

Figure 6.4: Access Create Nodes Table

After the table has been defined and saved, the appropriate data can be created to describe the nodes which make up the network. To enter data into the newly created database table, the user will need to switch to the datasheet view of the table. This can be accomplished by selecting Datasheet from the View menu in Microsoft Access. Once the datasheet view, which has a spreadsheet look, has been chosen, the user fills in the data fields for each of the twelve nodes. From Figure 6.1 the twelve nodes are described with the node number and the mode which represents the node. For example, from Figure 6.1 it can be seen that node 4 represents City A and barge transportation. This information is entered for each of the nodes in the table. The completed nodes table for the example network can be seen in Table 6.1.

NodeNumber	City	Mode
1	City A	start
2	City B	start
3	City C	start
4	City A	barge
5	City A	truck
6	City B	barge
7	City B	truck
8	City C	barge
9	City C	truck
10	City A	end
11	City B	end
12	City C	end

Table 6.1: Nodes Table for the Example Network

The "arcs" table can be created in the same way in which the "nodes" table was created. Following the same steps which were outlined above, the "arcs" table is created and the data is entered for each of the 36 arcs shown in Figure 6.1. The arcs are the lines between the nodes in Figure 6.1. The numbers on the arcs represent the distance (in miles) between the two nodes, which are connected by the arc. One entry needs to be made for each of these connecting arcs. For example, from Figure 6.1 the arc, which goes from node 4 to node 6, has a length of 100. The SourceNode entry for this arc would be 4, the DestNode entry would be 6, and the Distance entry would be 100. The entire example "arcs" table is shown in Table 6.2

SourceNode	DestNode	Distance
1	4	0
1	5	0
2	6	0
2	7	0
3	8	0
3	9	0
4	6	100
4	7	100
4	8	250
4	9	250
4	10	0
5	6	80
5	7	80
5	8	210
5	9	210
5	10	0
6	4	100
6	5	100
6	8	175
6	9	175
6	11	0
7	4	80
7	5	80
7	8	150
7	9	150
7	11	0
8	4	250
8	5	210
8	6	175
8	7	150
8	12	0
9	4	250
9	5	210
9	6	175
9	7	150
9	12	0

Table 6.2: Arcs Table for the Example Network

The "rates" table is created in the same way as the two previously described tables. The "rates" table has a total of four entries, one for each of the modes, one for start nodes, and another for the end nodes. The start and end nodes need to be included in the rates table so that the k-shortest path algorithm will know what values to assign to arcs leaving these nodes. The "rates" table for the example network is provided in Table 6.3. The values shown in Table 6.3 are arbitrary values.

mode	rate	avgspd
Truck	0.2483	60
Barge	0.0079	5
start	0	0
end	0	0

Table 6.3: Rates Table for the Example Network

The "xfer" table for the example network will consist of two entries for each node in the network, excluding the starting nodes. There are no entries for the starting nodes because no arcs enter those nodes; therefore no transfer will ever be necessary at those nodes. One entry will provide the cost and time to transfer a shipment from barge to the mode of transportation which the node represents and the other entry will provide the cost and time to transfer a shipment from truck to that same node. If the modes of transportation for two nodes are the same, the transfer cost and transfer time is zero. Similarly, the transfer cost and time for a shipment entering a destination node are zero as well. As an example from Figure 6.1, it can be seen that between node 4 and node 6 the transfer cost and time would both be equal to zero because both nodes have the same transportation mode (barge). But also seen in Figure 6.1, a transfer between node 4 and node 7 would involve a transfer time and cost to account for the transfer of a material from barge to truck. The "xfer" table for the example problem is presented in Table 6.4.

Destnode	modefrom	cost	settime
4	Barge	0	0
4	Truck	40	1.5
5	Barge	55	2
5	Truck	0	0
6	Barge	0	0
6	Truck	45	1.25
7	Barge	50	2.5
7	Truck	0	0
8	Barge	0	0
8	Truck	45	1.25
9	Barge	55	2.25
9	Truck	0	0
10	Barge	0	0
10	Truck	0	0
11	Barge	0	0
11	Truck	0	0
12	Barge	0	0
12	Truck	0	0

Table 6.4: Xfer Table for the Example Network

The "input" table and the "trace" table need only to be created and defined in Microsoft Access. These tables are automatically populated by the Visual Basic user interface as needed. The tables and the fields need merely to be defined for the user interface to function properly.

C. USER'S GUIDE

1. Running the Program

Before the user can utilize the program, he or she must install the program on his/her computer as previously discussed. After the user has installed the program, he or she must activate the program for use by double-clicking the left mouse button on the 'ShipCost' Icon located on the desktop of the computer. Choosing the 'Start button' in the lower left of the display screen may also activate the program. The option 'Programs' should be chosen. Under the 'Programs' option, the user will find the program 'ShipCost'. To run the program, using the mouse left click on 'ShipCost' while it is highlighted.

After the user has chosen to begin the program, the 'Startup Screen' will be displayed. This is shown in Figure 6.5 below. The user has three options at this point: To 'Run Program', 'Update Database Information', or 'Exit the program'. The user selects one of these options by using the left mouse button to click on the appropriate option.

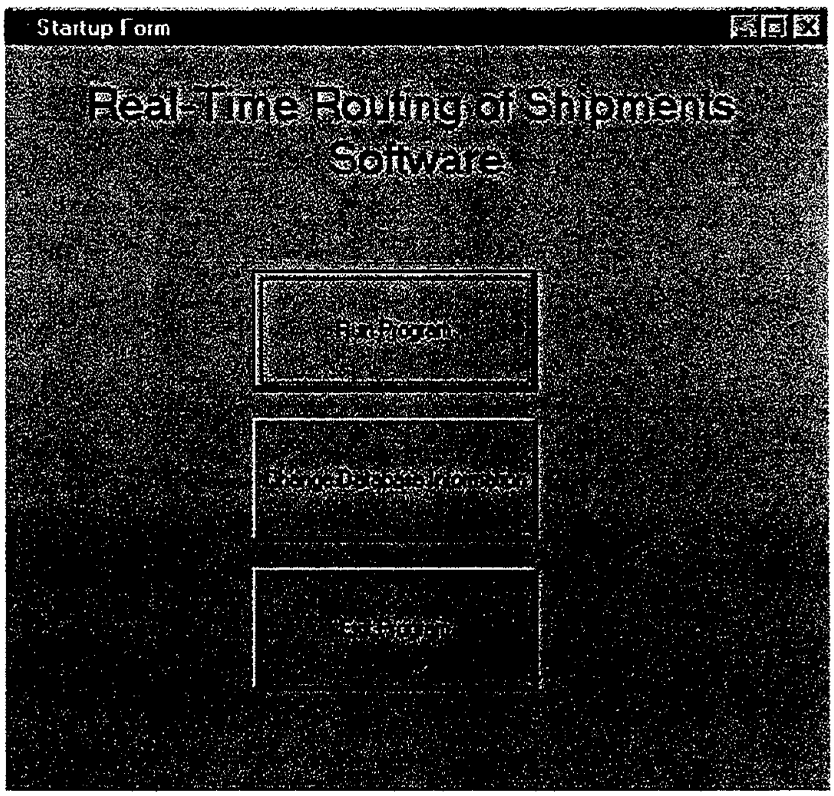

Figure 6.5: Startup Screen

If the user wishes to analyze the least cost or least time alternative between an origin-destination pair, then he or she should left click on the 'Run Program' option. The

'Input Data' screen will appear. This is shown is Figure 6.6. This screen allows the user to input all information required by the program in order to execute the appropriate shortest path calculation. The 'Input Data' screen prompts the user for the origin city, the destination city, the number of units to be shipped, the number of units that fit into one container, the unit cost to the producer, the annual percentage to be used in calculating the inventory carrying cost, the objective (to minimize cost or time), and the number of alternatives to display to the user.

The user will choose the source and destination city from pull down menus. These pull down menus read the information stored in the database 'routes' and list only those cities that are listed in the database. The user must then enter the number of units he or she wishes to ship, the number of units that will fit in one container, and the unit cost of each unit. If there are different types of units being shipped in one container, then the unit cost should be an average of the different unit costs for the types of units being shipped. The user must also enter the annual percentage of the unit cost the user customarily uses in calculating inventory or holding costs for the units shipped. Again, if there is more than one type of unit shipped, an average should be taken and entered in the appropriate space on the 'Input Data Form'. The user can then choose to either minimize cost or time and can choose the appropriate option by left clicking on the circle by the option he or she wishes to analyze. Finally, the user must enter the number of alternatives he or she wishes to have displayed back to them.

Once, all values have been entered, the user should choose the 'OK button' at the bottom of the screen. The user can choose to clear the values that he or she entered by selecting the 'Clear Values' button at the bottom of the 'Input Data' screen. The computer will begin processing the alternatives. While the alternatives are being processed a 'Time Left' screen will be shown. The user may choose to cancel the analysis at any time.

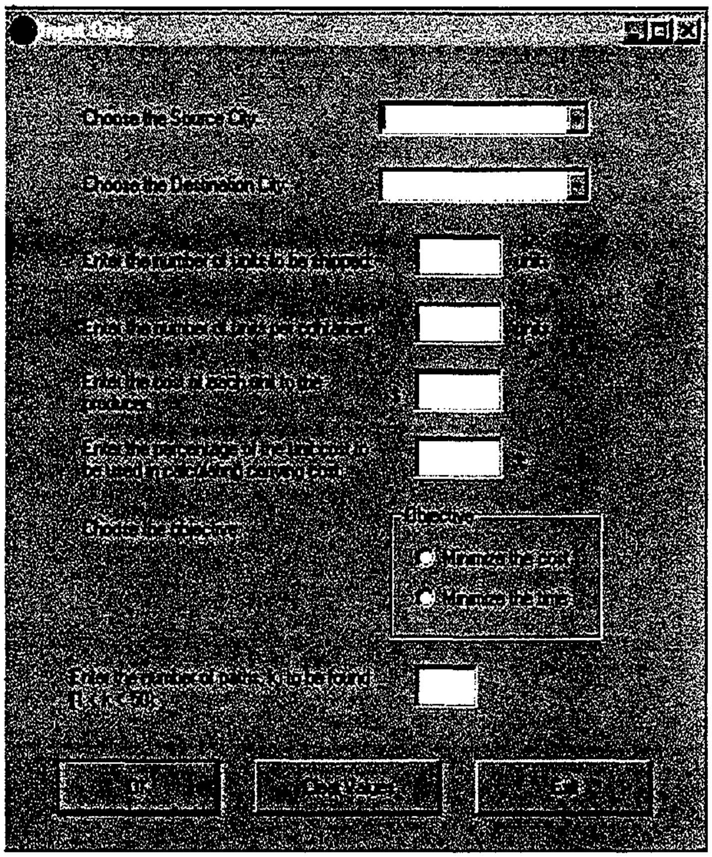

Figure 6.6: Input Data Screen

The computer will display the alternatives to the user in order of increasing cost if the alternative 'Minimize Cost' was chosen. The computer will display the alternatives in order of increasing time if the alternative 'Minimize Time' was chosen. An example of the 'K-alternatives' screen is shown in Figure 6.7 below. This screen shows the total cost and total time of each alternative. Only five alternatives are shown on this screen at a given time. If the user originally wanted the program to report more than five alternatives, a 'See Next 5 Best Solutions' Button would appear at the bottom of the 'K-alternatives' screen.

The user can examine any of the alternatives by left clicking on the radio button next to the alternative (see Figure 6.7) he or she wishes to examine. The user would then left clicking on the 'Examine a Specific Path' Button. (Note: the values presented in Figure 6.7 are solutions to an arbitrary problem and are intended for explanation purposes only).

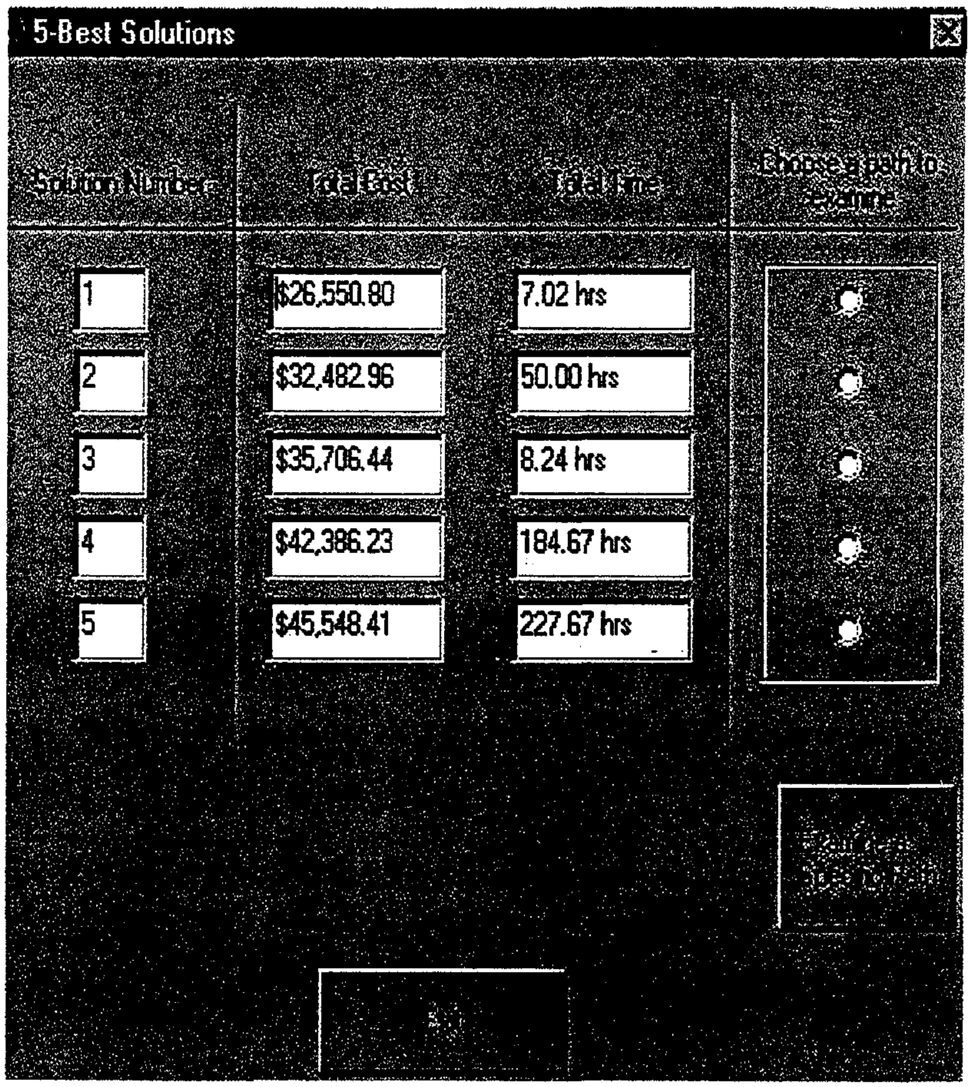

Figure 6.7: K-Alternatives Screen

The Specific path will then be displayed on the 'Path Description' screen. An example of this screen is shown in Figure 6.8. The total cost and total time for the alternative will be shown at the top of the screen. The cost and time for each portion of the path is shown next to each route. Figure 6.8 shows that the entire path for this example is represented by a direct route from the origin to the destination, involving one mode of transportation, truck.

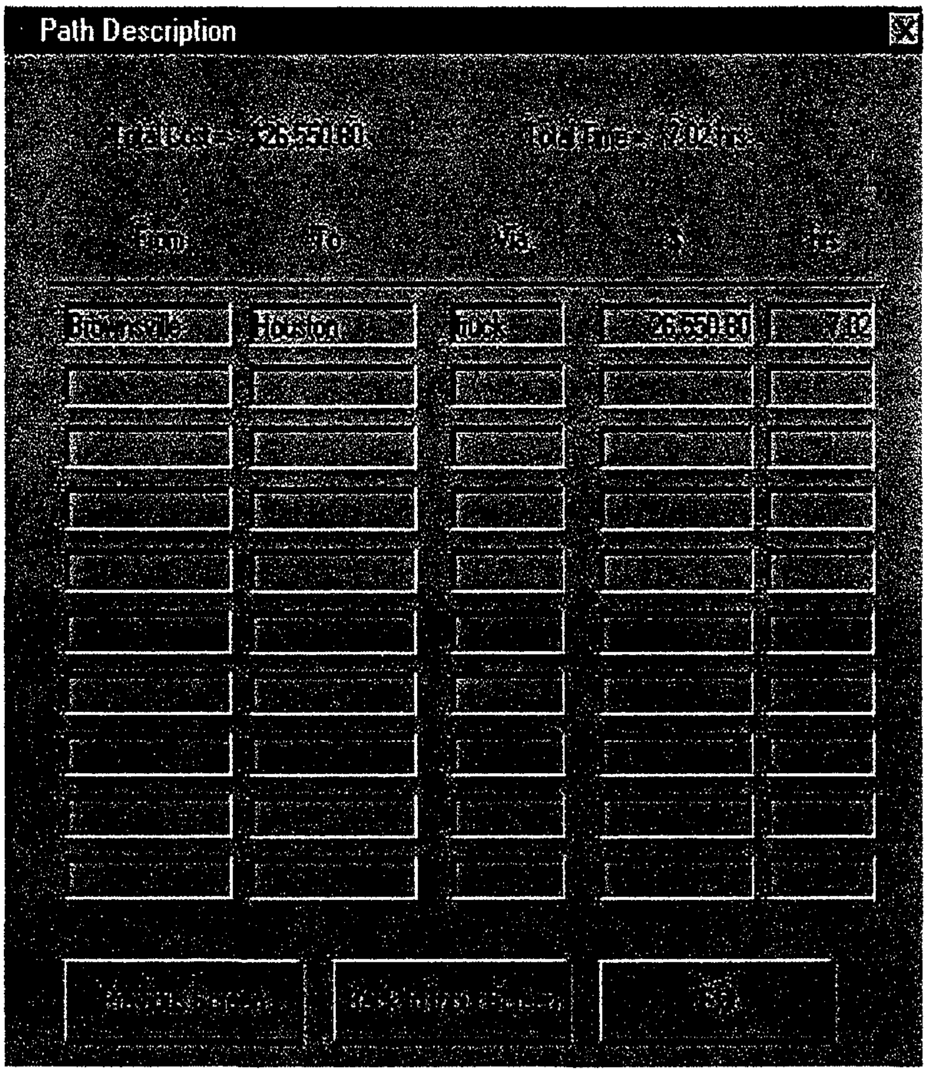

Figure 6.8: Path Description Screen

From here, the user can choose to exit, go back to the 'K-alternatives' screen (Figure 6.7), or go back to the 'Input Data' screen (Figure 6.6). The appropriate option can be chosen by using the left mouse button to click on the corresponding button at the bottom of the 'Path Description' screen.

2. Editing the Database Tables

If the "routes.mdb" Microsoft Access file already exists, then the user can edit portions of the file within the Visual Basic Program. The user can do this at the 'Startup' screen (Figure 6.9). The user clicks on the 'Update Database' button on this screen. Once this is done, the 'Change Database' screen appears. This is shown in Figure 6.9.

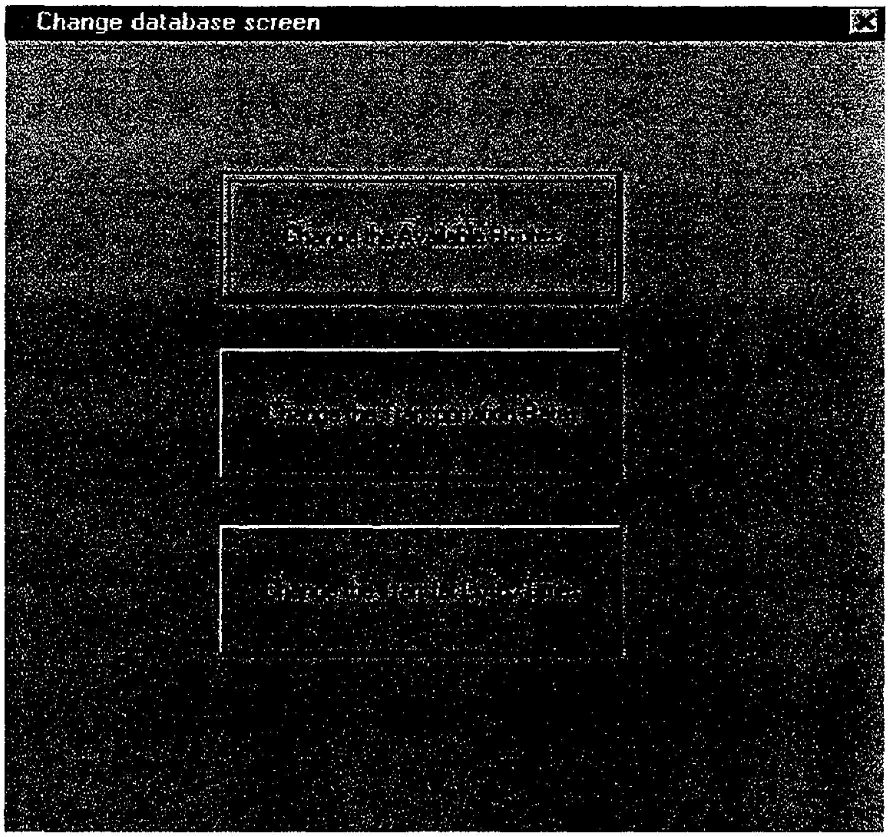

Figure 6.9: Change Database Screen

The user can edit the distances between the cities by choosing the 'Change the Available Routes' button. An example of this screen is shown in Figure 6.10. The source and destination cities available to change are read directly from the cities in the arcs database. The user must first choose the source city (origin) before the program will allow the user to change the destination city. Once both cities are chosen, the user can choose the mode of transportation to change. Only the modes of transportation available between the source and destination city will be listed. The modes of transportation are read directly from the arcs database. Once the desired mode is selected, the current mileage listed in the database will appear. The user can then type the new mileage information in the space provided. To update the database, the user should click on the 'Make Changes to Database' button. To cancel changes, the user should select the 'Return to Start' button.

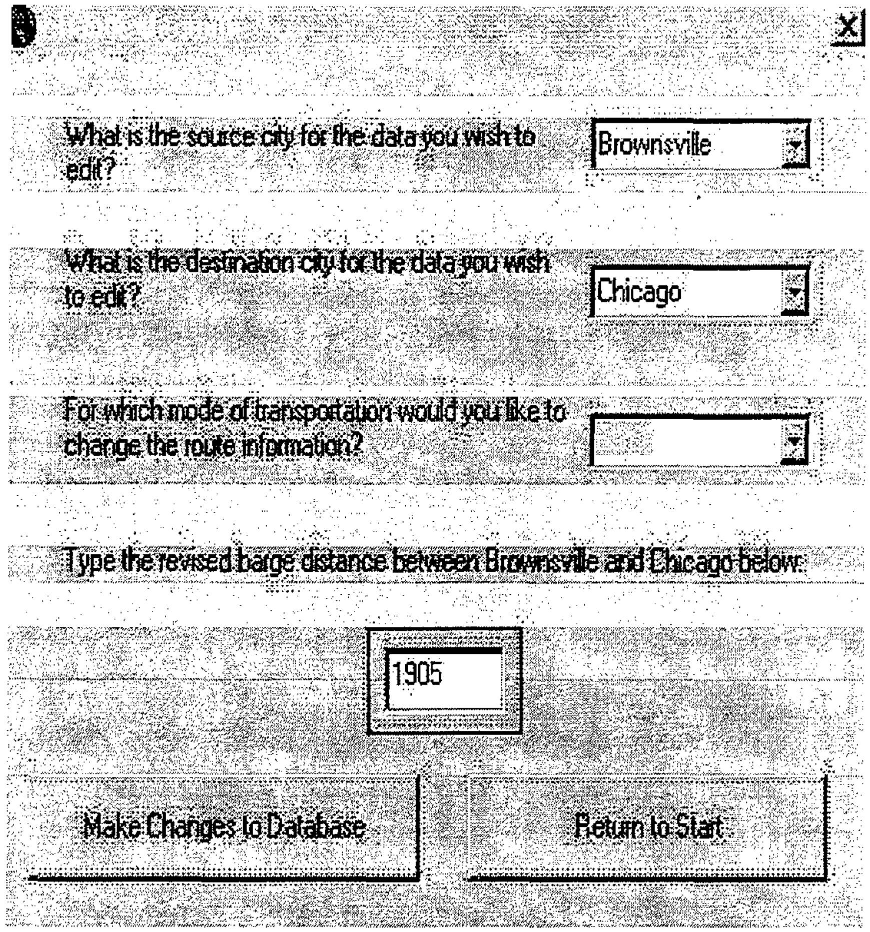

Figure 6.10: Change the Routes Screen

If the user wants to edit the cost or speed for a specific mode of transportation, he or she may do so by selecting the 'Change the Transportation Rates' button on the 'Change Database' screen (Figure 6.9). Figure 6.11 shows the 'Change the Transportation Rates' screen.

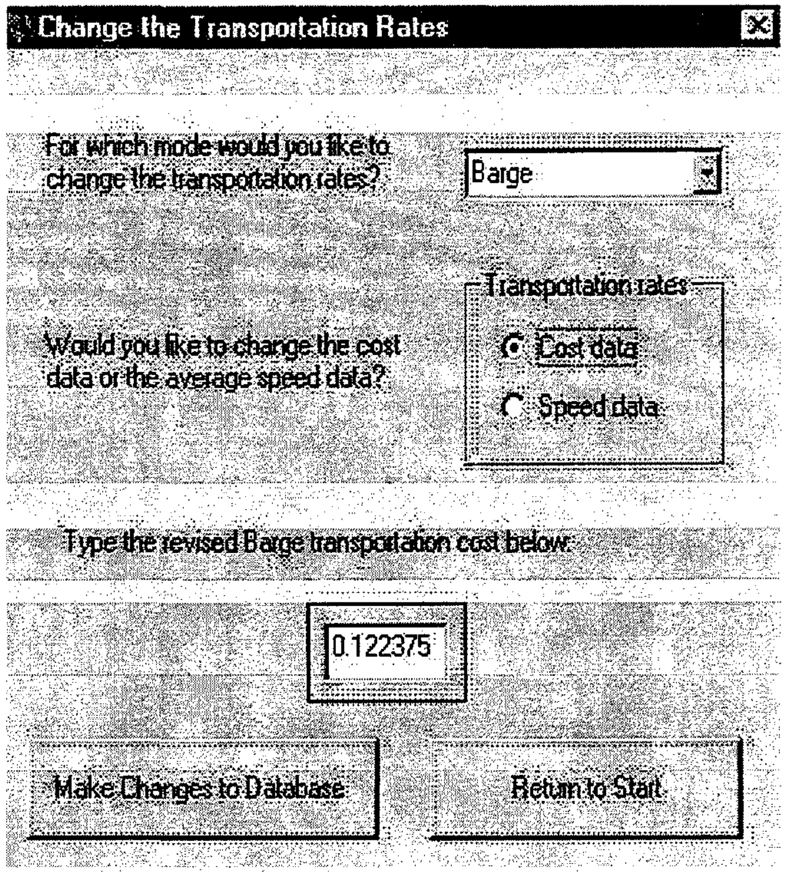

Figure 6.11: Change Transportation Rates Screen

The user must select the mode of transportation he or she wishes to change. This is done at the pull-down menu at the top of the screen. The user must choose whether he or she wishes to alter the cost or the speed data for this mode of transportation. He or she must click on the radio next to the appropriate option. The current data reported in the rates array will be listed in the white box. The user can alter this information by typing new data in the space provided. To permanently change the database, the user should click on the 'Make Changes to Database' button. To cancel the changes the user should click on the 'Return to Start' button.

The user may also choose to change the transfer speeds or transfer times by selecting the 'Change Transfer Costs/Times' button on the 'Change Database' screen (Figure 6.9). The 'Edit Transfer Information' screen in Figure 6.12 will appear.

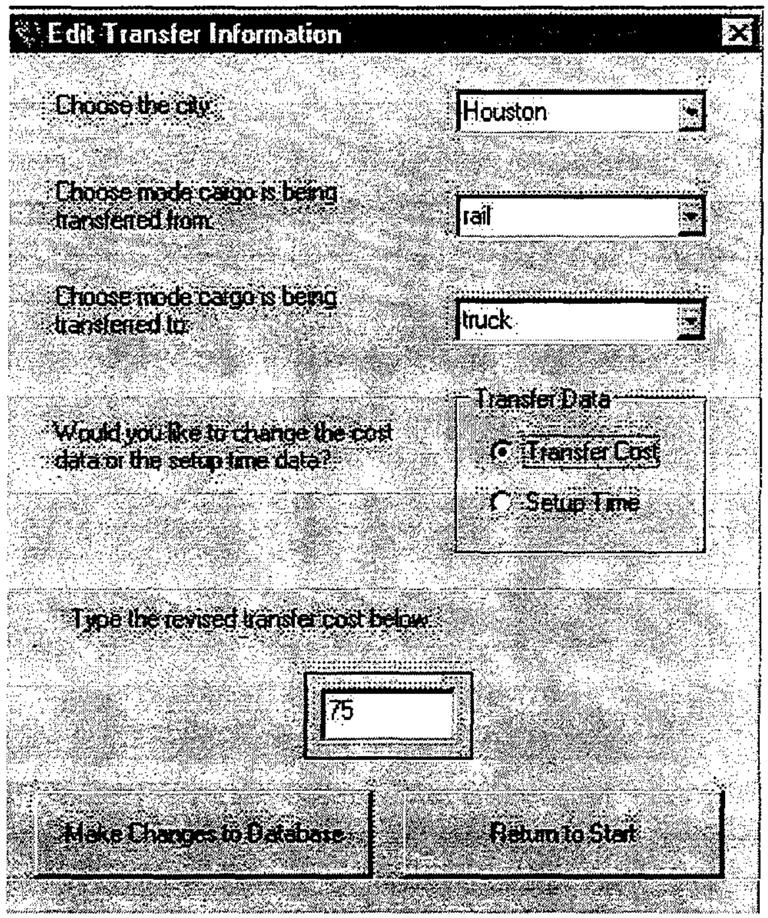

Figure 6.12: Edit Transfer Information Screen

The user must choose the city at which he or she wishes to change the transfer information. The available cities are read directly from the nodes database. The user must then select what two modes of transportation he or she wishes to change. The modes of transportation available to change at a particular city are read directly from the nodes database. The user must choose to change the transfer cost or transfer time between the modes of transportation. The current information stored in the transfer database is listed in the box provided. The user may change the information by typing the new information in the space provided. To permanently change the database, the user should click on the 'Make Changes to Database' button. To cancel the changes the user should click on the 'Return to Start' button.

D. SUMMARY

This chapter has discussed how to use the software. It has presented installation procedures, how to create a network, and a complete user's guide. The next chapter examines the feasibility of transportation modes as well as the feasibility of truck-barge along the defined network.

VII. FEASIBILITY ASSESSMENT

A. INTRODUCTION

It is an often quoted theory in the transportation industry that truck transportation is more appropriate for hauls that are 500 miles or less, and over that mileage, rail is more appropriate. At what mileage, then is barge considered more appropriate? The following sections in this chapter deal with specific origin-destination pairs and what transportation mode(s) are cheapest along the route. The sections consider single or multiple modes of transportation and list the costs associated with the cheapest transportation modal combination between the origin and destination pairs. However, these considerations do not address at what mileage a certain mode of transportation is considered more appropriate. The software is not designed to address this question. This section will therefore discuss this problem and provide possible solutions based upon the rates reported in Chapter IV.

B. RATE COMPARISON

Truck transportation, in general, uses different rates for different mileage ranges. As reported in Chapter IV, these averages are \$0.90 per container-mile for long hauls (over 500 miles), \$1.80 per container-mile for regional hauls (between 50 and 500 miles), and \$3.00 per container-mile for local hauls (anything under 50 miles).

Rail transportation, as reported in Chapter IV, applies an average rate of \$0.3510 per container-mile. However, rail transportation requires an additional cost for dray which is \$50 per container at the origin and at the destination (or a total of \$100 per container). Rail transportation also includes an initial transfer cost from the truck to the train at the rail terminal and another transfer at the destination terminal. This cost is $75 per container at each end (or a total of $150 per container).

Barge transportation, as reported in Chapter IV, uses an average rate of $0.1234 per container-mile. Like rail, barge incurs dray and transfer costs at the origin and destination terminals. The dray cost is $44.03 per container at each end ($88.06 total per container), whereas the transfer cost is $100 per container at each end ($200 total per container).

Also associated with all three modes of transportation is the inventory carrying cost. The equations developed for inventory carrying costs were described in Chapter IV. These also must be used when considering appropriate mileage for each transportation mode. Stated again the inventory carrying cost equation (4.2) is as follows:

Let:

u = unit cost of item to producer
Q = number of units shipped
t_m = shipment throughput time for mode *m*
CC_u = carrying cost per unit ($/unit-year)
CC_m = carrying cost per order associated with mode *m*

$$CC_m = Q * CC_u * [t_m / (365 * 24)]$$

where $CC_u = u * x\%$ (x is a standard percentage used by a shipper)

The total transportation cost (including dray, initial transfer, transportation, and inventory carrying cost) can be expressed as follows:

Let:

v = average speed in miles per hour for mode *m*
d = distance traveled in miles for mode *m*
T = transportation cost (in dollars) for mode *m*

D = Dray cost (in dollars) for mode m
Ts = transfer cost (in dollars) at terminal for mode m
CC_m = carrying cost (in dollars) for mode m

Then,

$$\text{Total Transportation Cost} = T + D + Ts + CC_m \tag{7.1}$$

Where:

T = (number of containers) * ($/ container-mile) * (distance traveled in miles)

D = $100 per container for rail, $88 for barge and $0 for truck

Ts = $150 per container for rail, $200 per container for barge, and $0 for truck

CC_m = (number of units shipped) * (unit cost of item to producer) * (x yearly %) * (throughput time in hours / (365 days per year *24 hours a day))

and,

throughput time in hours = d/v

Each of these factors above are either known or will be assumed, except for the distance traveled. Therefore, the distance traveled for mode *m* is what must be determined. The mode specific equations become:

Truck Cost = (number of containers)($/container-mile)(d) + (Q)(u)(x%)[(d/v) / (365 * 24) (7.2)

Barge Cost = (number of containers)($/container-mile)(d) + (Q)(u)(x%)[(d/v) / (365 * 24) + (D)(number of containers) + (Ts)(number of containers) (7.3)

Rail Cost (number of containers)($/container-mile)(d) + (Q)(u)(x%)[(d/v) / (365 * 24) + (D)(number of containers) + (Ts)(number of containers) (7.4)

Constants in the above equations are as follows:
v of truck = 42 miles per hours

v of rail = 37 miles per hour
v of barge = 6 miles per hour
truck rate = \$0.90, \$1.80, or \$3.00 (per container-mile), depending upon distance
rail rate = \$0.3510 (per container-mile)
barge rate = \$0.1234 (per container-mile)

C. Spreadsheet Analysis

Assumptions for the number of containers, number of units shipped, unit cost of the item shipped, and the annual percentage must be made. It is apparent that the number of miles where a mode becomes cheaper than the other modes will vary depending upon the assumptions made. Therefore, a set of Excel spreadsheets, Table 7.1 – Table 7.12, was constructed that evaluates a number of different alternatives.

Each table was constructed in a similar manner. The general procedure for developing the tables is as follows. Each table consists of fourteen columns. These are listed below:

Column 1: Number of Containers

Column 2: Average Truck Transportation Rate

Column 3: Average Barge Transportation Rate

Column 4: Average Rail Transportation Rate

Column 5: Number of Units Shipped

Column 6: Unit Cost to Producer

Column 7: Average Annual Percentage Used to Calculate Inventory Carrying Cost

Column 8: Dray Cost for Rail

Column 9: Dray Cost for Barge

Column 10: Transfer Cost for Rail (associated with Dray Cost)

Column 11: Transfer Cost for Barge (associated with Dray Cost)

Column 12: Mileage where Rail becomes cheaper than Truck

Column 13: Mileage where Barge becomes cheaper than Truck

Column 14: Mileage where Barge becomes cheaper than Rail

Column 1 (# containers) is a number that is set by the shipment being transported. Columns 2, 3, and 4 were determined from data provided by sources described in Chapter IV. These are the average transportation rates for the three different modes of transportation. Column 5 (# units) is a number that is dependent upon the characteristics of the shipment being transported. Column 6 (unit cost) is dependent upon the type of unit being shipped. Column 7 (annual %) is determined by the shipper. It is usually a set standard for particular products. Column 8 (dray cost rail) is the average dray cost per container (described in Chapter IV) multiplied by the number of containers being shipped (or Column #1 --# Cont). Column 9 (dray cost barge) is the average dray cost per container (described in Chapter IV) multiplied by the number of containers being shipped (or Column #1--# Cont). Column 10 (transfer cost rail) refers to the initial transfer cost from truck to rail that is necessitated by the dray to the rail terminal. This cost was discussed in Chapter IV. Column 11 (transfer cost barge) refers to the initial transfer cost from truck to barge that is necessitated by the dray to the barge terminal. This cost was discussed in Chapter IV. Columns 12, 13, and 14 display the mileage where each mode becomes cheaper when compared to one of the other modes of transportation. These numbers are found in the following manner:

For truck/rail, equation 7.2 is set equal to equation 7.4, solving for distance traveled (d).

Let,

Ts = Transfer cost (in dollars) for mode *m*
D = Dray cost (in dollars) for mode *m*
Nc = Number of containers shipped
R = transportation rate (in dollars per container-mile) for mode *m*
Q = number of units shipped
x = annual percentage used to calculate inventory cost
u = unit cost (in dollars) to producer
V = average speed (miles per hour) for mode *m*
d= distance traveled in miles

d = (Tsrail + Drail) / {[(Nc* Rtruck) + [(Q * x * u) / (365 days per year * 24 hours a day * Vtruck)]] – [(Rrail * Nc) + [(Q * x * u) / (365 days per year * 24 hours per day * Vrail)]]}

For truck/barge, equation 7.2 is set equal to equation 7.3, solving for distance traveled.

Let,

Ts = Transfer cost (in dollars) for mode *m*
D = Dray cost (in dollars) for mode *m*
Nc = Number of containers shipped
R = transportation rate (in dollars per container-mile) for mode *m*
Q = number of units shipped
x = annual percentage used to calculate inventory cost
u = unit cost (in dollars) to producer
V = average speed (miles per hour) for mode *m*
d= distance traveled in miles

d = (Tsbarge + Dbarge) / {[(Nc* Rtruck) + [(Q * x * u) / (365 days per year * 24 hours a day * Vtruck)]] – [(Rbarge * Nc) + [(Q * x * u) / (365 days per year * 24 hours per day * Vbarge)]]}

For rail/barge, equation 7.3 is set equal to equation 7.4, solving for distance traveled.

Let,

Ts = Transfer cost (in dollars) for mode *m*
D = Dray cost (in dollars) for mode *m*
Nc = Number of containers shipped
R = transportation rate (in dollars per container-mile) for mode *m*
Q = number of units shipped
x = annual percentage used to calculate inventory cost
u = unit cost (in dollars) to producer
V = average speed (miles per hour) for mode *m*
d= distance traveled in miles

d = [(Tsbarge + Dbarge) – (Tsrail + Drail) / {[(Nc* Rrail) + [(Q * x * u) / (365 days per year * 24 hours a day * Vrail)]] – [(Rbarge * Nc) + [(Q * x * u) / (365 days per year * 24 hours per day * Vbarge)]]}

These equations produce the figures found in columns 12, 13, and 14. The obtained figures are in miles. Some figures in Columns 12, 13, and 14 are negative numbers. This means that there is no range where the mode is cheaper than the other mode.

Each table (7.1-7.12) illustrates the process of allowing one of the variables to vary (either number of containers, number of units, unit cost, or annual percentage). These variations constitute a set of four tables. However, the truck transportation rate was also varied considering three different truck cost rates. One set of tables is for the local rate, one set for the regional rate, and one set is for the long haul rate. The tables are described below.

Table 7.1: Varying the Number of Containers Using the Long Haul Truck Rate

Table 7.2: Varying the Number of Units Using the Long Haul Rate

Table 7.3: Varying the Unit Cost Using the Long Haul Rate

Table 7.4: Varying the Annual Percentage Using the Long Haul Rate

Table 7.5: Varying the Number of Containers Using the Regional Rate

Table 7.6: Varying the Number of Units Using the Regional Rate

Table 7.7: Varying the Unit Cost Using the Regional Rate

Table 7.8: Varying the Annual Percentage Using the Regional Rate

Table 7.9: Varying the Number of Containers Using the Local Rate

Table 7.10: Varying the Number of Units Using the Local Rate

Table 7.11: Varying the Unit Cost Using the Local Rate

Table 7.12: Varying the Annual Percentage Using the Local Rate

Table 7.13: Summary of Tables 7.1-7.12

1. An Example from Tables 7.1-7.12

Each Table (7.1-7.12) is numbered along the left-hand side with row numbers. The tables are numbered consecutively (Table 7.1 contains rows 1-16, Table 7.2 contains rows 17-34, etc.). Row 1 of Table 7.1 is used to illustrate how each calculation was performed.

The scenario for Row 1 contains 1 container with 200 units being shipped. The unit cost (per unit) is $250. The annual percentage used to calculate the inventory carrying cost is 25 percent. For this scenario, the truck transportation rate is $0.90 per container-mile, the barge transportation rate is $0.12334 per container-mile, and the rail rate is $0.351 per container-mile. Using this data, the following is calculated:

Dray Cost for Rail = (1 container) * ($100 per container) = $100 (as shown in 'Dray Cost Rail' Column)

Dray Cost for Barge = (1 container) * ($88.03 per container) = $88.03 (as shown in 'Dray Cost Barge' Column)

Transfer Cost for Rail = (1 container) * ($150 per container) = $150 (as shown in 'Transfer Cost Rail' Column)

Transfer Cost for Barge = (1 container) * ($200 per container) = $200 (as shown in "Transfer Cost Barge' Column)

Mileage where Rail Becomes Cheaper than Truck:

d = ($100 dray cost rail + $150 transfer cost rail) / (((1 container * $0.90 truck rate per container-mile) + (200 units * $250 unit cost per unit * 25% annual percentage) / (365 days per year * 24 hours per day * 42 miles per hour average truck speed)) – ((1 container * $0.351 rail rate per container-mile) + (200 units * $250 unit cost per unit *

25% annual percentage) / (365 days per year * 24 hours per day * 37 miles per hour average rail speed))))

This equals 459 miles, meaning that truck is cheaper than rail below 459 miles and rail is cheaper than truck above 459 miles for one container. For two containers, the breakeven point is 457 miles as shown in Row 2 of Table 7.1

Mileage where Barge Becomes Cheaper than Truck:

d = ($88.03 dray cost barge + $200 transfer cost barge) / (((1 container * $0.90 truck rate per container-mile) + (200 units * $250 unit cost per unit 25% annual percentage) / (365 days per year * 24 hours per day * 42 miles per hour average truck speed)) – ((1 container * $0.123375 barge rate per container-mile) + (200 units * $250 unit cost per unit * 25% annual percentage) / (365 days per year * 24 hours per day * 6 miles per hour average barge speed))))

This equals 503 miles, meaning that truck is cheaper than barge below 503 miles and barge is cheaper than truck above 503 miles for one container. For two containers, the breakeven point is 427 mile as shown in Row 2 of Table 7.1.

Mileage where Barge Becomes Cheaper than Rail:

d = (($88.03 dray cost barge + $200 transfer cost barge) – ($100 dray cost rail + $150 transfer cost rail)) / (((1 container * $0.351rail rate per container-mile) + (200 units * $250 unit cost per unit 25% annual percentage) / (365 days per year * 24 hours per day * 37 miles per hour average rail speed)) – ((1 container * $0.123375 barge rate per container-mile) + (200 units * $250 unit cost per unit * 25% annual percentage) / (365 days per year * 24 hours per day * 6 miles per hour average barge speed))))

This equals 1341 miles, meaning that barge is cheaper than rail above 1341 miles and rail is cheaper than barge below 1341 miles for one container. For two containers, the breakeven point is 297 miles as shown in Row 2 of Table 7.1.

Each row in Tables 7.1-7.12 was computed in a similar manner to that above. The only difference is in the data that makes up each specific scenario. Each row represents a different scenario with one of the variables changing.

2. Summary Spreadsheet Table 7.13

Table 7.13 is a summary of Tables 7.1-7.12. It actually advances Tables 7.1-7.12 one step further by considering all three modes of transportation at one time, instead of only two modes of transportation at one time. Columns 12, 13, and 14 (Truck/Rail, Truck/Barge, and Barge/Rail columns of Tables 7.1-7.12 compare only two modes of transportation at one time. For example, Column 12—Truck/Rail presents the mileage where truck is cheaper than rail, independent upon where barge becomes cheaper than either mode of transportation. In order to compare all three modes of transportation at a time, Table 7.13 was developed. Table 7.13 contains four columns that are described below:

Column 1: Row #—describes the scenario consistent with the corresponding row number in Tables 7.1-7.12. In other words, Row 1 means that the information presented is consistent with that presented in Row 1 of Table 7.1-7.12 (recall, that in Table 7.1-7.12 the row numbers are presented on the far left column and are consecutive throughout all the tables). The table number where the row can be found is indicated next to the row number. For example, Row 1 (7.1) means that the row this row in Table 7.13 is describing corresponds to Row 1 of Table 7.1.

Column 2: Truck Range—describes the mileage range where truck transportation is cheaper than rail or barge for the given scenario in the corresponding row of Tables 7.1-7.12. In other words, the range presented in Row 1 corresponds to the range where truck is cheaper for the scenario presented in Row 1 in Tables 7.1-

7.12 (recall, that in Table 7.1-7.12 the row numbers are presented on the far left column and are consecutive throughout all the tables).

Column 3: Rail Range---describes the mileage range where rail transportation is cheaper than truck or barge for the given scenario in the corresponding row of Tables 7.1-7.12. In other words, the range presented in Row 1 corresponds to the range where rail is cheaper for the scenario presented in Row 1 in Tables 7.1-7.12 (recall, that in Table 7.1-7.12 the row numbers are presented on the far left column and are consecutive throughout all the tables).

Column 4: Barge Range---describes the mileage range where barge transportation is cheaper than truck or rail for the given scenario in the corresponding row of Tables 7.1-7.12. In other words, the range presented in Row 1 corresponds to the range where barge is cheaper for the scenario presented in Row 1 in Tables 7.1-7.12 (recall, that in Table 7.1-7.12 the row numbers are presented on the far left column and are consecutive throughout all the tables).

The figures in the 'Truck Range', 'Rail Range' and 'Barge Range' Columns were determined by graphing each equation (7.2, 7.3, and 7.4). An example of this is presented in the next section.

3. An example from Table 7.13

The figures displayed in Table 7.13 represent numbers obtained by graphing equations 7.2, 7.3, and 7.4 above. Row 1 will be taken as an example and is illustrated in detail.

Row 1 of Table 7.13 corresponds to Row 1 of Tables 7.1-7.12. Since the rows in Tables 7.1-7.12 are numbered consecutively, this row is found in Table 7.1. The far-left column of Tables 7.1-7.12 indicates the row number of the table. Row 1 is presented in Table 7.1. This is also apparent from the Row 1 (7.1) indication in Table 7.13. The scenario presented in Row 1 of Table 7.1 was presented as an example in a section above. Repeating the specific of the data presented in Row 1 of Table 7.1:

> The scenario for Row 1 contains 1 container with 200 units being shipped. The unit cost (per unit) is \$250. The annual percentage used to calculate the inventory carrying cost is 25 percent. For this scenario, the truck transportation rate is \$0.90 per container-mile, the barge transportation rate is \$0.1234 per container-mile, and the rail rate is \$0.3510 per container-mile. The calculated Dray Cost for Rail is \$100. The calculated Dray Cost for Rail is \$88.03. The calculated Transfer Cost for Rail is \$150. The calculated Transfer Cost for Barge is \$200. The mileage where rail becomes cheaper than truck is 459 miles. The mileage where barge becomes cheaper than truck is 503 miles. The mileage where barge becomes cheaper than rail is 1341 miles.

Using this data presented above for this scenario, the columns in Table 7.13 of Row 1 of the same table are generated as follows:

A graph is drawn with three lines. One line represents barge transportation, one line represents rail transportation, and the other represents truck transportation. The y-axis represents units in dollars, while the x axis represents units in miles. The y-intercept of each line (where the line crosses the y-axis) is equal to the Dray Cost plus the Transfer Cost for the mode of transportation. In this example the y-intercepts would be:

Y-intercept Rail = \$100 + \$150 = \$250

Y-intercept Barge = \$88.03 + \$200 = \$288.03

Y-intercept Truck = \$0 (note, the y-intercept for truck will always be zero since there is no dray or transfer cost associated with truck)

From the figures in columns 12, 13, and 14 (Truck/Rail, Truck/Barge, Barge/Rail columns) presented in Tables 7.1-7.12, the points where each of the lines intersect can also be determined. For this example the following is obtained:

Truck line intersects Rail line at 459 miles

Truck line intersects Barge line at 503 miles

Barge line intersects Rail line at 1341 miles

From the information provided by the y-intercept and the points where each line intersects the other lines, a graph can be formed. For this example the following result is obtained:

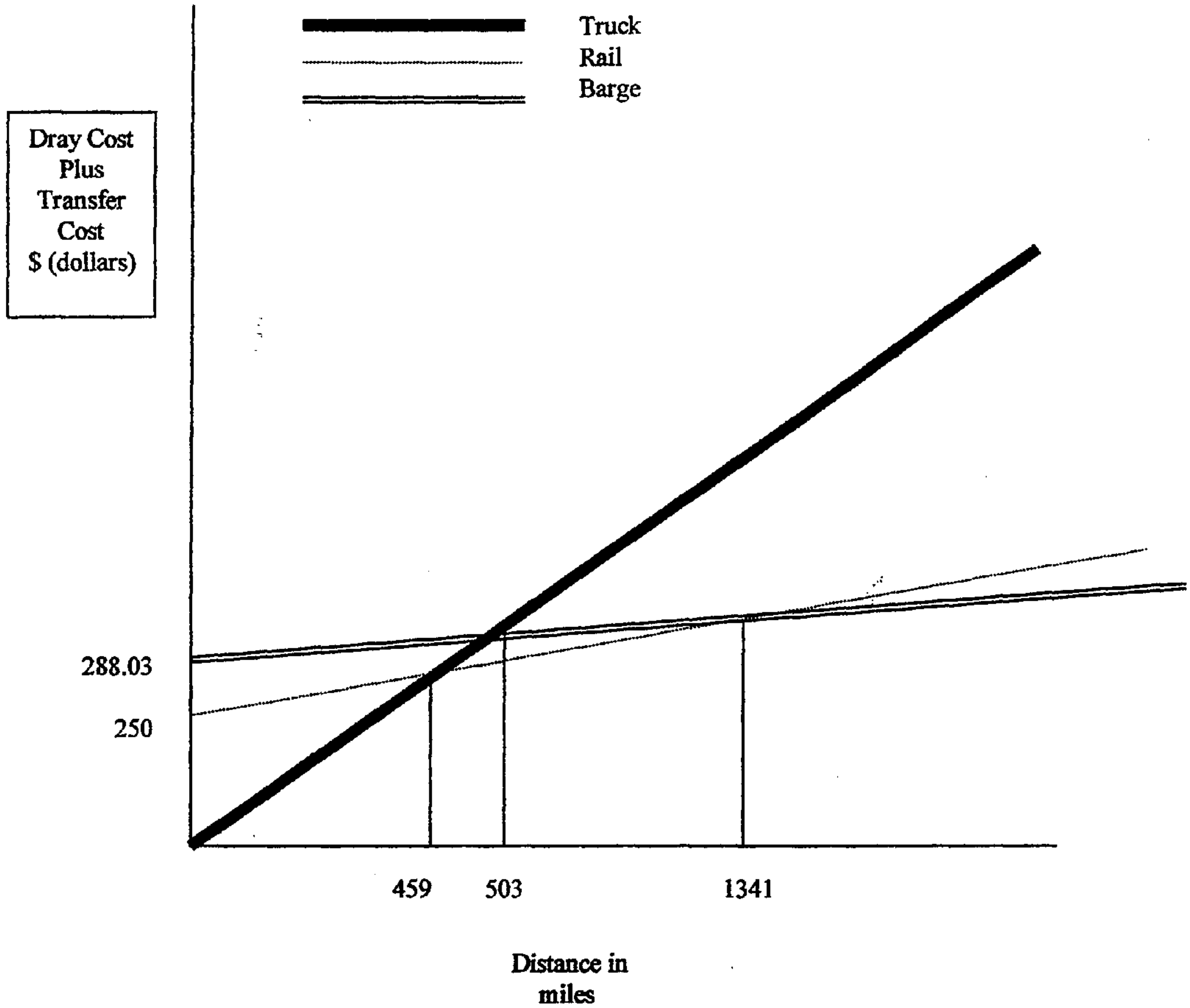

Figure 7.1: Graph of Example, Table 7.13

This graph indicates that truck is the cheaper mode of transportation from zero to 459 miles. At 459 miles rail becomes cheaper and remains cheaper until 1341 miles. After 1341 miles, barge becomes the cheapest mode of transportation. These mileage ranges appear in Table 7.13, Row 1 in the Columns 'Truck Range', 'Rail Range' and 'Barge

Range'. Recall, however, that these mileages are specifically related to the scenario presented in the corresponding row in Table 7.1-7.12 (in this case, Row 1 of Table 7.1). As the scenario data changes, the mileage ranges will change as well. This is why different mileage ranges are presented in Table 7.13. However, each row in Tables 7.1-7.12 can be interpreted in the same manner as this example. In fact, each row in Table 7.1-7.12 was graphed in the same manner as that above to achieve the figures presented in the corresponding rows in Table 7.13.

Describing the results in Table 7.13 in more detail, sometimes 'none' or 'infinity' is displayed. When 'none' is displayed (as in Row 2 under the 'Rail Range' columns), this indicates that there is no mileage range or no mileage point where the specific mode of transportation is cheaper than the other modes of transportation (for the given scenario in Tables 7.1-7.12). When 'infinity' is displayed (as in Row 1 under the 'Barge Range' column) this indicates that this mode is cheaper for all mileage points.

Table 7.1 Vary the Number of Containers (Long Haul Truck Rate)

Vary # Containers

Row #	# Cont.	Truck Rate	Barge Rate	Rail Rate	# Units	Unit Cost	Annual % (as decimal)	Dray Cost Rail	Dray Cost Barge	Transfer Cost Rail	Transfer Cost Barge	Truck/Rail	Truck/Barge	Barge/Rail
1	1	0.9000	0.1234	0.3510	200	250	0.2500	100	88	150	200	459	503	1341
2	2	0.9000	0.1234	0.3510	200	250	0.2500	200	176	300	400	457	427	297
3	3	0.9000	0.1234	0.3510	200	250	0.2500	300	264	450	600	457	406	236
4	5	0.9000	0.1234	0.3510	200	250	0.2500	500	440	750	1000	456	391	203
5	7	0.9000	0.1234	0.3510	200	250	0.2500	700	616	1050	1400	456	385	191
6	10	0.9000	0.1234	0.3510	200	250	0.2500	1000	880	1500	2000	456	381	183
7	25	0.9000	0.1234	0.3510	200	250	0.2500	2500	2201	3750	5000	456	375	173
8	50	0.9000	0.1234	0.3510	200	250	0.2500	5000	4402	7500	10000	455	373	170
9	75	0.9000	0.1234	0.3510	200	250	0.2500	7500	6602	11250	15000	455	372	169
10	100	0.9000	0.1234	0.3510	200	250	0.2500	10000	8803	15000	20000	455	372	169
11	250	0.9000	0.1234	0.3510	200	250	0.2500	25000	22008	37500	50000	455	371	168
12	500	0.9000	0.1234	0.3510	200	250	0.2500	50000	44015	75000	100000	455	371	167
13	1000	0.9000	0.1234	0.3510	200	250	0.2500	100000	88030	150000	200000	455	371	167
14	10000	0.9000	0.1234	0.3510	200	250	0.2500	1000000	880300	1500000	2000000	455	371	167
15	100000	0.9000	0.1234	0.3510	200	250	0.2500	10000000	8803000	15000000	20000000	455	371	167
16	1000000	0.9000	0.1234	0.3510	200	250	0.2500	100000000	88030000	150000000	200000000	455	371	167

Table 7.2 Vary the Number of Units (Long Haul Truck Rate)

									Vary # Units					
Row #	# Cont.	Truck Rate	Barge Rate	Rail Rate	# Units	Unit Cost	Annual % (as decimal)	Dray Cost Rail	Dray Cost Barge	Transfer Cost Rail	Transfer Cost Barge	Truck/Rail	Truck/Barge	Barge/Rail
17	100	0.9000	0.1234	0.3510	1	250	0.2500	10000	8803	15000	20000	455	371	167
18	100	0.9000	0.1234	0.3510	10	250	0.2500	10000	8803	15000	20000	455	371	167
19	100	0.9000	0.1234	0.3510	50	250	0.2500	10000	8803	15000	20000	455	371	167
20	100	0.9000	0.1234	0.3510	100	250	0.2500	10000	8803	15000	20000	455	371	168
21	100	0.9000	0.1234	0.3510	500	250	0.2500	10000	8803	15000	20000	455	373	171
22	100	0.9000	0.1234	0.3510	1000	250	0.2500	10000	8803	15000	20000	456	376	175
23	100	0.9000	0.1234	0.3510	1500	250	0.2500	10000	8803	15000	20000	456	378	179
24	100	0.9000	0.1234	0.3510	10000	250	0.2500	10000	8803	15000	20000	457	427	297
25	100	0.9000	0.1234	0.3510	12500	250	0.2500	10000	8803	15000	20000	458	444	369
26	100	0.9000	0.1234	0.3510	15000	250	0.2500	10000	8803	15000	20000	458	462	486
27	100	0.9000	0.1234	0.3510	20000	250	0.2500	10000	8803	15000	20000	459	503	1341
28	100	0.9000	0.1234	0.3510	22500	250	0.2500	10000	8803	15000	20000	460	526	10990
29	100	0.9000	0.1234	0.3510	25000	250	0.2500	10000	8803	15000	20000	460	552	-1773
30	100	0.9000	0.1234	0.3510	50000	250	0.2500	10000	8803	15000	20000	465	1079	-141
31	100	0.9000	0.1234	0.3510	100000	250	0.2500	10000	8803	15000	20000	475	-1187	-49
32	100	0.9000	0.1234	0.3510	1000000	250	0.2500	10000	8803	15000	20000	783	-31	-4
33	100	0.9000	0.1234	0.3510	10000000	250	0.2500	10000	8803	15000	20000	-143	-3	0
34	100	0.9000	0.1234	0.3510	500000000	250	0.2500	10000	8803	15000	20000	-2	0	0

Table 7.3 Vary the Unit Cost (Long Haul Truck Rate)

									Vary Unit Cost					
Row#	# Cont.	Truck Rate	Barge Rate	Rail Rate	# Units	Unit Cost	Annual % (as decimal)	Dray Cost Rail	Dray Cost Barge	Transfer Cost Rail	Transfer Cost Barge	Truck/Rail	Truck/Barge	Barge/Rail
35	100	0.9000	0.1234	0.3510	200	1	0.2500	10000	8803	15000	20000	455	371	167
36	100	0.9000	0.1234	0.3510	200	50	0.2500	10000	8803	15000	20000	455	371	167
37	100	0.9000	0.1234	0.3510	200	100	0.2500	10000	8803	15000	20000	455	371	168
38	100	0.9000	0.1234	0.3510	200	1000	0.2500	10000	8803	15000	20000	456	375	173
39	100	0.9000	0.1234	0.3510	200	10000	0.2500	10000	8803	15000	20000	457	414	257
40	100	0.9000	0.1234	0.3510	200	12500	0.2500	10000	8803	15000	20000	457	427	297
41	100	0.9000	0.1234	0.3510	200	15000	0.2500	10000	8803	15000	20000	458	440	352
42	100	0.9000	0.1234	0.3510	200	25000	0.2500	10000	8803	15000	20000	459	503	1341
43	100	0.9000	0.1234	0.3510	200	30000	0.2500	10000	8803	15000	20000	460	541	-3312
44	100	0.9000	0.1234	0.3510	200	40000	0.2500	10000	8803	15000	20000	462	639	-417
45	100	0.9000	0.1234	0.3510	200	50000	0.2500	10000	8803	15000	20000	463	781	-223
46	100	0.9000	0.1234	0.3510	200	100000	0.2500	10000	8803	15000	20000	471	-7429	-67
47	100	0.9000	0.1234	0.3510	200	1000000	0.2500	10000	8803	15000	20000	684	-39	-5
48	100	0.9000	0.1234	0.3510	200	500000000	0.2500	10000	8803	15000	20000	-3	0	0

Table 7.4 Vary the Annual Percentage (Long Haul Truck Rate)

Row #	# Cont.	Truck Rate	Barge Rate	Rail Rate	# Units	Unit Cost	Annual % (as decimal)	Dray Cost Rail	Dray Cost Barge	Transfer Cost Rail	Transfer Cost Barge	Truck/Rail	Truck/Barge	Barge/Rail
									Vary Annual %					
49	100	0.9000	0.1234	0.3510	200	250	0.0010	10000	8803	15000	20000	455	371	167
50	100	0.9000	0.1234	0.3510	200	250	0.0100	10000	8803	15000	20000	455	371	167
51	100	0.9000	0.1234	0.3510	200	250	0.1000	10000	8803	15000	20000	455	371	168
52	100	0.9000	0.1234	0.3510	200	250	0.2500	10000	8803	15000	20000	455	372	169
53	100	0.9000	0.1234	0.3510	200	250	0.4000	10000	8803	15000	20000	455	372	169
54	100	0.9000	0.1234	0.3510	200	250	0.5000	10000	8803	15000	20000	455	373	170
55	100	0.9000	0.1234	0.3510	200	250	0.7500	10000	8803	15000	20000	455	374	172
56	100	0.9000	0.1234	0.3510	200	250	0.8000	10000	8803	15000	20000	455	374	172
57	100	0.9000	0.1234	0.3510	200	250	0.9000	10000	8803	15000	20000	456	374	173
58	100	0.9000	0.1234	0.3510	200	250	1.0000	10000	8803	15000	20000	456	375	173
59	100	0.9000	0.1234	0.3510	200	250	1.0000	10000	8803	15000	20000	456	375	173

Table 7.5 Vary the Number of Containers (Regional Haul Truck Rate)

								Vary # Containers						
Row #	# Cont.	Truck Rate	Barge Rate	Rail Rate	# Units	Unit Cost	Annual % (as decimal)	Dray Cost Rail	Dray Cost Barge	Transfer Cost Rail	Transfer Cost Barge	Truck/Rail	Truck/Barge	Barge/Rail
60	1	1.8000	0.1234	0.3510	200	250	0.2500	100	88	150	200	173	196	1341
61	2	1.8000	0.1234	0.3510	200	250	0.2500	200	176	300	400	173	183	297
62	3	1.8000	0.1234	0.3510	200	250	0.2500	300	264	450	600	173	179	236
63	5	1.8000	0.1234	0.3510	200	250	0.2500	500	440	750	1000	173	176	203
64	7	1.8000	0.1234	0.3510	200	250	0.2500	700	616	1050	1400	173	175	191
65	10	1.8000	0.1234	0.3510	200	250	0.2500	1000	880	1500	2000	173	174	183
66	25	1.8000	0.1234	0.3510	200	250	0.2500	2500	2201	3750	5000	173	173	173
67	50	1.8000	0.1234	0.3510	200	250	0.2500	5000	4402	7500	10000	173	172	170
68	75	1.8000	0.1234	0.3510	200	250	0.2500	7500	6602	11250	15000	173	172	169
69	100	1.8000	0.1234	0.3510	200	250	0.2500	10000	8803	15000	20000	173	172	169
70	250	1.8000	0.1234	0.3510	200	250	0.2500	25000	22008	37500	50000	173	172	168
71	500	1.8000	0.1234	0.3510	200	250	0.2500	50000	44015	75000	100000	173	172	167
72	1000	1.8000	0.1234	0.3510	200	250	0.2500	100000	88030	150000	200000	173	172	167
73	10000	1.8000	0.1234	0.3510	200	250	0.2500	1000000	880300	1500000	2000000	173	172	167
74	100000	1.8000	0.1234	0.3510	200	250	0.2500	10000000	8803000	15000000	20000000	173	172	167
75	1000000	1.8000	0.1234	0.3510	200	250	0.2500	100000000	88030000	150000000	200000000	173	172	167

Table 7.6 Vary the Number of Units (Regional Haul Truck Rate)

									Vary # Units					
Row #	# Cont.	Truck Rate	Barge Rate	Rail Rate	# Units	Unit Cost	Annual % (as decimal)	Dray Cost Rail	Dray Cost Barge	Transfer Cost Rail	Transfer Cost Barge	Truck/Rail	Truck/Barge	Barge/Rail
76	100	1.8000	0.1234	0.3510	1	250	0.2500	10000	8803	15000	20000	173	172	167
77	100	1.8000	0.1234	0.3510	10	250	0.2500	10000	8803	15000	20000	173	172	167
78	100	1.8000	0.1234	0.3510	50	250	0.2500	10000	8803	15000	20000	173	172	167
79	100	1.8000	0.1234	0.3510	100	250	0.2500	10000	8803	15000	20000	173	172	168
80	100	1.8000	0.1234	0.3510	500	250	0.2500	10000	8803	15000	20000	173	172	171
81	100	1.8000	0.1234	0.3510	1000	250	0.2500	10000	8803	15000	20000	173	173	175
82	100	1.8000	0.1234	0.3510	1500	250	0.2500	10000	8803	15000	20000	173	173	179
83	100	1.8000	0.1234	0.3510	10000	250	0.2500	10000	8803	15000	20000	173	183	297
84	100	1.8000	0.1234	0.3510	12500	250	0.2500	10000	8803	15000	20000	173	186	369
85	100	1.8000	0.1234	0.3510	15000	250	0.2500	10000	8803	15000	20000	173	189	486
86	100	1.8000	0.1234	0.3510	20000	250	0.2500	10000	8803	15000	20000	173	196	1341
87	100	1.8000	0.1234	0.3510	22500	250	0.2500	10000	8803	15000	20000	173	199	10990
88	100	1.8000	0.1234	0.3510	25000	250	0.2500	10000	8803	15000	20000	173	203	-1773
89	100	1.8000	0.1234	0.3510	50000	250	0.2500	10000	8803	15000	20000	174	247	-141
90	100	1.8000	0.1234	0.3510	100000	250	0.2500	10000	8803	15000	20000	175	438	-49
91	100	1.8000	0.1234	0.3510	1000000	250	0.2500	10000	8803	15000	20000	205	-34	-4
92	100	1.8000	0.1234	0.3510	10000000	250	0.2500	10000	8803	15000	20000	-295	-3	0
93	100	1.8000	0.1234	0.3510	500000000	250	0.2500	10000	8803	15000	20000	-2	0	0

Table 7.7 Vary the Unit Cost(Regional Haul Truck Rate)

									Vary Unit Cost					
Row #	# Cont.	Truck Rate	Barge Rate	Rail Rate	# Units	Unit Cost	Annual % (as decimal)	Dray Cost Rail	Dray Cost Barge	Transfer Cost Rail	Transfer Cost Barge	Truck/Rail	Truck/Barge	Barge/Rail
94	100	1.8000	0.1234	0.3510	200	1	0.2500	10000	8803	15000	20000	173	172	167
95	100	1.8000	0.1234	0.3510	200	50	0.2500	10000	8803	15000	20000	173	172	167
96	100	1.8000	0.1234	0.3510	200	100	0.2500	10000	8803	15000	20000	173	172	168
97	100	1.8000	0.1234	0.3510	200	1000	0.2500	10000	8803	15000	20000	173	173	173
98	100	1.8000	0.1234	0.3510	200	10000	0.2500	10000	8803	15000	20000	173	181	257
99	100	1.8000	0.1234	0.3510	200	12500	0.2500	10000	8803	15000	20000	173	183	297
100	100	1.8000	0.1234	0.3510	200	15000	0.2500	10000	8803	15000	20000	173	185	352
101	100	1.8000	0.1234	0.3510	200	25000	0.2500	10000	8803	15000	20000	173	196	1341
102	100	1.8000	0.1234	0.3510	200	30000	0.2500	10000	8803	15000	20000	173	201	-3312
103	100	1.8000	0.1234	0.3510	200	40000	0.2500	10000	8803	15000	20000	173	213	-417
104	100	1.8000	0.1234	0.3510	200	50000	0.2500	10000	8803	15000	20000	174	227	-223
105	100	1.8000	0.1234	0.3510	200	100000	0.2500	10000	8803	15000	20000	175	334	-67
106	100	1.8000	0.1234	0.3510	200	1000000	0.2500	10000	8803	15000	20000	198	-44	-5
107	100	1.8000	0.1234	0.3510	200	500000000	0.2500	10000	8803	15000	20000	-3	0	0

Table 7.8 Vary the Annual Percentage (Regional Haul Truck Rate)

									Vary Annual %					
Row #	# Cont.	Truck Rate	Barge Rate	Rail Rate	# Units	Unit Cost	Annual % (as decimal)	Dray Cost Rail	Dray Cost Barge	Transfer Cost Rail	Transfer Cost Barge	Truck/Rail	Truck/Barge	Barge/Rail
108	100	1.8000	0.1234	0.3510	200	250	0.0010	10000	8803	15000	20000	173	172	167
109	100	1.8000	0.1234	0.3510	200	250	0.0100	10000	8803	15000	20000	173	172	167
110	100	1.8000	0.1234	0.3510	200	250	0.1000	10000	8803	15000	20000	173	172	168
111	100	1.8000	0.1234	0.3510	200	250	0.2500	10000	8803	15000	20000	173	172	169
112	100	1.8000	0.1234	0.3510	200	250	0.4000	10000	8803	15000	20000	173	172	169
113	100	1.8000	0.1234	0.3510	200	250	0.5000	10000	8803	15000	20000	173	172	170
114	100	1.8000	0.1234	0.3510	200	250	0.7500	10000	8803	15000	20000	173	172	172
115	100	1.8000	0.1234	0.3510	200	250	0.8000	10000	8803	15000	20000	173	172	172
116	100	1.8000	0.1234	0.3510	200	250	0.9000	10000	8803	15000	20000	173	173	173
117	100	1.8000	0.1234	0.3510	200	250	1.0000	10000	8803	15000	20000	173	173	173
118	100	1.8000	0.1234	0.3510	200	250	1.0000	10000	8803	15000	20000	173	173	173

Table 7.9 Vary the Number of Containers (Local Haul Truck Rate)

Row #	# Cont.	Truck Rate	Barge Rate	Rail Rate	# Units	Unit Cost	Annual % (as decimal)	Dray Cost Rail	Dray Cost Barge	Transfer Cost Rail	Transfer Cost Barge	Truck/Rail	Truck/Barge	Barge/Rail
								Vary # Containers						
119	1	3.0000	0.1234	0.3510	200	250	0.2500	100	88	150	200	95	108	1341
120	2	3.0000	0.1234	0.3510	200	250	0.2500	200	176	300	400	94	104	297
121	3	3.0000	0.1234	0.3510	200	250	0.2500	300	264	450	600	94	103	236
122	5	3.0000	0.1234	0.3510	200	250	0.2500	500	440	750	1000	94	102	203
123	7	3.0000	0.1234	0.3510	200	250	0.2500	700	616	1050	1400	94	101	191
124	10	3.0000	0.1234	0.3510	200	250	0.2500	1000	880	1500	2000	94	101	183
125	25	3.0000	0.1234	0.3510	200	250	0.2500	2500	2201	3750	5000	94	100	173
126	50	3.0000	0.1234	0.3510	200	250	0.2500	5000	4402	7500	10000	94	100	170
127	75	3.0000	0.1234	0.3510	200	250	0.2500	7500	6602	11250	15000	94	100	169
128	100	3.0000	0.1234	0.3510	200	250	0.2500	10000	8803	15000	20000	94	100	169
129	250	3.0000	0.1234	0.3510	200	250	0.2500	25000	22008	37500	50000	94	100	168
130	500	3.0000	0.1234	0.3510	200	250	0.2500	50000	44015	75000	100000	94	100	167
131	1000	3.0000	0.1234	0.3510	200	250	0.2500	100000	88030	150000	200000	94	100	167
132	10000	3.0000	0.1234	0.3510	200	250	0.2500	1000000	880300	1500000	2000000	94	100	167
133	100000	3.0000	0.1234	0.3510	200	250	0.2500	10000000	8803000	15000000	20000000	94	100	167
134	1000000	3.0000	0.1234	0.3510	200	250	0.2500	100000000	88030000	150000000	200000000	94	100	167

Table 7.10 Vary the Number of Units (Local Haul Truck Rate)

									Vary # Units					
Row #	# Cont.	Truck Rate	Barge Rate	Rail Rate	# Units	Unit Cost	Annual % (as decimal)	Dray Cost Rail	Dray Cost Barge	Transfer Cost Rail	Transfer Cost Barge	Truck/Rail	Truck/Barge	Barge/Rail
135	100	3.0000	0.1234	0.3510	1	250	0.2500	10000	8803	15000	20000	94	100	167
136	100	3.0000	0.1234	0.3510	10	250	0.2500	10000	8803	15000	20000	94	100	167
137	100	3.0000	0.1234	0.3510	50	250	0.2500	10000	8803	15000	20000	94	100	167
138	100	3.0000	0.1234	0.3510	100	250	0.2500	10000	8803	15000	20000	94	100	168
139	100	3.0000	0.1234	0.3510	500	250	0.2500	10000	8803	15000	20000	94	100	171
140	100	3.0000	0.1234	0.3510	1000	250	0.2500	10000	8803	15000	20000	94	100	175
141	100	3.0000	0.1234	0.3510	1500	250	0.2500	10000	8803	15000	20000	94	101	179
142	100	3.0000	0.1234	0.3510	10000	250	0.2500	10000	8803	15000	20000	94	104	297
143	100	3.0000	0.1234	0.3510	12500	250	0.2500	10000	8803	15000	20000	94	105	369
144	100	3.0000	0.1234	0.3510	15000	250	0.2500	10000	8803	15000	20000	94	106	486
145	100	3.0000	0.1234	0.3510	20000	250	0.2500	10000	8803	15000	20000	95	108	1341
146	100	3.0000	0.1234	0.3510	22500	250	0.2500	10000	8803	15000	20000	95	109	10990
147	100	3.0000	0.1234	0.3510	25000	250	0.2500	10000	8803	15000	20000	95	110	-1773
148	100	3.0000	0.1234	0.3510	50000	250	0.2500	10000	8803	15000	20000	95	122	-141
149	100	3.0000	0.1234	0.3510	100000	250	0.2500	10000	8803	15000	20000	95	155	-49
150	100	3.0000	0.1234	0.3510	1000000	250	0.2500	10000	8803	15000	20000	103	-39	-4
151	100	3.0000	0.1234	0.3510	10000000	250	0.2500	10000	8803	15000	20000	707	-3	0
152	100	3.0000	0.1234	0.3510	500000000	250	0.2500	10000	8803	15000	20000	-2	0	0

Table 7.11 Vary the Units Cost (Local Haul Truck Rate)

									Vary Unit Cost					
Row #	# Cont.	Truck Rate	Barge Rate	Rail Rate	# Units	Unit Cost	Annual % (as decimal)	Dray Cost Rail	Dray Cost Barge	Transfer Cost Rail	Transfer Cost Barge	Truck/Rail	Truck/Barge	Barge/Rail
153	100	3.0000	0.1234	0.3510	200	1	0.2500	10000	8803	15000	20000	94	100	167
154	100	3.0000	0.1234	0.3510	200	50	0.2500	10000	8803	15000	20000	94	100	167
155	100	3.0000	0.1234	0.3510	200	100	0.2500	10000	8803	15000	20000	94	100	168
156	100	3.0000	0.1234	0.3510	200	1000	0.2500	10000	8803	15000	20000	94	100	173
157	100	3.0000	0.1234	0.3510	200	10000	0.2500	10000	8803	15000	20000	94	103	257
158	100	3.0000	0.1234	0.3510	200	12500	0.2500	10000	8803	15000	20000	94	104	297
159	100	3.0000	0.1234	0.3510	200	15000	0.2500	10000	8803	15000	20000	94	105	352
160	100	3.0000	0.1234	0.3510	200	25000	0.2500	10000	8803	15000	20000	95	108	1341
161	100	3.0000	0.1234	0.3510	200	30000	0.2500	10000	8803	15000	20000	95	109	-3312
162	100	3.0000	0.1234	0.3510	200	40000	0.2500	10000	8803	15000	20000	95	113	-417
163	100	3.0000	0.1234	0.3510	200	50000	0.2500	10000	8803	15000	20000	95	117	-223
164	100	3.0000	0.1234	0.3510	200	100000	0.2500	10000	8803	15000	20000	95	140	-67
165	100	3.0000	0.1234	0.3510	200	1000000	0.2500	10000	8803	15000	20000	101	-55	-5
166	100	3.0000	0.1234	0.3510	200	500000000	0.2500	10000	8803	15000	20000	-3	0	0

Table 7.12 Vary the Annual Percentage (Local Haul Truck Rate)

									Vary Annual %					
Row #	# Cont.	Truck Rate	Barge Rate	Rail Rate	# Units	Unit Cost	Annual % (as decimal)	Dray Cost Rail	Dray Cost Barge	Transfer Cost Rail	Transfer Cost Barge	Truck/Rail	Truck/Barge	Barge/Rail
167	100	3.0000	0.1234	0.3510	200	250	0.0010	10000	8803	15000	20000	94	100	167
168	100	3.0000	0.1234	0.3510	200	250	0.0100	10000	8803	15000	20000	94	100	167
169	100	3.0000	0.1234	0.3510	200	250	0.1000	10000	8803	15000	20000	94	100	168
170	100	3.0000	0.1234	0.3510	200	250	0.2500	10000	8803	15000	20000	94	100	169
171	100	3.0000	0.1234	0.3510	200	250	0.4000	10000	8803	15000	20000	94	100	169
172	100	3.0000	0.1234	0.3510	200	250	0.5000	10000	8803	15000	20000	94	100	170
173	100	3.0000	0.1234	0.3510	200	250	0.7500	10000	8803	15000	20000	94	100	172
174	100	3.0000	0.1234	0.3510	200	250	0.8000	10000	8803	15000	20000	94	100	172
175	100	3.0000	0.1234	0.3510	200	250	0.9000	10000	8803	15000	20000	94	100	173
176	100	3.0000	0.1234	0.3510	200	250	1.0000	10000	8803	15000	20000	94	100	173
177	100	3.0000	0.1234	0.3510	200	250	1.0000	10000	8803	15000	20000	94	100	173

Table 7.13
Appropriate Ranges for Scenarios in Tables 7.1-7.12

Row #	Truck Range	Rail Range	Barge Range
1 (7.1)	0<d<459	459<d<1340	1340<d<infinity
2 (7.1)	0<d<427	none	427<d<infinity
3 (7.1)	0<d<406	npne	406<d<infinity
4 (7.1)	0<d<391	none	391<d<infinity
5 (7.1)	0<d<385	none	385<d<infinity
6 (7.1)	0<d<381	none	381<d<infinity
7 (7.1)	0<d<375	none	375<d<infinity
8 (7.1)	0<d<373	none	373<d<infinity
9 (7.1)	0<d<372	none	372<d<infinity
10 (7.1)	0<d<372	none	372<d<infinity
11 (7.1)	0<d<371	none	371<d<infinity
12 (7.1)	0<d<371	none	371<d<infinity
13 (7.1)	0<d<371	none	371<d<infinity
14 (7.1)	0<d<371	none	371<d<infinity
15 (7.1)	0<d<371	none	371<d<infinity
16 (7.1)	0<d<371	none	371<d<infinity
17 (7.2)	0<d<371	none	371<d<infinity
18 (7.2)	0<d<371	none	371<d<infinity
19 (7.2)	0<d<371	none	371<d<infinity
20 (7.2)	0<d<371	none	371<d<infinity
21 (7.2)	0<d<373	none	373<d<infinity
22 (7.2)	0<d<376	none	376<d<infinity
23 (7.2)	0<d<378	none	378<d<infinity
24 (7.2)	0<d<427	none	427<d<infinity
25 (7.2)	0<d<444	none	444<d<infinity
26 (7.2)	0<d<458	458<d<486	486<d<infinity
27 (7.2)	0<d<459	459<d<1341	1341<d<infinity
28 (7.2)	0<d<460	460<d<10990	10990<d<infinity
29 (7.2)	0<d<460	460<d<infinity	none
30 (7.2)	0<d<465	465<d<infinity	none
31 (7.2)	0<d<475	475<d<infinity	none
32 (7.2)	0<d<783	783<d<infinity	none
33 (7.2)	0<d<infinity	none	none
34 (7.2)	0<d<infinity	none	none
35 (7.3)	0<d<371	none	371<d<infinity
36 (7.3)	0<d<371	none	371<d<infinity
37 (7.3)	0<d<371	none	371<d<infinity
38 (7.3)	0<d<375	none	375<d<infinity
39 (7.3)	0<d<414	none	414<d<infinity
40 (7.3)	0<d<427	none	427<d<infinity
41 (7.3)	0<d<440	none	440<d<infinity
42 (7.3)	0<d<459	459<d<1341	1341<d<infinity
43 (7.3)	0<d<460	460<d<infinity	none
44 (7.3)	0<d<462	462<d<infinity	none
45 (7.3)	0<d<463	463<d<infinity	none
46 (7.3)	0<d<471	471<d<infinity	none
47 (7.3)	0<d<684	684<d<infinity	none

Table 7.13
Appropriate Ranges for Scenarios in Tables 7.1-7.12

48 (7.3)	0<d<infinity	none	none
49 (7.4)	0<d<371	none	371<d<infinity
50 (7.4)	0<d<371	none	371<d<infinity
51 (7.4)	0<d<371	none	371<d<infinity
52 (7.4)	0<d<372	none	372<d<infinity
53 (7.4)	0<d<372	none	372<d<infinity
54 (7.4)	0<d<373	none	373<d<infinity
55 (7.4)	0<d<374	none	374<d<infinity
56 (7.4)	0<d<374	none	374<d<infinity
57 (7.4)	0<d<374	none	374<d<infinity
58 (7.4)	0<d<375	none	375<d<infinity
59 (7.4)	0<d<375	none	375<d<infinity
60 (7.5)	0<d<173	173<d<1341	1341<d<infinity
61 (7.5)	0<d<173	173<d<297	297<d<infinity
62 (7.5)	0<d<173	173<d<236	236<d<infinity
63 (7.5)	0<d<173	173<d<203	203<d<infinity
64 (7.5)	0<d<173	173<d<191	191<d<infinity
65 (7.5)	0<d<173	173<d<183	183<d<infinity
66 (7.5)	0<d<173	none	173<d<infinity
67 (7.5)	0<d<173	none	173<d<infinity
68 (7.5)	0<d<172	none	172<d<infinity
69 (7.5)	0<d<172	none	172<d<infinity
70 (7.5)	0<d<172	none	172<d<infinity
71 (7.5)	0<d<172	none	172<d<infinity
72 (7.5)	0<d<172	none	172<d<infinity
73 (7.5)	0<d<172	none	172<d<infinity
74 (7.5)	0<d<172	none	172<d<infinity
75 (7.5)	0<d<172	none	172<d<infinity
76 (7.6)	0<d<172	none	172<d<infinity
77 (7.6)	0<d<172	none	172<d<infinity
78 (7.6)	0<d<172	none	172<d<infinity
79 (7.6)	0<d<172	none	172<d<infinity
80 (7.6)	0<d<172	none	172<d<infinity
81 (7.6)	0<d<173	173<d<175	175<d<infinity
82 (7.6)	0<d<173	173<d<179	179<d<infinity
83 (7.6)	0<d<173	173<d<297	297<d<infinity
84 (7.6)	0<d<173	173<d<369	369<d<infinity
85 (7.6)	0<d<173	173<d<486	486<d<infinity
86 (7.6)	0<d<173	173<d<1341	1341<d<infinity
87 (7.6)	0<d<173	173<d<10990	10990<d<infinity
88 (7.6)	0<d<173	173<d<infinity	none
89 (7.6)	0<d<174	174<d<infinity	none
90 (7.6)	0<d<175	175<d<infinity	none
91 (7.6)	0<d<205	205<d<infinity	none
92 (7.6)	0<d<infinity	none	none
93 (7.6)	0<d<infinity	none	none
94 (7.7)	0<d<172	none	172<d<infinity
95 (7.7)	0<d<172	none	172<d<infinity

Table 7.13
Appropriate Ranges for Scenarios in Tables 7.1-7.12

96 (7.7)	0<d<172	none	172<d<infinity
97 (7.7)	0<d<173	none	173<d<infinity
98 (7.7)	0<d<173	173<d<257	257<d<infinity
99 (7.7)	0<d<173	173<d<297	297<d<infinity
100 (7.7)	0<d<173	173<d<352	352<d<infinity
101 (7.7)	0<d<173	173<d<1341	1341<d<infinity
102 (7.7)	0<d<173	173<d<infinity	none
103 (7.7)	0<d<173	173<d<infinity	none
104 (7.7)	0<d<174	174<d<infinity	none
105 (7.7)	0<d<174	174<d<infinity	none
106 (7.7)	0<d<198	198<d<infinity	none
107 (7.7)	0<d<infinity	none	none
108 (7.8)	0<d<172	none	172<d<infinity
109 (7.8)	0<d<172	none	172<d<infinity
110 (7.8)	0<d<172	none	172<d<infinity
111 (7.8)	0<d<172	none	172<d<infinity
112 (7.8)	0<d<172	none	172<d<infinity
113 (7.8)	0<d<172	none	172<d<infinity
114 (7.8)	0<d<172	none	172<d<infinity
115 (7.8)	0<d<172	none	172<d<infinity
116 (7.8)	0<d<173	none	173<d<infinity
117 (7.8)	0<d<173	none	173<d<infinity
118 (7.8)	0<d<173	none	173<d<infinity
119 (7.9)	0<d<94	95<d<1341	1341<d<infinity
120 (7.9)	0<d<94	95<d<297	297<d<infinity
121 (7.9)	0<d<94	95<d<236	236<d<infinity
122 (7.9)	0<d<94	95<d<203	203<d<infinity
123 (7.9)	0<d<94	94<d<191	191<d<infinity
124 (7.9)	0<d<94	94<d<183	183<d<infinity
125 (7.9)	0<d<94	94<d<173	173<d<infinity
126 (7.9)	0<d<94	94<d<170	170<d<infinity
127 (7.9)	0<d<94	94<d<169	169<d<infinity
128 (7.9)	0<d<94	94<d<169	169<d<infinity
129 (7.9)	0<d<94	94<d<168	168<d<infinity
130 (7.9)	0<d<94	94<d<167	167<d<infinity
131 (7.9)	0<d<94	94<d<167	167<d<infinity
132 (7.9)	0<d<94	94<d<167	167<d<infinity
133 (7.9)	0<d<94	94<d<167	167<d<infinity
134 (7.9)	0<d<94	94<d<167	167<d<infinity
135 (7.10)	0<d<94	94<d<167	167<d<infinity
136 (7.10)	0<d<94	94<d<167	167<d<infinity
137 (7.10)	0<d<94	94<d<167	167<d<infinity
138 (7.10)	0<d<94	94<d<168	168<d<infinity
139 (7.10)	0<d<94	94<d<171	171<d<infinity
140 (7.10)	0<d<94	94<d<175	175<d<infinity
141 (7.10)	0<d<94	94<d<179	179<d<infinity
142 (7.10)	0<d<94	94<d<297	297<d<infinity
143 (7.10)	0<d<94	94<d<369	369<d<infinity

Table 7.13
Appropriate Ranges for Scenarios in Tables 7.1-7.12

144 (7.10)	0<d<94	94<d<486	486<d<infinity
145 (7.10)	0<d<95	95<d<1341	1341<d<infinity
146 (7.10)	0<d<95	95<d<10990	10990<d<infinity
147 (7.10)	0<d<95	95<d<infinity	none
148 (7.10)	0<d<95	95<d<infinity	none
149 (7.10)	0<d<95	95<d<infinity	none
150 (7.10)	0<d<103	103<d<infinity	none
151 (7.10)	0<d<707	707<d<infinity	none
152 (7.10)	0<d<infinity	none	none
153 (7.11)	0<d<94	94<d<167	167<d<infinity
154 (7.11)	0<d<94	94<d<167	167<d<infinity
155 (7.11)	0<d<94	94<d<168	168<d<infinity
156 (7.11)	0<d<94	94<d<173	173<d<infinity
157 (7.11)	0<d<94	94<d<257	257<d<infinity
158 (7.11)	0<d<94	94<d<297	297<d<infinity
159 (7.11)	0<d<94	94<d<352	352<d<infinity
160 (7.11)	0<d<95	95<d<1341	1341<d<infinity
161 (7.11)	0<d<95	95<d<infinity	none
162 (7.11)	0<d<95	95<d<infinity	none
163 (7.11)	0<d<95	95<d<infinity	none
164 (7.11)	0<d<95	95<d<infinity	none
165 (7.11)	0<d<101	101<d<infinity	none
166 (7.11)	0<d<infinity	none	none
167 (7.12)	0<d<94	94<d<167	167<d<infinity
168 (7.12)	0<d<94	94<d<167	167<d<infinity
169 (7.12)	0<d<94	94<d<167	167<d<infinity
170 (7.12)	0<d<94	94<d<168	168<d<infinity
171 (7.12)	0<d<94	94<d<169	169<d<infinity
172 (7.12)	0<d<94	94<d<170	170<d<infinity
173 (7.12)	0<d<94	94<d<172	172<d<infinity
174 (7.12)	0<d<94	94<d<172	172<d<infinity
175 (7.12)	0<d<94	94<d<173	173<d<infinity
176 (7.12)	0<d<94	94<d<173	173<d<infinity
177 (7.12)	0<d<94	94<d<173	173<d<infinity

D. Specific Origin/Destination Pair Feasibility

Using the enhanced software, a feasibility assessment between the origin/destination pairs in the defined network was completed. As stated in Chapter VI, the user is required to enter a few data requirements about the specific shipment in order to determine the least cost alternative. The user must choose the source and destination city from one of those in the defined network. The user must enter the number of units shipped, the number of units that fit in one container, the cost of each unit to the producer, the percentage of the unit cost that should be used in calculating the inventory carrying cost, whether to find the least cost or least time alternative, and how many alternatives to display. For the purposes of this analysis between the origin/destination pairs, all the data requirements entered by the user will remain constant except for that of the origin/destination pairs. Tables 7.14 –7.26 defines the cheapest alternative, the corresponding path of each alternative, and the corresponding cost between the origin/destination pairs.

The constants used in the analysis are:

Number of units shipped = 1000
Number of units per container = 100
Cost of each unit = $100
Percentage of units cost used in Inventory Cost = 15%
Objective = minimize cost
K Alternatives Displayed = 10

Tables 7.14-7.16 were developed in the following manner. Using Table 7.14 as an example, Brownsville was selected as the source city (origin city). Then, each of the other cities (Chicago, Cincinnati, Houston, Little Rock, Memphis, Mobile, New Orleans, Omaha, Pittsburgh, St.Louis, St.Paul, and Veracruz) were selected as the destination city---one at a time. The constants listed above (1000 units shipped, 100 units per container, $100 cost per units, 15% inventory cost percentage, objective to minimize cost, and display 10 alternatives) were entered into the software. Each origin/destination pair was processed individually using the same constraints. The software then displayed the ten cheapest alternatives and the corresponding throughput times. The cheapest path alternative for each origin-destination pair is listed in the tables. The following sections discuss the tables in more detail.

Because dray costs were considered in the assessment, and because dray costs included an initial transfer cost between truck and rail or truck and barge, the initial mode of transportation reported is hauling detachable truck containers. For example, if the first mode of transportation listed is barge, this means that the barge is hauling detachable trailer containers. Because the routes reported are the same when inverting the destination and origin city (for example, from Brownsville to Chicago is the same as from Chicago to Brownsville except in the path order) the route will only be presented ~~once in~~ the following subsections. Intermediate cities are listed in some explanations below. These cities refer to points where no actual transfer between modes is being made. The cities are reported by the computer to describe the direction of the route analyzed.

1. From Brownsville

Table 7.14 describes the cheapest alternatives when Brownsville is the city of origin. From Brownsville to Chicago the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Brownsville, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. Once at a barge terminal in Chicago, the detachable containers will be unloaded by crane and reattached to a tractor where it is then hauled by truck to the receiver's final destination facility in Chicago. The exact same type of route is reported from Brownsville to Omaha and from Brownsville to Veracruz, with the difference being the destination port.

A similar cheapest path is reported from Brownsville to Cincinnati. In this instance, however, the path from Brownsville to Cincinnati travels through Houston. At this point there are no transfers between modes being made. Houston acts as an intermediate city. The same type of route is reported from Brownsville to New Orleans from Brownsville to Pittsburgh, and from Brownsville to St.Louis, with Houston being reported as an intermediate city.

From Brownsville to Houston, the cheapest route is entirely by truck.

From Brownsville to Little Rock, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Brownsville, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. The detachable containers are shipped by barge to Memphis (Houston is reported as an intermediate city), where the containers are then unloaded by crane and reattached to tractors. From Memphis to Little Rock the containers are shipped by truck to the receiver's final destination point in Little Rock.

From Brownsville to Memphis, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Brownsville, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. The detachable containers are shipped by barge to Little Rock (Houston is reported as an intermediate city), where the containers are then unloaded by crane and reattached to tractors. From Little Rock to Memphis the containers are shipped by truck to the receiver's final destination point in Memphis.

From Brownsville to Mobile, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Brownsville, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. The detachable containers are shipped by barge to New Orleans (Houston is reported as an intermediate city), where the containers are then unloaded by crane and reattached to tractors. From New Orleans to Mobile the containers are shipped by truck to the receiver's final destination point in Mobile.

From Brownsville to St.Paul, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Brownsville, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. The containers are shipped by barge to Omaha where they are then unloaded by crane and transferred to railcars. The railcars transport the containers to St.Paul where they are then unloaded by crane. The containers are reattached to a tractor and then transported to the receiver's final destination point in Omaha.

2. From Chicago

Table 7.15 presents Chicago as the origin city. From Chicago to Cincinnati, the cheapest alternative is transportation entirely by truck. Single modal truck is also the cheapest mode of transportation from Chicago to St.Louis and from Chicago to St.Paul.

Single modal rail transportation is the cheapest alternative from Chicago to Pittsburgh.

From Chicago to Little Rock, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Chicago, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. The containers are transported by barge to Memphis, where the containers are then unloaded by crane and reattached to tractors. From Memphis to Little Rock the containers are shipped by truck to the receiver's final destination point in Little Rock.

From Chicago to Memphis, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Chicago, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. Once at a barge terminal in Memphis, the detachable containers will be unloaded by crane and reattached to a tractor where it is then hauled by truck to the receiver's final destination facility in Memphis. The exact same type of route is reported from Chicago to Mobile, Chicago to Houston, from Chicago to Omaha, and from Chicago to Veracruz (with intermediate city Mobile) with the difference being the destination port.

From Chicago to New Orleans, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Chicago, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. The containers are transported by barge to Mobile, where the containers are then unloaded by crane and reattached to tractors. From

Mobile to New Orleans the containers are shipped by truck to the receiver's final destination point in New Orleans.

3. From Cincinnati

Table 7.16 presents Cincinnati as the origin city. From Cincinnati to St.Louis and from Cincinnati to Pittsburgh, single modal truck is the cheapest alternative.

From Cincinnati to Houston, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Cincinnati, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. The containers are transported by barge to Houston, where the containers are then unloaded by crane and reattached to tractors, where the containers are shipped by truck to the receiver's final destination point in Houston. The exact same type of route exists from Cincinnati to Memphis, from Cincinnati to Mobile, from Cincinnati to St.Paul, and from Cincinnati to Veracruz (with intermediate city Mobile) with the difference being the destination city.

From Cincinnati to Little Rock, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Cincinnati, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. The containers are transported by barge to Memphis, where the containers are then unloaded by crane and reattached to tractors. From Memphis to Little Rock the containers are shipped by truck to the receiver's final destination point in Little Rock. The same type of route exists from Cincinnati to New Orleans. However, the transfer point between barge and truck is in Mobile. Or in other words, the detachable containers travel by barge from Cincinnati to Mobile and by truck from Mobile to New Orleans.

From Cincinnati to Omaha, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a rail terminal in Cincinnati, subsequently removing the detachable container from the tractor, and loading it by crane onto railcars. The detachable containers are shipped by rail to Chicago, where the containers are then unloaded by crane and transferred to barges. The detachable containers are shipped by barge to Omaha where they are reattached to tractors. The containers are shipped by truck to the receiver's final destination point in Omaha.

4. From Houston

Table 7.17 lists scenarios where Houston is the city of origin. The cheapest alternative from Houston to New Orleans is by single modal truck.

From Houston to Pittsburgh, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Houston, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. The containers are transported by barge to Pittsburgh, where the containers are then unloaded by crane and reattached to tractors, where the containers are shipped by truck to the receiver's final destination point in Pittsburgh. The exact same type of route exists from Houston to St.Louis, from Houston to St.Paul, from Houston to Veracruz, and from Houston to Omaha (with intermediate city Brownsville) with the difference being the destination city.

From Houston to Little Rock, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Houston, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. The containers are transported by barge to Memphis, where the containers are then unloaded by crane and reattached to tractors. From Memphis to Little Rock the containers are shipped by truck to the receiver's final destination point in Little Rock. The same type of route exists from Houston to Memphis. However, the transfer point between barge and truck is in Little Rock. Or in other words, the detachable containers travel by barge from Houston to Little Rock and by truck from Little Rock to Memphis. The same type of route exists from Houston to Mobile. However, the transfer point between barge and truck is in New Orleans. Or in other words, the detachable containers travel by barge from Houston to New Orleans and by truck from New Orleans to Mobile.

5. From Little Rock

Table 7.18 depicts Little Rock as the city of origin. The cheapest alternative from Little Rock to Memphis is by single modal truck.

From Little Rock to New Orleans, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Little Rock. The detachable container is removed from the tractor, and loaded by crane onto a barge. The containers are transported by barge to New Orleans, where the containers are then unloaded by crane and reattached to tractors, where the containers are shipped by truck to the receiver's final destination point in New

Orleans. The same type of route exists between Little Rock and Veracruz (with intermediate city New Orleans) with the difference being the destination city.

From Little Rock to Mobile, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Little Rock, subsequently removing the detachable container from the tractor, and loading it by crane onto a barge. The containers are transported by barge to Memphis, where the containers are then unloaded by crane and reattached to tractors. From Memphis to Mobile the containers are shipped by truck to the receiver's final destination point in Mobile.

From Little Rock to Omaha the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory in Little Rock to a Memphis barge terminal. Once at the barge terminal in Memphis, the containers will be removed from the tractor and loaded onto a barge. The containers travel by barge from Memphis to Omaha. At the barge terminal in Omaha the containers are unloaded from the barge and reattached to a tractor. The containers are then transported by truck to the receiver's final destination in Omaha. The exact same type of route exists from Little Rock to St. Louis and from Little Rock to St.Paul. In both scenarios the transfer between truck and barge takes place in Memphis. The same type of route also exists between Little Rock and Pittsburgh. However, here Cincinnati is reported as an intermediate city. The transfer between truck and barge takes place in Memphis as well.

6. From Memphis

Table 7.19 presents Memphis as the origin city. From Memphis to St.Louis, the cheapest alternative is by single modal truck.

From Memphis to Omaha, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Memphis. The detachable container is removed from the tractor, and loaded by crane onto a barge. The containers are transported by barge to Omaha, where the containers are then unloaded by crane and reattached to tractors, where the containers are shipped by truck to the receiver's final destination point in Omaha. The same type of route exists between Memphis and Pittsburgh and from Memphis to St. Paul with the difference being the destination city.

From Memphis to New Orleans, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory in Memphis to a Little Rock barge terminal. Once at the barge terminal in Little Rock, the containers will be removed from the tractor and loaded onto a barge. The containers travel by barge from Little Rock to New Orleans. At the barge terminal in New Orleans the containers are unloaded from the barge and reattached to a tractor. The containers are then transported by truck to the receiver's final destination in New Orleans. The exact same type of route exists from Memphis to Veracruz. The transfer between truck and barge occurs in Little Rock as well. New Orleans is listed as an intermediate city.

From Memphis to Mobile, the cheapest alternative is to haul the shipments by truck equipped with a detachable container from the shipper's warehouse or factory in Memphis to a Little Rock barge terminal. Once at Little Rock, the containers are detached from the tractor portion of the truck and loaded onto barges. The containers are shipped by barge to New Orleans where they are unloaded and reattached to a tractor. From New Orleans to Mobile the containers are transported by truck.

7. From Mobile

The origin city of Mobile is presented in Table 7.20. The cheapest mode of transportation from Mobile to New Orleans and from Mobile to St.Paul is single modal truck.

From Mobile to St. Louis, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in Mobile. The detachable container is removed from the tractor, and loaded by crane onto a barge. The containers are transported by barge to St.Louis, where the containers are then unloaded by crane and reattached to tractors. The containers are then shipped by truck to the receiver's final destination point in St.Louis.

From Mobile to Omaha, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in New Orleans. Once in New Orleans, the detachable containers are removed from the tractor and loaded by crane onto barges. The containers are transported by barge to Omaha with Memphis being an intermediate city. Once in Omaha, the containers are unloaded from the barge by crane and reattached to the tractor portion of the truck. The containers are then hauled to the receiver's final destination. The same type of route exists between Mobile and Pittsburgh. The transfer between truck and barge for this scenario takes place in New Orleans as well. In this case, however, Houston is listed as an intermediate city. The same type of route also exists between Mobile and Veracruz. The transfer between truck and barge for these cities takes place in New Orleans as well. There is no intermediate city listed for this origin destination pair.

8. From New Orleans

Table 7.21 lists the origin–destination pairs with New Orleans being the destination city.

From New Orleans to Omaha, the cheapest alternative is to haul the shipment by a truck equipped with a detachable container from the shipper's warehouse or factory to a barge terminal in New Orleans. The detachable container is removed from the tractor, and loaded by crane onto a barge. The containers are transported by barge to Omaha (with Memphis reported as an intermediate city), where the containers are then unloaded by crane and reattached to tractors. The containers are then shipped by truck to the receiver's final destination point in Omaha. The same type of route exists between New Orleans and Pittsburgh. In this scenario, Houston is listed as the intermediate city while Pittsburgh is listed as the destination.

From New Orleans to St.Louis, the cheapest alternative is to haul the shipment by trucks equipped with detachable containers to a barge terminal in Mobile. Once in Mobile the trucks are detached from the tractor portion of the truck and loaded onto barges by crane. The containers are then transported by barge to St.Louis where they are subsequently unloaded and reattached to the tractor portion of a truck. Then trucks transport the containers to the receiver's final destination in St.Louis. The same type of route exists between New Orleans and St.Paul. In this scenario, the transfer between truck and barge takes place in Mobile. The intermediate city of St.Louis is reported. The same type of route also exists between New Orleans and Veracruz. In this scenario, the transfer between truck and barge again takes place in Mobile. There is no intermediate city reported for this origin-destination pair.

9. From Omaha

The origin city of Omaha is listed in Table 7.22. From Omaha to St.Louis and from Omaha to St.Paul, the cheapest alternative is transportation by single modal truck.

From Omaha to Veracruz, the cheapest alternative is to haul shipment by trucks equipped with detachable containers from the shipper's origin to a barge terminal in Omaha. At the barge terminal, containers should be detached from the truck and loaded onto barges. The containers are shipped by barge to Veracruz with Memphis and New Orleans reported as intermediate cities.

From Omaha to Pittsburgh, the cheapest alternative is to haul shipment by trucks equipped with detachable containers from the shipper's origin to a barge terminal in Omaha. At the barge terminal, containers should be detached from the truck and loaded onto barges. The containers are shipped by barge to Chicago. Once at Chicago, the containers are unloaded from the barges and reloaded onto railcars. The containers are transported by rail to Pittsburgh. Once in Pittsburgh the containers are unloaded from the railcars and reattached to the tractor portion of a truck. Trucks then haul the shipments to the receiver's final destination in Pittsburgh.

10. From Pittsburgh

Table 7.23 describes the cheapest alternatives of the origin city Pittsburgh.

From Pittsburgh to St.Louis, the cheapest alternative is to haul the shipment by trucks equipped with detachable containers from the shipper's origin to a barge terminal in Pittsburgh. At the barge terminal, containers should be detached from the truck and loaded onto barges. The containers are shipped by barge to St.Louis. Once in St.Louis, the containers are unloaded from the barge and reattached to the tractor portion of a truck. Trucks then haul the shipments to the receiver's final destination in Pittsburgh. The same type of route exists between Pittsburgh and Veracruz. The intermediate city of Houston is reported for this scenario.

From Pittsburgh to St. Paul, the cheapest alternative is to haul shipments by trucks equipped with detachable containers from the shipper's origin to a rail terminal in St.Paul. At the rail terminal, containers should be detached from the truck and loaded onto barges. The containers are shipped by rail to St.Paul. Once in St.Paul, the containers are unloaded from the railcars and reattached to the tractor portion of a truck. Trucks then haul the shipments to the receiver's final destination in St.Paul.

11. From St.Louis

The origin city of St.Louis is depicted in Table 7.24. The cheapest alternative to St.Paul is to haul the shipment by trucks equipped with detachable containers from the shipper's origin to a barge terminal in St.Louis. At the barge terminal, containers should be detached from the truck and loaded onto barges. The containers are shipped by barge to St.Paul. Once in St.Paul, the containers are unloaded from the barge and reattached to the tractor portion of a truck. Trucks then haul the shipments to the receiver's final destination in St.Paul. The same type of route exists between St.Louis and Veracruz. In this scenario the intermediate city of Mobile is reported.

12. From St.Paul

The origin city of St.Paul is presented in Table 7.25. The cheapest alternative between St.Paul and Veracruz is to haul the shipment by trucks equipped with detachable containers from the shipper's origin to a barge terminal in St.Paul. At the barge terminal, containers should be detached from the truck and loaded onto barges. The containers are shipped by barge to Veracruz. The intermediate cities of St.Louis and Mobile are reported. Once in Veracruz, the containers are unloaded from the barge and reattached to the tractor portion of a truck. Trucks then haul the shipments to the receiver's final destination in Veracruz.

Table 7.26 presents the Veracruz as the origin city.

	Table 7.14 Brownsville as the Source City					
From Brownsville	Path	Mode	Path Time (hrs)	Total Time (hrs)	Path Cost	Total Cost
To:						
Brownsville	-	-	-	-	-	-
Chicago				317.50		5755.51
	Brownsville-Chicago	barge	317.50		5755.51	
Cincinnati				305.83		5649.87
	Brownsville-Houston	barge	50.00		1893.04	
	Houston-Cincinnati	barge	255.83		3756.83	
Houston				7.02		2667.03
	Brownsville-Houston	truck	7.02		2667.03	
Little Rock				193.64		4479.18
	Brownsville-Houston	barge	50.00		1893.04	
	Houston-Memphis	barge	140.33		1329.47	
	Memphis-Little Rock	truck	3.31		1256.67	
Memphis				203.64		4569.73
	Brownsville-Houston	barge	50.00		1893.04	
	Houston-Little Rock	barge	150.33		1420.02	
	Little Rock-Memphis	truck	3.31		1256.67	
Mobile				120.95		3873.93
	Brownsville-Houston	barge	50.00		1893.04	
	Houston-New Orleans	barge	67.50		669.98	
	New Orleans-Mobile	truck	3.45		1310.91	
New Orleans				120.95		3943.03
	Brownsville-Houston	barge	50.00		1893.04	
	Houston-New Orleans	barge	67.50		2049.99	
Omaha				213.50		4183.80
	Brownsville-Omaha	barge	213.50		4183.80	
Pittsburgh				229.17		4955.66
	Brownsville-Houston	barge	50.00		1893.04	
	Houston-Pittsburgh	barge	179.17		3062.62	
St.Louis				256.67		5204.67
	Brownsville-Houston	barge	50.00		1893.04	
	Houston-St.Louis	barge	206.67		3311.63	
St.Paul				224.26		6077.85
	Brownsville-Omaha	barge	213.50		3433.79	
	Omaha-St.Paul	rail	10.59		2644.06	
Veracruz				5133.74		249.00
	Brownsville-Veracruz	barge	5133.74		249.00	

	Table 7.15 Chicago as the Source City					
From Chicago	**Path**	**Mode**	**Path Time (hrs)**	**Total Time (hrs)**	**Path Cost**	**Total Cost**
To:						
Brownsville				317.50		5755.51
	Chicago-Brownsville	barge	317.50		5755.51	
Chicago	-	-	-	-	-	-
Cincinnati				7.19		2730.31
	Chicago-Cincinnati	truck	7.19		2730.31	
Houston				267.50		5302.77
	Chicago-Houston	barge	267.50		5302.77	
Little Rock				130.81		3910.23
	Chicago-Memphis	barge	127.50		2653.57	
	Memphis-Little Rock	truck	3.31		1256.67	
Memphis				127.50		4033.38
	Chicago-Memphis	barge	127.50		4033.38	
Mobile				209.33		4766.08
	Chicago-Mobile	barge	209.33		4766.08	
New Orleans				212.95		4706.97
	Chicago-Mobile	barge	209.50		3396.06	
	Mobile-New Orleans	truck	3.45		1310.91	
Omaha				135.33		4106.02
	Chicago-Omaha	barge	135.33		4106.02	
Pittsburgh				12.86		4192.79
	Chicago-Pittsburgh	rail	12.86		4192.79	
St.Louis				7.00		2657.99
	Chicago-St.Louis	truck	7.00		2657.99	
St.Paul				9.50		3607.27
	Chicago-St.Paul	truck	9.50		3607.27	
Veracruz				347.00		6021.12
	Chicago-Mobile	barge	209.33		3335.78	
	Mobile-Veracruz	barge	137.50		2685.34	

	Table 7.16 Cincinnati as the Source City					
From Cincinnati	**Path**	**Mode**	**Path Time (hrs)**	**Total Time (hrs)**	**Path Cost**	**Total Cost**
To:						
Brownsville				305.83		5649.87
	Cincinnati-Houston	barge	255.83		3756.83	
	Houston-Brownsville	barge	50.00		1893.04	
Chicago				7.19		2730.31
	Cincinnati-Chicago	truck	7.19		2730.31	
Cincinnati	-	-	-	-	-	-
Houston				255.83		5197.13
	Cincinnati-Houston	barge	255.83		5197.13	
Little Rock				125.14		3858.92
	Cincinnati-Memphis	barge	121.83		2602.26	
	Memphis-Little Rock	truck	3.31		1256.67	
Memphis				121.67		3982.27
	Cincinnati-Memphis	barge	121.67		3982.27	
Mobile				215.67		4833.42
	Cincinnati-Mobile	barge	215.67		4833.42	
New Orleans				219.29		4764.32
	Cincinnati-Mobile	barge	215.83		3453.41	
	Mobile-New Orleans	truck	3.45		1310.91	
Omaha				143.66		5050.00
	Cincinnati-Chicago	rail	8.33		2384.28	
	Chicago-Omaha	barge	135.33		2665.72	
Pittsburgh				6.93		2630.86
	Cincinnati-Pittsburgh	truck	6.93		2630.86	
St.Louis				8.33		3164.27
	Cincinnati-St.Louis	truck	8.33		3164.27	
St.Paul				224.67		4914.92
	Cincinnati-St.Paul	barge	224.67		4914.92	
Veracruz				353.33		6078.46
	Cincinnati-Mobile	barge	215.67		3393.12	
	Mobile-Veracruz	barge	137.50		2685.34	

	Table 7.17 Houston as the Source City					
From Houston	**Path**	**Mode**	**Path Time (hrs)**	**Total Time (hrs)**	**Path Cost**	**Total Cost**
To:						
Brownsville				7.02		2667.03
	Houston-Brownsville	truck	7.02		2667.03	
Chicago				267.50		5302.77
	Houston-Chicago	barge	267.50		5302.77	
Cincinnati				255.83		5197.13
	Houston-Cincinnati	barge	255.83		5197.13	
Houston	-	-	-	-	-	-
Little Rock				143.64		4026.44
	Houston-Memphis	barge	140.33		2769.77	
	Memphis-Little Rock	truck	3.31		1256.67	
Memphis				153.64		4116.99
	Houston-Little Rock	barge	150.33		2860.32	
	Little Rock-Memphis	truck	3.31		1256.67	
Mobile				70.95		3421.19
	Houston-New Orleans	barge	67.50		2110.28	
	New Orleans-Mobile	truck	3.45		1310.91	
New Orleans				8.55		3245.64
	Houston-New Orleans	truck	8.55		3245.64	
Omaha				263.50		5266.55
	Houston-Brownsville	barge	50.00		1893.04	
	Brownsville-Omaha	barge	213.50		3373.51	
Pittsburgh				179.17		4502.92
	Houston-Pittsburgh	barge	179.17		4502.92	
St.Louis				206.67		4751.93
	Houston-St.Louis	barge	206.67		4751.93	
St.Paul				316.67		5747.96
	Houston-St.Paul	barge	316.67		5747.96	
Veracruz				199.00		4681.00
	Houston-Veracruz	barge	199.00		4681.00	

	Table 7.18 Little Rock as the Source City					
From Little Rock	Path	Mode	Path Time (hrs)	Total Time (hrs)	Path Cost	Total Cost
To:						
Brownsville				193.64		4479.48
	Little Rock-Memphis	truck	3.48		1316.95	
	Memphis-Houston	barge	140.17		1269.19	
	Houston-Brownsville	barge	50.00		1893.04	
Chicago				130.81		3910.23
	Little Rock-Memphis	truck	3.48		1316.95	
	Memphis-Chicago	barge	127.33		2593.28	
Cincinnati				125.14		3858.92
	Little Rock-Memphis	truck	3.48		1316.95	
	Memphis-Cincinnati	barge	121.67		2541.97	
Houston				143.64		4026.44
	Little Rock-Memphis	truck	3.48		1316.95	
	Memphis-Houston	barge	140.17		2709.49	
Little Rock	-	-	-	-	-	-
Memphis				3.31		1256.67
	Little Rock-Memphis	truck	3.31		1256.67	
Mobile				86.45		3651.54
	Little Rock-New Orleans	barge	83.00		2250.63	
	New Orleans-Mobile	truck	3.45		1310.91	
New Orleans				82.83		3630.64
	Little Rock-New Orleans	barge	82.83		3630.64	
Omaha				144.48		4033.98
	Little Rock-Memphis	truck	3.48		1316.95	
	Memphis-Omaha	barge	141.00		2717.03	
Pittsburgh				203.48		4568.22
	Little Rock-Memphis	truck	3.48		1316.95	
	Memphis-Cincinnati	barge	121.67		1101.67	
	Cincinnati-Pittsburgh	barge	78.33		2149.59	
St.Louis				69.98		3359.40
	Little Rock-Memphis	truck	3.48		1316.95	
	Memphis-St.Louis	barge	66.50		2042.45	
St.Paul				179.98		4355.43
	Little Rock-Memphis	truck	3.48		1316.95	
	Memphis-St.Paul	barge	176.50		3038.48	
Veracruz				214.50		4821.35
	Little Rock-New Orleans	barge	82.83		2190.34	
	New Orleans-Veracruz	barge	131.50		2631.01	

	Table 7.19 Memphis as the Source City					
From Memphis	**Path**	**Mode**	**Path Time (hrs)**	**Total Time (hrs)**	**Path Cost**	**Total Cost**
To:						
Brownsville				203.64		4569.73
	Memphis-Little Rock	truck	3.48		1316.95	
	Little Rock-Houston	barge	150.17		1359.73	
	Houston-Brownsville	barge	50.00		1893.04	
Chicago				127.33		4033.58
	Memphis-Chicago	barge	127.33		4033.58	
Cincinnati				121.67		3982.27
	Memphis-Cincinnati	barge	121.67		3982.27	
Houston				153.64		4116.99
	Memphis-Little Rock	truck	3.48		1316.95	
	Little Rock-Houston	barge	150.17		2800.03	
Little Rock				3.31		1256.67
	Memphis-Little Rock	truck	3.31		1256.67	
Memphis	-	-	-	-	-	-
Mobile				89.93		3438.19
	Memphis-Little Rock	truck	3.48		1316.95	
	Little Rock-New Orleans	barge	83.00		810.33	
	New Orleans-Mobile	truck	3.45		1310.91	
New Orleans				86.31		3507.29
	Memphis-Little Rock	truck	3.48		1316.95	
	Little Rock-New Orleans	barge	82.83		2190.34	
Omaha				141.00		4157.33
	Memphis-Omaha	barge	141.00		4157.33	
Pittsburgh				200.00		4691.57
	Memphis-Pittsburgh	barge	200.00		4691.57	
St.Louis				6.98		2648.95
	Memphis-St.Louis	truck	6.98		2648.95	
St.Paul				176.50		4478.78
	Memphis-St.Paul	barge	176.50		4478.78	
Veracruz				217.98		4698.00
	Memphis-Little Rock	truck	3.48		1316.95	
	Little Rock-New Orleans	barge	82.83		750.04	
	New Orleans-Veracruz	barge	131.50		2631.01	

	Table 7.20 Mobile as the Source City					
From Mobile	**Path**	**Mode**	**Path Time (hrs)**	**Total Time (hrs)**	**Path Cost**	**Total Cost**
To:						
Brownsville				120.95		3873.93
	Mobile-Houston	truck	3.62		1371.20	
	Houston-New Orleans	barge	67.33		609.69	
	New Orelans-Brownsville	barge	50.00		1893.04	
Chicago				209.33		4776.08
	Chicago-Mobile	barge	209.33		4776.08	
Cincinnati				215.67		4833.42
	Mobile-Cincinnati	barge	215.67		4833.42	
Houston				70.95		3421.19
	Mobile-New Orleans	truck	3.62		1371.20	
	New Orleans-Houston	barge	67.33		2049.99	
Little Rock				86.45		3561.64
	Mobile-New Orleans	truck	3.62		1371.20	
	New Orleans-Little Rock	barge	82.83		2190.34	
Memphis				89.93		3438.19
	Mobile-New Orleans	truck	3.62		1371.20	
	New Orleans-Little Rock	barge	83.00		810.33	
	Little Rock-Memphis	truck	3.31		1256.67	
Mobile	-	-	-	-	-	-
New Orleans				3.45		1310.91
	Mobile-New Orleans	truck	3.45		1310.91	
Omaha				249.95		5042.00
	Mobile-New Orleans	truck	3.45		1310.91	
	New Orleans-Memphis	barge	105.50		1014.06	
	Memphis-Omaha	barge	141.00		2717.03	
Pittsburgh				250.12		5043.51
	Mobile-New Orleans	truck	3.62		1371.20	
	New Orleans-Houston	barge	67.33		609.69	
	Houston-Pittsburgh	barge	179.17		3062.62	
St.Louis				148.50		4225.24
	Mobile-St.Louis	barge	148.50		4225.24	
St.Paul				9.19		3489.74
	Mobile-St.Paul	truck	9.19		3489.74	
Veracruz				135.29		4002.21
	Mobile-New Orleans	truck	3.62		1371.20	
	New Orleans-Veracruz	barge	131.50		2631.01	

	Table 7.21 New Orleans as the Source City					
From New Orleans	**Path**	**Mode**	**Path Time (hrs)**	**Total Time (hrs)**	**Path Cost**	**Total Cost**
To:						
Brownsville				117.33		3943.03
	New Orleans-Houston	barge	67.33		2049.99	
	Houston-Brownsville	barge	50.00		1893.04	
Chicago				212.95		4706.97
	New Orleans-Mobile	truck	3.62		1371.20	
	Mobile-Chicago	barge	209.33		3335.78	
Cincinnati				219.29		4764.32
	New Orleans-Mobile	truck	3.62		1371.20	
	Mobile-Cincinnati	barge	215.67		3393.12	
Houston				8.55		3245.64
	New Orleans-Houston	truck	8.55		3245.64	
Little Rock				82.83		3630.64
	New Orleans-Little Rock	barge	82.83		3630.64	
Memphis				86.31		3507.29
	New Orleans-Little Rock	barge	82.83		2190.34	
	Little ROck-Memphis	truck	3.48		1316.95	
Mobile				3.45		1310.91
	New Orleans-Mobile	truck	3.45		1310.91	
New Orleans	-	-	-	-	-	-
Omaha				246.33		5111.11
	New Orleans-Memphis	barge	105.33		2394.08	
	Memphis-Omaha	barge	141.00		2717.03	
Pittsburgh				246.50		5112.62
	New Orleans-Houston	barge	67.33		2049.99	
	Hosuton-Pittsburgh	barge	179.17		3062.62	
St.Louis				152.12		4156.14
	New Orleans-Mobile	truck	3.55		1371.20	
	Mobile-St.Louis	barge	148.50		2784.94	
St.Paul				262.05		5152.17
	New Orleans-Mobile	truck	3.55		1371.20	
	Mobile-St.Louis	barge	148.50		1344.64	
	St.Louis-St.Paul	barge	110.00		2436.33	
Veracruz				141.05		4056.54
	New Orleans-Mobile	truck	3.55		1371.20	
	Mobile-Veracruz	barge	137.50		2685.34	

	Table 7.22 Omaha as the Source City					
From Omaha	**Path**	**Mode**	**Path Time (hrs)**	**Total Time (hrs)**	**Path Cost**	**Total Cost**
To:						
Brownsville				213.50		4183.80
	Omaha-Brownsville	barge	213.50		4183.80	
Chicago				135.33		4106.02
	Omaha-Chicago	barge	135.33		4106.02	
Cincinnati				143.66		5050.00
	Omaha-Chicago	barge	135.50		2726.01	
	Chicago-Cincinnati	rail	8.16		2324.00	
Houston				263.50		5266.55
	Omaha-Brownsville	barge	213.50		3373.51	
	Brownsville-Houston	barge	50.00		1893.04	
Little Rock				144.48		4033.98
	Omaha-Memphis	barge	141.17		2777.32	
	Memphis-Little Rock	truck	3.31		1256.67	
Memphis				141.00		4157.33
	Omaha-Memphis	barge	141.00		4157.33	
Mobile				249.95		5042.00
	Omaha-Memphis	barge	141.00		2717.03	
	Memphis-New Orleans	barge	105.50		1014.06	
	New Orleans-Mobile	truck	3.45		1310.91	
New Orleans				246.33		5111.11
	Omaha-Memphis	barge	141.00		2717.03	
	Memphis-New Orleans	barge	105.33		2394.08	
Omaha	-	-	-	-	-	-
Pittsburgh				148.36		5668.79
	Omaha-Chicago	barge	135.50		2726.01	
	Chicago-Pittsburgh	rail	12.86		2942.79	
St.Louis				18.48		3991.64
	Omaha-St.Louis	truck	18.48		3991.64	
St.Paul				9.19		3489.74
	Omaha-St.Paul	truck	9.19		3489.74	
Veracruz				378.00		6301.82
	Omaha-Memphis	barge	141.00		2717.03	
	Memphis-New Orleans	barge	105.33		953.78	
	New Orleans-Veracruz	barge	131.50		2631.01	

	Table 7.23 Pittsburgh as the Source City					
From Pittsburgh	**Path**	**Mode**	**Path Time (hrs)**	**Total Time (hrs)**	**Path Cost**	**Total Cost**
To:						
Brownsville				229.17		4955.66
	Pittsburgh-Houston	barge	179.17		3062.62	
	Houston-Brownsville	barge	50		1893.04	
Chicago				12.86		4192.79
	Pittsburgh-Chicago	rail	12.86		4192.79	
Cincinnati				6.93		2630.86
	Pittsburgh-Cincinnati	truck	6.93		2630.86	
Houston				179.17		4502.92
	Pittsburgh-Houston	barge	179.17		4502.92	
Little Rock				203.48		4568.22
	Pittsburgh-Cincinnati	barge	78.33		2149.59	
	Cincinatti-Memphis	barge	121.83		1161.96	
	Memphis-Little Rock	truck	3.31		1256.67	
Memphis				200.00		4691.57
	Pittsburgh-Memphis	barge	200.00		2149.59	
Mobile				250.12		5043.51
	Pittsburgh-Houston	barge	179.17		3062.62	
	Houston-New Orleans	barge	67.50		669.98	
	New Orleans-Mobile	truck	3.45		1310.91	
New Orleans				246.50		5112.62
	Pittsburgh-Houston	barge	179.17		3062.62	
	Houston-New Orleans	barge	67.33		2049.99	
Omaha				148.66		5668.79
	Pittsburgh-Chicago	rail	13.03		3003.07	
	Chicago-Omaha	barge	135.33		2665.72	
Pittsburgh	-	-	-	-	-	-
St.Louis				193.50		4632.71
	Pittsburgh-St.Louis	barge	193.50		4632.71	
St.Paul				23.68		5615.30
	Pittsburgh-St.Paul	rail	23.68		5615.30	
Veracruz				378.17		6303.33
	Pittsburgh-Houston	barge	179.17		3062.62	
	Houston-Veracruz	barge	198.83		3240.70	

	Table 7.24 St.Louis as the Source City					
From St.Louis	**Path**	**Mode**	**Path Time (hrs)**	**Total Time (hrs)**	**Path Cost**	**Total Cost**
To:						
Brownsville				256.67		5204.67
	St.Louis-Houston	barge	206.67		3311.63	
	Houston-Brownsville	barge	50.00		1893.04	
Chicago				7.00		2657.99
	St.Louis-Chicago	truck	7.00		2657.99	
Cincinnati				8.33		3164.27
	St.Louis-Cincinnati	truck	8.33		3164.27	
Houston				206.67		4751.93
	St.Louis-Houston	barge	206.67		4751.93	
Little Rock				69.98		3359.40
	St.Louis-Memphis	barge	66.67		2101.73	
	Memphis-Little Rock	truck	3.31		1256.67	
Memphis				6.98		2648.95
	St.Louis-Memphis	truck	6.98		2648.95	
Mobile				148.50		4225.24
	St.Louis-Mobile	barge	148.50		4225.24	
New Orleans				152.12		4156.14
	St.Louis-Mobile	barge	148.67		2845.23	
	Mobile-New Orleans	truck	3.45		1310.91	
Omaha				18.48		3991.64
	St.Louis-Omaha	truck	18.48		3991.64	
Pittsburgh				193.50		4632.71
	St.Louis-Pittsburgh	barge	193.50		4632.71	
St.Louis	-	-	-	-	-	-
St.Paul				110.00		3876.63
	St.Louis-St.Paul	barge	110.00		3876.63	
Veracruz				286.17		5470.28
	St.Louis-Mobile	barge	148.50		2784.94	
	Mobile-Veracruz	barge	137.50		2685.34	

	Table 7.25 St.Paul as the Source City					
From St.Paul	**Path**	**Mode**	**Path Time (hrs)**	**Total Time (hrs)**	**Path Cost**	**Total Cost**
To:						
Brownsville				224.26		6077.85
	St.Paul-Omaha	rail	10.76		2704.35	
	Omaha-Brownsville	barge	213.50		3373.51	
Chicago				9.50		3607.27
	St.Paul-Chicago	truck	9.50		3607.27	
Cincinnati				224.67		4914.92
	St.Paul-Cincinnati	barge	224.67		4914.92	
Houston				316.67		5747.96
	St.Paul-Houston	barge	316.67		5747.96	
Little Rock				179.98		4355.43
	St.Paul-St.Louis	barge	110.00		2436.33	
	St.Louis-Memphis	barge	66.67		662.43	
	Memphis-Little Rock	truck	3.31		1256.67	
Memphis				176.50		4478.78
	St.Paul-Memphis	barge	176.50		4478.78	
Mobile				9.19		3489.74
	St.Paul-Mobile	truck	9.19		3489.74	
New Orleans				262.12		5152.17
	St.Paul-St.Louis	barge	110.00		2436.33	
	St.Louis-Mobile	barge	148.67		1404.93	
	Mobile-New Orleans	truck	3.45		1310.91	
Omaha				9.19		3489.74
	St.Paul-Omaha	truck	9.19		3489.74	
Pittsburgh				23.68		5615.30
	St.Paul-Pittsburgh	rail	23.68		5615.30	
St.Louis				110.00		3876.63
	St.Paul-St.Louis	barge	110.00		3876.63	
St.Paul	-	-	-	-	-	-
Veracruz				396.17		6466.31
	St.Paul-St.Louis	barge	110.00		2436.33	
	St.Louis-Mobile	barge	148.50		1344.64	
	Mobile-Veracruz	barge	137.50		2685.34	

	Table 7.26 Veracruz as the Source City					
From Veracruz	**Path**	**Mode**	**Path Time (hrs)**	**Total Time (hrs)**	**Path Cost**	**Total Cost**
To:						
Brownsville				5133.74		249.00
	Veracruz-Brownsville	barge	5133.74		249.00	
Chicago				347.00		6021.12
	Veracruz-Mobile	barge	137.50		3685.34	
	Mobile-Chicago	barge	209.33		3335.78	
Cincinnati				353.33		6078.46
	Veracruz-Mobile	barge	215.67		3393.12	
	Mobile-Cincinnati	barge	137.50		2685.34	
Houston				199.00		4681.00
	Veracruz-Houston	barge	199.00		4681.00	
Little Rock				214.50		4821.35
	Veracruz-New Orleans	barge	131.50		2631.01	
	New Orleans-Little Rock	barge	82.83		2190.34	
Memphis				217.98		4698.00
	Veracruz-New Orleans	barge	131.50		2631.01	
	New Orleans-Little Rock	barge	82.83		750.04	
	Little Rock-Memphis	truck	3.48		1316.95	
Mobile				135.29		4002.21
	Veracruz-New Orleans	barge	131.50		2631.01	
	New Orleans-Mobile	truck	3.62		1371.20	
New Orleans				141.05		4056.54
	Veracruz-Mobile	barge	137.50		2685.34	
	Mobile-New Orleans	truck	3.55		1371.20	
Omaha				378.00		6301.82
	Veracruz-New Orleans	barge	131.50		2631.01	
	New Orleans-Memphis	barge	105.33		953.78	
	Memphis-Omaha	barge	141.00		2717.03	
Pittsburgh				378.17		6303.33
	Veracruz-Houston	barge	198.83		3240.70	
	Houston-Pittsburgh	barge	179.17		3062.62	
St.Louis				286.17		5470.28
	Veracruz-Mobile	barge	137.50		2685.34	
	Mobile-St.Louis	barge	148.50		2784.94	
St.Paul				396.17		64[illegible].31
	Veracruz-Mobile	barge	137.50		2685.34	
	Mobile-St.Louis	barge	148.50		1344.64	
	St.Louis-St.Paul	barge	110.00		2436.33	
Veracruz	-	-	-	-	-	-

E. Other Considerations

Although the past sections on specific pairs truck-barge feasibility and single modal general feasibility indicate that barge indeed offers fierce competition to the other modes of transportation financially, there are other alternatives that must be considered when discussing shipper's needs and concerns.

Shippers offered a variety of viewpoints at the Memphis COCITE meeting [47]. Helen Blancq of Cargill, a member of COCITE, addressed her concerns as a shipper who might potentially utilize barge transportation. In summary, Blanq stated that when utilizing barge transportation, one major problem is that of comfort. She, along with other shippers feel uncomfortable dealing with the inconsistency of rivers (such as floods, droughts, etc) that often halt barge traffic during times of the year. Blancq feels this problem makes barge transportation and the waterways unreliable.

Another shipper attending the Memphis COCITE meeting [47], Janet Weigel of DuPont Chemical, stated that the liability of transporting hazardous material is greater when transporting by water. This is because the hazardous material must be transferred from trucks to the barge by crane which causes greater risk of spills. Weigel also states that spills of hazardous material utilizing barge transportation are much harder to clean up and is more environmentally unfriendly than spills that occur on trucks or railways. Because of these problems and their frequency, she feels that terminals should be required to be certified in the handling of containers.

One of the major costs involved in transporting by barge is that of transfer costs. At the COCITE Pittsburgh meeting [46], John Hopkinson of Vibtech Incorporated, presented a brief discussion of possible new TechShips that eliminate the transfer of the containers by crane. These vessels are self loading and unloading. Ships of this sort utilize jack-ups, onboard cranes, ramps for roll-on/roll-off, and float-in/float-out equipment. Designs for TechShips are now being developed by MARAD (Maritime Administration). Although designs and costs are still in the first phases, it is possible that these types of ships could eliminate or greatly reduce all transfer costs involved in barge transportation.

F. SUMMARY

This chapter has presented information regarding the general feasibility of truck, barge, and rail single modal alternatives when the units being shipped are containerized. It has shown that the cheapest single modal alternatives depend upon what assumptions are made regarding number of units shipped, number of containers shipped, unit cost to the producer, and the annual percentage used in calculating the inventory carrying cost. This chapter presented a number of scenarios regarding at what mileage one mode of transportation becomes cheaper than another mode of transportation based on underlying assumptions. This chapter also presented a truck-barge feasibility assessment for the specific origin-destination pairs that define the network of analysis. The chapter detailed the cheapest alternative between every origin-destination pair combination. This chapter also explained where the appropriate transfer points are for each origin-pair combination.

The following chapter presents the conclusions regarding this particular truck-barge feasibility assessment and makes some general recommendations for further research opportunities using this same topic.

VIII. CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

The main objective of this research was to analyze the feasibility of truck-barge transportation utilizing detachable truck containers along a defined network of cities. Although some prior work has been done in the area of barge feasibility, little work has been done in the area of intermodal barge feasibility.

Another result of this research was the enhancement of software developed by Boardman [8] in order to evaluate the cheapest modes of transportation and their routes between specified origin-destination pairs. Included in the enhancement was the addition of inventory carrying cost calculations and average dray costs calculations to the total cost formulation, resulting in a more complete cost analysis. These additions will aid shipper's utilizing the program to visualize a more accurate assessment of the true total cost of his/her shipments. The results of this project are applicable to any transportation user or provider, either single or multi-modal. The resulting enhanced software can and should be used as a tool in examining shipper's needs.

This research defined the cheapest transportation alternatives between thirteen city combinations while identifying potential transfer locations and transfer terminals. It has also identified mileage ranges for single modal transportation where one mode of transportation becomes cheaper than the competing modes of transportation under specified conditions. The project listed possible commodities that may benefit by utilizing truck-barge transportation, as well as those commodities that are currently using barge transportation. The thesis has discussed seasonal data of the rivers evaluated in this analysis and has listed approximate closure times for locks along these rivers, providing shipper's with an estimate of what time delays can be expected when utilizing barge transportation.

This project has also provided shippers and waterway transportation providers a forum to meet and discuss concerns and issues relating to barge transportation under the Council on Cooperative Intermodal Transportation Enhancement. The research has shown that barge transportation can and does offer cheaper alternatives in most scenarios and that barge transportation is not limited to single modal alternatives. The project has shown that there are indeed intermodal opportunities utilizing barge transportation (truck-barge or rail-barge) that will offer an alternative to current modes of transportation. The research has indicated that barge, truck-barge, or rail-barge is a viable alternative and can offer competitive rates and prices at the present time and will continue to do so if rail rates increase due to mergers and consolidations. It is apparent by the results of this study that barge transportation is an economically feasible option and should be considered by shippers.

Future research opportunities might address container and chassis management and routings. Another consideration for further research is the establishment of a clearinghouse for barge transportation. This clearinghouse would act as the central authority for all-inclusive rates for barge transportation. At the present, shipper's must contact a variety of different sources (terminals, barge operators, tow operators, container leasers, etc.) to establish the actual costs of shipping by barge.

Other opportunities exist in the advancement of the software. The algorithm utilized by the software takes considerable time to process as the number of cities in the network increase. As stated previously, the number of cities in the network are limited by software capabilities. If a new algorithm, such as Floyd's algorithm, was used instead of the double-sweep method, it is possible that the processing time would decrease and the limitation on the number of cities would increase. Other software enhancements might include programming in a language other than Visual Basic. Visual Basic programs involving complicate mathematical calculations are somewhat slow in processing speed. Other languages might be used to speed the processing time. Another enhancement to the software might include a graphical interface that would represent the network of analysis allowing a more user-friendly environment and a visual concept of the cheapest paths reported.

These tasks are left as suggestions for individuals who wish to extend the work initiated in this research.

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Appendix A

Nodes Array

NodeNumber	City	Mode
1	Chicago	barge
2	Chicago	rail
3	Chicago	truck
4	Chicago	start
5	Chicago	end
6	Cincinnati	barge
7	Cincinnati	rail
8	Cincinnati	truck
9	Cincinnati	start
10	Cincinnati	end
11	Houston	barge
12	Houston	rail
13	Houston	truck
14	Houston	start
15	Houston	end
16	Little Rock	barge
17	Little Rock	rail
18	Little Rock	truck
19	Little Rock	start
20	Little Rock	end
21	Memphis	barge
22	Memphis	rail
23	Memphis	truck
24	Memphis	start
25	Memphis	end
26	New Orleans	barge
27	New Orleans	rail
28	New Orleans	truck
29	New Orleans	start
30	New Orleans	end
31	Mobile	barge
32	Mobile	rail
33	Mobile	truck
34	Mobile	start
35	Mobile	end
36	Omaha	barge
37	Omaha	rail
38	Omaha	truck
39	Omaha	start
40	Omaha	end
41	Pittsburgh	barge
42	Pittsburgh	rail
43	Pittsburgh	truck
44	Pittsburgh	start
45	Pittsburgh	end
46	St. Louis	barge
47	St. Louis	rail
48	St. Louis	truck
49	St. Louis	start
50	St. Louis	end

51	St. Paul	barge
52	St. Paul	rail
53	St. Paul	truck
54	St. Paul	start
55	St. Paul	end
56	Veracruz	barge-load line
57	Veracruz	rail
58	Veracruz	truck
59	Veracruz	start
60	Veracruz	end
61	Brownsville	barge
62	Brownsville	rail
63	Brownsville	truck
64	Brownsville	start
65	Brownsville	end

Appendix B

Arcs Array

SourceNode	DestNode	Distance
4	1	0
19	18	0
39	37	0
59	56	0
1	17	900
1	36	812
1	53	1025
2	18	662
2	41	476
3	6	302
3	27	920
3	46	294
6	3	835
6	26	1373
6	43	470
7	2	302
59	57	0
1	18	900
1	37	812
2	21	539
2	42	476
3	7	302
7	23	498
59	58	0
1	21	764
1	38	812
1	57	2183
2	22	539
2	43	476
3	8	302
3	28	920
3	47	294
6	10	0
6	27	1373
6	46	691
7	3	302
7	26	836
1	5	0
1	22	764
1	41	1526
1	58	2183
2	23	539
2	46	297
3	11	1108
3	31	923
3	48	294
6	11	1535
6	28	1373
6	47	691
7	10	0

7	27	836
4	2	0
24	21	0
39	38	0
2	5	0
2	26	921
2	47	297
3	12	1108
7	28	836
4	3	0
24	22	0
44	41	0
2	6	302
2	27	921
2	48	297
3	13	1108
3	32	923
3	51	399
6	12	1535
6	31	1294
6	48	691
7	11	1085
7	31	824
9	6	0
24	23	0
44	42	0
2	7	302
2	28	921
2	51	406
3	16	866
3	33	923
3	52	399
6	13	1535
6	32	1294
6	51	1348
7	12	1085
7	32	824
9	7	0
29	26	0
44	43	0
1	6	835
1	23	764
1	42	1526
7	33	824
9	8	0
29	27	0
49	46	0
1	7	835
1	26	1409
1	43	1526
3	36	474

3	53	399
6	16	886
6	33	1294
6	52	1348
7	13	1085
7	36	735
14	11	0
29	28	0
49	47	0
1	8	835
1	27	1409
1	46	365
3	37	474
3	56	2098
6	17	886
6	36	1683
6	53	1348
7	16	640
7	37	735
3	38	474
3	57	2098
6	18	886
6	37	1683
7	17	640
7	38	735
14	12	0
34	31	0
49	48	0
1	11	1605
1	28	1409
1	47	365
2	8	302
2	31	926
2	52	406
3	17	866
6	38	1683
6	57	2162
7	18	640
7	41	300
14	13	0
34	32	0
54	51	0
1	12	1605
1	31	1256
1	48	365
2	11	1108
2	32	926
2	53	406
3	18	866
6	41	470
6	58	2162

7	21	498
7	42	300
2	12	1108
2	33	926
2	56	2110
3	21	539
6	42	470
7	1	302
7	22	498
7	43	300
19	16	0
34	33	0
54	52	0
1	13	1605
1	32	1256
1	51	1025
2	13	1108
2	36	474
2	57	2110
3	22	539
3	41	467
3	58	2098
6	21	730
7	46	352
2	16	662
2	37	474
2	58	2110
3	23	539
3	42	467
6	1	835
6	22	730
7	47	352
19	17	0
39	36	0
54	53	0
1	16	900
1	33	1256
1	52	1025
2	17	662
2	38	474
3	5	0
3	26	920
3	43	467
6	2	835
6	23	730
7	48	352
7	51	1348
7	52	1348
7	53	1348
7	56	2065
7	57	2065

7	58	2065
8	1	302
8	2	302
8	3	302
8	10	0
8	11	1078
8	12	1078
8	13	1078
8	16	632
8	17	632
8	18	632
8	21	492
8	22	492
8	23	492
8	26	811
8	27	811
8	28	811
8	31	820
8	32	820
8	33	820
8	36	731
8	37	731
8	38	731
8	41	291
8	42	291
8	43	291
8	46	350
8	47	350
8	48	350
8	51	704
8	52	704
8	53	704
8	56	2059
8	57	2059
8	58	2059
11	1	1605
11	2	1605
11	3	1605
11	6	1535
11	7	1535
11	8	1535
11	15	0
11	16	901
11	17	901
11	18	901
11	21	841
11	22	841
11	23	841
11	26	404
11	27	404
11	28	404

11	31	533
11	32	533
11	33	533
11	36	1687
11	37	1687
11	38	1687
11	41	1075
11	42	1075
11	43	1075
11	46	1240
11	47	1240
11	48	1240
11	51	1900
11	52	1900
11	53	1900
11	56	1193
11	57	1193
11	58	1193
12	1	1108
12	2	1108
12	3	1108
12	6	1085
12	7	1085
12	8	1085
12	15	0
12	16	451
12	17	451
12	18	451
12	21	587
12	22	587
12	23	587
12	26	364
12	27	364
12	28	364
12	31	480
12	32	480
12	33	480
12	36	915
12	37	915
12	38	915
12	41	1369
12	42	1369
12	43	1369
12	46	872
12	47	872
12	48	872
12	51	1250
12	52	1250
12	53	1250
12	56	937
12	57	937

12	58	937
13	1	1108
13	2	1108
13	3	1108
13	6	1078
13	7	1078
13	8	1078
13	15	0
13	16	447
13	17	447
13	18	447
13	21	585
13	22	585
13	23	585
13	26	359
13	27	359
13	28	359
13	31	473
13	32	473
13	33	473
13	36	910
13	37	910
13	38	910
13	41	1366
13	42	1366
13	43	1366
13	46	862
13	47	862
13	48	862
13	51	1243
13	52	1243
13	53	1243
13	56	934
13	57	934
13	58	934
16	1	900
16	2	900
16	3	900
16	6	886
16	7	886
16	8	886
16	11	901
16	12	901
16	13	901
16	20	0
16	21	136
16	22	136
16	23	136
16	26	497
16	27	497
16	28	497

16	31	661
16	32	661
16	33	661
16	36	982
16	37	982
16	38	982
16	41	1336
16	42	1336
16	43	1336
16	46	535
16	47	535
16	48	535
16	51	1195
16	52	1195
16	53	1195
16	57	1286
16	58	1286
17	1	662
17	2	662
17	3	662
17	6	640
17	7	640
17	8	640
17	11	451
17	12	451
17	13	451
17	20	0
17	21	145
17	22	145
17	23	145
17	26	460
17	27	460
17	28	460
17	31	661
17	32	661
17	33	661
17	36	573
17	37	573
17	38	573
17	41	922
17	42	922
17	43	922
17	46	421
17	47	421
17	48	421
17	51	825
17	52	825
17	53	825
17	56	1435
17	57	1435
17	58	1435

18	1	866
18	2	866
18	3	866
18	6	632
18	7	632
18	8	632
18	11	447
18	12	447
18	13	447
18	20	0
18	21	139
18	22	139
18	23	139
18	26	454
18	27	454
18	28	454
18	31	456
18	32	456
18	33	456
18	36	570
18	37	570
18	38	570
18	41	919
18	42	919
18	43	919
18	46	416
18	47	416
18	48	416
18	51	817
18	52	817
18	53	817
18	56	1428
18	57	1428
18	58	1428
21	1	764
21	2	764
21	3	764
21	6	730
21	7	730
21	8	730
21	11	841
21	12	841
21	13	841
21	16	136
21	17	136
21	18	136
21	25	0
21	26	632
21	27	632
21	28	632
21	31	813

21	32	813
21	33	813
21	36	846
21	37	846
21	38	846
21	41	1200
21	42	1200
21	43	1200
21	46	399
21	47	399
21	48	399
21	51	1059
21	52	1059
21	53	1059
21	57	1421
21	58	1421
22	1	539
22	2	539
22	3	539
22	6	498
22	7	498
22	8	498
22	11	587
22	12	587
22	13	587
22	16	145
22	17	145
22	18	145
22	25	0
22	26	392
22	27	392
22	28	392
22	31	865
22	32	865
22	33	865
22	36	729
22	37	729
22	38	729
22	41	791
22	42	791
22	43	791
22	46	920
22	47	920
22	48	920
22	51	937
22	52	937
22	53	937
22	56	1571
22	57	1571
22	58	1571
23	1	539

23	2	539
23	3	539
23	6	492
23	7	492
23	8	492
23	11	585
23	12	585
23	13	585
23	16	139
23	17	139
23	18	139
23	25	0
23	26	414
23	27	414
23	28	414
23	31	394
23	32	394
23	33	394
23	36	724
23	37	724
23	38	724
23	41	780
23	42	780
23	43	780
23	46	293
23	47	293
23	48	293
23	51	930
23	52	930
23	53	930
23	56	1566
23	57	1566
23	58	1566
26	1	1409
26	2	1409
26	3	1409
26	6	1373
26	7	1373
26	8	1373
26	11	404
26	12	404
26	13	404
26	16	497
26	17	497
26	18	497
26	21	632
26	22	632
26	23	632
26	30	0
26	31	164
26	32	164

26	33	164
26	36	1491
26	37	1491
26	38	1491
26	41	1836
26	42	1836
26	43	1836
26	46	1044
26	47	1044
26	48	1044
26	51	1704
26	52	1704
26	53	1704
26	56	789
26	57	789
26	58	789
27	1	921
27	2	921
27	3	921
27	6	836
27	7	836
27	8	836
27	11	364
27	12	364
27	13	364
27	16	460
27	17	460
27	18	460
27	21	392
27	22	392
27	23	392
27	30	0
27	31	152
27	32	152
27	33	152
27	36	1127
27	37	1127
27	38	1127
27	41	1115
27	42	1115
27	43	1115
27	46	699
27	47	699
27	48	699
27	51	1335
27	52	1335
27	53	1335
27	56	1301
27	57	1301
27	58	1301
28	1	920

28	2	920
28	3	920
28	6	811
28	7	811
28	8	811
28	11	359
28	12	359
28	13	359
28	16	454
28	17	454
28	18	454
28	21	414
28	22	414
28	23	414
28	30	0
28	31	145
28	32	145
28	33	145
28	36	1120
28	37	1120
28	38	1120
28	41	1107
28	42	1107
28	43	1107
28	46	698
28	47	698
28	48	698
28	51	1326
28	52	1326
28	53	1326
28	56	1293
28	57	1293
28	58	1293
31	1	1256
31	2	1256
31	3	1256
31	6	1294
31	7	1294
31	8	1294
31	11	533
31	12	533
31	13	533
31	16	661
31	17	661
31	18	661
31	21	813
31	22	813
31	23	813
31	26	164
31	27	164
31	28	164

31	35	0
31	36	2187
31	37	2187
31	38	2187
31	41	1600
31	42	1600
31	43	1600
31	46	891
31	47	891
31	48	891
31	51	1865
31	52	1865
31	53	1865
31	56	825
31	57	825
31	58	825
32	1	926
32	2	926
32	3	926
32	6	824
32	7	824
32	8	824
32	11	480
32	12	480
32	13	480
32	16	661
32	17	661
32	18	661
32	21	864
32	22	864
32	23	864
32	26	152
32	27	152
32	28	152
32	35	0
32	36	1121
32	37	1121
32	38	1121
32	41	1025
32	42	1025
32	43	1025
32	46	691
32	47	691
32	48	691
32	51	1330
32	52	1330
32	53	1330
32	56	1411
32	57	1411
32	58	1411
33	1	923

33	2	923
33	3	923
33	6	820
33	7	820
33	8	820
33	11	473
33	12	473
33	13	473
33	16	456
33	17	456
33	18	456
33	21	394
33	22	394
33	23	394
33	26	145
33	27	145
33	28	145
33	35	0
33	36	1118
33	37	1118
33	38	1118
33	41	1018
33	42	1018
33	43	1018
33	46	688
33	47	688
33	48	688
33	51	1325
33	52	1325
33	53	1325
33	56	1406
33	57	1406
33	58	1406
36	1	812
36	2	812
36	3	812
36	6	1683
36	7	1683
36	8	1683
36	11	1687
36	12	1687
36	13	1687
36	16	982
36	17	982
36	18	982
36	21	846
36	22	846
36	23	846
36	26	1491
36	27	1491
36	28	1491

36	31	2187
36	32	2187
36	33	2187
36	40	0
36	41	2153
36	42	2153
36	43	2153
36	46	1608
36	47	1608
36	48	1608
36	51	1652
36	52	1652
36	53	1652
36	57	2812
36	58	2812
37	1	474
37	2	474
37	3	474
37	6	735
37	7	735
37	8	735
37	11	915
37	12	915
37	13	915
37	16	573
37	17	573
37	18	573
37	21	729
37	22	729
37	23	729
37	26	1127
37	27	1127
37	28	1127
37	31	1121
37	32	1121
37	33	1121
37	40	0
37	41	938
37	42	938
37	43	938
37	46	447
37	47	447
37	48	447
37	51	392
37	52	392
37	53	392
37	56	1761
37	57	1761
37	58	1761
38	1	474
38	2	474

38	3	474
38	6	731
38	7	731
38	8	731
38	11	910
38	12	910
38	13	910
38	16	570
38	17	570
38	18	570
38	21	724
38	22	724
38	23	724
38	26	1120
38	27	1120
38	28	1120
38	31	1118
38	32	1118
38	33	1118
38	40	0
38	41	927
38	42	927
38	43	927
38	46	440
38	47	440
38	48	440
38	51	386
38	52	386
38	53	386
38	56	1755
38	57	1755
38	58	1755
41	1	1526
41	2	1526
41	3	1526
41	6	470
41	7	470
41	8	470
41	11	1075
41	12	1075
41	13	1075
41	16	1336
41	17	1336
41	18	1336
41	21	1200
41	22	1200
41	23	1200
41	26	1836
41	27	1836
41	28	1836
41	31	1600

41	32	1600
41	33	1600
41	36	2153
41	37	2153
41	38	2153
41	45	0
41	46	1161
41	47	1161
41	48	1161
41	51	1821
41	52	1821
41	53	1821
41	57	2625
41	58	2625
42	1	476
42	2	476
42	3	476
42	6	300
42	7	300
42	8	300
42	11	1369
42	12	1369
42	13	1369
42	16	922
42	17	922
42	18	922
42	21	791
42	22	791
42	23	791
42	26	1115
42	27	1115
42	28	1115
42	31	1025
42	32	1025
42	33	1025
42	36	938
42	37	938
42	38	938
42	45	0
42	46	615
42	47	615
42	48	615
42	51	876
42	52	876
42	53	876
42	56	2350
42	57	2350
42	58	2350
43	1	467
43	2	467
43	3	467

43	6	291
43	7	291
43	8	291
43	11	1366
43	12	1366
43	13	1366
43	16	919
43	17	919
43	18	919
43	21	780
43	22	780
43	23	780
43	26	1107
43	27	1107
43	28	1107
43	31	1018
43	32	1018
43	33	1018
43	36	927
43	37	927
43	38	927
43	45	0
43	46	611
43	47	611
43	48	611
43	51	871
43	52	871
43	53	871
43	56	2346
43	57	2346
43	58	2346
46	1	365
46	2	365
46	3	365
46	6	691
46	7	691
46	8	691
46	11	1240
46	12	1240
46	13	1240
46	16	535
46	17	535
46	18	535
46	21	399
46	22	399
46	23	399
46	26	1044
46	27	1044
46	28	1044
46	31	891
46	32	891

46	33	891
46	36	1608
46	37	1608
46	38	1608
46	41	1161
46	42	1161
46	43	1161
46	50	0
46	51	660
46	52	660
46	53	660
46	57	1833
46	58	1833
47	1	297
47	2	297
47	3	297
47	6	352
47	7	352
47	8	352
47	11	872
47	12	872
47	13	872
47	16	421
47	17	421
47	18	421
47	21	920
47	22	920
47	23	920
47	26	699
47	27	699
47	28	699
47	31	691
47	32	691
47	33	691
47	36	447
47	37	447
47	38	447
47	41	615
47	42	615
47	43	615
47	50	0
47	51	617
47	52	617
47	53	617
47	56	1803
47	57	1803
47	58	1803
48	1	294
48	2	294
48	3	294
48	6	350

48	7	350
48	8	350
48	11	862
48	12	862
48	13	862
48	16	416
48	17	416
48	18	416
48	21	293
48	22	293
48	23	293
48	26	698
48	27	698
48	28	698
48	31	688
48	32	688
48	33	688
48	36	440
48	37	440
48	38	440
48	41	611
48	42	611
48	43	611
48	50	0
48	51	611
48	52	611
48	53	611
48	56	1796
48	57	1796
48	58	1796
51	1	1025
51	2	1025
51	3	1025
51	6	1348
51	7	1348
51	8	1348
51	11	1900
51	12	1900
51	13	1900
51	16	1195
51	17	1195
51	18	1195
51	21	1059
51	22	1059
51	23	1059
51	26	1704
51	27	1704
51	28	1704
51	31	1865
51	32	1865
51	33	1865

51	36	1652
51	37	1652
51	38	1652
51	41	1821
51	42	1821
51	43	1821
51	46	660
51	47	660
51	48	660
51	55	0
51	57	2490
51	58	2490
52	1	406
52	2	406
52	3	406
52	6	1348
52	7	1348
52	8	1348
52	11	1250
52	12	1250
52	13	1250
52	16	825
52	17	825
52	18	825
52	21	937
52	22	937
52	23	937
52	26	1335
52	27	1335
52	28	1335
52	31	1330
52	32	1330
52	33	1330
52	36	392
52	37	392
52	38	392
52	41	876
52	42	876
52	43	876
52	46	617
52	47	617
52	48	617
52	55	0
52	56	2095
52	57	2095
52	58	2095
53	1	399
53	2	399
53	3	399
53	6	704
53	7	704

53	8	704
53	11	1243
53	12	1243
53	13	1243
53	16	817
53	17	817
53	18	817
53	21	930
53	22	930
53	23	930
53	26	1326
53	27	1326
53	28	1326
53	31	1325
53	32	1325
53	33	1325
53	36	871
53	37	871
53	38	871
53	41	611
53	42	611
53	43	611
53	46	2088
53	47	2088
53	48	2088
53	55	0
53	56	2183
53	57	2183
53	58	2183
56	2	2183
56	3	2183
56	7	2162
56	8	2162
56	11	1193
56	12	1193
56	13	1193
56	17	1286
56	18	1286
56	22	1421
56	23	1421
56	26	789
56	27	789
56	28	789
56	31	825
56	32	825
56	33	825
56	37	2812
56	38	2812
56	42	2625
56	43	2625
56	47	1833

56	48	1833
56	51	2490
56	52	2490
56	53	2490
56	60	0
57	1	2110
57	2	2110
57	3	2100
57	6	2065
57	7	2065
57	8	2065
57	11	937
57	12	937
57	13	937
57	16	1435
57	17	1435
57	18	1435
57	21	1571
57	22	1571
57	23	1571
57	26	1301
57	27	1301
57	28	1301
57	31	1411
57	32	1411
57	33	1411
57	36	1761
57	37	1761
57	38	1761
57	41	2350
57	42	2350
57	43	2350
57	46	1803
57	47	1803
57	48	1803
57	51	2095
57	52	2095
57	53	2095
57	60	0
58	1	2098
58	2	2098
58	3	2098
58	6	2059
58	7	2059
58	8	2059
58	11	934
58	12	934
58	13	934
58	16	1428
58	17	1428
58	18	1428

58	21	1566
58	22	1566
58	23	1566
58	26	1293
58	27	1293
58	28	1293
58	31	1406
58	32	1406
58	33	1406
58	36	1755
58	37	1755
58	38	1755
58	41	2346
58	42	2346
58	43	2346
58	46	1796
58	47	1796
58	48	1796
58	51	2088
58	52	2088
58	53	2088
58	60	0
64	61	0
64	62	0
64	63	0
1	61	1905
2	61	1308
3	61	1308
6	61	1835
7	61	1385
8	61	1378
11	61	300
12	61	305
13	61	295
16	61	1201
17	61	751
18	61	747
21	61	1336
22	61	881
23	61	885
26	61	704
27	61	664
28	61	659
31	61	833
32	61	780
33	61	773
36	61	1281
37	61	1215
38	61	1210
41	61	1375
42	61	1669

43	61	1666
46	61	1540
47	61	1172
48	61	1162
51	61	2208
52	61	1550
53	61	1543
56	61	1493
57	61	1237
58	61	1234
1	62	1905
2	62	1308
3	62	1308
6	62	1835
7	62	1385
8	62	1378
11	62	300
12	62	305
13	62	295
16	62	1201
17	62	751
18	62	751
21	62	1336
22	62	881
23	62	747
26	62	704
27	62	664
28	62	885
31	62	833
32	62	780
33	62	659
36	62	1281
37	62	1205
38	62	1210
41	62	1375
42	62	1669
43	62	1666
46	62	1540
47	62	1172
48	62	1162
51	62	2208
52	62	1550
53	62	1543
56	62	1493
57	62	1237
58	62	1234
1	63	1905
2	63	1308
3	63	1308
6	63	1835
7	63	1385

8	63	1378
11	63	300
12	63	305
13	63	295
16	63	1201
17	63	751
18	63	747
21	63	1336
22	63	881
23	63	885
26	63	704
27	63	664
28	63	659
31	63	833
32	63	780
33	63	773
36	63	1281
37	63	1215
38	63	1210
41	63	1375
42	63	1669
43	63	1666
46	63	1540
47	63	1172
48	63	1162
51	63	2208
52	63	1550
53	63	1543
56	63	1493
57	63	1237
58	63	1234
61	1	1905
61	2	1905
61	3	1905
61	6	1835
61	7	1835
61	8	1885
61	11	300
61	12	300
61	13	300
61	16	1201
61	17	1201
61	18	1201
61	21	1336
61	22	1336
61	23	1336
61	26	704
61	27	704
61	28	704
61	31	833
61	32	880

61	33	880
61	36	1281
61	37	1281
61	38	1281
61	41	1375
61	42	1375
61	43	1375
61	46	1540
61	47	1542
61	48	1540
61	51	2208
61	52	2208
61	53	2208
61	56	1493
61	57	1493
61	58	1493
61	65	0
62	1	1308
62	2	1308
62	3	1308
62	6	1385
62	7	1385
62	8	1335
62	11	305
62	12	305
62	13	305
62	16	751
62	17	751
62	18	751
62	21	881
62	22	881
62	23	881
62	26	664
62	27	664
62	28	664
62	31	780
62	32	780
62	33	780
62	36	1215
62	37	1215
62	38	1215
62	41	1669
62	42	1669
62	43	1669
62	46	1172
62	47	1172
62	48	1172
62	51	1550
62	52	1550
62	53	1550
62	56	1237

62	57	1237
62	58	1237
62	65	0
63	1	1308
63	2	1308
63	3	1308
63	6	1378
63	7	1378
63	8	1378
63	11	295
63	12	295
63	13	295
63	16	747
63	17	747
63	18	747
63	21	885
63	22	885
63	23	885
63	26	659
63	27	659
63	28	659
63	31	773
63	32	773
63	33	773
63	36	1210
63	37	1210
63	38	1210
63	41	1666
63	42	1666
63	43	1666
63	46	1162
63	47	1162
63	48	1162
63	51	1543
63	52	1543
63	53	1543
63	56	1234
63	57	1234
63	58	1234
63	65	0

Appendix C

Rates Array

mode	rate	avgspd
Truck	0.9	42
Rail	0.351	37
Air	0.4445	300
Barge	0.122375	6
start	0	0
end	0	0
Barge-load line	0.24675	4
Ocean Going vessel	0.4935	10

Appendix D

Transfer (Xfer) Array

Destnode	modefrom	cost	settime
1	Barge	0	0
1	Rail	60	0.1667
1	Truck	60	0.1667
2	Barge	60	0.1667
2	Rail	0	0
2	Truck	75	0.1
3	Barge	60	0.1667
3	Rail	75	0.1
3	Truck	0	0
4	Barge	0	0
4	Rail	0	0
4	Truck	0	0
5	Barge	0	0
5	Rail	0	0
5	Truck	0	0
6	Barge	0	0
6	Rail	60	0.1667
6	Truck	60	0.1667
7	Barge	60	0.1667
7	Rail	0	0
7	Truck	65	0.1
8	Barge	60	0.1667
8	Rail	65	0.1
8	Truck	0	0
9	Barge	0	0
9	Rail	0	0
9	Truck	0	0
10	Barge	0	0
10	Rail	0	0
10	Truck	0	0
25	Barge	0	0
25	Rail	0	0
25	Truck	0	0
26	Barge	0	0
26	Rail	60	0.1667
26	Truck	60	0.1667
27	Barge	60	0.1667
27	Rail	0	0
27	Truck	75	0.1
28	Barge	60	0.1667
28	Rail	60	0.1
35	Barge	0	0
35	Rail	0	0
35	Truck	0	0
36	Barge	0	0
36	Rail	60	0.1667
36	Truck	60	0.1667
37	Barge	60	0.1667
37	Rail	0	0
37	Truck	50	0.1

38	Barge	60	0.1667
38	Rail	50	0.1
38	Truck	0	0
39	Barge	0	0
39	Rail	0	0
39	Truck	0	0
40	Barge	0	0
40	Rail	0	0
40	Truck	0	0
41	Barge	0	0
41	Rail	60	0.1667
41	Truck	60	0.1667
42	Barge	60	0.1667
42	Rail	0	0
42	Truck	65	0.1
43	Barge	60	0.1667
43	Rail	65	0.1
43	Truck	0	0
44	Barge	0	0
44	Rail	0	0
44	Truck	0	0
45	Barge	0	0
45	Rail	0	0
45	Truck	0	0
46	Barge	0	0
46	Rail	60	0.1667
46	Truck	60	0.1667
47	Barge	60	0.1667
47	Rail	0	0
47	Truck	65	0.1
48	Barge	60	0.1667
48	Rail	65	0.1
48	Truck	0	0
49	Barge	0	0
49	Rail	0	0
49	Truck	0	0
50	Barge	0	0
50	Rail	0	0
50	Truck	0	0
51	Barge	0	0
51	Rail	60	0.1667
51	Truck	60	0.1667
52	Barge	60	0.1667
52	Rail	0	0
52	Truck	65	0.1
53	Barge	60	0.1667
53	Rail	65	0.1
53	Truck	0	0
54	Barge	0	0
54	Rail	0	0
54	Truck	0	0

55	Barge	0	0
55	Rail	0	0
55	Truck	0	0
56	Barge	0	0
56	Rail	60	0.1667
56	Truck	60	0.1667
57	Barge	60	0.1667
11	Barge	0	0
11	Rail	60	0.1667
11	Truck	60	0.1667
12	Barge	60	0.1667
12	Rail	0	0
12	Truck	75	0.1
13	Barge	60	0.1667
13	Rail	75	0.1
13	Truck	0	0
14	Barge	0	0
14	Rail	0	0
14	Truck	0	0
15	Barge	0	0
15	Rail	0	0
15	Truck	0	0
16	Barge	0	0
16	Rail	60	0.1667
16	Truck	60	0.1667
17	Barge	60	0.1667
17	Rail	0	0
17	Truck	50	0.1
18	Barge	60	0.1667
18	Rail	50	0.1
18	Truck	0	0
19	Barge	0	0
19	Rail	0	0
19	Truck	0	0
20	Barge	0	0
20	Rail	0	0
20	Truck	0	0
21	Barge	0	0
21	Rail	60	0.1667
21	Truck	60	0.1667
22	Barge	60	0.1667
22	Rail	0	0
22	Truck	50	0.1
23	Barge	60	0.1667
23	Rail	50	0.1
23	Truck	0	0
24	Barge	0	0
24	Rail	0	0
24	Truck	0	0
28	Truck	0	0
29	Barge	0	0

29	Rail	0	0
29	Truck	0	0
30	Barge	0	0
30	Rail	0	0
30	Truck	0	0
31	Barge	0	0
31	Rail	60	0.1667
31	Truck	60	0.1667
32	Barge	60	0.1667
32	Rail	0	0
32	Truck	50	0.1
33	Barge	60	0.1667
33	Rail	50	0.1
33	Truck	0	0
34	Barge	0	0
34	Rail	0	0
34	Truck	0	0
57	Rail	0	0
57	Truck	35	0.1
58	Barge	60	0.1667
58	Rail	35	0.1
58	Truck	0	0
59	Barge	0	0
59	Rail	0	0
59	Truck	0	0
60	Barge	0	0
60	Rail	0	0
60	Truck	0	0
61	Barge	0	0
61	Rail	60	0.1667
61	Truck	60	0.1667
62	Barge	60	0.1667
62	Rail	0	0
62	Truck	50	0.1
63	Barge	60	0.1667
63	Rail	50	0.1
63	Truck	0	0
64	Barge	0	0
64	Rail	0	0
64	Truck	0	0
65	Barge	0	0
65	Rail	0	0
65	Truck	0	0

Appendix E

Visual Basic Code

Module1 – General declarations and subroutines (Duplicates, subinput, DSWP, xmult, trace)

```
Attribute VB_Name = "Module1"
Option Base 1
Dim llen(1000)
Dim linc(5000)
Dim lval(5000) As Double
Dim ulen(1000)
Dim uinc(5000)
Dim uval(5000) As Double
Dim start(1001)
Dim val(10000) As Double
Dim inc(10000)
Dim X(1000, 150) As Double
Dim n, mu, ml, k As Integer
Dim inf As Long

Public kvalue As String
Public actualk As Integer
Public CarryCostPct As Double
Public Cancel As Boolean
Public Update As Double

Public Const BARGE_DRAY_PER_CONT = 44.03
Public Const RAIL_DRAY_PER_CONT = 50


Public Sub Duplicates()

  Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
  Set Rs = Db.OpenRecordset("Select * from trace order by [ll]")

  Dim P1(20)
  Dim P2(20)
  Deletions = 0

  records = Rs.RecordCount
  Rs.MoveFirst
  Cost1 = Rs.Fields("ll").Value
  For j = 1 To 20
    pvalue = "p" & j
    P1(j) = Rs.Fields(pvalue).Value
  Next j

  Rs.MoveNext
  Cost2 = Rs.Fields("ll").Value
  For j = 1 To 20
    pvalue = "p" & j
    P2(j) = Rs.Fields(pvalue).Value
```

```
    Next j

    For i = 3 To records
        Update = Update + 5 / records
        frmProgress.ProgressBar1.Value = Update
        If Cancel = True Then Exit Sub
        DoEvents

        Same = False
        If Cost1 <> 0 And Cost2 <> 0 Then
            Same = True
            For j = 1 To 20
                If P1(j) <> P2(j) Then
                    Same = False
                End If
            Next j
        End If

        If Same = True Then
            Rs.Edit
            Rs.Fields("ll").Value = 0
            Rs.Update
        End If

        Rs.MoveNext

        Cost1 = Cost2
        Cost2 = Rs.Fields("ll").Value
        For j = 1 To 20
            pvalue = "p" & j
            P1(j) = P2(j)
            P2(j) = Rs.Fields(pvalue).Value
        Next j

    Next i

End Sub


Public Sub subinput()

        Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
        Dim length As Currency

        Const HRS_PER_YR = 8760
        Const HUGE_XFER_COST = 9999999999#

        'input subroutine
        'llen = an array whose jth enty is the number of arcs (i,j) with j less than i
```

```
'linc = an array containing the nodes i incident to node j with i greater than j, listed in order of increasing j
'lval = an array containing the arc length values corresponding to arcs in linc
'ulen = an array whose jth entry is the nubmer of arcs (i,j) with i less than j
'uinc = an array contaiing the nodes i incident ot node j with i less than j, listed in order of increasing j
'uval = an array containing the arc length values corresponding to arc in uinc
'start = an array whose jth element indicates the first position of inc where nodes incident to node j are listed
'val = an array containing the arc length values corresponing to arcs in inc
'inc = an array containing nodes i which are incident ot nodej, listed in order of increasing j
'n = the number of nodes in the network
'mu = the number of arcs (i,j) with i less than j
'ml = the number of arc (i,j) with j less than i
'k = the number of distinct path lengths required

'infinity is defined
inf = 99999999


j = 0
mu = 0
ml = 0
nprev = 0
n = 0

Set Rs = Db.OpenRecordset("Select * from nodes order by [NodeNumber]")
Rs.MoveLast
Nodes = Rs.RecordCount
Rs.Close
Set Rs = Db.OpenRecordset("arcs")
Rs.MoveLast
narcs = Rs.RecordCount
Rs.Close

Set rsarcs = Db.OpenRecordset("Select * from arcs order by DestNode")
rsarcs.MoveFirst
Set rsnodes = Db.OpenRecordset("Select * from nodes order by [NodeNumber]")
Set rsrates = Db.OpenRecordset("Select * from rates order by [mode]")
Set rsinput = Db.OpenRecordset("Select * from input order by [NS]")
Set rsxfer = Db.OpenRecordset("Select * from xfer order by [Destnode]")
Units = rsinput!Units
UnitCost = rsinput!UnitCost
Containers = rsinput!Containers
obj = rsinput!Objective
DestCity = rsinput!nf
OrigCity = rsinput!ns
```

```
For i = 1 To (narcs - 1)

  Update = Update + 20 / (narcs - 1)
  frmProgress.ProgressBar1.Value = Update
  If Cancel = True Then Exit Sub
  DoEvents

  nb = rsarcs!SourceNode
  na = rsarcs!DestNode
  dist = rsarcs!Distance

  rsnodes.FindFirst "NodeNumber = " & nb
  CurOrig = rsnodes!city

  rsnodes.FindFirst "NodeNumber = " & na
  mode = rsnodes!mode
  CurDest = rsnodes!city

  Destination = False
  Origin = False
  If CurDest = DestCity Then Destination = True
  If CurOrig = OrigCity Then Origin = True

  If mode = "end" Then
   length = 0
  Else
  rsnodes.FindFirst "NodeNumber = " & nb
  mode = rsnodes!mode
  rsrates.FindFirst "mode = '" & mode & "'"
  spd = rsrates!avgspd
  trate = rsrates!Rate

  If mode = "start" Then
   length = 0
  Else
   rsxfer.FindFirst "Destnode = " & na & "AND modefrom = '" & mode & "'"
   xcost = rsxfer!cost
   xtime = rsxfer!settime
   DrayCost = 0
   If (Origin = True And Destination = True) Then
     If mode = "barge" Then
       DrayCost = 2 * (BARGE_DRAY_PER_CONT + 100) * Containers
     ElseIf mode = "rail" Then
       DrayCost = 2 * (RAIL_DRAY_PER_CONT + 75) * Containers
     End If
   ElseIf (Origin = True Or Destination = True) Then
     If mode = "barge" Then
       DrayCost = (BARGE_DRAY_PER_CONT + 100) * Containers
     ElseIf mode = "rail" Then
```

```
        DrayCost = (RAIL_DRAY_PER_CONT + 75) * Containers
      End If
    End If
    If Destination = True And xcost <> 0 Then
      xcost = HUGE_XFER_COST
      xtime = HUGE_XFER_COST
    End If
    Hours = (dist / spd) + xtime
    If mode = "truck" And Hours >= 10 Then
       Hours = Hours + 8
    End If
    CarryCost = (UnitCost * CarryCostPct) * Units * (Hours / HRS_PER_YR)
    TransCost = trate * Containers * dist
    TotalCost = TransCost + xcost + CarryCost + DrayCost
    If obj = "cost" Then
     length = TotalCost
    Else
     length = Hours
    End If
  End If
  End If


  If na > n Then
   n = na
  End If
  If nb > n Then
   n = nb
  End If
  If na = nprev Then
   GoTo 10
  ElseIf na = nprev + 1 Then
  GoTo 3
  End If
  l1 = nprev + 1
  l2 = na - 1
  For L = l1 To l2
   start(L) = 0
   ulen(L) = 0
   llen(L) = 0
  Next L
3 If j = 0 Then
   GoTo 5
  End If
  ulen(nprev) = ju
  llen(nprev) = jl

5 start(na) = j + 1
```

```
    ju = 0
    jl = 0
    nprev = na
   10 j = j + 1
    inc(j) = nb
    val(j) = length
    If nb > na Then
     GoTo 20
    End If
    mu = mu + 1
    uinc(mu) = nb
    uval(mu) = length
    ju = ju + 1
    GoTo 30
   20 ml = ml + 1
    linc(ml) = nb
    lval(ml) = length
    jl = jl + 1
   30 rsarcs.MoveNext
   Next i

   start(nprev + 1) = j + 1
   test = nprev + 1
   ulen(nprev) = ju
   llen(nprev) = jl

    Update = 25
    frmProgress.ProgressBar1.Value = Update
    If Cancel = True Then Exit Sub
    DoEvents

   Call DSWP

End Sub


Public Sub DSWP()

   Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")

   imax = 50
   Set Rs = Db.OpenRecordset("Select * from input order by [k]")
   k = Rs!k
   Rs.Close

   'clear existing paths out of the database
   Set rstrace = Db.OpenRecordset("Select * from trace order by [ID]")

   For z = 1 To 150
```

```
  If Cancel = True Then Exit Sub
  DoEvents

  For j = 1 To 20
   Criteria = "p" & j
   rstrace.FindFirst "ID = " & z
   rstrace.Edit
   rstrace.Fields("kk").Value = 0
   rstrace.Fields("jj").Value = 0
   rstrace.Fields("nph").Value = 0
   rstrace.Fields("ll").Value = 0
   rstrace.Fields(Criteria).Value = 0
   rstrace.Update
  Next j
Next z
rstrace.Close

  Update = Update + 5
  frmProgress.ProgressBar1.Value = Update
  If Cancel = True Then Exit Sub
  DoEvents

Set rsinput = Db.OpenRecordset("Select * from input order by [NS]")
cns = rsinput!ns    'source city
cnf = rsinput!nf    'dest. city
rsinput.Close

Set Rs = Db.OpenRecordset("Select * from nodes order by [NodeNumber]")
Rs.FindFirst "City = '" & cns & "'" & "AND mode = 'start'"
ns = Rs!NodeNumber
Rs.FindFirst "City = '" & cnf & "'" & "AND mode = 'end'"
nf = Rs!NodeNumber
Rs.Close

n1 = n - 1

For i = 1 To n

  Update = Update + 25 / n
  frmProgress.ProgressBar1.Value = Update
  If Cancel = True Then Exit Sub
  DoEvents

  For j = 1 To k
  X(i, j) = inf
  Next j

Next i
```

```
  Update = 55
  frmProgress.ProgressBar1.Value = Update
  If Cancel = True Then Exit Sub
  DoEvents

X(ns, 1) = 0
itns = 1

30 ifin = ml
indx = 1
For iii = 1 To n1

  i = -iii + n1 + 1
  If llen(i) = 0 Then
    GoTo 40
  End If
  iis = ifin - llen(i) + 1
  Call xmult(i, iis, ifin, linc, lval, indx)
  ifin = iis - 1
40 Next iii

If itns = 1 Then
  GoTo 50
End If

If indx = 1 Then
  GoTo 100
End If

50 itns = itns + 1
iis = 1
indx = 1
For i = 2 To n

  If Cancel = True Then Exit Sub
  DoEvents

  If ulen(i) = 0 Then
    GoTo 60
  End If
  ifin = iis + ulen(i) - 1
  Call xmult(i, iis, ifin, uinc, uval, indx)
  If Cancel = True Then Exit Sub
    DoEvents
  iis = ifin + 1
60 Next i

If indx = 1 Then
```

```
 GoTo 100
End If
itns = itns + 1

If itns < imax Then
 GoTo 30
End If
MsgBox "Too many iterations have been performed", 16, "error"
GoTo 200

100 ' Set rspaths = Db.OpenRecordset("Select * from paths order by [ID]")
  'rspaths.MoveFirst
  'For i = 1 To n
   ' For j = 1 To k
    '  Criteria = "n" & j
     ' rspaths.FindFirst "ID = " & i
      'rspaths.Edit
      'rspaths.Fields(Criteria).Value = X(i, j)
      'rspaths.Update
     'Next j
     'rspaths.MoveNext
   'Next i

 Update = 85
 frmProgress.ProgressBar1.Value = Update
 If Cancel = True Then Exit Sub
 DoEvents


Call trace(ns, nf, k)

200 End Sub


Public Sub xmult(i, iis, ifin, inc, val, indx)

 Dim A(150)
 For j = 1 To k
  A(j) = X(i, j)
 Next j
 Max = A(k)

 For L = iis To ifin

  If Cancel = True Then Exit Sub
  DoEvents

  ii = inc(L)
  iv = val(L)
```

```
For m = 1 To k
  ix = X(ii, m)
  If ix >= inf Then
    GoTo 100
  End If
  ixv = ix + iv
  If ixv >= Max Then
    GoTo 100
  End If

    For jjj = 2 To k
      j = -jjj + k + 2
      If ixv - A(j - 1) < 0 Then
        GoTo 30
      ElseIf ixv - A(j - 1) = 0 Then
        GoTo 90
      Else
        GoTo 50
      End If
30    Next jjj

  j = 1
50 jj = k
70 If jj <= j Then
    GoTo 80
  End If
  A(jj) = A(jj - 1)
  jj = jj - 1
  GoTo 70
80 A(j) = ixv

  indx = 0
  Max = A(k)
90 Next m
100 Next L
 If indx = 1 Then
   GoTo 120
 End If

 For j = 1 To k
   X(i, j) = A(j)
 Next j

120 End Sub


Public Sub trace(ns, nf, pmax)

      Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
```

```
 Set rstrace = Db.OpenRecordset("Select * from trace order by [ID]")

 Dim P(200) As Double
 Dim q(200) As Double
 Dim pv(200) As Double
 Dim lab, ll, ni, nv, lt As Double


For i = 1 To 200
  P(i) = 0
  q(i) = 0
  pv(i) = 0
Next i
jj = 1
rstrace.FindFirst "ID = " & jj
bookmark1 = rstrace.Bookmark
If ns = nf Then
jj = 2
End If
nph = 0
If X(nf, jj) < inf Then
  GoTo 15
End If
Form3.Text1.Text = "There are no paths from node" & ns & " to node " & nf
GoTo 200
15  'Form3.Text1.Text = "path          length          node sequence"

20  kk = 1
    lab = X(nf, jj)
    If lab = inf Then
      GoTo 200
    End If
    ll = lab
    P(1) = nf
30  Last = 0

40  nt = P(kk)
    iis = start(nt)
    For nd = nt To 200
    If start(nd + 1) <> 0 Then
      GoTo 48
    End If
45  Next nd
48  rrf = start(nd + 1) - 1
    ii = iis + Last
50  If ii > rrf Then
      GoTo 90
    End If
    ni = inc(ii)
```

```
  nv = val(ii)
  lt = lab - nv

  For j = 1 To k

    If Cancel = True Then Exit Sub
    DoEvents

   If (X(ni, j) - lt) < -0.0001 Then
    GoTo 60
   ElseIf (X(ni, j) - lt) > 0.0001 Then
    GoTo 70
   Else
    GoTo 180
   End If
180 For ia = 1 To kk
     If ni - P(ia) < 0 Then
      GoTo 181
     ElseIf ni - P(ia) = 0 Then
      GoTo 70
     Else
      GoTo 181
     End If
181  Next ia
    GoTo 80
60 Next j

70 ii = ii + 1
  GoTo 50
80 kk = kk + 1
  If kk > 200 Then
   GoTo 190
  End If
  P(kk) = ni
  q(kk) = ii - iis + 1
  pv(kk) = nv
  lab = lt

  If lab > 0.0001 Or lab < -0.0001 Then
   GoTo 30
  End If
  If ni <> ns Then
   GoTo 30
  End If

  nph = nph + 1

    'rstrace.FindFirst "ID = " & jj
    rstrace.Bookmark = bookmark1
```

```
            rstrace.Edit
            rstrace.Fields("kk").Value = kk
            rstrace.Fields("jj").Value = jj
            rstrace.Fields("nph").Value = nph
            rstrace.Fields("ll").Value = ll
        For j = 1 To kk
            Criteria = "p" & j
            rstrace.Fields(Criteria).Value = P(j)
        Next j
            rstrace.Update
            rstrace.MoveNext
            bookmark1 = rstrace.Bookmark

        If nph >= pmax Then
          GoTo 200
        End If
    90  'last = q(kk)
        'p(kk) = 0
        'lab = lab + pv(kk)
        'kk = kk - 1
        'If kk > 0 Then
        ' GoTo 40
        'End If

        jj = jj + 1
        If jj > k Then
          GoTo 200
        End If
        GoTo 20

    190 MsgBox "The number of arcs in path exceeds 200", 16, "Termination"

    200 Update = 95
        frmProgress.ProgressBar1.Value = 95
        If Cancel = True Then Exit Sub
        DoEvents
        Call Duplicates

End Sub
```

Form1 – Form that displays the detailed breakdown of each alternative route.

```
Private Sub Command1_Click()
        End
End Sub
```

```
Private Sub Command2_Click()

   frmpath.Hide
   solutions.Visible = True

End Sub


Private Sub Command3_Click()

   Unload frmpath
   Unload solutions
   frminput.Show 0

End Sub
```

Form3 – Form that displays the K-Best alternative solutions

```
Option Base 1
Dim fn As Integer
Dim B(50) 'As Currency
Dim L(50) 'As Currency
Dim TL(50) ' As Currency
Dim id(6) As Integer


Private Sub cmdnext5_Click()

        fn = fn + 5
        Call display(fn)

        'If txtk5.Text <> "$." And txtk5.Text <> ". hrs" Then
        '  cmdnext5.Visible = True
        'Else
        '  cmdnext5.Visible = False
        'End If

        cmdprev5.Visible = True

End Sub


Private Sub cmdprev5_Click()

        fn = fn - 5
        Call display(fn)
```

```
        If txtsn(1).Text <> "1" Then
                cmdprev5.Visible = True
        Else
                cmdprev5.Visible = False
        End If
        'cmdnext5.Visible = True

End Sub


Private Sub Command1_Click()
        End
End Sub


Private Sub Command3_Click()

        If Option1(1).Value = True Then
                pat = id(1)
        ElseIf Option1(2).Value = True Then
                pat = id(2)
        ElseIf Option1(3).Value = True Then
                pat = id(3)
        ElseIf Option1(4).Value = True Then
                pat = id(4)
        Else
                pat = id(5)
        End If

        Call pathenum(pat)

        solutions.Hide
        frminput.Hide
        frmpath.Show 1

        End Sub

        Private Sub Form_Load()

        fn = 1

        Call display(fn)

        'If txtk5.Text <> "$." And txtk5.Text <> ". hrs" Then
        '  cmdnext5.Visible = True
        'End If

        solutions.Caption = kvalue & "-Best Solutions"
```

```
End Sub

Public Sub display(fn)

        Const HRS_PER_YR = 8760

        Dim Disable As Boolean
        Dim Temp As Long

        Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
        Set Rs = Db.OpenRecordset("Select * from trace order by [ID]")
        Set rsarcs = Db.OpenRecordset("Select * from arcs order by DestNode")
        Set rsinput = Db.OpenRecordset("Select * from input order by [NS]")
        Set rsnodes = Db.OpenRecordset("Select * from nodes order by [NodeNumber]")
        Set rsrates = Db.OpenRecordset("Select * from rates order by [mode]")
        Set rsxfer = Db.OpenRecordset("Select * from xfer order by [Destnode]")

        obj = rsinput!Objective
        Units = rsinput!Units
        UnitCost = rsinput!UnitCost
        Containers = rsinput!Containers
        rsinput.Close

        'initialize form
        For i = 1 To 5
                txtsn(i).Enabled = True
                txtk(i).Enabled = True
                txtc(i).Enabled = True
                Option1(i).Enabled = True
        Next i
        cmdnext5.Visible = True
        Disable = False

        For i = 1 To 5
                txtsn(i).Text = fn + (i - 1)
        Next i


        If obj = "cost" Then
                Label1.Caption = "Total Cost"
                Label3.Caption = "Total Time"
        Else
                Label1.Caption = "Total Time"
                Label3.Caption = "Total Cost"
        End If

        For j = 1 To (fn + 5)
```

```
        TL(j) = 0
Next j

DataID = 0
z = 1

For j = 1 To (fn + 5)
        Temp = 1
  100 If Temp = 0 Then B(DataID) = 1
        DataID = DataID + 1
        Rs.FindFirst "ID = " & DataID
        kk = Rs!kk
        Temp = CLng(Rs!ll)
        If Temp = 0 And Rs!nph > 0 Then GoTo 100

        If j >= fn Then
                id(z) = DataID
                z = z + 1
        End If

        B(DataID) = Format(Rs!ll, "###,##0.00")

        DestNode = Rs.Fields("p2").Value
        For i = 1 To 20
                n = "p" & i
                Node = Rs.Fields(n).Value
                If Node = 0 Then
                Node = i - 2
                Exit For
                End If
        Next i
        n = "p" & Node
        OrigNode = Rs.Fields(n).Value

 For i = 1 To (kk - 1)

 n1 = "p" & i
 n2 = "p" & (i + 1)
 nb = Rs.Fields(n1).Value
 na = Rs.Fields(n2).Value

 rsarcs.FindFirst "DestNode = " & nb & "AND SourceNode = " & na
 dist = rsarcs!Distance

 rsnodes.FindFirst "NodeNumber = " & na
 mode = rsnodes!mode
 rsrates.FindFirst "mode = '" & mode & "'"
 spd = rsrates!avgspd
 trate = rsrates!Rate
```

```
Destination = False
Origin = False
If nb = DestNode Then Destination = True
If na = OrigNode Then Origin = True

If mode = "start" Then
 length = 0
ElseIf mode = "end" Then
 length = 0
Else
 rsxfer.FindFirst "Destnode = " & nb & "AND modefrom = '" & mode & "'"
 'If n1 = "p2" Then
 ' xcost = 0
 ' xtime = 0
 'Else
  xcost = rsxfer!cost
  xtime = rsxfer!settime
 'End If
 DrayCost = 0
 If (Origin = True And Destination = True) Then
   If mode = "barge" Then
     DrayCost = 2 * (BARGE_DRAY_PER_CONT + 100) * Containers
   ElseIf mode = "rail" Then
     DrayCost = 2 * (RAIL_DRAY_PER_CONT + 75) * Containers
   End If
 ElseIf (Origin = True Or Destination = True) Then
   If mode = "barge" Then
     DrayCost = (BARGE_DRAY_PER_CONT + 100) * Containers
   ElseIf mode = "rail" Then
     DrayCost = (RAIL_DRAY_PER_CONT + 75) * Containers
   End If
 End If
 Hours = (dist / spd) + xtime
 If mode = "truck" And Hours >= 10 Then
   Hours = Hours + 8
 End If
 CarryCost = (UnitCost * CarryCostPct) * Units * (Hours / HRS_PER_YR)
 TransCost = trate * Containers * dist
 TotalCost = TransCost + xcost + CarryCost + DrayCost
 If obj = "time" Then
  length = TotalCost
 Else
  length = Hours
 End If
End If

L(i) = length
TL(DataID) = L(i) + TL(DataID)
```

```
  If z > 1 And z < 7 Then
   If obj = "cost" Then
     txtk(z - 1).Text = "$" & B(DataID)
     txtc(z - 1).Text = Format(TL(DataID), "###,##0.00") & " hrs"
   Else
     txtk(z - 1).Text = B(DataID) & " hrs"
     txtc(z - 1).Text = "$" & Format(TL(DataID), "###,##0.00")
   End If
  End If

  Next i
 Next j

 If obj = "cost" Then
   For i = 1 To 5
     If B(fn + (i - 1)) = 0 Or (fn + (i - 1)) > actualk Then
       txtsn(i).Text = ""
       txtk(i).Text = ""
       txtc(i).Text = ""
       Option1(i).Enabled = False
       Disable = True
     End If
   Next i
   If B(fn + 5) = 0 Or (fn + 5) > actualk Then Disable = True
 Else
   For i = 1 To 5
     If TL(fn + (i - 1)) = 0 Or (fn + (i - 1)) > actualk Then
       txtsn(i).Text = ""
       txtk(i).Text = ""
       txtc(i).Text = ""
       Option1(i).Enabled = False
       Disable = True
     End If
   Next i
   If TL(fn + 5) = 0 Or (fn + 5) > actualk Then Disable = True
 End If

 If Disable = True Then cmdnext5.Visible = False

End Sub

Public Sub pathenum(pat)

 Const HRS_PER_YR = 8760

 Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
 Set Rs = Db.OpenRecordset("Select * from trace order by [ID]")
 Set rsarcs = Db.OpenRecordset("Select * from arcs order by DestNode")
```

```
Set rsinput = Db.OpenRecordset("Select * from input order by [NS]")
Set rsnodes = Db.OpenRecordset("Select * from nodes order by [NodeNumber]")
Set rsrates = Db.OpenRecordset("Select * from rates order by [mode]")
Set rsxfer = Db.OpenRecordset("Select * from xfer order by [Destnode]")

Dim NSA(50)
Dim NDA(50)
Dim MODEA(50)
Dim lcosta(50)
Dim ltimea(50)

obj = rsinput!Objective
Units = rsinput!Units
UnitCost = rsinput!UnitCost
Containers = rsinput!Containers
rsinput.Close

If obj = "cost" Then
        frmpath.lbltc.Caption = "$" & Format(B(pat), "###,###,##0.00")
        frmpath.lbltt.Caption = Format(TL(pat), "###,###,##0.00") & " hrs"
Else
        frmpath.lbltc.Caption = "$" & Format(TL(pat), "###,###,##0.00")
        frmpath.lbltt.Caption = Format(B(pat), "###,###,##0.00") & " hrs"
End If

Rs.FindFirst "ID = " & pat
kk = Rs!kk

OrigNode = Rs.Fields("p2").Value
For i = 1 To 20
        n = "p" & i
        Node = Rs.Fields(n).Value
        If Node = 0 Then
        Node = i - 2
        Exit For
        End If
Next i
n = "p" & Node
DestNode = Rs.Fields(n).Value

For i = kk To 2 Step -1

        n1 = "p" & i
        n2 = "p" & (i - 1)
        nb = Rs.Fields(n1).Value
        na = Rs.Fields(n2).Value

        rsarcs.FindFirst "DestNode = " & na & "AND SourceNode = " & nb
        dist = rsarcs!Distance
```

```
rsnodes.FindFirst "NodeNumber = " & na
nd = rsnodes!city
rsnodes.FindFirst "NodeNumber = " & nb
ns = rsnodes!city
mode = rsnodes!mode
If ns = nd Then
        GoTo 200
End If
rsrates.FindFirst "mode = '" & mode & "'"
spd = rsrates!avgspd
trate = rsrates!Rate
If mode = "start" Then
        length = 0
ElseIf mode = "end" Then
        length = 0
Else
        'kkkkkkk
        rsxfer.FindFirst "Destnode = " & na & "AND modefrom = '" & mode &
        "'"
        Destination = False
        Origin = False
        If nb = DestNode Then Destination = True
        If na = OrigNode Then Origin = True

        DrayCost = 0
        If (Origin = True And Destination = True) Then
        If mode = "barge" Then
        DrayCost = 2 * (BARGE_DRAY_PER_CONT + 100) * Containers
        ElseIf mode = "rail" Then
        DrayCost = 2 * (RAIL_DRAY_PER_CONT + 75) * Containers
        End If
        ElseIf (Origin = True Or Destination = True) Then
        If mode = "barge" Then
        DrayCost = (BARGE_DRAY_PER_CONT + 100) * Containers
        ElseIf mode = "rail" Then
        DrayCost = (RAIL_DRAY_PER_CONT + 75) * Containers
        End If
        End If

        xcost = rsxfer!cost
        xtime = rsxfer!settime
        ltime = (dist / spd) + xtime
        If mode = "truck" And ltime >= 10 Then
        ltime = ltime + 8
        End If
        CarryCost = (UnitCost * CarryCostPct) * Units * (ltime /
HRS_PER_YR)
        TransCost = trate * Containers * dist
```

```
                lcost = TransCost + xcost + CarryCost + DrayCost

            End If
            NSA(kk - i) = ns
            NDA(kk - i) = nd
            MODEA(kk - i) = mode
            lcosta(kk - i) = Format(lcost, "###,###,##0.00")
            ltimea(kk - i) = Format(ltime, "###,##0.00")

200 Next I

 frmpath.lblfr1.Caption = NSA(1)
 frmpath.lblto1.Caption = NDA(1)
 frmpath.lblm1.Caption = MODEA(1)
 frmpath.lblc1.Caption = lcosta(1)
 frmpath.lblt1.Caption = ltimea(1)

 frmpath.lblfr2.Caption = NSA(2)
 frmpath.lblto2.Caption = NDA(2)
 frmpath.lblm2.Caption = MODEA(2)
 frmpath.lblc2.Caption = lcosta(2)
 frmpath.lblt2.Caption = ltimea(2)

 frmpath.lblfr3.Caption = NSA(3)
 frmpath.lblto3.Caption = NDA(3)
 frmpath.lblm3.Caption = MODEA(3)
 frmpath.lblc3.Caption = lcosta(3)
 frmpath.lblt3.Caption = ltimea(3)

 frmpath.lblfr4.Caption = NSA(4)
 frmpath.lblto4.Caption = NDA(4)
 frmpath.lblm4.Caption = MODEA(4)
 frmpath.lblc4.Caption = lcosta(4)
 frmpath.lblt4.Caption = ltimea(4)

 frmpath.lblfr5.Caption = NSA(5)
 frmpath.lblto5.Caption = NDA(5)
 frmpath.lblm5.Caption = MODEA(5)
 frmpath.lblc5.Caption = lcosta(5)
 frmpath.lblt5.Caption = ltimea(5)

 frmpath.lblfr6.Caption = NSA(6)
 frmpath.lblto6.Caption = NDA(6)
 frmpath.lblm6.Caption = MODEA(6)
 frmpath.lblc6.Caption = lcosta(6)
 frmpath.lblt6.Caption = ltimea(6)

 frmpath.lblfr7.Caption = NSA(7)
 frmpath.lblto7.Caption = NDA(7)
```

```
        frmpath.lblm7.Caption = MODEA(7)
        frmpath.lblc7.Caption = lcosta(7)
        frmpath.lblt7.Caption = ltimea(7)

        frmpath.lblfr8.Caption = NSA(8)
        frmpath.lblto8.Caption = NDA(8)
        frmpath.lblm8.Caption = MODEA(8)
        frmpath.lblc8.Caption = lcosta(8)
        frmpath.lblt8.Caption = ltimea(8)

        frmpath.lblfr9.Caption = NSA(9)
        frmpath.lblto9.Caption = NDA(9)
        frmpath.lblm9.Caption = MODEA(9)
        frmpath.lblc9.Caption = lcosta(9)
        frmpath.lblt9.Caption = ltimea(9)

        frmpath.lblfr10.Caption = NSA(10)
        frmpath.lblto10.Caption = NDA(10)
        frmpath.lblm10.Caption = MODEA(10)
        frmpath.lblc10.Caption = lcosta(10)
        frmpath.lblt10.Caption = ltimea(10)

End Sub
```

Frnchgrates -- Form that allows the user to update the transportation rates in the database

```
Dim word As String
Dim Db As Database, Rs As Recordset


Private Sub cbomode_Click()

  If frmchgrates.cbomode.Text <> "" Then
    Label2.Enabled = True
    Frame1.Enabled = True
    optcost.Enabled = True
    optcost.Value = False
    optspd.Enabled = True
    optspd.Value = False
    Text1.Caption = ""
    txtchg.Enabled = False
    txtchg.Text = ""
    Command2.Enabled = False
  End If

End Sub
```

```
Private Sub Command1_Click()

        Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
        Set Rs = Db.OpenRecordset("Select * from rates order by [mode]")

        Criteria = "mode = '" & cbomode.Text & "'"
        Rs.FindFirst Criteria

        If optcost.Value = True Then
                word = "cost"
                txtchg.Text = Rs!Rate
        ElseIf optspd.Value = True Then
                word = "average speed"
                txtchg.Text = Rs!avgspd
        Else
                MsgBox "Please choose a rate to view", 16, "error"
        End If

        Text1.Caption = "Type the revised " & cbomode.Text & " transportation " & word & "
below:"

End Sub


Private Sub Command2_Click()

        If txtchg.Text = "" Then
                MsgBox "Enter the New Value", 16, "Error"
        End If

        If word = "cost" Then
                Rs.Edit
                Rs.Fields("rate").Value = txtchg.Text
                Rs.Update
        ElseIf word = "average speed" Then
                Rs.Edit
                Rs.Fields("avgspd").Value = txtchg.Text
                Rs.Update
        End If

End Sub


Private Sub Command3_Click()

        frmchgrates.Hide
        frmdbchg.Hide
        'frmstart.Show 0
```

```
End Sub

Private Sub Form_Load()

        Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
        Set Rs = Db.OpenRecordset("Select * from rates order by [mode]")

        cbomode.Clear

        cbomode.AddItem "Air"
        cbomode.AddItem "Barge"
        cbomode.AddItem "Truck"
        cbomode.AddItem "Rail"
        cbomode.AddItem "Barge-Line Load"
        cbomode.AddItem "Ocean Vessel"
        'Add/Remove modes here

        cbomode.Text = ""
        Label2.Enabled = False
        Frame1.Enabled = False
        optcost.Enabled = False
        optcost.Value = False
        optspd.Enabled = False
        optspd.Value = False
        Text1.Caption = ""
        txtchg.Enabled = False
        txtchg.Text = ""
        Command2.Enabled = False

End Sub

Private Sub optcost_Click()

  Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
  Set Rs = Db.OpenRecordset("Select * from rates order by [mode]")

  Criteria = "mode = '" & cbomode.Text & "'"
  Rs.FindFirst Criteria

  txtchg.Text = Rs!Rate

  Text1.Caption = "Type the revised " & cbomode.Text & " transportation cost below:"

  txtchg.Enabled = True
  Command2.Enabled = True
```

```
End Sub

Private Sub optspd_Click()

   Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
   Set Rs = Db.OpenRecordset("Select * from rates order by [mode]")

   Criteria = "mode = '" & cbomode.Text & "'"
   Rs.FindFirst Criteria

   txtchg.Text = Rs!avgspd

   Text1.Caption = "Type the revised " & cbomode.Text & " transportation average speed below:"

   txtchg.Enabled = True
   Command2.Enabled = True

End Sub
```

Frmdbchg – Form that allows the user to select a portion of the database to update

```
Private Sub cmdclr_Click()

        cbosource.Text = ""
        cbodest.Text = ""
        txtunit.Text = ""
        txtunitpercont.Text = ""
        txtcostperunit.Text = ""
        txtCarryPct.Text = ""
        optcost.Value = False
        opttime.Value = False
        txtk.Text = ""

End Sub

Private Sub cmdexit_Click()
        End
End Sub

Private Sub cmdok1_Click()

        Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
        Set Rs = Db.OpenRecordset("Select * from input order by [NS]")
```

```
If cbosource.Text = "" Then
   MsgBox "Please select a source city", 16, "Error"
ElseIf cbosource.Text = cbodest.Text Then
   MsgBox "Source and destination cities cannot be the same", 16, "Error"
ElseIf cbodest.Text = "" Then
   MsgBox "Please select a destination city", 16, "Error"
ElseIf txtunit.Text = "" Then
   MsgBox "Please enter the number of units to be shipped", 16, "Error"
ElseIf txtunitpercont.Text = "" Then
   MsgBox "Please enter the number of units per container", 16, "Error"
ElseIf txtcostperunit.Text = "" Then
   MsgBox "Please enter the cost per unit to the producer", 16, "Error"
ElseIf txtCarryPct.Text = "" Then
   MsgBox "Please enter the carrying cost percentage", 16, "Error"
ElseIf optcost.Value = False And opttime.Value = False Then
   MsgBox "Please choose an objective", 16, "Error"
ElseIf txtk.Text = "" Then
   MsgBox "Please choose a k-value", 16, "Error"
ElseIf CInt(txtk.Text) > 50 Or CInt(txtk.Text) < 1 Then
   MsgBox "The k-value must be between 1 and 50.", 16, "Error"
Else

Rs.MoveFirst

CarryCostPct = CLng(txtCarryPct.Text) / 100
srccity = cbosource.Text
DestCity = cbodest.Text
Units = CInt(txtunit.Text)
UnitsPerCont = CInt(txtunitpercont.Text)
UnitCost = txtcostperunit.Text
Containers = Units / UnitsPerCont

Rs.Edit
Rs.Fields("mode") = " "
Rs.Update

Rs.Edit
Rs.Fields("ModeFrom") = " "
Rs.Update

Rs.Edit
Rs.Fields("NS").Value = srccity
Rs.Update

Rs.Edit
Rs.Fields("NF").Value = DestCity
Rs.Update

Rs.Edit
```

```
Rs.Fields("Units").Value = txtunit.Text
Rs.Update

Rs.Edit
Rs.Fields("Containers").Value = CStr(Containers)
Rs.Update

Rs.Edit
Rs.Fields("UnitCost").Value = UnitCost
Rs.Update

actualk = CInt(txtk.Text)
kvalue = CStr(actualk)

Rs.Edit
Rs.Fields("k").Value = actualk * 3
Rs.Update

If optcost.Value = True Then
  obj = "cost"
Else
  obj = "time"
End If

Rs.Edit
Rs.Fields("Objective").Value = obj
Rs.Update

Cancel = False

Screen.MousePointer = 11

frmProgress.Show

Update = 0

Call subinput

Unload frmProgress

Screen.MousePointer = 0

If Cancel = True Then Exit Sub
DoEvents

solutions.Show 1

End If
```

```
End Sub

Private Sub Form_Load()

        Dim city(1000)
        Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
        Set Rs = Db.OpenRecordset("Select * from nodes order by [City]")

        Rs.MoveLast
        Nodes = Rs.RecordCount

        Rs.MoveFirst
        For i = 1 To Nodes
          city(i) = Rs!city
          If city(i) <> city(i - 1) Then
            cbosource.AddItem Rs!city
            cbodest.AddItem Rs!city
          End If
          Rs.MoveNext
        Next i

        cbosource.Text = ""
        cbodest.Text = ""
        txtunit.Text = ""
        txtunitpercont.Text = ""
        txtcostperunit.Text = ""
        optcost.Value = False
        opttime.Value = False

End Sub
```

FrmProgress – Form that displays the progress bar when performing calculations

```
Dim fn As String
Dim Db As Database, Rs As Recordset


Private Sub cbochdest_Click()

   If cbochdest.Text <> "" Then

      Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
      Set Rs = Db.OpenRecordset("Select * from nodes order by [City]")

      Rs.MoveLast
      Nodes = Rs.RecordCount
```

```
      cbochmode.Clear

      Rs.MoveFirst
      For i = 1 To Nodes
         If Rs!city = cbochdest.Text Then
            If Rs!mode <> "start" And Rs!mode <> "end" Then
               cbochmode.AddItem Rs!mode
            End If
         End If
         Rs.MoveNext
      Next i

      cbochmode.Enabled = True
      Label3.Enabled = True
      txtchgdist.Enabled = False
      cmdmakechg.Enabled = False

      cbochmode.Text = ""
      txtwhat.Caption = ""
      txtchgdist.Text = ""

   End If

End Sub


Private Sub cbochmode_Click()

   If cbochmode.Text <> "" Then

      Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")

      txtwhat.Caption = "Type the revised " & cbochmode.Text & " distance between " &
cbochsrc.Text & " and " & cbochdest.Text & " below:"

      Call Nodenn

      Set Rs = Db.OpenRecordset("NodeNS")
      Set Rs2 = Db.OpenRecordset("NodeNF")

      SN = Rs!NodeNumber
      DN = Rs2!NodeNumber

      Set Rs3 = Db.OpenRecordset("Select * from arcs order by [DestNode]")

      Criteria = "SourceNode = " & SN & "AND DestNode = " & DN

      Rs3.FindFirst Criteria
```

```
      txtchgdist.Text = Rs3!Distance

      txtchgdist.Enabled = True
      cmdmakechg.Enabled = True

   End If

End Sub


Private Sub cbochsrc_Click()

   If cbochsrc.Text <> "" Then
      cbochdest.Enabled = True
      Label2.Enabled = True
      Label3.Enabled = False
      cbochmode.Enabled = False
      txtchgdist.Enabled = False
      cmdmakechg.Enabled = False

      cbochdest.Text = ""
      cbochmode.Text = ""
      txtwhat.Caption = ""
      txtchgdist.Text = ""
   End If

End Sub


Private Sub cmdmakechg_Click()

        Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
        Set Rs = Db.OpenRecordset("NodeNS")
        Set Rs2 = Db.OpenRecordset("NodeNF")

        If txtchgdist.Text = "" Then
                MsgBox "Enter the New Value", 16, "Error"
        ElseIf cbochsrc.Text = cbochdest.Text Then
                MsgBox "Source and destination cities cannot be the same", 16, "Error"
        End If

        SN = Rs!NodeNumber
        DN = Rs2!NodeNumber

        Set Rs3 = Db.OpenRecordset("Select * from arcs order by [DestNode]")

        Criteria = "SourceNode = " & SN & "AND DestNode = " & DN

        Rs3.FindFirst Criteria
```

```
        Rs3.Edit
        Rs3.Fields("Distance").Value = txtchgdist.Text
        Rs3.Update

        Criteria = "SourceNode = " & DN & "AND DestNode = " & SN

        Rs3.FindFirst Criteria
        Rs3.Edit
        Rs3.Fields("Distance").Value = txtchgdist.Text
        Rs3.Update

End Sub


Private Sub Command1_Click()

        Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")

        txtwhat.Caption = "Type the revised " & cbochmode.Text & " distance between " &
        cbochsrc.Text & " and " & cbochdest.Text & " below:"

        Call Nodenn

        Set Rs = Db.OpenRecordset("NodeNS")
        Set Rs2 = Db.OpenRecordset("NodeNF")

        SN = Rs!NodeNumber
        DN = Rs2!NodeNumber

        Set Rs3 = Db.OpenRecordset("Select * from arcs order by [DestNode]")

        Criteria = "SourceNode = " & SN & "AND DestNode = " & DN

        Rs3.FindFirst Criteria
        txtchgdist.Text = Rs3!Distance

End Sub


Private Sub Command3_Click()

        frmroutes.Hide
        frmdbchg.Hide
        'frmstart.Show 0

End Sub


Private Sub Form_Load()
```

```
    Dim city(1000)
    Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
    Set Rs = Db.OpenRecordset("Select * from nodes order by [City]")

    Rs.MoveLast
    Nodes = Rs.RecordCount

    Rs.MoveFirst
    For i = 1 To Nodes
            city(i) = Rs!city
            If city(i) <> city(i - 1) Then
            cbochsrc.AddItem Rs!city
            cbochdest.AddItem Rs!city
            End If
            Rs.MoveNext
    Next i

    Label2.Enabled = False
    Label3.Enabled = False
    cbochdest.Enabled = False
    cbochmode.Enabled = False
    txtchgdist.Enabled = False
    cmdmakechg.Enabled = False

    cbochsrc.Text = ""
    cbochdest.Text = ""
    cbochmode.Text = ""
    txtwhat.Caption = ""
    txtchgdist.Text = ""

End Sub


Public Sub Nodenn()

    Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
    Set Rs = Db.OpenRecordset("Select * from input order by [NS]")
    Rs.MoveFirst

    srccity = cbochsrc.Text
    DestCity = cbochdest.Text
    mode = cbochmode.Text

    Rs.Edit
    Rs.Fields("NS").Value = srccity
    Rs.Update

    Rs.Edit
```

```
        Rs.Fields("NF").Value = DestCity
        Rs.Update

        Rs.Edit
        Rs.Fields("Mode").Value = mode
        Rs.Update

End Sub
```

```
Public Sub Update()

        'On Error GoTo Update_Err

        DoCmd.RunMacro "Macro1", , ""

        Update_Exit:
          Exit Sub

        Update_Err:
          MsgBox Error$
          Resume Update_Exit

End Sub
```

Frmstart – Form displayed on program startup

```
Private Sub cmddata_Click()
        frmdbchg.Show 1
End Sub


Private Sub cmdrun_Click()
        frminput.Show 0
End Sub


Private Sub Command1_Click()
        End
End Sub
```

Frmxfer – Form that allows the user to update transfer costs in the database

```
Dim Db As Database, Rs As Recordset
```

```
Dim word As String

Private Sub cbocity_Click()
   If cbocity.Text <> "" Then

      Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
      Set Rs = Db.OpenRecordset("Select * from nodes order by [City]")

      Rs.MoveLast
      Nodes = Rs.RecordCount

      cbomodefrom.Clear
      cbomodeto.Clear

      Rs.MoveFirst
      For i = 1 To Nodes
         If Rs!city = cbocity.Text Then
            If Rs!mode <> "start" And Rs!mode <> "end" Then
               cbomodefrom.AddItem Rs!mode
               cbomodeto.AddItem Rs!mode
            End If
         End If
         Rs.MoveNext
      Next i

      Label2.Enabled = True
      cbomodefrom.Enabled = True
      cbomodefrom.Text = ""
      Label3.Enabled = False
      cbomodeto.Enabled = False
      cbomodeto.Text = ""
      Label4.Enabled = False
      Frame1.Enabled = False
      optcost.Enabled = False
      optcost.Value = False
      opttime.Enabled = False
      opttime.Value = False
      Command2.Enabled = False
      txtchg.Enabled = False
      txtchg.Text = ""
      Text1.Caption = ""

   End If
End Sub

Private Sub cbomodefrom_Click()

   If cbomodefrom.Text <> "" Then
      Label3.Enabled = True
```

```
        cbomodeto.Enabled = True
        cbomodeto.Text = ""
        Label4.Enabled = False
        Frame1.Enabled = False
        optcost.Enabled = False
        optcost.Value = False
        opttime.Enabled = False
        opttime.Value = False
        Command2.Enabled = False
        txtchg.Enabled = False
        txtchg.Text = ""
        Text1.Caption = ""

    End If

End Sub


Private Sub cbomodeto_Click()

    If cbomodeto.Text <> "" Then
        Label4.Enabled = True
        Frame1.Enabled = True
        optcost.Enabled = True
        opttime.Enabled = True
        optcost.Value = False
        opttime.Value = False
        Command2.Enabled = False
        txtchg.Enabled = False
        txtchg.Text = ""
        Text1.Caption = ""

    End If

End Sub


Private Sub Command1_Click()

        Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
        Set Rs = Db.OpenRecordset("Select * from xfer order by [Destnode]")

        Call Nodenn

        Set Rs2 = Db.OpenRecordset("getxfer")

        If optcost.Value = True Then
                txtchg.Text = Rs2!cost
        Else
```

```
        txtchg.Text = Rs2!settime
    End If

    Text1.Caption = "Type the revised " & "transfer " & obj & " below:"

End Sub


Private Sub Command2_Click()

    Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
    Set Rs = Db.OpenRecordset("NodeNS")

    If txtchg.Text = "" Then
        MsgBox "Enter the New Value", 16, "Error"
    End If

    DN = Rs!NodeNumber
    mf = cbomodefrom.Text

    Set Rs3 = Db.OpenRecordset("Select * from xfer order by [Destnode]")

    Criteria = "Destnode = " & DN & "AND modefrom = '" & mf & "'"

    Rs3.FindFirst Criteria
    If optcost.Value = True Then
        Rs3.Edit
        Rs3.Fields("cost").Value = txtchg.Text
        Rs3.Update
    Else
        Rs3.Edit
        Rs3.Fields("settime").Value = txtchg.Text
        Rs3.Update
    End If

End Sub


Private Sub Command3_Click()

    frmxfer.Hide
    frmdbchg.Hide
    'frmstart.Show 0

End Sub


Private Sub Form_Load()
```

```
        Dim city(1000)
        Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
        Set Rs = Db.OpenRecordset("Select * from nodes order by [City]")

        Rs.MoveLast
        Nodes = Rs.RecordCount

        Rs.MoveFirst
        For i = 1 To Nodes
                city(i) = Rs!city
                If city(i) <> city(i - 1) Then
                cbocity.AddItem Rs!city
                End If
                Rs.MoveNext
        Next i

        cbomodefrom.Enabled = False
        cbomodeto.Enabled = False
        Label2.Enabled = False
        Label3.Enabled = False
        Label4.Enabled = False
        Frame1.Enabled = False
        optcost.Enabled = False
        opttime.Enabled = False
        txtchg.Enabled = False
        Command2.Enabled = False

        cbocity.Text = ""
        cbomodefrom.Text = ""
        cbomodeto.Text = ""
        optcost.Value = False
        opttime.Value = False
        txtchg.Text = ""
        Text1.Caption = ""

End Sub


Public Sub Nodenn()

        Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
        Set Rs = Db.OpenRecordset("Select * from input order by [NS]")
        Rs.MoveFirst

        srccity = cbocity.Text
        frommode = cbomodefrom.Text
        tomode = cbomodeto.Text
        If optcost.Value = True Then
                obj = "cost"
```

```
        ElseIf opttime.Value = True Then
                obj = "time"
        Else
                MsgBox "Please pick the type of data which you would like to change", 16,
        "error"
        End If

        Rs.Edit
        Rs.Fields("NS").Value = srccity
        Rs.Update

        Rs.Edit
        Rs.Fields("ModeFrom").Value = frommode
        Rs.Update

        Rs.Edit
        Rs.Fields("Mode").Value = tomode
        Rs.Update

        Rs.Edit
        Rs.Fields("Objective").Value = obj
        Rs.Update

End Sub


Private Sub optcost_Click()

   Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
   Set Rs = Db.OpenRecordset("Select * from xfer order by [Destnode]")

   Call Nodenn

   Set Rs2 = Db.OpenRecordset("getxfer")

   txtchg.Text = Rs2!cost

   Text1.Caption = "Type the revised transfer cost below:"

   txtchg.Enabled = True
   Command2.Enabled = True

End Sub


Private Sub opttime_Click()

   Set Db = DBEngine.Workspaces(0).OpenDatabase("C:\My Documents\routes.mdb")
   Set Rs = Db.OpenRecordset("Select * from xfer order by [Destnode]")
```

```
    Call Nodenn

    Set Rs2 = Db.OpenRecordset("getxfer")

    txtchg.Text = Rs2!settime

    Text1.Caption = "Type the revised transfer time below:"

End Sub
```

Appendix F

Average Dray Length and Cost Calculations For Barge

Computation of Average Dray Cost

City	Terminal	Term. Lat.	Term. Lon.	Zip Code	Zip Lat.	Zip Lon.	Dist (mi)
Brownsville	Allison	25.9706	-97.3442	78520	25.9317	-97.515	14.14177852
Brownsville	Allison	25.9706	-97.3442	78521	25.9217	-97.46	10.1478766
Brownsville	Allison	25.9706	-97.3442	78523	26.0017	-97.5733	18.66487726
Brownsville	American Scrap	25.9642	-97.3683	78520	25.9317	-97.515	12.13024061
Brownsville	American Scrap	25.9642	-97.3683	78521	25.9217	-97.46	8.159379143
Brownsville	American Scrap	25.9642	-97.3683	78523	26.0017	-97.5733	16.82426565
Brownsville	Navigator Dock 3	25.9497	-97.4011	78520	25.9317	-97.515	9.309261207
Brownsville	Navigator Dock 3	25.9497	-97.4011	78521	25.9217	-97.46	5.264939265
Brownsville	Navigator Dock 3	25.9497	-97.4011	78523	26.0017	-97.5733	14.52171814
Brownsville	Navigator Dock 9	25.95	-97.3994	78520	25.9317	-97.515	9.448600711
Brownsville	Navigator Dock 9	25.95	-97.3994	78521	25.9217	-97.46	5.399412875
Brownsville	Navigator Dock 9	25.95	-97.3994	78523	26.0017	-97.5733	14.6462332
Brownsville	Navigator Dock 10,11	25.9508	-97.3981	78520	25.9317	-97.515	9.562474464
Brownsville	Navigator Dock 10,11	25.9508	-97.3981	78521	25.9217	-97.46	5.521849381
Brownsville	Navigator Dock 10,11	25.9508	-97.3981	78523	26.0017	-97.5733	14.72871228
Brownsville	Navigator Dock 12, 13	25.9522	-97.3944	78520	25.9317	-97.515	9.875694664
Brownsville	Navigator Dock 12, 13	25.9522	-97.3944	78521	25.9217	-97.46	5.840306382
Brownsville	Navigator Dock 12, 13	25.9522	-97.3944	78523	26.0017	-97.5733	14.98524952
Brownsville	Navigator Dock 1,2,4	25.9519	-97.4022	78520	25.9317	-97.515	9.251207141
Brownsville	Navigator Dock 1,2,4	25.9519	-97.4022	78521	25.9217	-97.46	5.264735012
Brownsville	Navigator Dock 1,2,4	25.9519	-97.4022	78523	26.0017	-97.5733	14.38608827
Brownsville	Navigator Dock 5, 6	25.95	-97.3944	78520	25.9317	-97.515	9.847488286
Brownsville	Navigator Dock 5, 6	25.95	-97.3944	78521	25.9217	-97.46	5.767676868
Brownsville	Navigator Dock 5, 6	25.95	-97.3944	78523	26.0017	-97.5733	15.03358647
Brownsville	Navigator Dock 7,8	25.9539	-97.3969	78520	25.9317	-97.515	9.701196827
Brownsville	Navigator Dock 7,8	25.9539	-97.3969	78521	25.9217	-97.46	5.718995479
Brownsville	Navigator Dock 7,8	25.9539	-97.3969	78523	26.0017	-97.5733	14.75434343
Brownsville	Express	25.9539	-97.3889	78520	25.9317	-97.515	10.3366088
Brownsville	Express	25.9539	-97.3889	78521	25.9217	-97.46	6.301104498
Brownsville	Express	25.9539	-97.3889	78523	26.0017	-97.5733	15.37863062
Brownsville	Hopper Dock 2	25.9544	-97.3883	78520	25.9317	-97.515	10.39135913
Brownsville	Hopper Dock 2	25.9544	-97.3883	78521	25.9217	-97.46	6.361903051
Brownsville	Hopper Dock 2	25.9544	-97.3883	78523	26.0017	-97.5733	15.41547541
Brownsville	Liquid Cargo Dock	25.9594	-97.3733	78520	25.9317	-97.515	11.65596391
Brownsville	Liquid Cargo Dock	25.9594	-97.3733	78521	25.9217	-97.46	7.632371491
Brownsville	Liquid Cargo Dock	25.9594	-97.3733	78523	26.0017	-97.5733	16.50317286
Brownsville	Oil Dock 1	25.9553	-97.3919	78520	25.9317	-97.515	10.11884454
Brownsville	Oil Dock 1	25.9553	-97.3919	78521	25.9217	-97.46	6.130469507
Brownsville	Oil Dock 1	25.9553	-97.3919	78523	26.0017	-97.5733	15.11590728
Brownsville	Oil Dock 2	25.9561	-97.39	78520	25.9317	-97.515	10.28170637
Brownsville	Oil Dock 2	25.9561	-97.39	78521	25.9217	-97.46	6.296608791
Brownsville	Oil Dock 2	25.9561	-97.39	78523	26.0017	-97.5733	15.24883709
Brownsville	Oil Dock 3	25.9597	-97.3792	78520	25.9317	-97.515	11.19374361
Brownsville	Oil Dock 3	25.9597	-97.3792	78521	25.9217	-97.46	7.208352722
Brownsville	Oil Dock 3	25.9597	-97.3792	78523	26.0017	-97.5733	16.03233776
Brownsville	Small Craft Pier	25.9513	-97.4031	78520	25.9317	-97.515	9.171215809
Brownsville	Small Craft Pier	25.9513	-97.4031	78521	25.9217	-97.46	5.177915465
Brownsville	Small Craft Pier	25.9513	-97.4031	78523	26.0017	-97.5733	14.33001844
Brownsville	Gateway Tugs	25.9547	-97.3942	78520	25.9317	-97.515	9.92737437
Brownsville	Gateway Tugs	25.9547	-97.3942	78521	25.9217	-97.46	5.942649304
Brownsville	Gateway Tugs	25.9547	-97.3942	78523	26.0017	-97.5733	14.9483122
Brownsville	Goldwils Slip	25.9631	-97.3606	78520	25.9317	-97.515	12.71986143
Brownsville	Goldwils Slip	25.9631	-97.3606	78521	25.9217	-97.46	8.692758089
Brownsville	Goldwils Slip	25.9631	-97.3606	78523	26.0017	-97.5733	17.45173668
Brownsville	Marathon	25.9681	-97.3603	78520	25.9317	-97.515	12.82998842
Brownsville	Marathon	25.9681	-97.3603	78521	25.9217	-97.46	8.8777493
Brownsville	Marathon	25.9681	-97.3603	78523	26.0017	-97.5733	17.40812122
Brownsville	Texas Parks	25.9656	-97.3756	78520	25.9317	-97.515	11.58175044
Brownsville	Texas Parks	25.9656	-97.3756	78521	25.9217	-97.46	7.680206874
Brownsville	Texas Parks	25.9656	-97.3756	78523	26.0017	-97.5733	16.22421954
Brownsville	Border	25.9747	-97.3403	78520	25.9317	-97.515	14.52446678
Brownsville	Border	25.9747	-97.3403	78521	25.9217	-97.46	10.56826005
Brownsville	Border	25.9747	-97.3403	78523	26.0017	-97.5733	18.93596107
Brownsville	Fish Harbor	25.9781	-97.3419	78520	25.9317	-97.515	14.46770121
Brownsville	Fish Harbor	25.9781	-97.3419	78521	25.9217	-97.46	10.56563263
Brownsville	Fish Harbor	25.9781	-97.3419	78523	26.0017	-97.5733	18.77782577
Brownsville	Marine	25.9753	-97.3386	78520	25.9317	-97.515	14.6693141
Brownsville	Marine	25.9753	-97.3386	78521	25.9217	-97.46	10.71336681
Brownsville	Marine	25.9753	-97.3386	78523	26.0017	-97.5733	19.06682124

Brownsville	Apache	25.9744	-97.3442	78520	25.9317	-97.515	14.21305014
Brownsville	Apache	25.9744	-97.3442	78521	25.9217	-97.46	10.27110566
Brownsville	Apache	25.9744	-97.3442	78523	26.0017	-97.5733	18.62609236
Brownsville	Roca	25.9733	-97.3437	78520	25.9317	-97.515	14.23099546
Brownsville	Roca	25.9733	-97.3437	78521	25.9217	-97.46	10.27152444
Brownsville	Roca	25.9733	-97.3437	78523	26.0017	-97.5733	18.67686762
Chicago	Marsulex	41.6628	-87.5675	60601	41.885	-87.6183	18.40103596
Chicago	Marsulex	41.6628	-87.5675	60602	41.8833	-87.6317	18.54013093
Chicago	Marsulex	41.6628	-87.5675	60607	41.8717	-87.6567	18.33759337
Chicago	Marsulex	41.6628	-87.5675	60608	41.8517	-87.67	17.35027629
Chicago	Marsulex	41.6628	-87.5675	60609	41.8083	-87.6533	13.63641542
Chicago	Marsulex	41.6628	-87.5675	60610	41.9033	-87.6333	20.12912987
Chicago	Marsulex	41.6628	-87.5675	60612	41.88	-87.6883	20.06404114
Chicago	Marsulex	41.6628	-87.5675	60613	41.9533	-87.6583	24.57096694
Chicago	Marsulex	41.6628	-87.5675	60615	41.8017	-87.6	11.5162583
Chicago	Marsulex	41.6628	-87.5675	60616	41.8433	-87.63	15.4205923
Chicago	Marsulex	41.6628	-87.5675	60618	41.945	-87.705	25.34241746
Chicago	Marsulex	41.6628	-87.5675	60619	41.7467	-87.605	7.419021116
Chicago	Marsulex	41.6628	-87.5675	60620	41.74	-87.6533	9.317752942
Chicago	Marsulex	41.6628	-87.5675	60621	41.775	-87.6417	10.8594544
Chicago	Marsulex	41.6628	-87.5675	60622	41.9017	-87.6783	21.25972857
Chicago	Marsulex	41.6628	-87.5675	60623	41.8483	-87.715	19.1325842
Chicago	Marsulex	41.6628	-87.5675	60624	41.88	-87.7217	21.50412634
Chicago	Marsulex	41.6628	-87.5675	60625	41.97	-87.7033	27.11536474
Chicago	Marsulex	41.6628	-87.5675	60627	41.6467	-87.6183	4.302121318
Chicago	Marsulex	41.6628	-87.5675	60628	41.6933	-87.625	5.254586647
Chicago	Marsulex	41.6628	-87.5675	60629	41.7783	-87.7067	14.60228967
Chicago	Marsulex	41.6628	-87.5675	60630	41.97	-87.76	29.26705682
Chicago	Marsulex	41.6628	-87.5675	60632	41.8083	-87.705	16.16143224
Chicago	Marsulex	41.6628	-87.5675	60633	41.6517	-87.5483	1.790405034
Chicago	Marsulex	41.6628	-87.5675	60635	41.9233	-87.8083	28.63866341
Chicago	Marsulex	41.6628	-87.5675	60636	41.7767	-87.6667	12.19366455
Chicago	Marsulex	41.6628	-87.5675	60638	41.79	-87.7733	19.53156868
Chicago	Marsulex	41.6628	-87.5675	60639	41.92	-87.7533	25.61488988
Chicago	Marsulex	41.6628	-87.5675	60640	41.9733	-87.6617	26.19484988
Chicago	Marsulex	41.6628	-87.5675	60641	41.945	-87.7467	26.98719257
Chicago	Marsulex	41.6628	-87.5675	60644	41.8833	-87.7583	23.54008311
Chicago	Marsulex	41.6628	-87.5675	60647	41.9217	-87.705	23.66579812
Chicago	Marsulex	41.6628	-87.5675	60648	41.8564	-87.681	18.117224
Chicago	Marsulex	41.6628	-87.5675	60650	41.8483	-87.76	21.58172773
Chicago	Marsulex	41.6628	-87.5675	60651	41.9017	-87.7383	23.70849881
Chicago	Marsulex	41.6628	-87.5675	60658	41.6717	-87.7283	13.00125257
Chicago	Marsulex	41.6628	-87.5675	60659	41.9917	-87.7017	28.67731986
Chicago	Marsulex	41.6628	-87.5675	60680	41.8833	-87.6417	18.78181151
Chicago	S.E.E.	41.6633	-87.5664	60601	41.885	-87.6183	18.3817264
Chicago	S.E.E.	41.6633	-87.5664	60602	41.8833	-87.6317	18.52645153
Chicago	S.E.E.	41.6633	-87.5664	60607	41.8717	-87.6567	18.33560298
Chicago	S.E.E.	41.6633	-87.5664	60608	41.8517	-87.67	17.35742311
Chicago	S.E.E.	41.6633	-87.5664	60609	41.8083	-87.6533	13.64709788
Chicago	S.E.E.	41.6633	-87.5664	60610	41.9033	-87.6333	20.11386127
Chicago	S.E.E.	41.6633	-87.5664	60612	41.88	-87.6883	20.07216341
Chicago	S.E.E.	41.6633	-87.5664	60613	41.9533	-87.6583	24.55912353
Chicago	S.E.E.	41.6633	-87.5664	60615	41.8017	-87.6	11.49758463
Chicago	S.E.E.	41.6633	-87.5664	60616	41.8433	-87.63	15.4118116
Chicago	S.E.E.	41.6633	-87.5664	60618	41.945	-87.705	25.34521532
Chicago	S.E.E.	41.6633	-87.5664	60619	41.7467	-87.605	7.419047469
Chicago	S.E.E.	41.6633	-87.5664	60620	41.74	-87.6533	9.357195565
Chicago	S.E.E.	41.6633	-87.5664	60621	41.775	-87.6417	10.875197
Chicago	S.E.E.	41.6633	-87.5664	60622	41.9017	-87.6783	21.26069727
Chicago	S.E.E.	41.6633	-87.5664	60623	41.8483	-87.715	19.15649245
Chicago	S.E.E.	41.6633	-87.5664	60624	41.88	-87.7217	21.522833
Chicago	S.E.E.	41.6633	-87.5664	60625	41.97	-87.7033	27.11452588
Chicago	S.E.E.	41.6633	-87.5664	60627	41.6467	-87.6183	4.398985034
Chicago	S.E.E.	41.6633	-87.5664	60628	41.6933	-87.625	5.314683443
Chicago	S.E.E.	41.6633	-87.5664	60629	41.7783	-87.7067	14.64511847
Chicago	S.E.E.	41.6633	-87.5664	60630	41.97	-87.76	29.28016557
Chicago	S.E.E.	41.6633	-87.5664	60632	41.8083	-87.705	16.19335137
Chicago	S.E.E.	41.6633	-87.5664	60633	41.6517	-87.5483	1.735544798
Chicago	S.E.E.	41.6633	-87.5664	60635	41.9233	-87.8083	28.66945089
Chicago	S.E.E.	41.6633	-87.5664	60636	41.7767	-87.6667	12.22190611

Computation of Average Dray Cost

Chicago	S.E.E.	41.6633	-87.5664	60638	41.79	-87.7733	19.58605303
Chicago	S.E.E.	41.6633	-87.5664	60639	41.92	-87.7533	25.63434933
Chicago	S.E.E.	41.6633	-87.5664	60640	41.9733	-87.6617	26.18218279
Chicago	S.E.E.	41.6633	-87.5664	60641	41.945	-87.7467	27.00089406
Chicago	S.E.E.	41.6633	-87.5664	60644	41.8833	-87.7583	23.56785251
Chicago	S.E.E.	41.6633	-87.5664	60647	41.9217	-87.705	23.67200185
Chicago	S.E.E.	41.6633	-87.5664	60648	41.8564	-87.681	18.12757411
Chicago	S.E.E.	41.6633	-87.5664	60650	41.8483	-87.76	21.61785402
Chicago	S.E.E.	41.6633	-87.5664	60651	41.9017	-87.7383	23.72750289
Chicago	S.E.E.	41.6633	-87.5664	60658	41.6717	-87.7283	13.08776724
Chicago	S.E.E.	41.6633	-87.5664	60659	41.9917	-87.7017	28.67366067
Chicago	S.E.E.	41.6633	-87.5664	60680	41.8833	-87.6417	18.77212765
Chicago	Marathon	41.665	-87.5625	60601	41.885	-87.6183	18.32297849
Chicago	Marathon	41.665	-87.5625	60602	41.8833	-87.6317	18.48761595
Chicago	Marathon	41.665	-87.5625	60607	41.8717	-87.6567	18.33806961
Chicago	Marathon	41.665	-87.5625	60608	41.8517	-87.67	17.39223632
Chicago	Marathon	41.665	-87.5625	60609	41.8083	-87.6533	13.69546559
Chicago	Marathon	41.665	-87.5625	60610	41.9033	-87.6333	20.06908344
Chicago	Marathon	41.665	-87.5625	60612	41.88	-87.6883	20.10981545
Chicago	Marathon	41.665	-87.5625	60613	41.9533	-87.6583	24.52578596
Chicago	Marathon	41.665	-87.5625	60615	41.8017	-87.6	11.44349957
Chicago	Marathon	41.665	-87.5625	60616	41.8433	-87.63	15.39111469
Chicago	Marathon	41.665	-87.5625	60618	41.945	-87.705	25.36338878
Chicago	Marathon	41.665	-87.5625	60619	41.7467	-87.605	7.434676372
Chicago	Marathon	41.665	-87.5625	60620	41.74	-87.6533	9.507526549
Chicago	Marathon	41.665	-87.5625	60621	41.775	-87.6417	10.94260532
Chicago	Marathon	41.665	-87.5625	60622	41.9017	-87.6783	21.27301063
Chicago	Marathon	41.665	-87.5625	60623	41.8483	-87.715	19.24951621
Chicago	Marathon	41.665	-87.5625	60624	41.88	-87.7217	21.59729542
Chicago	Marathon	41.665	-87.5625	60625	41.97	-87.7033	27.11971002
Chicago	Marathon	41.665	-87.5625	60627	41.6467	-87.6183	4.740803521
Chicago	Marathon	41.665	-87.5625	60628	41.6933	-87.625	5.538772282
Chicago	Marathon	41.665	-87.5625	60629	41.7783	-87.7067	14.80477489
Chicago	Marathon	41.665	-87.5625	60630	41.97	-87.76	29.33413727
Chicago	Marathon	41.665	-87.5625	60632	41.8083	-87.705	16.31487988
Chicago	Marathon	41.665	-87.5625	60633	41.6517	-87.5483	1.570670565
Chicago	Marathon	41.665	-87.5625	60635	41.9233	-87.8083	28.7852582
Chicago	Marathon	41.665	-87.5625	60636	41.7767	-87.6667	12.33202741
Chicago	Marathon	41.665	-87.5625	60638	41.79	-87.7733	19.78488571
Chicago	Marathon	41.665	-87.5625	60639	41.92	-87.7533	25.71090683
Chicago	Marathon	41.665	-87.5625	60640	41.9733	-87.6617	26.14574506
Chicago	Marathon	41.665	-87.5625	60641	41.945	-87.7467	27.0571554
Chicago	Marathon	41.665	-87.5625	60644	41.8833	-87.7583	23.67365508
Chicago	Marathon	41.665	-87.5625	60647	41.9217	-87.705	23.70235275
Chicago	Marathon	41.665	-87.5625	60648	41.8564	-87.681	18.17343475
Chicago	Marathon	41.665	-87.5625	60650	41.8483	-87.76	21.75297377
Chicago	Marathon	41.665	-87.5625	60651	41.9017	-87.7383	23.80269392
Chicago	Marathon	41.665	-87.5625	60658	41.6717	-87.7283	13.39595828
Chicago	Marathon	41.665	-87.5625	60659	41.9917	-87.7017	28.66875981
Chicago	Marathon	41.665	-87.5625	60680	41.8833	-87.6417	18.74736423
Chicago	Arrow	41.6711	-87.5533	60601	41.885	-87.6183	18.04784287
Chicago	Arrow	41.6711	-87.5533	60602	41.8833	-87.6317	18.26272483
Chicago	Arrow	41.6711	-87.5533	60607	41.8717	-87.6567	18.21922825
Chicago	Arrow	41.6711	-87.5533	60608	41.8517	-87.67	17.35887427
Chicago	Arrow	41.6711	-87.5533	60609	41.8083	-87.6533	13.70600455
Chicago	Arrow	41.6711	-87.5533	60610	41.9033	-87.6333	19.82687383
Chicago	Arrow	41.6711	-87.5533	60612	41.88	-87.6883	20.07958294
Chicago	Arrow	41.6711	-87.5533	60613	41.9533	-87.6583	24.30788746
Chicago	Arrow	41.6711	-87.5533	60615	41.8017	-87.6	11.19712295
Chicago	Arrow	41.6711	-87.5533	60616	41.8433	-87.63	15.21835018
Chicago	Arrow	41.6711	-87.5533	60618	41.945	-87.705	25.27688401
Chicago	Arrow	41.6711	-87.5533	60619	41.7467	-87.605	7.393849992
Chicago	Arrow	41.6711	-87.5533	60620	41.74	-87.6533	9.803697104
Chicago	Arrow	41.6711	-87.5533	60621	41.775	-87.6417	11.01299534
Chicago	Arrow	41.6711	-87.5533	60622	41.9017	-87.6783	21.17548977
Chicago	Arrow	41.6711	-87.5533	60623	41.8483	-87.715	19.36623858
Chicago	Arrow	41.6711	-87.5533	60624	41.88	-87.7217	21.66179667
Chicago	Arrow	41.6711	-87.5533	60625	41.97	-87.7033	26.99826656
Chicago	Arrow	41.6711	-87.5533	60627	41.6467	-87.6183	5.60498803
Chicago	Arrow	41.6711	-87.5533	60628	41.6933	-87.625	6.059446664

Chicago	Arrow	41.6711	-87.5533	60629	41.7783	-87.7067	15.10824798
Chicago	Arrow	41.6711	-87.5533	60630	41.97	-87.76	29.33800843
Chicago	Arrow	41.6711	-87.5533	60632	41.8083	-87.705	16.51253757
Chicago	Arrow	41.6711	-87.5533	60633	41.6517	-87.5483	1.617342491
Chicago	Arrow	41.6711	-87.5533	60635	41.9233	-87.8083	28.95381647
Chicago	Arrow	41.6711	-87.5533	60636	41.7767	-87.6667	12.50948276
Chicago	Arrow	41.6711	-87.5533	60638	41.79	-87.7733	20.18850703
Chicago	Arrow	41.6711	-87.5533	60639	41.92	-87.7533	25.77692719
Chicago	Arrow	41.6711	-87.5533	60640	41.9733	-87.6617	25.91865536
Chicago	Arrow	41.6711	-87.5533	60641	41.945	-87.7467	27.06861009
Chicago	Arrow	41.6711	-87.5533	60644	41.8833	-87.7583	23.81929586
Chicago	Arrow	41.6711	-87.5533	60647	41.9217	-87.705	23.64896441
Chicago	Arrow	41.6711	-87.5533	60648	41.8564	-87.681	18.16754707
Chicago	Arrow	41.6711	-87.5533	60650	41.8483	-87.76	21.97943451
Chicago	Arrow	41.6711	-87.5533	60651	41.9017	-87.7383	23.86679197
Chicago	Arrow	41.6711	-87.5533	60658	41.6717	-87.7283	14.12783304
Chicago	Arrow	41.6711	-87.5533	60659	41.9917	-87.7017	28.52031286
Chicago	Arrow	41.6711	-87.5533	60680	41.8833	-87.6417	18.55796404
Chicago	PVS Chemicals	41.6733	-87.5519	60601	41.885	-87.6183	17.91148379
Chicago	PVS Chemicals	41.6733	-87.5519	60602	41.8833	-87.6317	18.13606952
Chicago	PVS Chemicals	41.6733	-87.5519	60607	41.8717	-87.6567	18.11405629
Chicago	PVS Chemicals	41.6733	-87.5519	60608	41.8517	-87.67	17.2721019
Chicago	PVS Chemicals	41.6733	-87.5519	60609	41.8083	-87.6533	13.63045664
Chicago	PVS Chemicals	41.6733	-87.5519	60610	41.9033	-87.6333	19.69645901
Chicago	PVS Chemicals	41.6733	-87.5519	60612	41.88	-87.6883	19.99267489
Chicago	PVS Chemicals	41.6733	-87.5519	60613	41.9533	-87.6583	24.18142602
Chicago	PVS Chemicals	41.6733	-87.5519	60615	41.8017	-87.6	11.06918996
Chicago	PVS Chemicals	41.6733	-87.5519	60616	41.8433	-87.63	15.1031159
Chicago	PVS Chemicals	41.6733	-87.5519	60618	41.945	-87.705	25.17695487
Chicago	PVS Chemicals	41.6733	-87.5519	60619	41.7467	-87.605	7.3136078
Chicago	PVS Chemicals	41.6733	-87.5519	60620	41.74	-87.6533	9.798257669
Chicago	PVS Chemicals	41.6733	-87.5519	60621	41.775	-87.6417	10.95281199
Chicago	PVS Chemicals	41.6733	-87.5519	60622	41.9017	-87.6783	21.07401255
Chicago	PVS Chemicals	41.6733	-87.5519	60623	41.8483	-87.715	19.31229836
Chicago	PVS Chemicals	41.6733	-87.5519	60624	41.88	-87.7217	21.59537761
Chicago	PVS Chemicals	41.6733	-87.5519	60625	41.97	-87.7033	26.89082854
Chicago	PVS Chemicals	41.6733	-87.5519	60627	41.6467	-87.6183	5.774605106
Chicago	PVS Chemicals	41.6733	-87.5519	60628	41.6933	-87.625	6.118252889
Chicago	PVS Chemicals	41.6733	-87.5519	60629	41.7783	-87.7067	15.10061933
Chicago	PVS Chemicals	41.6733	-87.5519	60630	41.97	-87.76	29.25685719
Chicago	PVS Chemicals	41.6733	-87.5519	60632	41.8083	-87.705	16.47853554
Chicago	PVS Chemicals	41.6733	-87.5519	60633	41.6517	-87.5483	1.767821109
Chicago	PVS Chemicals	41.6733	-87.5519	60635	41.9233	-87.8083	28.91001605
Chicago	PVS Chemicals	41.6733	-87.5519	60636	41.7767	-87.6667	12.47287644
Chicago	PVS Chemicals	41.6733	-87.5519	60638	41.79	-87.7733	20.20458372
Chicago	PVS Chemicals	41.6733	-87.5519	60639	41.92	-87.7533	25.71004623
Chicago	PVS Chemicals	41.6733	-87.5519	60640	41.9733	-87.6617	25.79017617
Chicago	PVS Chemicals	41.6733	-87.5519	60641	41.945	-87.7467	26.98942029
Chicago	PVS Chemicals	41.6733	-87.5519	60644	41.8833	-87.7583	23.77097009
Chicago	PVS Chemicals	41.6733	-87.5519	60647	41.9217	-87.705	23.55631265
Chicago	PVS Chemicals	41.6733	-87.5519	60648	41.8564	-87.681	18.08647866
Chicago	PVS Chemicals	41.6733	-87.5519	60650	41.8483	-87.76	21.95063545
Chicago	PVS Chemicals	41.6733	-87.5519	60651	41.9017	-87.7383	23.79981741
Chicago	PVS Chemicals	41.6733	-87.5519	60658	41.6717	-87.7283	14.24135778
Chicago	PVS Chemicals	41.6733	-87.5519	60659	41.9917	-87.7017	28.40716521
Chicago	PVS Chemicals	41.6733	-87.5519	60680	41.8833	-87.6417	18.43828664
Chicago	LTV Steel	41.6825	-87.5513	60601	41.885	-87.6183	17.21939864
Chicago	LTV Steel	41.6825	-87.5513	60602	41.8833	-87.6317	17.46173291
Chicago	LTV Steel	41.6825	-87.5513	60607	41.8717	-87.6567	17.48429906
Chicago	LTV Steel	41.6825	-87.5513	60608	41.8517	-87.67	16.68560989
Chicago	LTV Steel	41.6825	-87.5513	60609	41.8083	-87.6533	13.07468148
Chicago	LTV Steel	41.6825	-87.5513	60610	41.9033	-87.6333	19.01472406
Chicago	LTV Steel	41.6825	-87.5513	60612	41.88	-87.6883	19.40465247
Chicago	LTV Steel	41.6825	-87.5513	60613	41.9533	-87.6583	23.50638576
Chicago	LTV Steel	41.6825	-87.5513	60615	41.8017	-87.6	10.3951686
Chicago	LTV Steel	41.6825	-87.5513	60616	41.8433	-87.63	14.45277379
Chicago	LTV Steel	41.6825	-87.5513	60618	41.945	-87.705	24.55704425
Chicago	LTV Steel	41.6825	-87.5513	60619	41.7467	-87.605	6.756927385
Chicago	LTV Steel	41.6825	-87.5513	60620	41.74	-87.6533	9.452738407
Chicago	LTV Steel	41.6825	-87.5513	60621	41.775	-87.6417	10.44148538

Chicago	LTV Steel	41.6825	-87.5513	60622	41.9017	-87.6783	20.45157805
Chicago	LTV Steel	41.6825	-87.5513	60623	41.8483	-87.715	18.80980069
Chicago	LTV Steel	41.6825	-87.5513	60624	41.88	-87.7217	21.05837214
Chicago	LTV Steel	41.6825	-87.5513	60625	41.97	-87.7033	26.25404268
Chicago	LTV Steel	41.6825	-87.5513	60627	41.6467	-87.6183	6.132632545
Chicago	LTV Steel	41.6825	-87.5513	60628	41.6933	-87.625	6.013344631
Chicago	LTV Steel	41.6825	-87.5513	60629	41.7783	-87.7067	14.73776951
Chicago	LTV Steel	41.6825	-87.5513	60630	41.97	-87.76	28.68039799
Chicago	LTV Steel	41.6825	-87.5513	60632	41.8083	-87.705	16.03447587
Chicago	LTV Steel	41.6825	-87.5513	60633	41.6517	-87.5483	2.498251124
Chicago	LTV Steel	41.6825	-87.5513	60635	41.9233	-87.8083	28.43182236
Chicago	LTV Steel	41.6825	-87.5513	60636	41.7767	-87.6667	12.02600644
Chicago	LTV Steel	41.6825	-87.5513	60638	41.79	-87.7733	19.9127136
Chicago	LTV Steel	41.6825	-87.5513	60639	41.92	-87.7533	25.17045015
Chicago	LTV Steel	41.6825	-87.5513	60640	41.9733	-87.6617	25.11115701
Chicago	LTV Steel	41.6825	-87.5513	60641	41.945	-87.7467	26.41825695
Chicago	LTV Steel	41.6825	-87.5513	60644	41.8833	-87.7583	23.28184338
Chicago	LTV Steel	41.6825	-87.5513	60647	41.9217	-87.705	22.95350392
Chicago	LTV Steel	41.6825	-87.5513	60648	41.8564	-87.681	17.51362879
Chicago	LTV Steel	41.6825	-87.5513	60650	41.8483	-87.76	21.51804049
Chicago	LTV Steel	41.6825	-87.5513	60651	41.9017	-87.7383	23.26055882
Chicago	LTV Steel	41.6825	-87.5513	60658	41.6717	-87.7283	14.31578514
Chicago	LTV Steel	41.6825	-87.5513	60659	41.9917	-87.7017	27.75806871
Chicago	LTV Steel	41.6825	-87.5513	60680	41.8833	-87.6417	17.77761854
Chicago	Acme Steel	41.6695	-87.5522	60601	41.885	-87.6183	18.19731203
Chicago	Acme Steel	41.6695	-87.5522	60602	41.8833	-87.6317	18.41470412
Chicago	Acme Steel	41.6695	-87.5522	60607	41.8717	-87.6567	18.37473857
Chicago	Acme Steel	41.6695	-87.5522	60608	41.8517	-87.67	17.51556004
Chicago	Acme Steel	41.6695	-87.5522	60609	41.8083	-87.6533	13.86269505
Chicago	Acme Steel	41.6695	-87.5522	60610	41.9033	-87.6333	19.97796751
Chicago	Acme Steel	41.6695	-87.5522	60612	41.88	-87.6883	20.23626883
Chicago	Acme Steel	41.6695	-87.5522	60613	41.9533	-87.6583	24.45994438
Chicago	Acme Steel	41.6695	-87.5522	60615	41.8017	-87.6	11.34872007
Chicago	Acme Steel	41.6695	-87.5522	60616	41.8433	-87.63	15.37250137
Chicago	Acme Steel	41.6695	-87.5522	60618	41.945	-87.705	25.43290865
Chicago	Acme Steel	41.6695	-87.5522	60619	41.7467	-87.605	7.550598828
Chicago	Acme Steel	41.6695	-87.5522	60620	41.74	-87.6533	9.950266431
Chicago	Acme Steel	41.6695	-87.5522	60621	41.775	-87.6417	11.16893058
Chicago	Acme Steel	41.6695	-87.5522	60622	41.9017	-87.6783	21.33137301
Chicago	Acme Steel	41.6695	-87.5522	60623	41.8483	-87.715	19.52152226
Chicago	Acme Steel	41.6695	-87.5522	60624	41.88	-87.7217	21.81809464
Chicago	Acme Steel	41.6695	-87.5522	60625	41.97	-87.7033	27.153552
Chicago	Acme Steel	41.6695	-87.5522	60627	41.6467	-87.6183	5.644782229
Chicago	Acme Steel	41.6695	-87.5522	60628	41.6933	-87.625	6.183243457
Chicago	Acme Steel	41.6695	-87.5522	60629	41.7783	-87.7067	15.2551271
Chicago	Acme Steel	41.6695	-87.5522	60630	41.97	-87.76	29.49475715
Chicago	Acme Steel	41.6695	-87.5522	60632	41.8083	-87.705	16.66508121
Chicago	Acme Steel	41.6695	-87.5522	60633	41.6517	-87.5483	1.471081367
Chicago	Acme Steel	41.6695	-87.5522	60635	41.9233	-87.8083	29.10780017
Chicago	Acme Steel	41.6695	-87.5522	60636	41.7767	-87.6667	12.66254361
Chicago	Acme Steel	41.6695	-87.5522	60638	41.79	-87.7733	20.32816988
Chicago	Acme Steel	41.6695	-87.5522	60639	41.92	-87.7533	25.93324309
Chicago	Acme Steel	41.6695	-87.5522	60640	41.9733	-87.6617	26.07025203
Chicago	Acme Steel	41.6695	-87.5522	60641	41.945	-87.7467	27.22534719
Chicago	Acme Steel	41.6695	-87.5522	60644	41.8833	-87.7583	23.97390817
Chicago	Acme Steel	41.6695	-87.5522	60647	41.9217	-87.705	23.80545236
Chicago	Acme Steel	41.6695	-87.5522	60648	41.8564	-87.681	18.32429628
Chicago	Acme Steel	41.6695	-87.5522	60650	41.8483	-87.76	22.13096004
Chicago	Acme Steel	41.6695	-87.5522	60651	41.9017	-87.7383	24.02311708
Chicago	Acme Steel	41.6695	-87.5522	60658	41.6717	-87.7283	14.21766236
Chicago	Acme Steel	41.6695	-87.5522	60659	41.9917	-87.7017	28.67484712
Chicago	Acme Steel	41.6695	-87.5522	60680	41.8833	-87.6417	18.71137676
Chicago	Marblehead Lime	41.7056	-87.5464	60601	41.885	-87.6183	15.60282851
Chicago	Marblehead Lime	41.7056	-87.5464	60602	41.8833	-87.6317	15.9129008
Chicago	Marblehead Lime	41.7056	-87.5464	60607	41.8717	-87.6567	16.09653766
Chicago	Marblehead Lime	41.7056	-87.5464	60608	41.8517	-87.67	15.44923537
Chicago	Marblehead Lime	41.7056	-87.5464	60609	41.8083	-87.6533	11.96736139
Chicago	Marblehead Lime	41.7056	-87.5464	60610	41.9033	-87.6333	17.43411032
Chicago	Marblehead Lime	41.7056	-87.5464	60612	41.88	-87.6883	18.15096416
Chicago	Marblehead Lime	41.7056	-87.5464	60613	41.9533	-87.6583	21.94266053

Chicago	Marblehead Lime	41.7056	-87.5464	60615	41.8017	-87.6	8.883297513
Chicago	Marblehead Lime	41.7056	-87.5464	60616	41.8433	-87.63	13.00486133
Chicago	Marblehead Lime	41.7056	-87.5464	60618	41.945	-87.705	23.18319349
Chicago	Marblehead Lime	41.7056	-87.5464	60619	41.7467	-87.605	5.778356548
Chicago	Marblehead Lime	41.7056	-87.5464	60620	41.74	-87.6533	9.065863979
Chicago	Marblehead Lime	41.7056	-87.5464	60621	41.775	-87.6417	9.517395938
Chicago	Marblehead Lime	41.7056	-87.5464	60622	41.9017	-87.6783	19.07908335
Chicago	Marblehead Lime	41.7056	-87.5464	60623	41.8483	-87.715	17.83187551
Chicago	Marblehead Lime	41.7056	-87.5464	60624	41.88	-87.7217	19.96259635
Chicago	Marblehead Lime	41.7056	-87.5464	60625	41.97	-87.7033	24.82036859
Chicago	Marblehead Lime	41.7056	-87.5464	60627	41.6467	-87.6183	7.503470251
Chicago	Marblehead Lime	41.7056	-87.5464	60628	41.6933	-87.625	6.422602997
Chicago	Marblehead Lime	41.7056	-87.5464	60629	41.7783	-87.7067	14.20971383
Chicago	Marblehead Lime	41.7056	-87.5464	60630	41.97	-87.76	27.44016381
Chicago	Marblehead Lime	41.7056	-87.5464	60632	41.8083	-87.705	15.25375138
Chicago	Marblehead Lime	41.7056	-87.5464	60633	41.6517	-87.5483	4.354049642
Chicago	Marblehead Lime	41.7056	-87.5464	60635	41.9233	-87.8083	27.49385758
Chicago	Marblehead Lime	41.7056	-87.5464	60636	41.7767	-87.6667	11.28121956
Chicago	Marblehead Lime	41.7056	-87.5464	60638	41.79	-87.7733	19.54382598
Chicago	Marblehead Lime	41.7056	-87.5464	60639	41.92	-87.7533	24.05360748
Chicago	Marblehead Lime	41.7056	-87.5464	60640	41.9733	-87.6617	23.53073581
Chicago	Marblehead Lime	41.7056	-87.5464	60641	41.945	-87.7467	25.19920062
Chicago	Marblehead Lime	41.7056	-87.5464	60644	41.8833	-87.7583	22.32573518
Chicago	Marblehead Lime	41.7056	-87.5464	60647	41.9217	-87.705	21.64003301
Chicago	Marblehead Lime	41.7056	-87.5464	60648	41.8564	-87.681	16.31820714
Chicago	Marblehead Lime	41.7056	-87.5464	60650	41.8483	-87.76	20.73806627
Chicago	Marblehead Lime	41.7056	-87.5464	60651	41.9017	-87.7383	22.15017302
Chicago	Marblehead Lime	41.7056	-87.5464	60658	41.6717	-87.7283	14.93762877
Chicago	Marblehead Lime	41.7056	-87.5464	60659	41.9917	-87.7017	26.28022526
Chicago	Marblehead Lime	41.7056	-87.5464	60680	41.8833	-87.6417	16.27853541
Chicago	Morton Salt	41.7123	-87.5419	60601	41.885	-87.6183	15.24541752
Chicago	Morton Salt	41.7123	-87.5419	60602	41.8833	-87.6317	15.59260609
Chicago	Morton Salt	41.7123	-87.5419	60607	41.8717	-87.6567	15.8583395
Chicago	Morton Salt	41.7123	-87.5419	60608	41.8517	-87.67	15.2837839
Chicago	Morton Salt	41.7123	-87.5419	60609	41.8083	-87.6533	11.87196616
Chicago	Morton Salt	41.7123	-87.5419	60610	41.9033	-87.6333	17.09398607
Chicago	Morton Salt	41.7123	-87.5419	60612	41.88	-87.6883	17.9714935
Chicago	Morton Salt	41.7123	-87.5419	60613	41.9533	-87.6583	21.60639477
Chicago	Morton Salt	41.7123	-87.5419	60615	41.8017	-87.6	8.607487722
Chicago	Morton Salt	41.7123	-87.5419	60616	41.8433	-87.63	12.74476152
Chicago	Morton Salt	41.7123	-87.5419	60618	41.945	-87.705	22.9408042
Chicago	Morton Salt	41.7123	-87.5419	60619	41.7467	-87.605	5.801881497
Chicago	Morton Salt	41.7123	-87.5419	60620	41.74	-87.6533	9.267174594
Chicago	Morton Salt	41.7123	-87.5419	60621	41.775	-87.6417	9.514957805
Chicago	Morton Salt	41.7123	-87.5419	60622	41.9017	-87.6783	18.84268638
Chicago	Morton Salt	41.7123	-87.5419	60623	41.8483	-87.715	17.77153371
Chicago	Morton Salt	41.7123	-87.5419	60624	41.88	-87.7217	19.84896576
Chicago	Morton Salt	41.7123	-87.5419	60625	41.97	-87.7033	24.54766205
Chicago	Morton Salt	41.7123	-87.5419	60627	41.6467	-87.6183	8.129442856
Chicago	Morton Salt	41.7123	-87.5419	60628	41.6933	-87.625	6.881781486
Chicago	Morton Salt	41.7123	-87.5419	60629	41.7783	-87.7067	14.33157378
Chicago	Morton Salt	41.7123	-87.5419	60630	41.97	-87.76	27.25482343
Chicago	Morton Salt	41.7123	-87.5419	60632	41.8083	-87.705	15.2785892
Chicago	Morton Salt	41.7123	-87.5419	60633	41.6517	-87.5483	4.919445355
Chicago	Morton Salt	41.7123	-87.5419	60635	41.9233	-87.8083	27.43513288
Chicago	Morton Salt	41.7123	-87.5419	60636	41.7767	-87.6667	11.33743562
Chicago	Morton Salt	41.7123	-87.5419	60638	41.79	-87.7733	19.70593503
Chicago	Morton Salt	41.7123	-87.5419	60639	41.92	-87.7533	23.92514285
Chicago	Morton Salt	41.7123	-87.5419	60640	41.9733	-87.6617	23.18413805
Chicago	Morton Salt	41.7123	-87.5419	60641	41.945	-87.7467	25.02530127
Chicago	Morton Salt	41.7123	-87.5419	60644	41.8833	-87.7583	22.26596625
Chicago	Morton Salt	41.7123	-87.5419	60647	41.9217	-87.705	21.4276902
Chicago	Morton Salt	41.7123	-87.5419	60648	41.8564	-87.681	16.1689151
Chicago	Morton Salt	41.7123	-87.5419	60650	41.8483	-87.76	20.74990455
Chicago	Morton Salt	41.7123	-87.5419	60651	41.9017	-87.7383	22.02691384
Chicago	Morton Salt	41.7123	-87.5419	60658	41.6717	-87.7283	15.40088899
Chicago	Morton Salt	41.7123	-87.5419	60659	41.9917	-87.7017	25.98457803
Chicago	Morton Salt	41.7123	-87.5419	60680	41.8833	-87.6417	15.98393655
Chicago	Scrap Processing	41.7128	-87.54	60601	41.885	-87.6183	15.27136146
Chicago	Scrap Processing	41.7128	-87.54	60602	41.8833	-87.6317	15.62894853

Chicago	Scrap Processing	41.7128	-87.54	60607	41.8717	-87.6567	15.91591489
Chicago	Scrap Processing	41.7128	-87.54	60608	41.8517	-87.67	15.35848945
Chicago	Scrap Processing	41.7128	-87.54	60609	41.8083	-87.6533	11.96252444
Chicago	Scrap Processing	41.7128	-87.54	60610	41.9033	-87.6333	17.12449434
Chicago	Scrap Processing	41.7128	-87.54	60612	41.88	-87.6883	18.04251926
Chicago	Scrap Processing	41.7128	-87.54	60613	41.9533	-87.6583	21.63731779
Chicago	Scrap Processing	41.7128	-87.54	60615	41.8017	-87.6	8.658536192
Chicago	Scrap Processing	41.7128	-87.54	60616	41.8433	-87.63	12.79774219
Chicago	Scrap Processing	41.7128	-87.54	60618	41.945	-87.705	22.9962689
Chicago	Scrap Processing	41.7128	-87.54	60619	41.7467	-87.605	5.918235856
Chicago	Scrap Processing	41.7128	-87.54	60620	41.74	-87.6533	9.406597105
Chicago	Scrap Processing	41.7128	-87.54	60621	41.775	-87.6417	9.624062318
Chicago	Scrap Processing	41.7128	-87.54	60622	41.9017	-87.6783	18.90014995
Chicago	Scrap Processing	41.7128	-87.54	60623	41.8483	-87.715	17.86765741
Chicago	Scrap Processing	41.7128	-87.54	60624	41.88	-87.7217	19.9340549
Chicago	Scrap Processing	41.7128	-87.54	60625	41.97	-87.7033	24.5953362
Chicago	Scrap Processing	41.7128	-87.54	60627	41.6467	-87.6183	8.272402745
Chicago	Scrap Processing	41.7128	-87.54	60628	41.6933	-87.625	7.040308661
Chicago	Scrap Processing	41.7128	-87.54	60629	41.7783	-87.7067	14.45926812
Chicago	Scrap Processing	41.7128	-87.54	60630	41.97	-87.76	27.32347847
Chicago	Scrap Processing	41.7128	-87.54	60632	41.8083	-87.705	15.39071452
Chicago	Scrap Processing	41.7128	-87.54	60633	41.6517	-87.5483	4.977906329
Chicago	Scrap Processing	41.7128	-87.54	60635	41.9233	-87.8083	27.53060374
Chicago	Scrap Processing	41.7128	-87.54	60636	41.7767	-87.6667	11.45572638
Chicago	Scrap Processing	41.7128	-87.54	60638	41.79	-87.7733	19.83868586
Chicago	Scrap Processing	41.7128	-87.54	60639	41.92	-87.7533	24.00665473
Chicago	Scrap Processing	41.7128	-87.54	60640	41.9733	-87.6617	23.21196546
Chicago	Scrap Processing	41.7128	-87.54	60641	41.945	-87.7467	25.09673936
Chicago	Scrap Processing	41.7128	-87.54	60644	41.8833	-87.7583	22.36164751
Chicago	Scrap Processing	41.7128	-87.54	60647	41.9217	-87.705	21.49059439
Chicago	Scrap Processing	41.7128	-87.54	60648	41.8564	-87.681	16.24699223
Chicago	Scrap Processing	41.7128	-87.54	60650	41.8483	-87.76	20.8590214
Chicago	Scrap Processing	41.7128	-87.54	60651	41.9017	-87.7383	22.10972011
Chicago	Scrap Processing	41.7128	-87.54	60658	41.6717	-87.7283	15.55935409
Chicago	Scrap Processing	41.7128	-87.54	60659	41.9917	-87.7017	26.02614252
Chicago	Scrap Processing	41.7128	-87.54	60680	41.8833	-87.6417	16.02711933
Chicago	Cargill	41.6756	-87.5556	60601	41.885	-87.6183	17.64641281
Chicago	Cargill	41.6756	-87.5556	60602	41.8833	-87.6317	17.85766943
Chicago	Cargill	41.6756	-87.5556	60607	41.8717	-87.6567	17.81124458
Chicago	Cargill	41.6756	-87.5556	60608	41.8517	-87.67	16.95302513
Chicago	Cargill	41.6756	-87.5556	60609	41.8083	-87.6533	13.30321155
Chicago	Cargill	41.6756	-87.5556	60610	41.9033	-87.6333	19.42300383
Chicago	Cargill	41.6756	-87.5556	60612	41.88	-87.6883	19.67372874
Chicago	Cargill	41.6756	-87.5556	60613	41.9533	-87.6583	23.90270385
Chicago	Cargill	41.6756	-87.5556	60615	41.8017	-87.6	10.79265901
Chicago	Cargill	41.6756	-87.5556	60616	41.8433	-87.63	14.81096307
Chicago	Cargill	41.6756	-87.5556	60618	41.945	-87.705	24.86912776
Chicago	Cargill	41.6756	-87.5556	60619	41.7467	-87.605	6.989357979
Chicago	Cargill	41.6756	-87.5556	60620	41.74	-87.6533	9.446669166
Chicago	Cargill	41.6756	-87.5556	60621	41.775	-87.6417	10.61640018
Chicago	Cargill	41.6756	-87.5556	60622	41.9017	-87.6783	20.76762578
Chicago	Cargill	41.6756	-87.5556	60623	41.8483	-87.715	18.97303572
Chicago	Cargill	41.6756	-87.5556	60624	41.88	-87.7217	21.26259776
Chicago	Cargill	41.6756	-87.5556	60625	41.97	-87.7033	26.59029171
Chicago	Cargill	41.6756	-87.5556	60627	41.6467	-87.6183	5.573586571
Chicago	Cargill	41.6756	-87.5556	60628	41.6933	-87.625	5.782009747
Chicago	Cargill	41.6756	-87.5556	60629	41.7783	-87.7067	14.74919646
Chicago	Cargill	41.6756	-87.5556	60630	41.97	-87.76	28.93365002
Chicago	Cargill	41.6756	-87.5556	60632	41.8083	-87.705	16.13179536
Chicago	Cargill	41.6756	-87.5556	60633	41.6517	-87.5483	2.017442538
Chicago	Cargill	41.6756	-87.5556	60635	41.9233	-87.8083	28.56662506
Chicago	Cargill	41.6756	-87.5556	60636	41.7767	-87.6667	12.12682303
Chicago	Cargill	41.6756	-87.5556	60638	41.79	-87.7733	19.85377874
Chicago	Cargill	41.6756	-87.5556	60639	41.92	-87.7533	25.37756892
Chicago	Cargill	41.6756	-87.5556	60640	41.9733	-87.6617	25.51406482
Chicago	Cargill	41.6756	-87.5556	60641	41.945	-87.7467	26.66481104
Chicago	Cargill	41.6756	-87.5556	60644	41.8833	-87.7583	23.429312
Chicago	Cargill	41.6756	-87.5556	60647	41.9217	-87.705	23.24204923
Chicago	Cargill	41.6756	-87.5556	60648	41.8564	-87.681	17.76313181
Chicago	Cargill	41.6756	-87.5556	60650	41.8483	-87.76	21.60257719

Chicago	Cargill	41.6756	-87.5556	60651	41.9017	-87.7383	23.46737925
Chicago	Cargill	41.6756	-87.5556	60658	41.6717	-87.7283	13.94562557
Chicago	Cargill	41.6756	-87.5556	60659	41.9917	-87.7017	28.11264118
Chicago	Cargill	41.6756	-87.5556	60680	41.8833	-87.6417	18.15123884
Chicago	General Mills	41.7056	-87.5511	60601	41.885	-87.6183	15.46568527
Chicago	General Mills	41.7056	-87.5511	60602	41.8833	-87.6317	15.75241733
Chicago	General Mills	41.7056	-87.5511	60607	41.8717	-87.6567	15.88978261
Chicago	General Mills	41.7056	-87.5511	60608	41.8517	-87.67	15.20693076
Chicago	General Mills	41.7056	-87.5511	60609	41.8083	-87.6533	11.69669609
Chicago	General Mills	41.7056	-87.5511	60610	41.9033	-87.6333	17.28491892
Chicago	General Mills	41.7056	-87.5511	60612	41.88	-87.6883	17.91391242
Chicago	General Mills	41.7056	-87.5511	60613	41.9533	-87.6583	21.7891945
Chicago	General Mills	41.7056	-87.5511	60615	41.8017	-87.6	8.704783143
Chicago	General Mills	41.7056	-87.5511	60616	41.8433	-87.63	12.81205702
Chicago	General Mills	41.7056	-87.5511	60618	41.945	-87.705	22.97581615
Chicago	General Mills	41.7056	-87.5511	60619	41.7467	-87.605	5.472053054
Chicago	General Mills	41.7056	-87.5511	60620	41.74	-87.6533	8.705449467
Chicago	General Mills	41.7056	-87.5511	60621	41.775	-87.6417	9.213383535
Chicago	General Mills	41.7056	-87.5511	60622	41.9017	-87.6783	18.86994459
Chicago	General Mills	41.7056	-87.5511	60623	41.8483	-87.715	17.54396826
Chicago	General Mills	41.7056	-87.5511	60624	41.88	-87.7217	19.69542661
Chicago	General Mills	41.7056	-87.5511	60625	41.97	-87.7033	24.62889586
Chicago	General Mills	41.7056	-87.5511	60627	41.6467	-87.6183	7.213960706
Chicago	General Mills	41.7056	-87.5511	60628	41.6933	-87.625	6.048018758
Chicago	General Mills	41.7056	-87.5511	60629	41.7783	-87.7067	13.86504553
Chicago	General Mills	41.7056	-87.5511	60630	41.97	-87.76	27.20332326
Chicago	General Mills	41.7056	-87.5511	60632	41.8083	-87.705	14.93668633
Chicago	General Mills	41.7056	-87.5511	60633	41.6517	-87.5483	4.357214317
Chicago	General Mills	41.7056	-87.5511	60635	41.9233	-87.8083	27.20315076
Chicago	General Mills	41.7056	-87.5511	60636	41.7767	-87.6667	10.95627456
Chicago	General Mills	41.7056	-87.5511	60638	41.79	-87.7733	19.18865662
Chicago	General Mills	41.7056	-87.5511	60639	41.92	-87.7533	23.79169394
Chicago	General Mills	41.7056	-87.5511	60640	41.9733	-87.6617	23.38323929
Chicago	General Mills	41.7056	-87.5511	60641	41.945	-87.7467	24.95741804
Chicago	General Mills	41.7056	-87.5511	60644	41.8833	-87.7583	22.03635188
Chicago	General Mills	41.7056	-87.5511	60647	41.9217	-87.705	21.41771921
Chicago	General Mills	41.7056	-87.5511	60648	41.8564	-87.681	16.06803852
Chicago	General Mills	41.7056	-87.5511	60650	41.8483	-87.76	20.42365293
Chicago	General Mills	41.7056	-87.5511	60651	41.9017	-87.7383	21.88647474
Chicago	General Mills	41.7056	-87.5511	60658	41.6717	-87.7283	14.56478611
Chicago	General Mills	41.7056	-87.5511	60659	41.9917	-87.7017	26.1013424
Chicago	General Mills	41.7056	-87.5511	60680	41.8833	-87.6417	16.1026807
Chicago	North American Salt	41.7258	-87.5428	60601	41.885	-87.6183	14.22427091
Chicago	North American Salt	41.7258	-87.5428	60602	41.8833	-87.6317	14.60063149
Chicago	North American Salt	41.7258	-87.5428	60607	41.8717	-87.6567	14.94268903
Chicago	North American Salt	41.7258	-87.5428	60608	41.8517	-87.67	14.44833586
Chicago	North American Salt	41.7258	-87.5428	60609	41.8083	-87.6533	11.13269334
Chicago	North American Salt	41.7258	-87.5428	60610	41.9033	-87.6333	16.08462948
Chicago	North American Salt	41.7258	-87.5428	60612	41.88	-87.6883	17.11550064
Chicago	North American Salt	41.7258	-87.5428	60613	41.9533	-87.6583	20.59746492
Chicago	North American Salt	41.7258	-87.5428	60615	41.8017	-87.6	7.672599756
Chicago	North American Salt	41.7258	-87.5428	60616	41.8433	-87.63	11.81256466
Chicago	North American Salt	41.7258	-87.5428	60618	41.945	-87.705	22.01391493
Chicago	North American Salt	41.7258	-87.5428	60619	41.7467	-87.605	5.297296896
Chicago	North American Salt	41.7258	-87.5428	60620	41.74	-87.6533	8.994021295
Chicago	North American Salt	41.7258	-87.5428	60621	41.775	-87.6417	8.917596001
Chicago	North American Salt	41.7258	-87.5428	60622	41.9017	-87.6783	17.92516165
Chicago	North American Salt	41.7258	-87.5428	60623	41.8483	-87.715	17.06042662
Chicago	North American Salt	41.7258	-87.5428	60624	41.88	-87.7217	19.06712888
Chicago	North American Salt	41.7258	-87.5428	60625	41.97	-87.7033	23.59110868
Chicago	North American Salt	41.7258	-87.5428	60627	41.6467	-87.6183	8.827691687
Chicago	North American Salt	41.7258	-87.5428	60628	41.6933	-87.625	7.13586074
Chicago	North American Salt	41.7258	-87.5428	60629	41.7783	-87.7067	13.89387927
Chicago	North American Salt	41.7258	-87.5428	60630	41.97	-87.76	26.38395228
Chicago	North American Salt	41.7258	-87.5428	60632	41.8083	-87.705	14.69088376
Chicago	North American Salt	41.7258	-87.5428	60633	41.6517	-87.5483	5.998548656
Chicago	North American Salt	41.7258	-87.5428	60635	41.9233	-87.8083	26.71376315
Chicago	North American Salt	41.7258	-87.5428	60636	41.7767	-87.6667	10.81360797
Chicago	North American Salt	41.7258	-87.5428	60638	41.79	-87.7733	19.31656352
Chicago	North American Salt	41.7258	-87.5428	60639	41.92	-87.7533	23.12092119

Chicago	North American Salt	41.7258	-87.5428	60640	41.9733	-87.6617	22.16673808
Chicago	North American Salt	41.7258	-87.5428	[illegible]	41.945	-87.7467	24.16833603
Chicago	North American Salt	41.7258	-87.5428	[illegible]	41.8833	-87.7583	21.5484839
Chicago	North American Salt	41.7258	-87.5428	[illegible]	41.9217	-87.705	20.53236262
Chicago	North American Salt	41.7258	-87.5428	[illegible]	41.8564	-87.681	15.35050753
Chicago	North American Salt	41.7258	-87.5428	[illegible]	41.8483	-87.76	20.13110481
Chicago	North American Salt	41.7258	-87.5428	60651	41.9017	-87.7383	21.23077134
Chicago	North American Salt	41.7258	-87.5428	60658	41.6717	-87.7283	15.59929644
Chicago	North American Salt	41.7258	-87.5428	60659	41.9917	-87.7017	25.00702415
Chicago	North American Salt	41.7258	-87.5428	60680	41.8833	-87.6417	15.01392657
Chicago	First Brands	41.6571	-87.7214	60601	41.885	-87.6183	20.19347952
Chicago	First Brands	41.6571	-87.7214	60602	41.8833	-87.6317	19.64453537
Chicago	First Brands	41.6571	-87.7214	60607	41.8717	-87.6567	18.09491412
Chicago	First Brands	41.6571	-87.7214	60608	41.8517	-87.67	16.24882935
Chicago	First Brands	41.6571	-87.7214	60609	41.8083	-87.6533	13.38732472
Chicago	First Brands	41.6571	-87.7214	60610	41.9033	-87.6333	21.10993795
Chicago	First Brands	41.6571	-87.7214	60612	41.88	-87.6883	18.19203933
Chicago	First Brands	41.6571	-87.7214	60613	41.9533	-87.6583	24.44880427
Chicago	First Brands	41.6571	-87.7214	60615	41.8017	-87.6	15.24218318
Chicago	First Brands	41.6571	-87.7214	60616	41.8433	-87.63	16.74527807
Chicago	First Brands	41.6571	-87.7214	60618	41.945	-87.705	23.27984598
Chicago	First Brands	41.6571	-87.7214	60619	41.7467	-87.605	11.85855278
Chicago	First Brands	41.6571	-87.7214	60620	41.74	-87.6533	8.661098777
Chicago	First Brands	41.6571	-87.7214	60621	41.775	-87.6417	11.48878952
Chicago	First Brands	41.6571	-87.7214	60622	41.9017	-87.6783	20.05076596
Chicago	First Brands	41.6571	-87.7214	60623	41.8483	-87.715	15.44422081
Chicago	First Brands	41.6571	-87.7214	60624	41.88	-87.7217	17.9947333
Chicago	First Brands	41.6571	-87.7214	60625	41.97	-87.7033	25.30264434
Chicago	First Brands	41.6571	-87.7214	60627	41.6467	-87.6183	8.365501879
Chicago	First Brands	41.6571	-87.7214	60628	41.6933	-87.625	8.312995108
Chicago	First Brands	41.6571	-87.7214	60629	41.7783	-87.7067	9.856180856
Chicago	First Brands	41.6571	-87.7214	60630	41.97	-87.76	25.45190037
Chicago	First Brands	41.6571	-87.7214	60632	41.8083	-87.705	12.27796876
Chicago	First Brands	41.6571	-87.7214	60633	41.6517	-87.5483	13.98116114
Chicago	First Brands	41.6571	-87.7214	60635	41.9233	-87.8083	22.60642537
Chicago	First Brands	41.6571	-87.7214	60636	41.7767	-87.6667	10.61722276
Chicago	First Brands	41.6571	-87.7214	60638	41.79	-87.7733	11.51811438
Chicago	First Brands	41.6571	-87.7214	60639	41.92	-87.7533	21.37958737
Chicago	First Brands	41.6571	-87.7214	60640	41.9733	-87.6617	25.97782144
Chicago	First Brands	41.6571	-87.7214	60641	41.945	-87.7467	23.33173818
Chicago	First Brands	41.6571	-87.7214	60644	41.8833	-87.7583	18.50250763
Chicago	First Brands	41.6571	-87.7214	60647	41.9217	-87.705	21.40214879
Chicago	First Brands	41.6571	-87.7214	60648	41.8564	-87.681	16.41672886
Chicago	First Brands	41.6571	-87.7214	60650	41.8483	-87.76	15.74698612
Chicago	First Brands	41.6571	-87.7214	60651	41.9017	-87.7383	19.79363454
Chicago	First Brands	41.6571	-87.7214	60658	41.6717	-87.7283	1.303658276
Chicago	First Brands	41.6571	-87.7214	60659	41.9917	-87.7017	27.05903535
Chicago	First Brands	41.6571	-87.7214	60680	41.8833	-87.6417	19.36149292
Chicago	Proctor and Gamble	41.9117	-87.6575	60601	41.885	-87.6183	3.828960156
Chicago	Proctor and Gamble	41.9117	-87.6575	60602	41.8833	-87.6317	3.097550241
Chicago	Proctor and Gamble	41.9117	-87.6575	60607	41.8717	-87.6567	3.229845775
Chicago	Proctor and Gamble	41.9117	-87.6575	60608	41.8517	-87.67	4.947800694
Chicago	Proctor and Gamble	41.9117	-87.6575	60609	41.8083	-87.6533	8.354365415
Chicago	Proctor and Gamble	41.9117	-87.6575	60610	41.9033	-87.6333	2.068012052
Chicago	Proctor and Gamble	41.9117	-87.6575	60612	41.88	-87.6883	3.568165543
Chicago	Proctor and Gamble	41.9117	-87.6575	60613	41.9533	-87.6583	3.358988943
Chicago	Proctor and Gamble	41.9117	-87.6575	60615	41.8017	-87.6	10.02036227
Chicago	Proctor and Gamble	41.9117	-87.6575	60616	41.8433	-87.63	5.951509558
Chicago	Proctor and Gamble	41.9117	-87.6575	60618	41.945	-87.705	4.683133314
Chicago	Proctor and Gamble	41.9117	-87.6575	60619	41.7467	-87.605	13.97847585
Chicago	Proctor and Gamble	41.9117	-87.6575	60620	41.74	-87.6533	13.86548737
Chicago	Proctor and Gamble	41.9117	-87.6575	60621	41.775	-87.6417	11.10926055
Chicago	Proctor and Gamble	41.9117	-87.6575	60622	41.9017	-87.6783	1.863167248
Chicago	Proctor and Gamble	41.9117	-87.6575	60623	41.8483	-87.715	6.909757053
Chicago	Proctor and Gamble	41.9117	-87.6575	60624	41.88	-87.7217	5.780251087
Chicago	Proctor and Gamble	41.9117	-87.6575	60625	41.97	-87.7033	5.985208084
Chicago	Proctor and Gamble	41.9117	-87.6575	60627	41.6467	-87.6183	21.62624557
Chicago	Proctor and Gamble	41.9117	-87.6575	60628	41.6933	-87.625	17.8255807
Chicago	Proctor and Gamble	41.9117	-87.6575	60629	41.7783	-87.7067	11.47848881
Chicago	Proctor and Gamble	41.9117	-87.6575	60630	41.97	-87.76	9.519686255

Chicago	Proctor and Gamble	41.9117	-87.6575	60632	41.8083	-87.705	9.186141088
Chicago	Proctor and Gamble	41.9117	-87.6575	60633	41.6517	-87.5483	22.76595161
Chicago	Proctor and Gamble	41.9117	-87.6575	60635	41.9233	-87.8083	12.21004888
Chicago	Proctor and Gamble	41.9117	-87.6575	60636	41.7767	-87.6667	10.92382805
Chicago	Proctor and Gamble	41.9117	-87.6575	60638	41.79	-87.7733	13.56180624
Chicago	Proctor and Gamble	41.9117	-87.6575	60639	41.92	-87.7533	7.762906297
Chicago	Proctor and Gamble	41.9117	-87.6575	60640	41.9733	-87.6617	4.984513665
Chicago	Proctor and Gamble	41.9117	-87.6575	60641	41.945	-87.7467	7.686551693
Chicago	Proctor and Gamble	41.9117	-87.6575	60644	41.8833	-87.7583	8.454400829
Chicago	Proctor and Gamble	41.9117	-87.6575	60647	41.9217	-87.705	3.918732658
Chicago	Proctor and Gamble	41.9117	-87.6575	60648	41.8564	-87.681	4.850751247
Chicago	Proctor and Gamble	41.9117	-87.6575	60650	41.8483	-87.76	9.729827306
Chicago	Proctor and Gamble	41.9117	-87.6575	60651	41.9017	-87.7383	6.572750836
Chicago	Proctor and Gamble	41.9117	-87.6575	60658	41.6717	-87.7283	20.20067867
Chicago	Proctor and Gamble	41.9117	-87.6575	60659	41.9917	-87.7017	7.378580677
Chicago	Proctor and Gamble	41.9117	-87.6575	60680	41.8833	-87.6417	2.623662899
Chicago	Orange Crush	41.9228	-87.6719	60601	41.885	-87.6183	5.294928014
Chicago	Orange Crush	41.9228	-87.6719	60602	41.8833	-87.6317	4.549828493
Chicago	Orange Crush	41.9228	-87.6719	60607	41.8717	-87.6567	4.303938828
Chicago	Orange Crush	41.9228	-87.6719	60608	41.8517	-87.67	5.741952109
Chicago	Orange Crush	41.9228	-87.6719	60609	41.8083	-87.6533	9.364753074
Chicago	Orange Crush	41.9228	-87.6719	60610	41.9033	-87.6333	3.491243498
Chicago	Orange Crush	41.9228	-87.6719	60612	41.88	-87.6883	3.700217961
Chicago	Orange Crush	41.9228	-87.6719	60613	41.9533	-87.6583	2.69595898
Chicago	Orange Crush	41.9228	-87.6719	60615	41.8017	-87.6	11.36970206
Chicago	Orange Crush	41.9228	-87.6719	60616	41.8433	-87.63	7.254865131
Chicago	Orange Crush	41.9228	-87.6719	60618	41.945	-87.705	3.217523496
Chicago	Orange Crush	41.9228	-87.6719	60619	41.7467	-87.605	15.2078736
Chicago	Orange Crush	41.9228	-87.6719	60620	41.74	-87.6533	14.83364048
Chicago	Orange Crush	41.9228	-87.6719	60621	41.775	-87.6417	12.17843022
Chicago	Orange Crush	41.9228	-87.6719	60622	41.9017	-87.6783	1.780037004
Chicago	Orange Crush	41.9228	-87.6719	60623	41.8483	-87.715	6.948344385
Chicago	Orange Crush	41.9228	-87.6719	60624	41.88	-87.7217	5.301127935
Chicago	Orange Crush	41.9228	-87.6719	60625	41.97	-87.7033	4.576614958
Chicago	Orange Crush	41.9228	-87.6719	60627	41.6467	-87.6183	22.70568673
Chicago	Orange Crush	41.9228	-87.6719	60628	41.6933	-87.625	18.91045065
Chicago	Orange Crush	41.9228	-87.6719	60629	41.7783	-87.7067	11.99901209
Chicago	Orange Crush	41.9228	-87.6719	60630	41.97	-87.76	8.068740369
Chicago	Orange Crush	41.9228	-87.6719	60632	41.8083	-87.705	9.622074555
Chicago	Orange Crush	41.9228	-87.6719	60633	41.6517	-87.5483	24.05322814
Chicago	Orange Crush	41.9228	-87.6719	60635	41.9233	-87.8083	11.01164598
Chicago	Orange Crush	41.9228	-87.6719	60636	41.7767	-87.6667	11.80212134
Chicago	Orange Crush	41.9228	-87.6719	60638	41.79	-87.7733	13.48886935
Chicago	Orange Crush	41.9228	-87.6719	60639	41.92	-87.7533	6.575308585
Chicago	Orange Crush	41.9228	-87.6719	60640	41.9733	-87.6617	4.159193617
Chicago	Orange Crush	41.9228	-87.6719	60641	41.945	-87.7467	6.29894758
Chicago	Orange Crush	41.9228	-87.6719	60644	41.8833	-87.7583	7.669439227
Chicago	Orange Crush	41.9228	-87.6719	60647	41.9217	-87.705	2.673638171
Chicago	Orange Crush	41.9228	-87.6719	60648	41.8564	-87.681	5.410578564
Chicago	Orange Crush	41.9228	-87.6719	60650	41.8483	-87.76	9.314387964
Chicago	Orange Crush	41.9228	-87.6719	60651	41.9017	-87.7383	5.624610373
Chicago	Orange Crush	41.9228	-87.6719	60658	41.6717	-87.7283	20.77635918
Chicago	Orange Crush	41.9228	-87.6719	60659	41.9917	-87.7017	6.060264039
Chicago	Orange Crush	41.9228	-87.6719	60680	41.8833	-87.6417	4.014067383
Chicago	Tiger Concrete	41.9183	-87.6906	60601	41.885	-87.6183	6.426118142
Chicago	Tiger Concrete	41.9183	-87.6906	60602	41.8833	-87.6317	5.531159849
Chicago	Tiger Concrete	41.9183	-87.6906	60607	41.8717	-87.6567	4.652156873
Chicago	Tiger Concrete	41.9183	-87.6906	60608	41.8517	-87.67	5.627940699
Chicago	Tiger Concrete	41.9183	-87.6906	60609	41.8083	-87.6533	9.376951966
Chicago	Tiger Concrete	41.9183	-87.6906	60610	41.9033	-87.6333	4.781704073
Chicago	Tiger Concrete	41.9183	-87.6906	60612	41.88	-87.6883	3.097529201
Chicago	Tiger Concrete	41.9183	-87.6906	60613	41.9533	-87.6583	3.844892852
Chicago	Tiger Concrete	41.9183	-87.6906	60615	41.8017	-87.6	11.92071328
Chicago	Tiger Concrete	41.9183	-87.6906	60616	41.8433	-87.63	7.784214168
Chicago	Tiger Concrete	41.9183	-87.6906	60618	41.945	-87.705	2.448994814
Chicago	Tiger Concrete	41.9183	-87.6906	60619	41.7467	-87.605	15.4812105
Chicago	Tiger Concrete	41.9183	-87.6906	60620	41.74	-87.6533	14.70575783
Chicago	Tiger Concrete	41.9183	-87.6906	60621	41.775	-87.6417	12.22362572
Chicago	Tiger Concrete	41.9183	-87.6906	60622	41.9017	-87.6783	1.667909934
Chicago	Tiger Concrete	41.9183	-87.6906	60623	41.8483	-87.715	5.984571039

Computation of Average Dray Cost

Chicago	Tiger Concrete	41.9183	-87.6906	60624	41.88	-87.7217	3.982943637
Chicago	Tiger Concrete	41.9183	-87.6906	60625	41.97	-87.7033	4.297824398
Chicago	Tiger Concrete	41.9183	-87.6906	60627	41.6467	-87.6183	22.68984834
Chicago	Tiger Concrete	41.9183	-87.6906	60628	41.6933	-87.625	18.92052874
Chicago	Tiger Concrete	41.9183	-87.6906	60629	41.7783	-87.7067	11.37669032
Chicago	Tiger Concrete	41.9183	-87.6906	60630	41.97	-87.76	6.986410768
Chicago	Tiger Concrete	41.9183	-87.6906	60632	41.8083	-87.705	8.956068459
Chicago	Tiger Concrete	41.9183	-87.6906	60633	41.6517	-87.5483	24.39660734
Chicago	Tiger Concrete	41.9183	-87.6906	60635	41.9233	-87.8083	9.51049084
Chicago	Tiger Concrete	41.9183	-87.6906	60636	41.7767	-87.6667	11.59305568
Chicago	Tiger Concrete	41.9183	-87.6906	60638	41.79	-87.7733	12.32294728
Chicago	Tiger Concrete	41.9183	-87.6906	60639	41.92	-87.7533	5.063631182
Chicago	Tiger Concrete	41.9183	-87.6906	60640	41.9733	-87.6617	5.015802392
Chicago	Tiger Concrete	41.9183	-87.6906	60641	41.945	-87.7467	5.015730927
Chicago	Tiger Concrete	41.9183	-87.6906	60644	41.8833	-87.7583	6.152605912
Chicago	Tiger Concrete	41.9183	-87.6906	60647	41.9217	-87.705	1.194476671
Chicago	Tiger Concrete	41.9183	-87.6906	60648	41.8564	-87.681	5.056927458
Chicago	Tiger Concrete	41.9183	-87.6906	60650	41.8483	-87.76	7.957685134
Chicago	Tiger Concrete	41.9183	-87.6906	60651	41.9017	-87.7383	4.077344556
Chicago	Tiger Concrete	41.9183	-87.6906	60658	41.6717	-87.7283	20.13931977
Chicago	Tiger Concrete	41.9183	-87.6906	60659	41.9917	-87.7017	5.992956084
Chicago	Tiger Concrete	41.9183	-87.6906	60680	41.8833	-87.6417	4.854693029
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60601	41.885	-87.6183	5.321876885
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60602	41.8833	-87.6317	4.424364913
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60607	41.8717	-87.6567	2.473356935
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60608	41.8517	-87.67	0.613548
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60609	41.8083	-87.6533	3.189121119
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60610	41.9033	-87.6333	5.623080658
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60612	41.88	-87.6883	3.253028348
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60613	41.9533	-87.6583	8.86617202
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60615	41.8017	-87.6	6.606930574
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60616	41.8433	-87.63	3.229845775
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60618	41.945	-87.705	8.62180148
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60619	41.7467	-87.605	9.453258939
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60620	41.74	-87.6533	8.511446253
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60621	41.775	-87.6417	6.028158347
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60622	41.9017	-87.6783	4.698076784
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60623	41.8483	-87.715	3.64863877
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60624	41.88	-87.7217	5.081310633
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60625	41.97	-87.7033	10.51342051
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60627	41.6467	-87.6183	16.47359891
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60628	41.6933	-87.625	12.70456297
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60629	41.7783	-87.7067	6.08242022
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60630	41.97	-87.76	12.49381455
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60632	41.8083	-87.705	4.041856917
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60633	41.6517	-87.5483	18.37891634
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60635	41.9233	-87.8083	12.86612578
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60636	41.7767	-87.6667	5.447719978
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60638	41.79	-87.7733	9.413858804
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60639	41.92	-87.7533	9.097701503
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60640	41.9733	-87.6617	10.45181663
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60641	41.945	-87.7467	10.23193435
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60644	41.8833	-87.7583	7.799341135
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60647	41.9217	-87.705	6.872375671
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60648	41.8564	-87.681	1.332142851
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60650	41.8483	-87.76	7.273607237
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60651	41.9017	-87.7383	7.212876505
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60658	41.6717	-87.7283	14.692117
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60659	41.9917	-87.7017	12.18746295
Chicago	Cozzi Iron and Metal	41.8441	-87.67	60680	41.8833	-87.6417	3.903134788
Cincinnati	Cargill	39.0483	-84.6937	45201	39.1067	-84.5	16.33266864
Cincinnati	Cargill	39.0483	-84.6937	45202	39.1067	-84.5017	16.20131831
Cincinnati	Cargill	39.0483	-84.6937	45204	39.1067	-84.56	11.77835207
Cincinnati	Cargill	39.0483	-84.6937	45209	39.1517	-84.4267	23.11481345
Cincinnati	Cargill	39.0483	-84.6937	45211	39.1517	-84.5983	11.35762938
Cincinnati	Cargill	39.0483	-84.6937	45212	39.1633	-84.4533	21.51377404
Cincinnati	Cargill	39.0483	-84.6937	45213	39.18	-84.4183	24.64448374
Cincinnati	Cargill	39.0483	-84.6937	45214	39.1217	-84.5433	13.51057493
Cincinnati	Cargill	39.0483	-84.6937	45215	39.2283	-84.4567	24.02568745
Cincinnati	Cargill	39.0483	-84.6937	45216	39.1983	-84.48	21.07774961

Cincinnati	Cargill	39.0483	-84.6937	45217	39.1617	-84.4983	18.23867768
Cincinnati	Cargill	39.0483	-84.6937	45219	39.1267	-84.5133	15.87955611
Cincinnati	Cargill	39.0483	-84.6937	45225	39.1433	-84.5517	13.7925498
Cincinnati	Cargill	39.0483	-84.6937	45227	39.155	-84.3883	26.1163796
Cincinnati	Cargill	39.0483	-84.6937	45229	39.15	-84.4917	18.257637
Cincinnati	Cargill	39.0483	-84.6937	45231	39.2433	-84.545	19.79724295
Cincinnati	Cargill	39.0483	-84.6937	45232	39.1867	-84.5133	18.3558647
Cincinnati	Cargill	39.0483	-84.6937	45233	39.115	-84.6667	5.809133571
Cincinnati	Cargill	39.0483	-84.6937	45234	39.2767	-84.3933	30.46493068
Cincinnati	Cargill	39.0483	-84.6937	45235	39.2767	-84.3933	30.46493068
Cincinnati	Cargill	39.0483	-84.6937	45236	39.2067	-84.395	27.29488941
Cincinnati	Cargill	39.0483	-84.6937	45237	39.1883	-84.4583	22.11076063
Cincinnati	Cargill	39.0483	-84.6937	45241	39.2767	-84.3933	30.46493068
Cincinnati	Cargill	39.0483	-84.6937	45242	39.2383	-84.36	31.00028741
Cincinnati	Cargill	39.0483	-84.6937	45245	39.065	-84.275	33.82852686
Cincinnati	Cargill	39.0483	-84.6937	45246	39.29	-84.4767	26.2227009
Cincinnati	Cargill	39.0483	-84.6937	45249	39.275	-84.325	34.94150522
Cincinnati	Cargill	39.0483	-84.6937	45255	39.075	-84.3267	29.70621471
Cincinnati	Cargill	39.0483	-84.6937	45263	39.1067	-84.5017	16.20131831
Cincinnati	Hilltop	39.0478	-84.3944	45201	39.1067	-84.5	9.761512274
Cincinnati	Hilltop	39.0478	-84.3944	45202	39.1067	-84.5017	9.881596034
Cincinnati	Hilltop	39.0478	-84.3944	45204	39.1067	-84.56	14.18933271
Cincinnati	Hilltop	39.0478	-84.3944	45209	39.1517	-84.4267	8.783817253
Cincinnati	Hilltop	39.0478	-84.3944	45211	39.1517	-84.5983	18.47472493
Cincinnati	Hilltop	39.0478	-84.3944	45212	39.1633	-84.4533	10.46674958
Cincinnati	Hilltop	39.0478	-84.3944	45213	39.18	-84.4183	10.8455129
Cincinnati	Hilltop	39.0478	-84.3944	45214	39.1217	-84.5433	13.41974962
Cincinnati	Hilltop	39.0478	-84.3944	45215	39.2283	-84.4567	15.41531687
Cincinnati	Hilltop	39.0478	-84.3944	45216	39.1983	-84.48	13.97762726
Cincinnati	Hilltop	39.0478	-84.3944	45217	39.1617	-84.4983	12.44615224
Cincinnati	Hilltop	39.0478	-84.3944	45219	39.1267	-84.5133	11.5199249
Cincinnati	Hilltop	39.0478	-84.3944	45225	39.1433	-84.5517	14.855974
Cincinnati	Hilltop	39.0478	-84.3944	45227	39.155	-84.3883	8.668255699
Cincinnati	Hilltop	39.0478	-84.3944	45229	39.15	-84.4917	11.3918383
Cincinnati	Hilltop	39.0478	-84.3944	45231	39.2433	-84.545	19.92258892
Cincinnati	Hilltop	39.0478	-84.3944	45232	39.1867	-84.5133	14.76066313
Cincinnati	Hilltop	39.0478	-84.3944	45233	39.115	-84.6667	22.64230123
Cincinnati	Hilltop	39.0478	-84.3944	45234	39.2767	-84.3933	18.47931037
Cincinnati	Hilltop	39.0478	-84.3944	45235	39.2767	-84.3933	18.47931037
Cincinnati	Hilltop	39.0478	-84.3944	45236	39.2067	-84.395	12.82808845
Cincinnati	Hilltop	39.0478	-84.3944	45237	39.1883	-84.4583	12.46055455
Cincinnati	Hilltop	39.0478	-84.3944	45241	39.2767	-84.3933	18.47931037
Cincinnati	Hilltop	39.0478	-84.3944	45242	39.2383	-84.36	15.62779547
Cincinnati	Hilltop	39.0478	-84.3944	45245	39.065	-84.275	9.738661706
Cincinnati	Hilltop	39.0478	-84.3944	45246	39.29	-84.4767	20.65081132
Cincinnati	Hilltop	39.0478	-84.3944	45249	39.275	-84.325	19.17846456
Cincinnati	Hilltop	39.0478	-84.3944	45255	39.075	-84.3267	5.890043317
Cincinnati	Hilltop	39.0478	-84.3944	45263	39.1067	-84.5017	9.881596034
Cincinnati	Bulk Terminals	39.0969	-84.5336	45201	39.1067	-84.5	2.82555
Cincinnati	Bulk Terminals	39.0969	-84.5336	45202	39.1067	-84.5017	2.694072713
Cincinnati	Bulk Terminals	39.0969	-84.5336	45204	39.1067	-84.56	2.273377441
Cincinnati	Bulk Terminals	39.0969	-84.5336	45209	39.1517	-84.4267	9.697904414
Cincinnati	Bulk Terminals	39.0969	-84.5336	45211	39.1517	-84.5983	6.844994775
Cincinnati	Bulk Terminals	39.0969	-84.5336	45212	39.1633	-84.4533	8.411837443
Cincinnati	Bulk Terminals	39.0969	-84.5336	45213	39.18	-84.4183	11.47380361
Cincinnati	Bulk Terminals	39.0969	-84.5336	45214	39.1217	-84.5433	2.149799125
Cincinnati	Bulk Terminals	39.0969	-84.5336	45215	39.2283	-84.4567	12.29101193
Cincinnati	Bulk Terminals	39.0969	-84.5336	45216	39.1983	-84.48	9.259319247
Cincinnati	Bulk Terminals	39.0969	-84.5336	45217	39.1617	-84.4983	5.957157451
Cincinnati	Bulk Terminals	39.0969	-84.5336	45219	39.1267	-84.5133	2.910907079
Cincinnati	Bulk Terminals	39.0969	-84.5336	45225	39.1433	-84.5517	4.020783564
Cincinnati	Bulk Terminals	39.0969	-84.5336	45227	39.155	-84.3883	12.63307139
Cincinnati	Bulk Terminals	39.0969	-84.5336	45229	39.15	-84.4917	5.460607277
Cincinnati	Bulk Terminals	39.0969	-84.5336	45231	39.2433	-84.545	11.85465006
Cincinnati	Bulk Terminals	39.0969	-84.5336	45232	39.1867	-84.5133	7.432480132
Cincinnati	Bulk Terminals	39.0969	-84.5336	45233	39.115	-84.6667	10.84406157
Cincinnati	Bulk Terminals	39.0969	-84.5336	45234	39.2767	-84.3933	18.41141945
Cincinnati	Bulk Terminals	39.0969	-84.5336	45235	39.2767	-84.3933	18.41141945
Cincinnati	Bulk Terminals	39.0969	-84.5336	45236	39.2067	-84.395	14.27483557
Cincinnati	Bulk Terminals	39.0969	-84.5336	45237	39.1883	-84.4583	9.560303471

Cincinnati	Bulk Terminals	39.0969	-84.5336	45241	39.2767	-84.3933	18.41141945
Cincinnati	Bulk Terminals	39.0969	-84.5336	45242	39.2383	-84.36	18.07539472
Cincinnati	Bulk Terminals	39.0969	-84.5336	45245	39.065	-84.275	21.03501754
Cincinnati	Bulk Terminals	39.0969	-84.5336	45246	39.29	-84.4767	16.25165683
Cincinnati	Bulk Terminals	39.0969	-84.5336	45249	39.275	-84.325	22.14322065
Cincinnati	Bulk Terminals	39.0969	-84.5336	45255	39.075	-84.3267	16.79634553
Cincinnati	Bulk Terminals	39.0969	-84.5336	45263	39.1067	-84.5017	2.694072713
Cincinnati	Valley	39.0981	-84.5364	45201	39.1067	-84.5	3.01947468
Cincinnati	Valley	39.0981	-84.5364	45202	39.1067	-84.5017	2.886083386
Cincinnati	Valley	39.0981	-84.5364	45204	39.1067	-84.56	2.027785904
Cincinnati	Valley	39.0981	-84.5364	45209	39.1517	-84.4267	9.856683388
Cincinnati	Valley	39.0981	-84.5364	45211	39.1517	-84.5983	6.610288544
Cincinnati	Valley	39.0981	-84.5364	45212	39.1633	-84.4533	8.527109833
Cincinnati	Valley	39.0981	-84.5364	45213	39.18	-84.4183	11.60245426
Cincinnati	Valley	39.0981	-84.5364	45214	39.1217	-84.5433	1.98498966
Cincinnati	Valley	39.0981	-84.5364	45215	39.2283	-84.4567	12.32399177
Cincinnati	Valley	39.0981	-84.5364	45216	39.1983	-84.48	9.282545894
Cincinnati	Valley	39.0981	-84.5364	45217	39.1617	-84.4983	5.985229862
Cincinnati	Valley	39.0981	-84.5364	45219	39.1267	-84.5133	2.967933899
Cincinnati	Valley	39.0981	-84.5364	45225	39.1433	-84.5517	3.852377742
Cincinnati	Valley	39.0981	-84.5364	45227	39.155	-84.3883	12.80817006
Cincinnati	Valley	39.0981	-84.5364	45229	39.15	-84.4917	5.529680892
Cincinnati	Valley	39.0981	-84.5364	45231	39.2433	-84.545	11.74253857
Cincinnati	Valley	39.0981	-84.5364	45232	39.1867	-84.5133	7.391787103
Cincinnati	Valley	39.0981	-84.5364	45233	39.115	-84.6667	10.60722772
Cincinnati	Valley	39.0981	-84.5364	45234	39.2767	-84.3933	18.47563329
Cincinnati	Valley	39.0981	-84.5364	45235	39.2767	-84.3933	18.47563329
Cincinnati	Valley	39.0981	-84.5364	45236	39.2067	-84.395	14.39348661
Cincinnati	Valley	39.0981	-84.5364	45237	39.1883	-84.4583	9.632158123
Cincinnati	Valley	39.0981	-84.5364	45241	39.2767	-84.3933	18.47563329
Cincinnati	Valley	39.0981	-84.5364	45242	39.2383	-84.36	18.19078182
Cincinnati	Valley	39.0981	-84.5364	45245	39.065	-84.275	21.27133168
Cincinnati	Valley	39.0981	-84.5364	45246	39.29	-84.4767	16.22446057
Cincinnati	Valley	39.0981	-84.5364	45249	39.275	-84.325	22.25331932
Cincinnati	Valley	39.0981	-84.5364	45255	39.075	-84.3267	17.03148548
Cincinnati	Valley	39.0981	-84.5364	45263	39.1067	-84.5017	2.886083386
Cincinnati	Cohen	39.0617	-84.575	45201	39.1067	-84.5	7.060991197
Cincinnati	Cohen	39.0617	-84.575	45202	39.1067	-84.5017	6.943667035
Cincinnati	Cohen	39.0617	-84.575	45204	39.1067	-84.56	3.829360133
Cincinnati	Cohen	39.0617	-84.575	45209	39.1517	-84.4267	14.00447721
Cincinnati	Cohen	39.0617	-84.575	45211	39.1517	-84.5983	7.505237594
Cincinnati	Cohen	39.0617	-84.575	45212	39.1633	-84.4533	12.79855697
Cincinnati	Cohen	39.0617	-84.575	45213	39.18	-84.4183	15.85060723
Cincinnati	Cohen	39.0617	-84.575	45214	39.1217	-84.5433	5.478284503
Cincinnati	Cohen	39.0617	-84.575	45215	39.2283	-84.4567	16.49550185
Cincinnati	Cohen	39.0617	-84.575	45216	39.1983	-84.48	13.43240461
Cincinnati	Cohen	39.0617	-84.575	45217	39.1617	-84.4983	10.17418702
Cincinnati	Cohen	39.0617	-84.575	45219	39.1267	-84.5133	7.235088178
Cincinnati	Cohen	39.0617	-84.575	45225	39.1433	-84.5517	6.850857393
Cincinnati	Cohen	39.0617	-84.575	45227	39.155	-84.3883	16.84952884
Cincinnati	Cohen	39.0617	-84.575	45229	39.15	-84.4917	9.799897132
Cincinnati	Cohen	39.0617	-84.575	45231	39.2433	-84.545	14.85926828
Cincinnati	Cohen	39.0617	-84.575	45232	39.1867	-84.5133	11.2536259
Cincinnati	Cohen	39.0617	-84.575	45233	39.115	-84.6667	8.562625842
Cincinnati	Cohen	39.0617	-84.575	45234	39.2767	-84.3933	22.72515659
Cincinnati	Cohen	39.0617	-84.575	45235	39.2767	-84.3933	22.72515659
Cincinnati	Cohen	39.0617	-84.575	45236	39.2067	-84.395	18.65981003
Cincinnati	Cohen	39.0617	-84.575	45237	39.1883	-84.4583	13.90020805
Cincinnati	Cohen	39.0617	-84.575	45241	39.2767	-84.3933	22.72515659
Cincinnati	Cohen	39.0617	-84.575	45242	39.2383	-84.36	22.46159888
Cincinnati	Cohen	39.0617	-84.575	45245	39.065	-84.275	24.22046521
Cincinnati	Cohen	39.0617	-84.575	45246	39.29	-84.4767	20.06652591
Cincinnati	Cohen	39.0617	-84.575	45249	39.275	-84.325	26.53020325
Cincinnati	Cohen	39.0617	-84.575	45255	39.075	-84.3267	20.0739946
Cincinnati	Cohen	39.0617	-84.575	45263	39.1067	-84.5017	6.943667035
Cincinnati	Kosmos Cement	39.0825	-84.5736	45201	39.1067	-84.5	6.25467365
Cincinnati	Kosmos Cement	39.0825	-84.5736	45202	39.1067	-84.5017	6.124449377
Cincinnati	Kosmos Cement	39.0825	-84.5736	45204	39.1067	-84.56	2.241039208
Cincinnati	Kosmos Cement	39.0825	-84.5736	45209	39.1517	-84.4267	13.1091824
Cincinnati	Kosmos Cement	39.0825	-84.5736	45211	39.1517	-84.5983	5.931721558

Cincinnati	Kosmos Cement	39.0825	-84.5736	45212	39.1633	-84.4533	11.69909178
Cincinnati	Kosmos Cement	39.0825	-84.5736	45213	39.18	-84.4183	14.80341235
Cincinnati	Kosmos Cement	39.0825	-84.5736	45214	39.1217	-84.5433	3.999786568
Cincinnati	Kosmos Cement	39.0825	-84.5736	45215	39.2283	-84.4567	15.08663137
Cincinnati	Kosmos Cement	39.0825	-84.5736	45216	39.1983	-84.48	12.02053164
Cincinnati	Kosmos Cement	39.0825	-84.5736	45217	39.1617	-84.4983	8.822400305
Cincinnati	Kosmos Cement	39.0825	-84.5736	45219	39.1267	-84.5133	6.035737837
Cincinnati	Kosmos Cement	39.0825	-84.5736	45225	39.1433	-84.5517	5.217088414
Cincinnati	Kosmos Cement	39.0825	-84.5736	45227	39.155	-84.3883	16.06351332
Cincinnati	Kosmos Cement	39.0825	-84.5736	45229	39.15	-84.4917	8.567982572
Cincinnati	Kosmos Cement	39.0825	-84.5736	45231	39.2433	-84.545	13.18511464
Cincinnati	Kosmos Cement	39.0825	-84.5736	45232	39.1867	-84.5133	9.71907729
Cincinnati	Kosmos Cement	39.0825	-84.5736	45233	39.115	-84.6667	7.960755787
Cincinnati	Kosmos Cement	39.0825	-84.5736	45234	39.2767	-84.3933	21.39295191
Cincinnati	Kosmos Cement	39.0825	-84.5736	45235	39.2767	-84.3933	21.39295191
Cincinnati	Kosmos Cement	39.0825	-84.5736	45236	39.2067	-84.395	17.56199463
Cincinnati	Kosmos Cement	39.0825	-84.5736	45237	39.1883	-84.4583	12.63307913
Cincinnati	Kosmos Cement	39.0825	-84.5736	45241	39.2767	-84.3933	21.39295191
Cincinnati	Kosmos Cement	39.0825	-84.5736	45242	39.2383	-84.36	21.3436746
Cincinnati	Kosmos Cement	39.0825	-84.5736	45245	39.065	-84.275	24.14734165
Cincinnati	Kosmos Cement	39.0825	-84.5736	45246	39.29	-84.4767	18.48802663
Cincinnati	Kosmos Cement	39.0825	-84.5736	45249	39.275	-84.325	25.38290497
Cincinnati	Kosmos Cement	39.0825	-84.5736	45255	39.075	-84.3267	19.94143104
Cincinnati	Kosmos Cement	39.0825	-84.5736	45263	39.1067	-84.5017	6.124449377
Cincinnati	Valvoline	39.075	-84.5856	45201	39.1067	-84.5	7.369127971
Cincinnati	Valvoline	39.075	-84.5856	45202	39.1067	-84.5017	7.240585445
Cincinnati	Valvoline	39.075	-84.5856	45204	39.1067	-84.56	3.289437938
Cincinnati	Valvoline	39.075	-84.5856	45209	39.1517	-84.4267	14.24423601
Cincinnati	Valvoline	39.075	-84.5856	45211	39.1517	-84.5983	6.276299321
Cincinnati	Valvoline	39.075	-84.5856	45212	39.1633	-84.4533	12.84093826
Cincinnati	Valvoline	39.075	-84.5856	45213	39.18	-84.4183	15.94581813
Cincinnati	Valvoline	39.075	-84.5856	45214	39.1217	-84.5433	5.086745987
Cincinnati	Valvoline	39.075	-84.5856	45215	39.2283	-84.4567	16.1694149
Cincinnati	Valvoline	39.075	-84.5856	45216	39.1983	-84.48	13.10570183
Cincinnati	Valvoline	39.075	-84.5856	45217	39.1617	-84.4983	9.93280215
Cincinnati	Valvoline	39.075	-84.5856	45219	39.1267	-84.5133	7.175521098
Cincinnati	Valvoline	39.075	-84.5856	45225	39.1433	-84.5517	6.155682352
Cincinnati	Valvoline	39.075	-84.5856	45227	39.155	-84.3883	17.18758384
Cincinnati	Valvoline	39.075	-84.5856	45229	39.15	-84.4917	9.701787999
Cincinnati	Valvoline	39.075	-84.5856	45231	39.2433	-84.545	13.97661076
Cincinnati	Valvoline	39.075	-84.5856	45232	39.1867	-84.5133	10.74169608
Cincinnati	Valvoline	39.075	-84.5856	45233	39.115	-84.6667	7.300246555
Cincinnati	Valvoline	39.075	-84.5856	45234	39.2767	-84.3933	22.49778391
Cincinnati	Valvoline	39.075	-84.5856	45235	39.2767	-84.3933	22.49778391
Cincinnati	Valvoline	39.075	-84.5856	45236	39.2067	-84.395	18.70311306
Cincinnati	Valvoline	39.075	-84.5856	45237	39.1883	-84.4583	13.75781797
Cincinnati	Valvoline	39.075	-84.5856	45241	39.2767	-84.3933	22.49778391
Cincinnati	Valvoline	39.075	-84.5856	45242	39.2383	-84.36	22.483305
Cincinnati	Valvoline	39.075	-84.5856	45245	39.065	-84.275	25.08773045
Cincinnati	Valvoline	39.075	-84.5856	45246	39.29	-84.4767	19.45646763
Cincinnati	Valvoline	39.075	-84.5856	45249	39.275	-84.325	26.51981852
Cincinnati	Valvoline	39.075	-84.5856	45255	39.075	-84.3267	20.900997
Cincinnati	Valvoline	39.075	-84.5856	45263	39.1067	-84.5017	7.240585445
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45201	39.1067	-84.5	9.204806137
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45202	39.1067	-84.5017	9.073452251
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45204	39.1067	-84.56	4.773648933
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45209	39.1517	-84.4267	16.016126
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45211	39.1517	-84.5983	6.342136674
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45212	39.1633	-84.4533	14.50832205
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45213	39.18	-84.4183	17.63170184
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45214	39.1217	-84.5433	6.572259991
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45215	39.2283	-84.4567	17.51963951
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45216	39.1983	-84.48	14.47928053
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45217	39.1617	-84.4983	11.41912937
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45219	39.1267	-84.5133	8.83787043
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45225	39.1433	-84.5517	7.275833518
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45227	39.155	-84.3883	18.99712932
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45229	39.15	-84.4917	11.30146764
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45231	39.2433	-84.545	14.62483611
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45232	39.1867	-84.5133	11.9525802

Computation of Average Dray Cost

Cincinnati	Ashland Petroleum	39.0739	-84.6092	45233	39.115	-84.6667	5.705880809
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45234	39.2767	-84.3933	23.91307226
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45235	39.2767	-84.3933	23.91307226
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45236	39.2067	-84.395	20.34611909
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45237	39.1883	-84.4583	15.28723752
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45241	39.2767	-84.3933	23.91307226
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45242	39.2383	-84.36	24.10138682
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45245	39.065	-84.275	26.98953136
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45246	39.29	-84.4767	20.46397379
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45249	39.275	-84.325	28.10643095
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45255	39.075	-84.3267	22.80639789
Cincinnati	Ashland Petroleum	39.0739	-84.6092	45263	39.1067	-84.5017	9.073452251
Cincinnati	Indiana grain	39.0619	-84.6375	45201	39.1067	-84.5	11.67471083
Cincinnati	Indiana grain	39.0619	-84.6375	45202	39.1067	-84.5017	11.54429967
Cincinnati	Indiana grain	39.0619	-84.6375	45204	39.1067	-84.56	7.226705927
Cincinnati	Indiana grain	39.0619	-84.6375	45209	39.1517	-84.4267	18.49768659
Cincinnati	Indiana grain	39.0619	-84.6375	45211	39.1517	-84.5983	7.910172414
Cincinnati	Indiana grain	39.0619	-84.6375	45212	39.1633	-84.4533	16.97473756
Cincinnati	Indiana grain	39.0619	-84.6375	45213	39.18	-84.4183	20.10099997
Cincinnati	Indiana grain	39.0619	-84.6375	45214	39.1217	-84.5433	9.007702763
Cincinnati	Indiana grain	39.0619	-84.6375	45215	39.2283	-84.4567	19.83685759
Cincinnati	Indiana grain	39.0619	-84.6375	45216	39.1983	-84.48	16.82038368
Cincinnati	Indiana grain	39.0619	-84.6375	45217	39.1617	-84.4983	13.82739707
Cincinnati	Indiana grain	39.0619	-84.6375	45219	39.1267	-84.5133	11.30931353
Cincinnati	Indiana grain	39.0619	-84.6375	45225	39.1433	-84.5517	9.547871264
Cincinnati	Indiana grain	39.0619	-84.6375	45227	39.155	-84.3883	21.47603883
Cincinnati	Indiana grain	39.0619	-84.6375	45229	39.15	-84.4917	13.75238571
Cincinnati	Indiana grain	39.0619	-84.6375	45231	39.2433	-84.545	16.43846177
Cincinnati	Indiana grain	39.0619	-84.6375	45232	39.1867	-84.5133	14.21413915
Cincinnati	Indiana grain	39.0619	-84.6375	45233	39.115	-84.6667	4.89216473
Cincinnati	Indiana grain	39.0619	-84.6375	45234	39.2767	-84.3933	26.25558545
Cincinnati	Indiana grain	39.0619	-84.6375	45235	39.2767	-84.3933	26.25558545
Cincinnati	Indiana grain	39.0619	-84.6375	45236	39.2067	-84.395	22.80151503
Cincinnati	Indiana grain	39.0619	-84.6375	45237	39.1883	-84.4583	17.70355705
Cincinnati	Indiana grain	39.0619	-84.6375	45241	39.2767	-84.3933	26.25558545
Cincinnati	Indiana grain	39.0619	-84.6375	45242	39.2383	-84.36	26.54571441
Cincinnati	Indiana grain	39.0619	-84.6375	45245	39.065	-84.275	29.26569507
Cincinnati	Indiana grain	39.0619	-84.6375	45246	39.29	-84.4767	22.5302157
Cincinnati	Indiana grain	39.0619	-84.6375	45249	39.275	-84.325	30.53556731
Cincinnati	Indiana grain	39.0619	-84.6375	45255	39.075	-84.3267	25.11316188
Cincinnati	Indiana grain	39.0619	-84.6375	45263	39.1067	-84.5017	11.54429967
Cincinnati	Shell Oil	39.0867	-84.6444	45201	39.1067	-84.5	11.76869524
Cincinnati	Shell Oil	39.0867	-84.6444	45202	39.1067	-84.5017	11.63276721
Cincinnati	Shell Oil	39.0867	-84.6444	45204	39.1067	-84.56	7.002302596
Cincinnati	Shell Oil	39.0867	-84.6444	45209	39.1517	-84.4267	18.34158062
Cincinnati	Shell Oil	39.0867	-84.6444	45211	39.1517	-84.5983	6.433228781
Cincinnati	Shell Oil	39.0867	-84.6444	45212	39.1633	-84.4533	16.62073075
Cincinnati	Shell Oil	39.0867	-84.6444	45213	39.18	-84.4183	19.74605302
Cincinnati	Shell Oil	39.0867	-84.6444	45214	39.1217	-84.5433	8.637057428
Cincinnati	Shell Oil	39.0867	-84.6444	45215	39.2283	-84.4567	18.98131238
Cincinnati	Shell Oil	39.0867	-84.6444	45216	39.1983	-84.48	16.04109772
Cincinnati	Shell Oil	39.0867	-84.6444	45217	39.1617	-84.4983	13.25797258
Cincinnati	Shell Oil	39.0867	-84.6444	45219	39.1267	-84.5133	11.065374
Cincinnati	Shell Oil	39.0867	-84.6444	45225	39.1433	-84.5517	8.768352104
Cincinnati	Shell Oil	39.0867	-84.6444	45227	39.155	-84.3883	21.39757749
Cincinnati	Shell Oil	39.0867	-84.6444	45229	39.15	-84.4917	13.34469098
Cincinnati	Shell Oil	39.0867	-84.6444	45231	39.2433	-84.545	14.97403752
Cincinnati	Shell Oil	39.0867	-84.6444	45232	39.1867	-84.5133	13.31120198
Cincinnati	Shell Oil	39.0867	-84.6444	45233	39.115	-84.6667	2.908723298
Cincinnati	Shell Oil	39.0867	-84.6444	45234	39.2767	-84.3933	25.42049258
Cincinnati	Shell Oil	39.0867	-84.6444	45235	39.2767	-84.3933	25.42049258
Cincinnati	Shell Oil	39.0867	-84.6444	45236	39.2067	-84.395	22.34345646
Cincinnati	Shell Oil	39.0867	-84.6444	45237	39.1883	-84.4583	17.11700087
Cincinnati	Shell Oil	39.0867	-84.6444	45241	39.2767	-84.3933	25.42049258
Cincinnati	Shell Oil	39.0867	-84.6444	45242	39.2383	-84.36	26.01785498
Cincinnati	Shell Oil	39.0867	-84.6444	45245	39.065	-84.275	29.87307268
Cincinnati	Shell Oil	39.0867	-84.6444	45246	39.29	-84.4767	21.27571414
Cincinnati	Shell Oil	39.0867	-84.6444	45249	39.275	-84.325	29.93257315
Cincinnati	Shell Oil	39.0867	-84.6444	45255	39.075	-84.3267	25.6653075
Cincinnati	Shell Oil	39.0867	-84.6444	45263	39.1067	-84.5017	11.63276721

Computation of Average Dray Cost

Houston	Brown and Root	29.7652	-95.1795	77001	29.76	-95.3583	14.44062713
Houston	Brown and Root	29.7652	-95.1795	77003	29.7483	-95.3383	12.89231813
Houston	Brown and Root	29.7652	-95.1795	77007	29.7733	-95.4033	18.07920367
Houston	Brown and Root	29.7652	-95.1795	77008	29.7983	-95.4117	18.93500595
Houston	Brown and Root	29.7652	-95.1795	77009	29.7933	-95.3667	15.28196724
Houston	Brown and Root	29.7652	-95.1795	77010	29.7533	-95.3583	14.46645785
Houston	Brown and Root	29.7652	-95.1795	77011	29.7417	-95.3067	10.4426338
Houston	Brown and Root	29.7652	-95.1795	77012	29.715	-95.2817	9.192194459
Houston	Brown and Root	29.7652	-95.1795	77013	29.785	-95.2283	4.25155177
Houston	Brown and Root	29.7652	-95.1795	77015	29.785	-95.185	1.658976947
Houston	Brown and Root	29.7652	-95.1795	77016	29.8567	-95.3033	12.42788204
Houston	Brown and Root	29.7652	-95.1795	77017	29.6867	-95.255	8.792716391
Houston	Brown and Root	29.7652	-95.1795	77018	29.8267	-95.425	20.43162905
Houston	Brown and Root	29.7652	-95.1795	77020	29.775	-95.3117	10.70178999
Houston	Brown and Root	29.7652	-95.1795	77021	29.695	-95.3567	15.38703635
Houston	Brown and Root	29.7652	-95.1795	77022	29.8283	-95.3783	16.83816674
Houston	Brown and Root	29.7652	-95.1795	77023	29.725	-95.3167	11.54181539
Houston	Brown and Root	29.7652	-95.1795	77024	29.7683	-95.52	27.48970421
Houston	Brown and Root	29.7652	-95.1795	77025	29.69	-95.435	21.50136971
Houston	Brown and Root	29.7652	-95.1795	77026	29.7983	-95.3283	12.30624193
Houston	Brown and Root	29.7652	-95.1795	77027	29.74	-95.4467	21.66677696
Houston	Brown and Root	29.7652	-95.1795	77028	29.8317	-95.2883	10.29416401
Houston	Brown and Root	29.7652	-95.1795	77029	29.7583	-95.255	6.12051608
Houston	Brown and Root	29.7652	-95.1795	77030	29.705	-95.4067	18.97479266
Houston	Brown and Root	29.7652	-95.1795	77031	29.6583	-95.5417	30.4873561
Houston	Brown and Root	29.7652	-95.1795	77032	29.9367	-95.3283	18.33009983
Houston	Brown and Root	29.7652	-95.1795	77033	29.6683	-95.3383	15.01817784
Houston	Brown and Root	29.7652	-95.1795	77034	29.6383	-95.2233	10.83769807
Houston	Brown and Root	29.7652	-95.1795	77036	29.6983	-95.54	29.60005495
Houston	Brown and Root	29.7652	-95.1795	77037	29.8883	-95.3983	20.26741884
Houston	Brown and Root	29.7652	-95.1795	77038	29.9183	-95.4383	24.27504922
Houston	Brown and Root	29.7652	-95.1795	77040	29.875	-95.52	28.88242427
Houston	Brown and Root	29.7652	-95.1795	77041	29.865	-95.5783	33.18793313
Houston	Brown and Root	29.7652	-95.1795	77042	29.7417	-95.56	30.77629418
Houston	Brown and Root	29.7652	-95.1795	77043	29.8067	-95.5617	31.0363637
Houston	Brown and Root	29.7652	-95.1795	77044	29.86	-95.1983	7.802244395
Houston	Brown and Root	29.7652	-95.1795	77045	29.63	-95.4383	23.57212044
Houston	Brown and Root	29.7652	-95.1795	77049	29.8167	-95.1883	4.217854721
Houston	Brown and Root	29.7652	-95.1795	77051	29.6567	-95.3683	17.57944456
Houston	Brown and Root	29.7652	-95.1795	77052	29.76	-95.3583	14.44062713
Houston	Brown and Root	29.7652	-95.1795	77054	29.6833	-95.4017	19.11792253
Houston	Brown and Root	29.7652	-95.1795	77055	29.7983	-95.4967	25.74659938
Houston	Brown and Root	29.7652	-95.1795	77060	29.9333	-95.3983	22.27490509
Houston	Brown and Root	29.7652	-95.1795	77061	29.6667	-95.2783	11.26283034
Houston	Brown and Root	29.7652	-95.1795	77063	29.7333	-95.5217	27.74558091
Houston	Brown and Root	29.7652	-95.1795	77065	29.93	-95.605	36.83706362
Houston	Brown and Root	29.7652	-95.1795	77066	29.9617	-95.495	30.00642987
Houston	Brown and Root	29.7652	-95.1795	77070	29.9783	-95.5817	36.74558332
Houston	Brown and Root	29.7652	-95.1795	77073	30.0183	-95.4117	27.72889827
Houston	Brown and Root	29.7652	-95.1795	77074	29.69	-95.5117	27.49705516
Houston	Brown and Root	29.7652	-95.1795	77075	29.62	-95.26	13.40295254
Houston	Brown and Root	29.7652	-95.1795	77076	29.8567	-95.3833	18.0349248
Houston	Brown and Root	29.7652	-95.1795	77078	29.85	-95.26	9.439298073
Houston	Brown and Root	29.7652	-95.1795	77079	29.775	-95.6	33.9561829
Houston	Brown and Root	29.7652	-95.1795	77080	29.8183	-95.5233	28.08406877
Houston	Brown and Root	29.7652	-95.1795	77081	29.7117	-95.4833	24.903169
Houston	Brown and Root	29.7652	-95.1795	77084	29.8433	-95.66	39.29983
Houston	Brown and Root	29.7652	-95.1795	77087	29.6867	-95.3017	11.72534537
Houston	Brown and Root	29.7652	-95.1795	77090	30.0183	-95.4433	29.51341844
Houston	Brown and Root	29.7652	-95.1795	77091	29.8567	-95.445	22.67097629
Houston	Brown and Root	29.7652	-95.1795	77094	29.7733	-95.71	42.83225688
Houston	Brown and Root	29.7652	-95.1795	77095	29.8933	-95.65	39.36610858
Houston	Brown and Root	29.7652	-95.1795	77201	29.76	-95.3583	14.44062713
Houston	Brown and Root	29.7652	-95.1795	77221	29.6967	-95.3583	15.45756897
Houston	Brown and Root	29.7652	-95.1795	77224	29.7683	-95.52	27.48970421
Houston	Brown and Root	29.7652	-95.1795	77226	29.8	-95.3283	12.33676968
Houston	Brown and Root	29.7652	-95.1795	77234	29.6383	-95.2233	10.83769807
Houston	Brown and Root	29.7652	-95.1795	77255	29.795	-95.49	25.18184557
Houston	Brown and Root	29.7652	-95.1795	77270	29.7983	-95.4167	19.33470017
Houston	Brown and Root	29.7652	-95.1795	77280	29.86	-95.58	33.22579356

Houston	Brown and Root	29.7652	-95.1795	77287	29.6783	-95.245	8.785063675
Houston	BTL	29.7659	-95.1879	77001	29.76	-95.3583	13.76463546
Houston	BTL	29.7659	-95.1879	77003	29.7483	-95.3383	12.22464404
Houston	BTL	29.7659	-95.1879	77007	29.7733	-95.4033	17.39950075
Houston	BTL	29.7659	-95.1879	77008	29.7983	-95.4117	18.25572893
Houston	BTL	29.7659	-95.1879	77009	29.7933	-95.3667	14.60302831
Houston	BTL	29.7659	-95.1879	77010	29.7533	-95.3583	13.79394841
Houston	BTL	29.7659	-95.1879	77011	29.7417	-95.3067	9.787686023
Houston	BTL	29.7659	-95.1879	77012	29.715	-95.2817	8.615540246
Houston	BTL	29.7659	-95.1879	77013	29.785	-95.2283	3.607619476
Houston	BTL	29.7659	-95.1879	77015	29.785	-95.185	1.559615012
Houston	BTL	29.7659	-95.1879	77016	29.8567	-95.3033	11.85434218
Houston	BTL	29.7659	-95.1879	77017	29.6867	-95.255	8.380011209
Houston	BTL	29.7659	-95.1879	77018	29.8267	-95.425	19.76039706
Houston	BTL	29.7659	-95.1879	77020	29.775	-95.3117	10.02133783
Houston	BTL	29.7659	-95.1879	77021	29.695	-95.3567	14.78048132
Houston	BTL	29.7659	-95.1879	77022	29.8283	-95.3783	16.17542349
Houston	BTL	29.7659	-95.1879	77023	29.725	-95.3167	10.90968206
Houston	BTL	29.7659	-95.1879	77024	29.7683	-95.52	26.81113309
Houston	BTL	29.7659	-95.1879	77025	29.69	-95.435	20.86823186
Houston	BTL	29.7659	-95.1879	77026	29.7983	-95.3283	11.63238343
Houston	BTL	29.7659	-95.1879	77027	29.74	-95.4467	20.99728948
Houston	BTL	29.7659	-95.1879	77028	29.8317	-95.2883	9.690895914
Houston	BTL	29.7659	-95.1879	77029	29.7583	-95.255	5.451618656
Houston	BTL	29.7659	-95.1879	77030	29.705	-95.4067	18.33517644
Houston	BTL	29.7659	-95.1879	77031	29.6583	-95.5417	29.85397146
Houston	BTL	29.7659	-95.1879	77032	29.9367	-95.3283	17.84932815
Houston	BTL	29.7659	-95.1879	77033	29.6683	-95.3383	14.47431042
Houston	BTL	29.7659	-95.1879	77034	29.6383	-95.2233	10.69022502
Houston	BTL	29.7659	-95.1879	77036	29.6983	-95.54	28.94417296
Houston	BTL	29.7659	-95.1879	77037	29.8883	-95.3983	19.6507367
Houston	BTL	29.7659	-95.1879	77038	29.9183	-95.4383	23.66448447
Houston	BTL	29.7659	-95.1879	77040	29.875	-95.52	28.22009732
Houston	BTL	29.7659	-95.1879	77041	29.865	-95.5783	32.51655383
Houston	BTL	29.7659	-95.1879	77042	29.7417	-95.56	30.10309555
Houston	BTL	29.7659	-95.1879	77043	29.8067	-95.5617	30.35609885
Houston	BTL	29.7659	-95.1879	77044	29.86	-95.1983	7.642948336
Houston	BTL	29.7659	-95.1879	77045	29.63	-95.4383	23.00011301
Houston	BTL	29.7659	-95.1879	77049	29.8167	-95.1883	4.101211132
Houston	BTL	29.7659	-95.1879	77051	29.6567	-95.3683	17.02404104
Houston	BTL	29.7659	-95.1879	77052	29.76	-95.3583	13.76463546
Houston	BTL	29.7659	-95.1879	77054	29.6833	-95.4017	18.50341462
Houston	BTL	29.7659	-95.1879	77055	29.7983	-95.4967	25.0662685
Houston	BTL	29.7659	-95.1879	77060	29.9333	-95.3983	21.70585154
Houston	BTL	29.7659	-95.1879	77061	29.6667	-95.2783	10.83491643
Houston	BTL	29.7659	-95.1879	77063	29.7333	-95.5217	27.07588401
Houston	BTL	29.7659	-95.1879	77065	29.93	-95.605	36.18480525
Houston	BTL	29.7659	-95.1879	77066	29.9617	-95.495	29.40257642
Houston	BTL	29.7659	-95.1879	77070	29.9783	-95.5817	36.12089716
Houston	BTL	29.7659	-95.1879	77073	30.0183	-95.4117	27.2327312
Houston	BTL	29.7659	-95.1879	77074	29.69	-95.5117	26.84891561
Houston	BTL	29.7659	-95.1879	77075	29.62	-95.26	13.1382265
Houston	BTL	29.7659	-95.1879	77076	29.8567	-95.3833	17.39460818
Houston	BTL	29.7659	-95.1879	77078	29.85	-95.26	8.942909249
Houston	BTL	29.7659	-95.1879	77079	29.775	-95.6	33.27694321
Houston	BTL	29.7659	-95.1879	77080	29.8183	-95.5233	27.40529884
Houston	BTL	29.7659	-95.1879	77081	29.7117	-95.4833	24.24573379
Houston	BTL	29.7659	-95.1879	77084	29.8433	-95.66	38.62145222
Houston	BTL	29.7659	-95.1879	77087	29.6867	-95.3017	11.19299833
Houston	BTL	29.7659	-95.1879	77090	30.0183	-95.4433	28.98813199
Houston	BTL	29.7659	-95.1879	77091	29.8567	-95.445	22.01207488
Houston	BTL	29.7659	-95.1879	77094	29.7733	-95.71	42.15336643
Houston	BTL	29.7659	-95.1879	77095	29.8933	-95.65	38.69714636
Houston	BTL	29.7659	-95.1879	77201	29.76	-95.3583	13.76463546
Houston	BTL	29.7659	-95.1879	77221	29.6967	-95.3583	14.84747392
Houston	BTL	29.7659	-95.1879	77224	29.7683	-95.52	26.81113309
Houston	BTL	29.7659	-95.1879	77226	29.8	-95.3283	11.66400998
Houston	BTL	29.7659	-95.1879	77234	29.6383	-95.2233	10.69022502
Houston	BTL	29.7659	-95.1879	77255	29.795	-95.49	24.50141801
Houston	BTL	29.7659	-95.1879	77270	29.7983	-95.4167	18.65530388

Computation of Average Dray Cost

Houston	BTL	29.7659	-95.1879	77280	29.86	-95.58	32.5530369
Houston	BTL	29.7659	-95.1879	77287	29.6783	-95.245	8.441660137
Houston	Green's Bayou	29.7235	-95.1652	77001	29.76	-95.3583	15.86500817
Houston	Green's Bayou	29.7235	-95.1652	77003	29.7483	-95.3383	14.11705499
Houston	Green's Bayou	29.7235	-95.1652	77007	29.7733	-95.4033	19.63775296
Houston	Green's Bayou	29.7235	-95.1652	77008	29.7983	-95.4117	20.79597435
Houston	Green's Bayou	29.7235	-95.1652	77009	29.7933	-95.3667	17.21543163
Houston	Green's Bayou	29.7235	-95.1652	77010	29.7533	-95.3583	15.77350372
Houston	Green's Bayou	29.7235	-95.1652	77011	29.7417	-95.3067	11.51739858
Houston	Green's Bayou	29.7235	-95.1652	77012	29.715	-95.2817	9.430045003
Houston	Green's Bayou	29.7235	-95.1652	77013	29.785	-95.2283	7.113343813
Houston	Green's Bayou	29.7235	-95.1652	77015	29.785	-95.185	5.215864027
Houston	Green's Bayou	29.7235	-95.1652	77016	29.8567	-95.3033	15.48961316
Houston	Green's Bayou	29.7235	-95.1652	77017	29.6867	-95.255	7.834670772
Houston	Green's Bayou	29.7235	-95.1652	77018	29.8267	-95.425	22.5677939
Houston	Green's Bayou	29.7235	-95.1652	77020	29.775	-95.3117	12.53643587
Houston	Green's Bayou	29.7235	-95.1652	77021	29.695	-95.3567	15.63006606
Houston	Green's Bayou	29.7235	-95.1652	77022	29.8283	-95.3783	19.17140339
Houston	Green's Bayou	29.7235	-95.1652	77023	29.725	-95.3167	12.23119447
Houston	Green's Bayou	29.7235	-95.1652	77024	29.7683	-95.52	28.87043862
Houston	Green's Bayou	29.7235	-95.1652	77025	29.69	-95.435	21.94821255
Houston	Green's Bayou	29.7235	-95.1652	77026	29.7983	-95.3283	14.48572699
Houston	Green's Bayou	29.7235	-95.1652	77027	29.74	-95.4467	22.76450015
Houston	Green's Bayou	29.7235	-95.1652	77028	29.8317	-95.2883	13.23106577
Houston	Green's Bayou	29.7235	-95.1652	77029	29.7583	-95.255	7.774881609
Houston	Green's Bayou	29.7235	-95.1652	77030	29.705	-95.4067	19.55341597
Houston	Green's Bayou	29.7235	-95.1652	77031	29.6583	-95.5417	30.84723724
Houston	Green's Bayou	29.7235	-95.1652	77032	29.9367	-95.3283	21.67053211
Houston	Green's Bayou	29.7235	-95.1652	77033	29.6683	-95.3383	14.66769905
Houston	Green's Bayou	29.7235	-95.1652	77034	29.6383	-95.2233	8.325235992
Houston	Green's Bayou	29.7235	-95.1652	77036	29.6983	-95.54	30.32591906
Houston	Green's Bayou	29.7235	-95.1652	77037	29.8883	-95.3983	23.04620931
Houston	Green's Bayou	29.7235	-95.1652	77038	29.9183	-95.4383	27.0813535
Houston	Green's Bayou	29.7235	-95.1652	77040	29.875	-95.52	31.14496961
Houston	Green's Bayou	29.7235	-95.1652	77041	29.865	-95.5783	35.25173784
Houston	Green's Bayou	29.7235	-95.1652	77042	29.7417	-95.56	31.90605255
Houston	Green's Bayou	29.7235	-95.1652	77043	29.8067	-95.5617	32.70656068
Houston	Green's Bayou	29.7235	-95.1652	77044	29.86	-95.1983	11.33900485
Houston	Green's Bayou	29.7235	-95.1652	77045	29.63	-95.4383	23.30369861
Houston	Green's Bayou	29.7235	-95.1652	77049	29.8167	-95.1883	7.751698636
Houston	Green's Bayou	29.7235	-95.1652	77051	29.6567	-95.3683	17.2603402
Houston	Green's Bayou	29.7235	-95.1652	77052	29.76	-95.3583	15.86500817
Houston	Green's Bayou	29.7235	-95.1652	77054	29.6833	-95.4017	19.36650107
Houston	Green's Bayou	29.7235	-95.1652	77055	29.7983	-95.4967	27.43481574
Houston	Green's Bayou	29.7235	-95.1652	77060	29.9333	-95.3983	25.31778909
Houston	Green's Bayou	29.7235	-95.1652	77061	29.6667	-95.2783	10.21732161
Houston	Green's Bayou	29.7235	-95.1652	77063	29.7333	-95.5217	28.79111715
Houston	Green's Bayou	29.7235	-95.1652	77065	29.93	-95.605	39.22400538
Houston	Green's Bayou	29.7235	-95.1652	77066	29.9617	-95.495	32.84305164
Houston	Green's Bayou	29.7235	-95.1652	77070	29.9783	-95.5817	39.41702001
Houston	Green's Bayou	29.7235	-95.1652	77073	30.0183	-95.4117	31.02273234
Houston	Green's Bayou	29.7235	-95.1652	77074	29.69	-95.5117	28.10337575
Houston	Green's Bayou	29.7235	-95.1652	77075	29.62	-95.26	11.33079127
Houston	Green's Bayou	29.7235	-95.1652	77076	29.8567	-95.3833	20.63119081
Houston	Green's Bayou	29.7235	-95.1652	77078	29.85	-95.26	12.76179932
Houston	Green's Bayou	29.7235	-95.1652	77079	29.775	-95.6	35.34677013
Houston	Green's Bayou	29.7235	-95.1652	77080	29.8183	-95.5233	29.90527866
Houston	Green's Bayou	29.7235	-95.1652	77081	29.7117	-95.4833	25.69787565
Houston	Green's Bayou	29.7235	-95.1652	77084	29.8433	-95.66	41.09934726
Houston	Green's Bayou	29.7235	-95.1652	77087	29.6867	-95.3017	11.41308936
Houston	Green's Bayou	29.7235	-95.1652	77090	30.0183	-95.4433	32.71773366
Houston	Green's Bayou	29.7235	-95.1652	77091	29.8567	-95.445	25.01722013
Houston	Green's Bayou	29.7235	-95.1652	77094	29.7733	-95.71	44.16507141
Houston	Green's Bayou	29.7235	-95.1652	77095	29.8933	-95.65	41.46906718
Houston	Green's Bayou	29.7235	-95.1652	77201	29.76	-95.3583	15.86500817
Houston	Green's Bayou	29.7235	-95.1652	77221	29.6967	-95.3583	15.73838545
Houston	Green's Bayou	29.7235	-95.1652	77224	29.7683	-95.52	28.87043862
Houston	Green's Bayou	29.7235	-95.1652	77226	29.8	-95.3283	14.54347309
Houston	Green's Bayou	29.7235	-95.1652	77234	29.6383	-95.2233	8.325235992
Houston	Green's Bayou	29.7235	-95.1652	77255	29.795	-95.49	26.84892046

Houston	Green's Bayou	29.7235	-95.1652	77270	29.7983	-95.4167	21.1825567
Houston	Green's Bayou	29.7235	-95.1652	77280	29.86	-95.58	35.25334903
Houston	Green's Bayou	29.7235	-95.1652	77287	29.6783	-95.245	7.403904943
Houston	Platzer	29.7548	-95.1767	77001	29.76	-95.3583	14.66657706
Houston	Platzer	29.7548	-95.1767	77003	29.7483	-95.3383	13.05651708
Houston	Platzer	29.7548	-95.1767	77007	29.7733	-95.4033	18.35428286
Houston	Platzer	29.7548	-95.1767	77008	29.7983	-95.4117	19.29383665
Houston	Platzer	29.7548	-95.1767	77009	29.7933	-95.3667	15.6504324
Houston	Platzer	29.7548	-95.1767	77010	29.7533	-95.3583	14.66106811
Houston	Platzer	29.7548	-95.1767	77011	29.7417	-95.3067	10.54805032
Houston	Platzer	29.7548	-95.1767	77012	29.715	-95.2817	9.065170226
Houston	Platzer	29.7548	-95.1767	77013	29.785	-95.2283	4.826681902
Houston	Platzer	29.7548	-95.1767	77015	29.785	-95.185	2.528447619
Houston	Platzer	29.7548	-95.1767	77016	29.8567	-95.3033	13.11984707
Houston	Platzer	29.7548	-95.1767	77017	29.6867	-95.255	8.377463777
Houston	Platzer	29.7548	-95.1767	77018	29.8267	-95.425	20.86874404
Houston	Platzer	29.7548	-95.1767	77020	29.775	-95.3117	11.01987861
Houston	Platzer	29.7548	-95.1767	77021	29.695	-95.3567	15.31234238
Houston	Platzer	29.7548	-95.1767	77022	29.8283	-95.3783	17.32308734
Houston	Platzer	29.7548	-95.1767	77023	29.725	-95.3167	11.55540467
Houston	Platzer	29.7548	-95.1767	77024	29.7683	-95.52	27.73602956
Houston	Platzer	29.7548	-95.1767	77025	29.69	-95.435	21.49873853
Houston	Platzer	29.7548	-95.1767	77026	29.7983	-95.3283	12.73253382
Houston	Platzer	29.7548	-95.1767	77027	29.74	-95.4467	21.82982192
Houston	Platzer	29.7548	-95.1767	77028	29.8317	-95.2883	10.94127409
Houston	Platzer	29.7548	-95.1767	77029	29.7583	-95.255	6.327470935
Houston	Platzer	29.7548	-95.1767	77030	29.705	-95.4067	18.99816193
Houston	Platzer	29.7548	-95.1767	77031	29.6583	-95.5417	30.47888956
Houston	Platzer	29.7548	-95.1767	77032	29.9367	-95.3283	19.11617021
Houston	Platzer	29.7548	-95.1767	77033	29.6683	-95.3383	14.79735095
Houston	Platzer	29.7548	-95.1767	77034	29.6383	-95.2233	10.12954347
Houston	Platzer	29.7548	-95.1767	77036	29.6983	-95.54	29.68176977
Houston	Platzer	29.7548	-95.1767	77037	29.8883	-95.3983	20.88533781
Houston	Platzer	29.7548	-95.1767	77038	29.9183	-95.4383	24.90449321
Houston	Platzer	29.7548	-95.1767	77040	29.875	-95.52	29.36430211
Houston	Platzer	29.7548	-95.1767	77041	29.865	-95.5783	33.61962055
Houston	Platzer	29.7548	-95.1767	77042	29.7417	-95.56	30.96187583
Houston	Platzer	29.7548	-95.1767	77043	29.8067	-95.5617	31.36218778
Houston	Platzer	29.7548	-95.1767	77044	29.86	-95.1983	8.669966017
Houston	Platzer	29.7548	-95.1767	77045	29.63	-95.4383	23.39911387
Houston	Platzer	29.7548	-95.1767	77049	29.8167	-95.1883	5.084176455
Houston	Platzer	29.7548	-95.1767	77051	29.6567	-95.3683	17.37743395
Houston	Platzer	29.7548	-95.1767	77052	29.76	-95.3583	14.66657706
Houston	Platzer	29.7548	-95.1767	77054	29.6833	-95.4017	19.05933402
Houston	Platzer	29.7548	-95.1767	77055	29.7983	-95.4967	26.07119698
Houston	Platzer	29.7548	-95.1767	77060	29.9333	-95.3983	22.97173675
Houston	Platzer	29.7548	-95.1767	77061	29.6667	-95.2783	10.85636017
Houston	Platzer	29.7548	-95.1767	77063	29.7333	-95.5217	27.90588084
Houston	Platzer	29.7548	-95.1767	77065	29.93	-95.605	37.3576651
Houston	Platzer	29.7548	-95.1767	77066	29.9617	-95.495	30.64790875
Houston	Platzer	29.7548	-95.1767	77070	29.9783	-95.5817	37.34382106
Houston	Platzer	29.7548	-95.1767	77073	30.0183	-95.4117	28.50320678
Houston	Platzer	29.7548	-95.1767	77074	29.69	-95.5117	27.54585679
Houston	Platzer	29.7548	-95.1767	77075	29.62	-95.26	12.7925671
Houston	Platzer	29.7548	-95.1767	77076	29.8567	-95.3833	18.59721519
Houston	Platzer	29.7548	-95.1767	77078	29.85	-95.26	10.21224289
Houston	Platzer	29.7548	-95.1767	77079	29.775	-95.6	34.21189671
Houston	Platzer	29.7548	-95.1767	77080	29.8183	-95.5233	28.44673767
Houston	Platzer	29.7548	-95.1767	77081	29.7117	-95.4833	24.99518268
Houston	Platzer	29.7548	-95.1767	77084	29.8433	-95.66	39.66556145
Houston	Platzer	29.7548	-95.1767	77087	29.6867	-95.3017	11.49165675
Houston	Platzer	29.7548	-95.1767	77090	30.0183	-95.4433	30.26113304
Houston	Platzer	29.7548	-95.1767	77091	29.8567	-95.445	23.16943968
Houston	Platzer	29.7548	-95.1767	77094	29.7733	-95.71	43.07920581
Houston	Platzer	29.7548	-95.1767	77095	29.8933	-95.65	39.8118536
Houston	Platzer	29.7548	-95.1767	77201	29.76	-95.3583	14.66657706
Houston	Platzer	29.7548	-95.1767	77221	29.6967	-95.3583	15.39260304
Houston	Platzer	29.7548	-95.1767	77224	29.7683	-95.52	27.73602956
Houston	Platzer	29.7548	-95.1767	77226	29.8	-95.3283	12.77106754
Houston	Platzer	29.7548	-95.1767	77234	29.6383	-95.2233	10.12954347

Houston	Platzer	29.7548	-95.1767	77255	29.795	-95.49	25.50006665
Houston	Platzer	29.7548	-95.1767	77270	29.7983	-95.4167	19.69088109
Houston	Platzer	29.7548	-95.1767	77280	29.86	-95.58	33.6478466
Houston	Platzer	29.7548	-95.1767	77287	29.6783	-95.245	8.279112424
Houston	Bulk Material	29.7481	-95.1673	77001	29.76	-95.3583	15.44932817
Houston	Bulk Material	29.7481	-95.1673	77003	29.7483	-95.3383	13.80483944
Houston	Bulk Material	29.7481	-95.1673	77007	29.7733	-95.4033	19.1605882
Houston	Bulk Material	29.7481	-95.1673	77008	29.7983	-95.4117	20.14232105
Houston	Bulk Material	29.7481	-95.1673	77009	29.7933	-95.3667	16.50595875
Houston	Bulk Material	29.7481	-95.1673	77010	29.7533	-95.3583	15.42514344
Houston	Bulk Material	29.7481	-95.1673	77011	29.7417	-95.3067	11.26561623
Houston	Bulk Material	29.7481	-95.1673	77012	29.715	-95.2817	9.614319373
Houston	Bulk Material	29.7481	-95.1673	77013	29.785	-95.2283	5.755437548
Houston	Bulk Material	29.7481	-95.1673	77015	29.785	-95.185	3.303919018
Houston	Bulk Material	29.7481	-95.1673	77016	29.8567	-95.3033	14.05025811
Houston	Bulk Material	29.7481	-95.1673	77017	29.6867	-95.255	8.642729991
Houston	Bulk Material	29.7481	-95.1673	77018	29.8267	-95.425	21.75029362
Houston	Bulk Material	29.7481	-95.1673	77020	29.775	-95.3117	11.85796196
Houston	Bulk Material	29.7481	-95.1673	77021	29.695	-95.3567	15.87981263
Houston	Bulk Material	29.7481	-95.1673	77022	29.8283	-95.3783	18.22300535
Houston	Bulk Material	29.7481	-95.1673	77023	29.725	-95.3167	12.20438161
Houston	Bulk Material	29.7481	-95.1673	77024	29.7683	-95.52	28.52013119
Houston	Bulk Material	29.7481	-95.1673	77025	29.69	-95.435	22.11455384
Houston	Bulk Material	29.7481	-95.1673	77026	29.7983	-95.3283	13.61468787
Houston	Bulk Material	29.7481	-95.1673	77027	29.74	-95.4467	22.56543871
Houston	Bulk Material	29.7481	-95.1673	77028	29.8317	-95.2883	11.87306405
Houston	Bulk Material	29.7481	-95.1673	77029	29.7583	-95.255	7.127745834
Houston	Bulk Material	29.7481	-95.1673	77030	29.705	-95.4067	19.63747418
Houston	Bulk Material	29.7481	-95.1673	77031	29.6583	-95.5417	31.08255972
Houston	Bulk Material	29.7481	-95.1673	77032	29.9367	-95.3283	20.01891747
Houston	Bulk Material	29.7481	-95.1673	77033	29.6683	-95.3383	15.23403978
Houston	Bulk Material	29.7481	-95.1673	77034	29.6383	-95.2233	9.950456377
Houston	Bulk Material	29.7481	-95.1673	77036	29.6983	-95.54	30.35548159
Houston	Bulk Material	29.7481	-95.1673	77037	29.8883	-95.3983	21.81459046
Houston	Bulk Material	29.7481	-95.1673	77038	29.9183	-95.4383	25.83474029
Houston	Bulk Material	29.7481	-95.1673	77040	29.875	-95.52	30.26038893
Houston	Bulk Material	29.7481	-95.1673	77041	29.865	-95.5783	34.49605369
Houston	Bulk Material	29.7481	-95.1673	77042	29.7417	-95.56	31.70688093
Houston	Bulk Material	29.7481	-95.1673	77043	29.8067	-95.5617	32.18944325
Houston	Bulk Material	29.7481	-95.1673	77044	29.86	-95.1983	9.373935018
Houston	Bulk Material	29.7481	-95.1673	77045	29.63	-95.4383	23.86505108
Houston	Bulk Material	29.7481	-95.1673	77049	29.8167	-95.1883	5.791757224
Houston	Bulk Material	29.7481	-95.1673	77051	29.6567	-95.3683	17.82560812
Houston	Bulk Material	29.7481	-95.1673	77052	29.76	-95.3583	15.44932817
Houston	Bulk Material	29.7481	-95.1673	77054	29.6833	-95.4017	19.63289865
Houston	Bulk Material	29.7481	-95.1673	77055	29.7983	-95.4967	26.89949767
Houston	Bulk Material	29.7481	-95.1673	77060	29.9333	-95.3983	23.9020849
Houston	Bulk Material	29.7481	-95.1673	77061	29.6667	-95.2783	11.11231955
Houston	Bulk Material	29.7481	-95.1673	77063	29.7333	-95.5217	28.63564907
Houston	Bulk Material	29.7481	-95.1673	77065	29.93	-95.605	38.26541537
Houston	Bulk Material	29.7481	-95.1673	77066	29.9617	-95.495	31.57897673
Houston	Bulk Material	29.7481	-95.1673	77070	29.9783	-95.5817	38.26971569
Houston	Bulk Material	29.7481	-95.1673	77073	30.0183	-95.4117	29.41269894
Houston	Bulk Material	29.7481	-95.1673	77074	29.69	-95.5117	28.19627091
Houston	Bulk Material	29.7481	-95.1673	77075	29.62	-95.26	12.7652741
Houston	Bulk Material	29.7481	-95.1673	77076	29.8567	-95.3833	19.51762914
Houston	Bulk Material	29.7481	-95.1673	77078	29.85	-95.26	11.12109593
Houston	Bulk Material	29.7481	-95.1673	77079	29.775	-95.6	34.99930883
Houston	Bulk Material	29.7481	-95.1673	77080	29.8183	-95.5233	29.2933163
Houston	Bulk Material	29.7481	-95.1673	77081	29.7117	-95.4833	25.67936914
Houston	Bulk Material	29.7481	-95.1673	77084	29.8433	-95.66	40.51136695
Houston	Bulk Material	29.7481	-95.1673	77087	29.6867	-95.3017	11.92874741
Houston	Bulk Material	29.7481	-95.1673	77090	30.0183	-95.4433	31.18143762
Houston	Bulk Material	29.7481	-95.1673	77091	29.8567	-95.445	24.07206295
Houston	Bulk Material	29.7481	-95.1673	77094	29.7733	-95.71	43.85937864
Houston	Bulk Material	29.7481	-95.1673	77095	29.8933	-95.65	40.69323198
Houston	Bulk Material	29.7481	-95.1673	77201	29.76	-95.3583	15.44932817
Houston	Bulk Material	29.7481	-95.1673	77221	29.6967	-95.3583	15.96801034
Houston	Bulk Material	29.7481	-95.1673	77224	29.7683	-95.52	28.52013119
Houston	Bulk Material	29.7481	-95.1673	77226	29.8	-95.3283	13.65616854

Houston	Bulk Material	29.7481	-95.1673	77234	29.6383	-95.2233	9.950456377
Houston	Bulk Material	29.7481	-95.1673	77255	29.795	-95.49	26.32527193
Houston	Bulk Material	29.7481	-95.1673	77270	29.7983	-95.4167	20.53787701
Houston	Bulk Material	29.7481	-95.1673	77280	29.86	-95.58	34.52025561
Houston	Bulk Material	29.7481	-95.1673	77287	29.6783	-95.245	8.432065899
Houston	Stauffer Chemical	29.7611	-95.1834	77001	29.76	-95.3583	14.11995625
Houston	Stauffer Chemical	29.7611	-95.1834	77003	29.7483	-95.3383	12.54769902
Houston	Stauffer Chemical	29.7611	-95.1834	77007	29.7733	-95.4033	17.77982718
Houston	Stauffer Chemical	29.7611	-95.1834	77008	29.7983	-95.4117	18.67372853
Houston	Stauffer Chemical	29.7611	-95.1834	77009	29.7933	-95.3667	15.02439958
Houston	Stauffer Chemical	29.7611	-95.1834	77010	29.7533	-95.3583	14.13371123
Houston	Stauffer Chemical	29.7611	-95.1834	77011	29.7417	-95.3067	10.07646558
Houston	Stauffer Chemical	29.7611	-95.1834	77012	29.715	-95.2817	8.765099655
Houston	Stauffer Chemical	29.7611	-95.1834	77013	29.785	-95.2283	4.106309051
Houston	Stauffer Chemical	29.7611	-95.1834	77015	29.785	-95.185	1.933765782
Houston	Stauffer Chemical	29.7611	-95.1834	77016	29.8567	-95.3033	12.3797211
Houston	Stauffer Chemical	29.7611	-95.1834	77017	29.6867	-95.255	8.33590319
Houston	Stauffer Chemical	29.7611	-95.1834	77018	29.8267	-95.425	20.21056161
Houston	Stauffer Chemical	29.7611	-95.1834	77020	29.775	-95.3117	10.41826828
Houston	Stauffer Chemical	29.7611	-95.1834	77021	29.695	-95.3567	14.97364145
Houston	Stauffer Chemical	29.7611	-95.1834	77022	29.8283	-95.3783	16.64327808
Houston	Stauffer Chemical	29.7611	-95.1834	77023	29.725	-95.3167	11.14895622
Houston	Stauffer Chemical	29.7611	-95.1834	77024	29.7683	-95.52	27.17993393
Houston	Stauffer Chemical	29.7611	-95.1834	77025	29.69	-95.435	21.10711594
Houston	Stauffer Chemical	29.7611	-95.1834	77026	29.7983	-95.3283	12.07712436
Houston	Stauffer Chemical	29.7611	-95.1834	77027	29.74	-95.4467	21.32435234
Houston	Stauffer Chemical	29.7611	-95.1834	77028	29.8317	-95.2883	10.20791506
Houston	Stauffer Chemical	29.7611	-95.1834	77029	29.7583	-95.255	5.784686166
Houston	Stauffer Chemical	29.7611	-95.1834	77030	29.705	-95.4067	18.58721251
Houston	Stauffer Chemical	29.7611	-95.1834	77031	29.6583	-95.5417	30.09255879
Houston	Stauffer Chemical	29.7611	-95.1834	77032	29.9367	-95.3283	18.3793986
Houston	Stauffer Chemical	29.7611	-95.1834	77033	29.6683	-95.3383	14.57748877
Houston	Stauffer Chemical	29.7611	-95.1834	77034	29.6383	-95.2233	10.42381871
Houston	Stauffer Chemical	29.7611	-95.1834	77036	29.6983	-95.54	29.2313286
Houston	Stauffer Chemical	29.7611	-95.1834	77037	29.8883	-95.3983	20.16018196
Houston	Stauffer Chemical	29.7611	-95.1834	77038	29.9183	-95.4383	24.17669417
Houston	Stauffer Chemical	29.7611	-95.1834	77040	29.875	-95.52	28.68730866
Houston	Stauffer Chemical	29.7611	-95.1834	77041	29.865	-95.5783	32.96525503
Houston	Stauffer Chemical	29.7611	-95.1834	77042	29.7417	-95.56	30.44323055
Houston	Stauffer Chemical	29.7611	-95.1834	77043	29.8067	-95.5617	30.76122873
Houston	Stauffer Chemical	29.7611	-95.1834	77044	29.86	-95.1983	8.074299648
Houston	Stauffer Chemical	29.7611	-95.1834	77045	29.63	-95.4383	23.14026841
Houston	Stauffer Chemical	29.7611	-95.1834	77049	29.8167	-95.1883	4.505985286
Houston	Stauffer Chemical	29.7611	-95.1834	77051	29.6567	-95.3683	17.14203605
Houston	Stauffer Chemical	29.7611	-95.1834	77052	29.76	-95.3583	14.11995625
Houston	Stauffer Chemical	29.7611	-95.1834	77054	29.6833	-95.4017	18.70911959
Houston	Stauffer Chemical	29.7611	-95.1834	77055	29.7983	-95.4967	25.47037641
Houston	Stauffer Chemical	29.7611	-95.1834	77060	29.9333	-95.3983	22.23153083
Houston	Stauffer Chemical	29.7611	-95.1834	77061	29.6667	-95.2783	10.80617717
Houston	Stauffer Chemical	29.7611	-95.1834	77063	29.7333	-95.5217	27.40301693
Houston	Stauffer Chemical	29.7611	-95.1834	77065	29.93	-95.605	36.6654446
Houston	Stauffer Chemical	29.7611	-95.1834	77066	29.9617	-95.495	29.9175098
Houston	Stauffer Chemical	29.7611	-95.1834	77070	29.9783	-95.5817	36.62498028
Houston	Stauffer Chemical	29.7611	-95.1834	77073	30.0183	-95.4117	27.7636949
Houston	Stauffer Chemical	29.7611	-95.1834	77074	29.69	-95.5117	27.11808302
Houston	Stauffer Chemical	29.7611	-95.1834	77075	29.62	-95.26	12.96131904
Houston	Stauffer Chemical	29.7611	-95.1834	77076	29.8567	-95.3833	17.88845828
Houston	Stauffer Chemical	29.7611	-95.1834	77078	29.85	-95.26	9.473578647
Houston	Stauffer Chemical	29.7611	-95.1834	77079	29.775	-95.6	33.6508332
Houston	Stauffer Chemical	29.7611	-95.1834	77080	29.8183	-95.5233	27.82596342
Houston	Stauffer Chemical	29.7611	-95.1834	77081	29.7117	-95.4833	24.53718861
Houston	Stauffer Chemical	29.7611	-95.1834	77084	29.8433	-95.66	39.04398598
Houston	Stauffer Chemical	29.7611	-95.1834	77087	29.6867	-95.3017	11.28207166
Houston	Stauffer Chemical	29.7611	-95.1834	77090	30.0183	-95.4433	29.5189165
Houston	Stauffer Chemical	29.7611	-95.1834	77091	29.8567	-95.445	22.48499635
Houston	Stauffer Chemical	29.7611	-95.1834	77094	29.7733	-95.71	42.52382537
Houston	Stauffer Chemical	29.7611	-95.1834	77095	29.8933	-95.65	39.15133671
Houston	Stauffer Chemical	29.7611	-95.1834	77201	29.76	-95.3583	14.11995625
Houston	Stauffer Chemical	29.7611	-95.1834	77221	29.6967	-95.3583	15.04642829
Houston	Stauffer Chemical	29.7611	-95.1834	77224	29.7683	-95.52	27.17993393

Houston	Stauffer Chemical	29.7611	-95.1834	77226	29.8	-95.3283	12.11198085
Houston	Stauffer Chemical	29.7611	-95.1834	77234	29.6383	-95.2233	10.42381871
Houston	Stauffer Chemical	29.7611	-95.1834	77255	29.795	-95.49	24.90265605
Houston	Stauffer Chemical	29.7611	-95.1834	77270	29.7983	-95.4167	19.07223483
Houston	Stauffer Chemical	29.7611	-95.1834	77280	29.86	-95.58	32.99801298
Houston	Stauffer Chemical	29.7611	-95.1834	77287	29.6783	-95.245	8.331398581
Houston	Amerada Hess	29.76	-95.1853	77001	29.76	-95.3583	13.96629
Houston	Amerada Hess	29.76	-95.1853	77003	29.7483	-95.3383	12.38775216
Houston	Amerada Hess	29.76	-95.1853	77007	29.7733	-95.4033	17.63186263
Houston	Amerada Hess	29.76	-95.1853	77008	29.7983	-95.4117	18.5369599
Houston	Amerada Hess	29.76	-95.1853	77009	29.7933	-95.3667	14.88912694
Houston	Amerada Hess	29.76	-95.1853	77010	29.7533	-95.3583	13.97675998
Houston	Amerada Hess	29.76	-95.1853	77011	29.7417	-95.3067	9.911346084
Houston	Amerada Hess	29.76	-95.1853	77012	29.715	-95.2817	8.588533814
Houston	Amerada Hess	29.76	-95.1853	77013	29.785	-95.2283	4.015455341
Houston	Amerada Hess	29.76	-95.1853	77015	29.785	-95.185	2.018395309
Houston	Amerada Hess	29.76	-95.1853	77016	29.8567	-95.3033	12.31625781
Houston	Amerada Hess	29.76	-95.1853	77017	29.6867	-95.255	8.165702821
Houston	Amerada Hess	29.76	-95.1853	77018	29.8267	-95.425	20.08619832
Houston	Amerada Hess	29.76	-95.1853	77020	29.775	-95.3117	10.27587305
Houston	Amerada Hess	29.76	-95.1853	77021	29.695	-95.3567	14.79870524
Houston	Amerada Hess	29.76	-95.1853	77022	29.8283	-95.3783	16.52775769
Houston	Amerada Hess	29.76	-95.1853	77023	29.725	-95.3167	10.97778402
Houston	Amerada Hess	29.76	-95.1853	77024	29.7683	-95.52	27.02863789
Houston	Amerada Hess	29.76	-95.1853	77025	29.69	-95.435	20.93540599
Houston	Amerada Hess	29.76	-95.1853	77026	29.7983	-95.3283	11.9512824
Houston	Amerada Hess	29.76	-95.1853	77027	29.74	-95.4467	21.16449927
Houston	Amerada Hess	29.76	-95.1853	77028	29.8317	-95.2883	10.13149921
Houston	Amerada Hess	29.76	-95.1853	77029	29.7583	-95.255	5.628554422
Houston	Amerada Hess	29.76	-95.1853	77030	29.705	-95.4067	18.41687529
Houston	Amerada Hess	29.76	-95.1853	77031	29.6583	-95.5417	29.92066074
Houston	Amerada Hess	29.76	-95.1853	77032	29.9367	-95.3283	18.35110102
Houston	Amerada Hess	29.76	-95.1853	77033	29.6683	-95.3383	14.40027018
Houston	Amerada Hess	29.76	-95.1853	77034	29.6383	-95.2233	10.29264443
Houston	Amerada Hess	29.76	-95.1853	77036	29.6983	-95.54	29.06492805
Houston	Amerada Hess	29.76	-95.1853	77037	29.8883	-95.3983	20.07401246
Houston	Amerada Hess	29.76	-95.1853	77038	29.9183	-95.4383	24.09325818
Houston	Amerada Hess	29.76	-95.1853	77040	29.875	-95.52	28.57078954
Houston	Amerada Hess	29.76	-95.1853	77041	29.865	-95.5783	32.83974946
Houston	Amerada Hess	29.76	-95.1853	77042	29.7417	-95.56	30.28558593
Houston	Amerada Hess	29.76	-95.1853	77043	29.8067	-95.5617	30.61975667
Houston	Amerada Hess	29.76	-95.1853	77044	29.86	-95.1983	8.140931044
Houston	Amerada Hess	29.76	-95.1853	77045	29.63	-95.4383	22.96325081
Houston	Amerada Hess	29.76	-95.1853	77049	29.8167	-95.1883	4.583793665
Houston	Amerada Hess	29.76	-95.1853	77051	29.6567	-95.3683	16.96480781
Houston	Amerada Hess	29.76	-95.1853	77052	29.76	-95.3583	13.96629
Houston	Amerada Hess	29.76	-95.1853	77054	29.6833	-95.4017	18.53485026
Houston	Amerada Hess	29.76	-95.1853	77055	29.7983	-95.4967	25.32875285
Houston	Amerada Hess	29.76	-95.1853	77060	29.9333	-95.3983	22.16797732
Houston	Amerada Hess	29.76	-95.1853	77061	29.6667	-95.2783	10.63489907
Houston	Amerada Hess	29.76	-95.1853	77063	29.7333	-95.5217	27.24297815
Houston	Amerada Hess	29.76	-95.1853	77065	29.93	-95.605	36.55634915
Houston	Amerada Hess	29.76	-95.1853	77066	29.9617	-95.495	29.83702384
Houston	Amerada Hess	29.76	-95.1853	77070	29.9783	-95.5817	36.53314375
Houston	Amerada Hess	29.76	-95.1853	77073	30.0183	-95.4117	27.72882775
Houston	Amerada Hess	29.76	-95.1853	77074	29.69	-95.5117	26.94942978
Houston	Amerada Hess	29.76	-95.1853	77075	29.62	-95.26	12.81042657
Houston	Amerada Hess	29.76	-95.1853	77076	29.8567	-95.3833	17.78899609
Houston	Amerada Hess	29.76	-95.1853	77078	29.85	-95.26	9.44233555
Houston	Amerada Hess	29.76	-95.1853	77079	29.775	-95.6	33.50062431
Houston	Amerada Hess	29.76	-95.1853	77080	29.8183	-95.5233	27.68967095
Houston	Amerada Hess	29.76	-95.1853	77081	29.7117	-95.4833	24.3714885
Houston	Amerada Hess	29.76	-95.1853	77084	29.8433	-95.66	38.90808963
Houston	Amerada Hess	29.76	-95.1853	77087	29.6867	-95.3017	11.10495365
Houston	Amerada Hess	29.76	-95.1853	77090	30.0183	-95.4433	29.4728513
Houston	Amerada Hess	29.76	-95.1853	77091	29.8567	-95.445	22.37182267
Houston	Amerada Hess	29.76	-95.1853	77094	29.7733	-95.71	42.3726369
Houston	Amerada Hess	29.76	-95.1853	77095	29.8933	-95.65	39.02817352
Houston	Amerada Hess	29.76	-95.1853	77201	29.76	-95.3583	13.96629
Houston	Amerada Hess	29.76	-95.1853	77221	29.6967	-95.3583	14.87183554

Computation of Average Dray Cost

Houston	Amerada Hess	29.76	-95.1853	77224	29.7683	-95.52	27.02863789
Houston	Amerada Hess	29.76	-95.1853	77226	29.8	-95.3283	11.98752156
Houston	Amerada Hess	29.76	-95.1853	77234	29.6383	-95.2233	10.29264443
Houston	Amerada Hess	29.76	-95.1853	77255	29.795	-95.49	24.76018054
Houston	Amerada Hess	29.76	-95.1853	77270	29.7983	-95.4167	18.93507479
Houston	Amerada Hess	29.76	-95.1853	77280	29.86	-95.58	32.87090162
Houston	Amerada Hess	29.76	-95.1853	77287	29.6783	-95.245	8.168894737
Houston	Cargill	29.7404	-95.1125	77001	29.76	-95.3583	19.90642036
Houston	Cargill	29.7404	-95.1125	77003	29.7483	-95.3383	18.23998727
Houston	Cargill	29.7404	-95.1125	77007	29.7733	-95.4033	23.62605208
Houston	Cargill	29.7404	-95.1125	77008	29.7983	-95.4117	24.60253207
Houston	Cargill	29.7404	-95.1125	77009	29.7933	-95.3667	20.96122231
Houston	Cargill	29.7404	-95.1125	77010	29.7533	-95.3583	19.87074287
Houston	Cargill	29.7404	-95.1125	77011	29.7417	-95.3067	15.67811727
Houston	Cargill	29.7404	-95.1125	77012	29.715	-95.2817	13.81257036
Houston	Cargill	29.7404	-95.1125	77013	29.785	-95.2283	10.0179392
Houston	Cargill	29.7404	-95.1125	77015	29.785	-95.185	6.871735513
Houston	Cargill	29.7404	-95.1125	77016	29.8567	-95.3033	18.03919573
Houston	Cargill	29.7404	-95.1125	77017	29.6867	-95.255	12.29376098
Houston	Cargill	29.7404	-95.1125	77018	29.8267	-95.425	26.17245434
Houston	Cargill	29.7404	-95.1125	77020	29.775	-95.3117	16.32220055
Houston	Cargill	29.7404	-95.1125	77021	29.695	-95.3567	20.05207096
Houston	Cargill	29.7404	-95.1125	77022	29.8283	-95.3783	22.60094709
Houston	Cargill	29.7404	-95.1125	77023	29.725	-95.3167	16.53187986
Houston	Cargill	29.7404	-95.1125	77024	29.7683	-95.52	32.97449042
Houston	Cargill	29.7404	-95.1125	77025	29.69	-95.435	26.35144063
Houston	Cargill	29.7404	-95.1125	77026	29.7983	-95.3283	18.03769993
Houston	Cargill	29.7404	-95.1125	77027	29.74	-95.4467	26.97998532
Houston	Cargill	29.7404	-95.1125	77028	29.8317	-95.2883	15.99214842
Houston	Cargill	29.7404	-95.1125	77029	29.7583	-95.255	11.59443012
Houston	Cargill	29.7404	-95.1125	77030	29.705	-95.4067	23.92208491
Houston	Cargill	29.7404	-95.1125	77031	29.6583	-95.5417	35.27753669
Houston	Cargill	29.7404	-95.1125	77032	29.9367	-95.3283	23.5509391
Houston	Cargill	29.7404	-95.1125	77033	29.6683	-95.3383	19.13557309
Houston	Cargill	29.7404	-95.1125	77034	29.6383	-95.2233	12.16348223
Houston	Cargill	29.7404	-95.1125	77036	29.6983	-95.54	34.67902402
Houston	Cargill	29.7404	-95.1125	77037	29.8883	-95.3983	25.9790156
Houston	Cargill	29.7404	-95.1125	77038	29.9183	-95.4383	29.9674773
Houston	Cargill	29.7404	-95.1125	77040	29.875	-95.52	34.64562634
Houston	Cargill	29.7404	-95.1125	77041	29.865	-95.5783	38.92616099
Houston	Cargill	29.7404	-95.1125	77042	29.7417	-95.56	36.12682744
Houston	Cargill	29.7404	-95.1125	77043	29.8067	-95.5617	36.65678353
Houston	Cargill	29.7404	-95.1125	77044	29.86	-95.1983	11.88289658
Houston	Cargill	29.7404	-95.1125	77045	29.63	-95.4383	27.77086185
Houston	Cargill	29.7404	-95.1125	77049	29.8167	-95.1883	8.682634414
Houston	Cargill	29.7404	-95.1125	77051	29.6567	-95.3683	21.72812069
Houston	Cargill	29.7404	-95.1125	77052	29.76	-95.3583	19.90642036
Houston	Cargill	29.7404	-95.1125	77054	29.6833	-95.4017	23.7978361
Houston	Cargill	29.7404	-95.1125	77055	29.7983	-95.4967	31.36670106
Houston	Cargill	29.7404	-95.1125	77060	29.9333	-95.3983	27.8362905
Houston	Cargill	29.7404	-95.1125	77061	29.6667	-95.2783	14.64784172
Houston	Cargill	29.7404	-95.1125	77063	29.7333	-95.5217	33.03968825
Houston	Cargill	29.7404	-95.1125	77065	29.93	-95.605	42.6040603
Houston	Cargill	29.7404	-95.1125	77066	29.9617	-95.495	35.67498252
Houston	Cargill	29.7404	-95.1125	77070	29.9783	-95.5817	42.46927853
Houston	Cargill	29.7404	-95.1125	77073	30.0183	-95.4117	32.96602902
Houston	Cargill	29.7404	-95.1125	77074	29.69	-95.5117	32.48324815
Houston	Cargill	29.7404	-95.1125	77075	29.62	-95.26	15.371045
Houston	Cargill	29.7404	-95.1125	77076	29.8567	-95.3833	23.79253353
Houston	Cargill	29.7404	-95.1125	77078	29.85	-95.26	14.8350925
Houston	Cargill	29.7404	-95.1125	77079	29.775	-95.6	39.45487533
Houston	Cargill	29.7404	-95.1125	77080	29.8183	-95.5233	33.75489668
Houston	Cargill	29.7404	-95.1125	77081	29.7117	-95.4833	30.02421636
Houston	Cargill	29.7404	-95.1125	77084	29.8433	-95.66	44.97354181
Houston	Cargill	29.7404	-95.1125	77087	29.6867	-95.3017	15.87742382
Houston	Cargill	29.7404	-95.1125	77090	30.0183	-95.4433	34.87844797
Houston	Cargill	29.7404	-95.1125	77091	29.8567	-95.445	28.43735765
Houston	Cargill	29.7404	-95.1125	77094	29.7733	-95.71	48.30924347
Houston	Cargill	29.7404	-95.1125	77095	29.8933	-95.65	45.1138902
Houston	Cargill	29.7404	-95.1125	77201	29.76	-95.3583	19.90642036

Houston	Cargill	29.7404	-95.1125	77221	29.6967	-95.3583	20.15460142
Houston	Cargill	29.7404	-95.1125	77224	29.7683	-95.52	32.97449042
Houston	Cargill	29.7404	-95.1125	77226	29.8	-95.3283	18.07375047
Houston	Cargill	29.7404	-95.1125	77234	29.6383	-95.2233	12.16348223
Houston	Cargill	29.7404	-95.1125	77255	29.795	-95.49	30.79269205
Houston	Cargill	29.7404	-95.1125	77270	29.7983	-95.4167	24.99894753
Houston	Cargill	29.7404	-95.1125	77280	29.86	-95.58	38.95675566
Houston	Cargill	29.7404	-95.1125	77287	29.6783	-95.245	11.81327361
Houston	TXTX	29.7443	-95.1536	77001	29.76	-95.3583	16.57396534
Houston	TXTX	29.7443	-95.1536	77003	29.7483	-95.3383	14.91432729
Houston	TXTX	29.7443	-95.1536	77007	29.7733	-95.4033	20.29377663
Houston	TXTX	29.7443	-95.1536	77008	29.7983	-95.4117	21.2875703
Houston	TXTX	29.7443	-95.1536	77009	29.7933	-95.3667	17.6524983
Houston	TXTX	29.7443	-95.1536	77010	29.7533	-95.3583	16.54139576
Houston	TXTX	29.7443	-95.1536	77011	29.7417	-95.3067	12.36154515
Houston	TXTX	29.7443	-95.1536	77012	29.715	-95.2817	10.60857937
Houston	TXTX	29.7443	-95.1536	77013	29.785	-95.2283	6.867546936
Houston	TXTX	29.7443	-95.1536	77015	29.785	-95.185	4.149906785
Houston	TXTX	29.7443	-95.1536	77016	29.8567	-95.3033	15.11265816
Houston	TXTX	29.7443	-95.1536	77017	29.6867	-95.255	9.414558013
Houston	TXTX	29.7443	-95.1536	77018	29.8267	-95.425	22.89769797
Houston	TXTX	29.7443	-95.1536	77020	29.775	-95.3117	13.00181651
Houston	TXTX	29.7443	-95.1536	77021	29.695	-95.3567	16.87239618
Houston	TXTX	29.7443	-95.1536	77022	29.8283	-95.3783	19.36613089
Houston	TXTX	29.7443	-95.1536	77023	29.725	-95.3167	13.25892867
Houston	TXTX	29.7443	-95.1536	77024	29.7683	-95.52	29.64285998
Houston	TXTX	29.7443	-95.1536	77025	29.69	-95.435	23.13649829
Houston	TXTX	29.7443	-95.1536	77026	29.7983	-95.3283	14.76191483
Houston	TXTX	29.7443	-95.1536	77027	29.74	-95.4467	23.66450926
Houston	TXTX	29.7443	-95.1536	77028	29.8317	-95.2883	12.96284755
Houston	TXTX	29.7443	-95.1536	77029	29.7583	-95.255	8.26367675
Houston	TXTX	29.7443	-95.1536	77030	29.705	-95.4067	20.67761493
Houston	TXTX	29.7443	-95.1536	77031	29.6583	-95.5417	32.09132856
Houston	TXTX	29.7443	-95.1536	77032	29.9367	-95.3283	20.98014899
Houston	TXTX	29.7443	-95.1536	77033	29.6683	-95.3383	16.12380216
Houston	TXTX	29.7443	-95.1536	77034	29.6383	-95.2233	10.24160838
Houston	TXTX	29.7443	-95.1536	77036	29.6983	-95.54	31.41434074
Houston	TXTX	29.7443	-95.1536	77037	29.8883	-95.3983	22.92136255
Houston	TXTX	29.7443	-95.1536	77038	29.9183	-95.4383	26.9365042
Houston	TXTX	29.7443	-95.1536	77040	29.875	-95.52	31.40505434
Houston	TXTX	29.7443	-95.1536	77041	29.865	-95.5783	35.64378797
Houston	TXTX	29.7443	-95.1536	77042	29.7417	-95.56	32.80934342
Houston	TXTX	29.7443	-95.1536	77043	29.8067	-95.5617	33.32881806
Houston	TXTX	29.7443	-95.1536	77044	29.86	-95.1983	10.01331261
Houston	TXTX	29.7443	-95.1536	77045	29.63	-95.4383	24.76695617
Houston	TXTX	29.7443	-95.1536	77049	29.8167	-95.1883	6.481492905
Houston	TXTX	29.7443	-95.1536	77051	29.6567	-95.3683	18.71993623
Houston	TXTX	29.7443	-95.1536	77052	29.76	-95.3583	16.57396534
Houston	TXTX	29.7443	-95.1536	77054	29.6833	-95.4017	20.62562395
Houston	TXTX	29.7443	-95.1536	77055	29.7983	-95.4967	28.03942573
Houston	TXTX	29.7443	-95.1536	77060	29.9333	-95.3983	24.96099146
Houston	TXTX	29.7443	-95.1536	77061	29.6667	-95.2783	11.85710453
Houston	TXTX	29.7443	-95.1536	77063	29.7333	-95.5217	29.72997862
Houston	TXTX	29.7443	-95.1536	77065	29.93	-95.605	39.40471326
Houston	TXTX	29.7443	-95.1536	77066	29.9617	-95.495	32.67488483
Houston	TXTX	29.7443	-95.1536	77070	29.9783	-95.5817	39.38644613
Houston	TXTX	29.7443	-95.1536	77073	30.0183	-95.4117	30.38834302
Houston	TXTX	29.7443	-95.1536	77074	29.69	-95.5117	29.23987775
Houston	TXTX	29.7443	-95.1536	77075	29.62	-95.26	13.20902918
Houston	TXTX	29.7443	-95.1536	77076	29.8567	-95.3833	20.64476991
Houston	TXTX	29.7443	-95.1536	77078	29.85	-95.26	12.10773727
Houston	TXTX	29.7443	-95.1536	77079	29.775	-95.6	36.12299461
Houston	TXTX	29.7443	-95.1536	77080	29.8183	-95.5233	30.43789624
Houston	TXTX	29.7443	-95.1536	77081	29.7117	-95.4833	26.74647768
Houston	TXTX	29.7443	-95.1536	77084	29.8433	-95.66	41.65558168
Houston	TXTX	29.7443	-95.1536	77087	29.6867	-95.3017	12.82854569
Houston	TXTX	29.7443	-95.1536	77090	30.0183	-95.4433	32.1911409
Houston	TXTX	29.7443	-95.1536	77091	29.8567	-95.445	25.2141025
Houston	TXTX	29.7443	-95.1536	77094	29.7733	-95.71	44.97914242
Houston	TXTX	29.7443	-95.1536	77095	29.8933	-95.65	41.84072895

Houston	TXTX	29.7443	-95.1536	77201	29.76	-95.3583	16.57396534
Houston	TXTX	29.7443	-95.1536	77221	29.6967	-95.3583	16.96633673
Houston	TXTX	29.7443	-95.1536	77224	29.7683	-95.52	29.64285998
Houston	TXTX	29.7443	-95.1536	77226	29.8	-95.3283	14.80302492
Houston	TXTX	29.7443	-95.1536	77234	29.6383	-95.2233	10.24160838
Houston	TXTX	29.7443	-95.1536	77255	29.795	-95.49	27.464276
Houston	TXTX	29.7443	-95.1536	77270	29.7983	-95.4167	21.68282313
Houston	TXTX	29.7443	-95.1536	77280	29.86	-95.58	35.66799499
Houston	TXTX	29.7443	-95.1536	77287	29.6783	-95.245	9.101375746
Houston	Warren Petroleum	29.7407	-95.2078	77001	29.76	-95.3583	12.24936165
Houston	Warren Petroleum	29.7407	-95.2078	77003	29.7483	-95.3383	10.55311564
Houston	Warren Petroleum	29.7407	-95.2078	77007	29.7733	-95.4033	16.00063916
Houston	Warren Petroleum	29.7407	-95.2078	77008	29.7983	-95.4117	17.10504108
Houston	Warren Petroleum	29.7407	-95.2078	77009	29.7933	-95.3667	13.51256463
Houston	Warren Petroleum	29.7407	-95.2078	77010	29.7533	-95.3583	12.19237103
Houston	Warren Petroleum	29.7407	-95.2078	77011	29.7417	-95.3067	7.984605129
Houston	Warren Petroleum	29.7407	-95.2078	77012	29.715	-95.2817	6.31641962
Houston	Warren Petroleum	29.7407	-95.2078	77013	29.785	-95.2283	3.94069915
Houston	Warren Petroleum	29.7407	-95.2078	77015	29.785	-95.185	4.022209713
Houston	Warren Petroleum	29.7407	-95.2078	77016	29.8567	-95.3033	12.13000152
Houston	Warren Petroleum	29.7407	-95.2078	77017	29.6867	-95.255	5.790001525
Houston	Warren Petroleum	29.7407	-95.2078	77018	29.8267	-95.425	18.85902564
Houston	Warren Petroleum	29.7407	-95.2078	77020	29.775	-95.3117	8.833094264
Houston	Warren Petroleum	29.7407	-95.2078	77021	29.695	-95.3567	12.57412188
Houston	Warren Petroleum	29.7407	-95.2078	77022	29.8283	-95.3783	15.47491342
Houston	Warren Petroleum	29.7407	-95.2078	77023	29.725	-95.3167	8.882391395
Houston	Warren Petroleum	29.7407	-95.2078	77024	29.7683	-95.52	25.30220388
Houston	Warren Petroleum	29.7407	-95.2078	77025	29.69	-95.435	18.7929886
Houston	Warren Petroleum	29.7407	-95.2078	77026	29.7983	-95.3283	10.78221913
Houston	Warren Petroleum	29.7407	-95.2078	77027	29.74	-95.4467	19.28647979
Houston	Warren Petroleum	29.7407	-95.2078	77028	29.8317	-95.2883	9.808362772
Houston	Warren Petroleum	29.7407	-95.2078	77029	29.7583	-95.255	4.066741197
Houston	Warren Petroleum	29.7407	-95.2078	77030	29.705	-95.4067	16.31379328
Houston	Warren Petroleum	29.7407	-95.2078	77031	29.6583	-95.5417	27.76442729
Houston	Warren Petroleum	29.7407	-95.2078	77032	29.9367	-95.3283	18.57426079
Houston	Warren Petroleum	29.7407	-95.2078	77033	29.6683	-95.3383	12.04799168
Houston	Warren Petroleum	29.7407	-95.2078	77034	29.6383	-95.2233	8.360919678
Houston	Warren Petroleum	29.7407	-95.2078	77036	29.6983	-95.54	27.03606599
Houston	Warren Petroleum	29.7407	-95.2078	77037	29.8883	-95.3983	19.45509421
Houston	Warren Petroleum	29.7407	-95.2078	77038	29.9183	-95.4383	23.49118295
Houston	Warren Petroleum	29.7407	-95.2078	77040	29.875	-95.52	27.43695842
Houston	Warren Petroleum	29.7407	-95.2078	77041	29.865	-95.5783	31.54888117
Houston	Warren Petroleum	29.7407	-95.2078	77042	29.7417	-95.56	28.43322061
Houston	Warren Petroleum	29.7407	-95.2078	77043	29.8067	-95.5617	29.06293567
Houston	Warren Petroleum	29.7407	-95.2078	77044	29.86	-95.1983	9.661576715
Houston	Warren Petroleum	29.7407	-95.2078	77045	29.63	-95.4383	20.64301618
Houston	Warren Petroleum	29.7407	-95.2078	77049	29.8167	-95.1883	6.334219026
Houston	Warren Petroleum	29.7407	-95.2078	77051	29.6567	-95.3683	14.62444617
Houston	Warren Petroleum	29.7407	-95.2078	77052	29.76	-95.3583	12.24936165
Houston	Warren Petroleum	29.7407	-95.2078	77054	29.6833	-95.4017	16.32502929
Houston	Warren Petroleum	29.7407	-95.2078	77055	29.7983	-95.4967	23.78193581
Houston	Warren Petroleum	29.7407	-95.2078	77060	29.9333	-95.3983	21.86948879
Houston	Warren Petroleum	29.7407	-95.2078	77061	29.6667	-95.2783	8.251162876
Houston	Warren Petroleum	29.7407	-95.2078	77063	29.7333	-95.5217	25.34818771
Houston	Warren Petroleum	29.7407	-95.2078	77065	29.93	-95.605	35.52141375
Houston	Warren Petroleum	29.7407	-95.2078	77066	29.9617	-95.495	29.25555845
Houston	Warren Petroleum	29.7407	-95.2078	77070	29.9783	-95.5817	35.76393397
Houston	Warren Petroleum	29.7407	-95.2078	77073	30.0183	-95.4117	27.80641343
Houston	Warren Petroleum	29.7407	-95.2078	77074	29.69	-95.5117	24.87292479
Houston	Warren Petroleum	29.7407	-95.2078	77075	29.62	-95.26	10.61632651
Houston	Warren Petroleum	29.7407	-95.2078	77076	29.8567	-95.3833	16.98330693
Houston	Warren Petroleum	29.7407	-95.2078	77078	29.85	-95.26	9.778442703
Houston	Warren Petroleum	29.7407	-95.2078	77079	29.775	-95.6	31.78315903
Houston	Warren Petroleum	29.7407	-95.2078	77080	29.8183	-95.5233	26.22942548
Houston	Warren Petroleum	29.7407	-95.2078	77081	29.7117	-95.4833	22.36399502
Houston	Warren Petroleum	29.7407	-95.2078	77084	29.8433	-95.66	37.43397086
Houston	Warren Petroleum	29.7407	-95.2078	77087	29.6867	-95.3017	8.744668979
Houston	Warren Petroleum	29.7407	-95.2078	77090	30.0183	-95.4433	29.38860418
Houston	Warren Petroleum	29.7407	-95.2078	77091	29.8567	-95.445	21.31636477
Houston	Warren Petroleum	29.7407	-95.2078	77094	29.7733	-95.71	40.62793696

Computation of Average Dray Cost

Houston	Warren Petroleum	29.7407	-95.2078	77095	29.8933	-95.65	37.7646967
Houston	Warren Petroleum	29.7407	-95.2078	77201	29.76	-95.3583	12.24936165
Houston	Warren Petroleum	29.7407	-95.2078	77221	29.6967	-95.3583	12.65846657
Houston	Warren Petroleum	29.7407	-95.2078	77224	29.7683	-95.52	25.30220388
Houston	Warren Petroleum	29.7407	-95.2078	77226	29.8	-95.3283	10.84211414
Houston	Warren Petroleum	29.7407	-95.2078	77234	29.6383	-95.2233	8.360919678
Houston	Warren Petroleum	29.7407	-95.2078	77255	29.795	-95.49	23.1999157
Houston	Warren Petroleum	29.7407	-95.2078	77270	29.7983	-95.4167	17.49383336
Houston	Warren Petroleum	29.7407	-95.2078	77280	29.86	-95.58	31.55348651
Houston	Warren Petroleum	29.7407	-95.2078	77287	29.6783	-95.245	5.86479975
Houston	Bludworth Bond	29.7269	-95.7228	77001	29.76	-95.3583	29.54716456
Houston	Bludworth Bond	29.7269	-95.7228	77003	29.7483	-95.3383	31.08872469
Houston	Bludworth Bond	29.7269	-95.7228	77007	29.7733	-95.4033	26.06381647
Houston	Bludworth Bond	29.7269	-95.7228	77008	29.7983	-95.4117	25.76807135
Houston	Bludworth Bond	29.7269	-95.7228	77009	29.7933	-95.3667	29.2434516
Houston	Bludworth Bond	29.7269	-95.7228	77010	29.7533	-95.3583	29.50316591
Houston	Bludworth Bond	29.7269	-95.7228	77011	29.7417	-95.3067	33.6129949
Houston	Bludworth Bond	29.7269	-95.7228	77012	29.715	-95.2817	35.62295935
Houston	Bludworth Bond	29.7269	-95.7228	77013	29.785	-95.2283	40.19558455
Houston	Bludworth Bond	29.7269	-95.7228	77015	29.785	-95.185	43.66921809
Houston	Bludworth Bond	29.7269	-95.7228	77016	29.8567	-95.3033	35.45033369
Houston	Bludworth Bond	29.7269	-95.7228	77017	29.6867	-95.255	37.90468055
Houston	Bludworth Bond	29.7269	-95.7228	77018	29.8267	-95.425	25.35550279
Houston	Bludworth Bond	29.7269	-95.7228	77020	29.775	-95.3117	33.41449906
Houston	Bludworth Bond	29.7269	-95.7228	77021	29.695	-95.3567	29.66723922
Houston	Bludworth Bond	29.7269	-95.7228	77022	29.8283	-95.3783	28.9911996
Houston	Bludworth Bond	29.7269	-95.7228	77023	29.725	-95.3167	32.78481182
Houston	Bludworth Bond	29.7269	-95.7228	77024	29.7683	-95.52	16.70970594
Houston	Bludworth Bond	29.7269	-95.7228	77025	29.69	-95.435	23.42428632
Houston	Bludworth Bond	29.7269	-95.7228	77026	29.7983	-95.3283	32.36540207
Houston	Bludworth Bond	29.7269	-95.7228	77027	29.74	-95.4467	22.31462777
Houston	Bludworth Bond	29.7269	-95.7228	77028	29.8317	-95.2883	36.08308517
Houston	Bludworth Bond	29.7269	-95.7228	77029	29.7583	-95.255	37.8504738
Houston	Bludworth Bond	29.7269	-95.7228	77030	29.705	-95.4067	25.57992441
Houston	Bludworth Bond	29.7269	-95.7228	77031	29.6583	-95.5417	15.63395803
Houston	Bludworth Bond	29.7269	-95.7228	77032	29.9367	-95.3283	36.07161397
Houston	Bludworth Bond	29.7269	-95.7228	77033	29.6683	-95.3383	31.39911441
Houston	Bludworth Bond	29.7269	-95.7228	77034	29.6383	-95.2233	40.95408393
Houston	Bludworth Bond	29.7269	-95.7228	77036	29.6983	-95.54	14.93696994
Houston	Bludworth Bond	29.7269	-95.7228	77037	29.8883	-95.3983	29.25838418
Houston	Bludworth Bond	29.7269	-95.7228	77038	29.9183	-95.4383	27.68158715
Houston	Bludworth Bond	29.7269	-95.7228	77040	29.875	-95.52	20.27294904
Houston	Bludworth Bond	29.7269	-95.7228	77041	29.865	-95.5783	16.13628122
Houston	Bludworth Bond	29.7269	-95.7228	77042	29.7417	-95.56	13.19704152
Houston	Bludworth Bond	29.7269	-95.7228	77043	29.8067	-95.5617	14.51372957
Houston	Bludworth Bond	29.7269	-95.7228	77044	29.86	-95.1983	43.68499099
Houston	Bludworth Bond	29.7269	-95.7228	77045	29.63	-95.4383	24.26334207
Houston	Bludworth Bond	29.7269	-95.7228	77049	29.8167	-95.1883	43.75493685
Houston	Bludworth Bond	29.7269	-95.7228	77051	29.6567	-95.3683	29.17451854
Houston	Bludworth Bond	29.7269	-95.7228	77052	29.76	-95.3583	29.54716456
Houston	Bludworth Bond	29.7269	-95.7228	77054	29.6833	-95.4017	26.16027841
Houston	Bludworth Bond	29.7269	-95.7228	77055	29.7983	-95.4967	19.14155287
Houston	Bludworth Bond	29.7269	-95.7228	77060	29.9333	-95.3983	31.04708395
Houston	Bludworth Bond	29.7269	-95.7228	77061	29.6667	-95.2783	36.2120883
Houston	Bludworth Bond	29.7269	-95.7228	77063	29.7333	-95.5217	16.24302245
Houston	Bludworth Bond	29.7269	-95.7228	77065	29.93	-95.605	18.95461491
Houston	Bludworth Bond	29.7269	-95.7228	77066	29.9617	-95.495	26.41041943
Houston	Bludworth Bond	29.7269	-95.7228	77070	29.9783	-95.5817	23.27365813
Houston	Bludworth Bond	29.7269	-95.7228	77073	30.0183	-95.4117	34.41193026
Houston	Bludworth Bond	29.7269	-95.7228	77074	29.69	-95.5117	17.30050116
Houston	Bludworth Bond	29.7269	-95.7228	77075	29.62	-95.26	38.34559852
Houston	Bludworth Bond	29.7269	-95.7228	77076	29.8567	-95.3833	29.34269423
Houston	Bludworth Bond	29.7269	-95.7228	77078	29.85	-95.26	38.66094293
Houston	Bludworth Bond	29.7269	-95.7228	77079	29.775	-95.6	10.64701385
Houston	Bludworth Bond	29.7269	-95.7228	77080	29.8183	-95.5233	17.71544572
Houston	Bludworth Bond	29.7269	-95.7228	77081	29.7117	-95.4833	19.37373503
Houston	Bludworth Bond	29.7269	-95.7228	77084	29.8433	-95.66	10.677378
Houston	Bludworth Bond	29.7269	-95.7228	77087	29.6867	-95.3017	34.14995894
Houston	Bludworth Bond	29.7269	-95.7228	77090	30.0183	-95.4433	32.59675169
Houston	Bludworth Bond	29.7269	-95.7228	77091	29.8567	-95.445	24.75409814

Computation of Average Dray Cost

Houston	Bludworth Bond	29.7269	-95.7228	77094	29.7733	-95.71	3.885789091
Houston	Bludworth Bond	29.7269	-95.7228	77095	29.8933	-95.65	14.66284391
Houston	Bludworth Bond	29.7269	-95.7228	77201	29.76	-95.3583	29.54716456
Houston	Bludworth Bond	29.7269	-95.7228	77221	29.6967	-95.3583	29.52691225
Houston	Bludworth Bond	29.7269	-95.7228	77224	29.7683	-95.52	16.70970594
Houston	Bludworth Bond	29.7269	-95.7228	77226	29.8	-95.3283	32.39012556
Houston	Bludworth Bond	29.7269	-95.7228	77234	29.6383	-95.2233	40.95408393
Houston	Bludworth Bond	29.7269	-95.7228	77255	29.795	-95.49	19.58155201
Houston	Bludworth Bond	29.7269	-95.7228	77270	29.7983	-95.4167	25.37481058
Houston	Bludworth Bond	29.7269	-95.7228	77280	29.86	-95.58	15.75940791
Houston	Bludworth Bond	29.7269	-95.7228	77287	29.6783	-95.245	38.77182117
Houston	General Stevedores	29.7544	-95.3104	77001	29.76	-95.3583	3.893304167
Houston	General Stevedores	29.7544	-95.3104	77003	29.7483	-95.3383	2.305573044
Houston	General Stevedores	29.7544	-95.3104	77007	29.7733	-95.4033	7.653450955
Houston	General Stevedores	29.7544	-95.3104	77008	29.7983	-95.4117	8.912862558
Houston	General Stevedores	29.7544	-95.3104	77009	29.7933	-95.3667	5.524492577
Houston	General Stevedores	29.7544	-95.3104	77010	29.7533	-95.3583	3.867986524
Houston	General Stevedores	29.7544	-95.3104	77011	29.7417	-95.3067	1.067896489
Houston	General Stevedores	29.7544	-95.3104	77012	29.715	-95.2817	3.935163127
Houston	General Stevedores	29.7544	-95.3104	77013	29.785	-95.2283	7.073334835
Houston	General Stevedores	29.7544	-95.3104	77015	29.785	-95.185	10.42058887
Houston	General Stevedores	29.7544	-95.3104	77016	29.8567	-95.3033	8.27854562
Houston	General Stevedores	29.7544	-95.3104	77017	29.6867	-95.255	7.062121788
Houston	General Stevedores	29.7544	-95.3104	77018	29.8267	-95.425	10.93897458
Houston	General Stevedores	29.7544	-95.3104	77020	29.775	-95.3117	1.666346207
Houston	General Stevedores	29.7544	-95.3104	77021	29.695	-95.3567	6.080019579
Houston	General Stevedores	29.7544	-95.3104	77022	29.8283	-95.3783	8.101857835
Houston	General Stevedores	29.7544	-95.3104	77023	29.725	-95.3167	2.427343158
Houston	General Stevedores	29.7544	-95.3104	77024	29.7683	-95.52	16.95817578
Houston	General Stevedores	29.7544	-95.3104	77025	29.69	-95.435	11.32308976
Houston	General Stevedores	29.7544	-95.3104	77026	29.7983	-95.3283	3.827334291
Houston	General Stevedores	29.7544	-95.3104	77027	29.74	-95.4467	11.06473788
Houston	General Stevedores	29.7544	-95.3104	77028	29.8317	-95.2883	6.490461052
Houston	General Stevedores	29.7544	-95.3104	77029	29.7583	-95.255	4.483510464
Houston	General Stevedores	29.7544	-95.3104	77030	29.705	-95.4067	8.737526163
Houston	General Stevedores	29.7544	-95.3104	77031	29.6583	-95.5417	20.22039138
Houston	General Stevedores	29.7544	-95.3104	77032	29.9367	-95.3283	14.78785424
Houston	General Stevedores	29.7544	-95.3104	77033	29.6683	-95.3383	7.306676025
Houston	General Stevedores	29.7544	-95.3104	77034	29.6383	-95.2233	11.717[illegible]231
Houston	General Stevedores	29.7544	-95.3104	77036	29.6983	-95.54	19.080[illegible]18
Houston	General Stevedores	29.7544	-95.3104	77037	29.8883	-95.3983	12.930[illegible]2427
Houston	General Stevedores	29.7544	-95.3104	77038	29.9183	-95.4383	16.78361362
Houston	General Stevedores	29.7544	-95.3104	77040	29.875	-95.52	19.5220631
Houston	General Stevedores	29.7544	-95.3104	77041	29.865	-95.5783	23.39816268
Houston	General Stevedores	29.7544	-95.3104	77042	29.7417	-95.56	20.17627476
Houston	General Stevedores	29.7544	-95.3104	77043	29.8067	-95.5617	20.72214715
Houston	General Stevedores	29.7544	-95.3104	77044	29.86	-95.1983	12.43288393
Houston	General Stevedores	29.7544	-95.3104	77045	29.63	-95.4383	14.40386325
Houston	General Stevedores	29.7544	-95.3104	77049	29.8167	-95.1883	11.06610726
Houston	General Stevedores	29.7544	-95.3104	77051	29.6567	-95.3683	9.168347972
Houston	General Stevedores	29.7544	-95.3104	77052	29.76	-95.3583	3.893304167
Houston	General Stevedores	29.7544	-95.3104	77054	29.6833	-95.4017	9.341999418
Houston	General Stevedores	29.7544	-95.3104	77055	29.7983	-95.4967	15.45192024
Houston	General Stevedores	29.7544	-95.3104	77060	29.9333	-95.3983	16.09174304
Houston	General Stevedores	29.7544	-95.3104	77061	29.6667	-95.2783	7.539378115
Houston	General Stevedores	29.7544	-95.3104	77063	29.7333	-95.5217	17.14308726
Houston	General Stevedores	29.7544	-95.3104	77065	29.93	-95.605	27.68750899
Houston	General Stevedores	29.7544	-95.3104	77066	29.9617	-95.495	22.40900339
Houston	General Stevedores	29.7544	-95.3104	77070	29.9783	-95.5817	28.39756213
Houston	General Stevedores	29.7544	-95.3104	77073	30.0183	-95.4117	22.82031625
Houston	General Stevedores	29.7544	-95.3104	77074	29.69	-95.5117	17.06232895
Houston	General Stevedores	29.7544	-95.3104	77075	29.62	-95.26	11.5879247
Houston	General Stevedores	29.7544	-95.3104	77076	29.8567	-95.3833	10.14108268
Houston	General Stevedores	29.7544	-95.3104	77078	29.85	-95.26	8.724638672
Houston	General Stevedores	29.7544	-95.3104	77079	29.775	-95.6	23.43848147
Houston	General Stevedores	29.7544	-95.3104	77080	29.8183	-95.5233	17.94488624
Houston	General Stevedores	29.7544	-95.3104	77081	29.7117	-95.4833	14.37758011
Houston	General Stevedores	29.7544	-95.3104	77084	29.8433	-95.66	29.12142374
Houston	General Stevedores	29.7544	-95.3104	77087	29.6867	-95.3017	5.510365109
Houston	General Stevedores	29.7544	-95.3104	77090	30.0183	-95.4433	23.85371647

Houston	General Stevedores	29.7544	-95.3104	77091	29.8567	-95.445	13.64849229
Houston	General Stevedores	29.7544	-95.3104	77094	29.7733	-95.71	32.29577088
Houston	General Stevedores	29.7544	-95.3104	77095	29.8933	-95.65	29.62047069
Houston	General Stevedores	29.7544	-95.3104	77201	29.76	-95.3583	3.893304167
Houston	General Stevedores	29.7544	-95.3104	77221	29.6967	-95.3583	6.0540503
Houston	General Stevedores	29.7544	-95.3104	77224	29.7683	-95.52	16.95817578
Houston	General Stevedores	29.7544	-95.3104	77226	29.8	-95.3283	3.954756626
Houston	General Stevedores	29.7544	-95.3104	77234	29.6383	-95.2233	11.71715231
Houston	General Stevedores	29.7544	-95.3104	77255	29.795	-95.49	14.86496026
Houston	General Stevedores	29.7544	-95.3104	77270	29.7983	-95.4167	9.284616876
Houston	General Stevedores	29.7544	-95.3104	77280	29.86	-95.58	23.37485813
Houston	General Stevedores	29.7544	-95.3104	77287	29.6783	-95.245	8.10055054
Houston	Gulf States Asphalt	29.7473	-95.2925	77001	29.76	-95.3583	5.410072628
Houston	Gulf States Asphalt	29.7473	-95.2925	77003	29.7483	-95.3383	3.698315227
Houston	Gulf States Asphalt	29.7473	-95.2925	77007	29.7733	-95.4033	9.18785431
Houston	Gulf States Asphalt	29.7473	-95.2925	77008	29.7983	-95.4117	10.46680562
Houston	Gulf States Asphalt	29.7473	-95.2925	77009	29.7933	-95.3667	7.047890828
Houston	Gulf States Asphalt	29.7473	-95.2925	77010	29.7533	-95.3583	5.334072478
Houston	Gulf States Asphalt	29.7473	-95.2925	77011	29.7417	-95.3067	1.232289968
Houston	Gulf States Asphalt	29.7473	-95.2925	77012	29.715	-95.2817	2.74948176
Houston	Gulf States Asphalt	29.7473	-95.2925	77013	29.785	-95.2283	6.010417627
Houston	Gulf States Asphalt	29.7473	-95.2925	77015	29.785	-95.185	9.19668138
Houston	Gulf States Asphalt	29.7473	-95.2925	77016	29.8567	-95.3033	8.874793975
Houston	Gulf States Asphalt	29.7473	-95.2925	77017	29.6867	-95.255	5.753172346
Houston	Gulf States Asphalt	29.7473	-95.2925	77018	29.8267	-95.425	12.47026618
Houston	Gulf States Asphalt	29.7473	-95.2925	77020	29.775	-95.3117	2.720888451
Houston	Gulf States Asphalt	29.7473	-95.2925	77021	29.695	-95.3567	6.684975354
Houston	Gulf States Asphalt	29.7473	-95.2925	77022	29.8283	-95.3783	9.525674765
Houston	Gulf States Asphalt	29.7473	-95.2925	77023	29.725	-95.3167	2.656654911
Houston	Gulf States Asphalt	29.7473	-95.2925	77024	29.7683	-95.52	18.44415503
Houston	Gulf States Asphalt	29.7473	-95.2925	77025	29.69	-95.435	12.39922922
Houston	Gulf States Asphalt	29.7473	-95.2925	77026	29.7983	-95.3283	5.030353607
Houston	Gulf States Asphalt	29.7473	-95.2925	77027	29.74	-95.4467	12.46250794
Houston	Gulf States Asphalt	29.7473	-95.2925	77028	29.8317	-95.2883	6.82204326
Houston	Gulf States Asphalt	29.7473	-95.2925	77029	29.7583	-95.255	3.154932118
Houston	Gulf States Asphalt	29.7473	-95.2925	77030	29.705	-95.4067	9.831485545
Houston	Gulf States Asphalt	29.7473	-95.2925	77031	29.6583	-95.5417	21.36245159
Houston	Gulf States Asphalt	29.7473	-95.2925	77032	29.9367	-95.3283	15.56100853
Houston	Gulf States Asphalt	29.7473	-95.2925	77033	29.6683	-95.3383	7.371953121
Houston	Gulf States Asphalt	29.7473	-95.2925	77034	29.6383	-95.2233	10.4231278
Houston	Gulf States Asphalt	29.7473	-95.2925	77036	29.6983	-95.54	20.36849257
Houston	Gulf States Asphalt	29.7473	-95.2925	77037	29.8883	-95.3983	14.23108477
Houston	Gulf States Asphalt	29.7473	-95.2925	77038	29.9183	-95.4383	18.14156685
Houston	Gulf States Asphalt	29.7473	-95.2925	77040	29.875	-95.52	21.06164164
Houston	Gulf States Asphalt	29.7473	-95.2925	77041	29.865	-95.5783	24.95261394
Houston	Gulf States Asphalt	29.7473	-95.2925	77042	29.7417	-95.56	21.60000662
Houston	Gulf States Asphalt	29.7473	-95.2925	77043	29.8067	-95.5617	22.25528585
Houston	Gulf States Asphalt	29.7473	-95.2925	77044	29.86	-95.1983	11.85795097
Houston	Gulf States Asphalt	29.7473	-95.2925	77045	29.63	-95.4383	15.10685242
Houston	Gulf States Asphalt	29.7473	-95.2925	77049	29.8167	-95.1883	10.10706069
Houston	Gulf States Asphalt	29.7473	-95.2925	77051	29.6567	-95.3683	9.536396766
Houston	Gulf States Asphalt	29.7473	-95.2925	77052	29.76	-95.3583	5.410072628
Houston	Gulf States Asphalt	29.7473	-95.2925	77054	29.6833	-95.4017	10.2182114
Houston	Gulf States Asphalt	29.7473	-95.2925	77055	29.7983	-95.4967	16.99143855
Houston	Gulf States Asphalt	29.7473	-95.2925	77060	29.9333	-95.3983	17.27502033
Houston	Gulf States Asphalt	29.7473	-95.2925	77061	29.6667	-95.2783	6.607048945
Houston	Gulf States Asphalt	29.7473	-95.2925	77063	29.7333	-95.5217	18.53780193
Houston	Gulf States Asphalt	29.7473	-95.2925	77065	29.93	-95.605	29.22331665
Houston	Gulf States Asphalt	29.7473	-95.2925	77066	29.9617	-95.495	23.80831724
Houston	Gulf States Asphalt	29.7473	-95.2925	77070	29.9783	-95.5817	29.8807501
Houston	Gulf States Asphalt	29.7473	-95.2925	77073	30.0183	-95.4117	23.90066699
Houston	Gulf States Asphalt	29.7473	-95.2925	77074	29.69	-95.5117	18.29063357
Houston	Gulf States Asphalt	29.7473	-95.2925	77075	29.62	-95.26	10.60656413
Houston	Gulf States Asphalt	29.7473	-95.2925	77076	29.8567	-95.3833	11.47758032
Houston	Gulf States Asphalt	29.7473	-95.2925	77078	29.85	-95.26	8.696213716
Houston	Gulf States Asphalt	29.7473	-95.2925	77079	29.775	-95.6	24.92499234
Houston	Gulf States Asphalt	29.7473	-95.2925	77080	29.8183	-95.5233	19.49418721
Houston	Gulf States Asphalt	29.7473	-95.2925	77081	29.7117	-95.4833	15.66910862
Houston	Gulf States Asphalt	29.7473	-95.2925	77084	29.8433	-95.66	30.66382692
Houston	Gulf States Asphalt	29.7473	-95.2925	77087	29.6867	-95.3017	4.948294626

Computation of Average Dray Cost

Houston	Gulf States Asphalt	29.7473	-95.2925	77090	30.0183	-95.4433	25.03692806
Houston	Gulf States Asphalt	29.7473	-95.2925	77091	29.8567	-95.445	15.15158439
Houston	Gulf States Asphalt	29.7473	-95.2925	77094	29.7733	-95.71	33.77006922
Houston	Gulf States Asphalt	29.7473	-95.2925	77095	29.8933	-95.65	31.17497949
Houston	Gulf States Asphalt	29.7473	-95.2925	77201	29.76	-95.3583	5.410072628
Houston	Gulf States Asphalt	29.7473	-95.2925	77221	29.6967	-95.3583	6.701076308
Houston	Gulf States Asphalt	29.7473	-95.2925	77224	29.7683	-95.52	18.44415503
Houston	Gulf States Asphalt	29.7473	-95.2925	77226	29.8	-95.3283	5.143286695
Houston	Gulf States Asphalt	29.7473	-95.2925	77234	29.6383	-95.2233	10.4231278
Houston	Gulf States Asphalt	29.7473	-95.2925	77255	29.795	-95.49	16.40260768
Houston	Gulf States Asphalt	29.7473	-95.2925	77270	29.7983	-95.4167	10.83907809
Houston	Gulf States Asphalt	29.7473	-95.2925	77280	29.86	-95.58	24.92943707
Houston	Gulf States Asphalt	29.7473	-95.2925	77287	29.6783	-95.245	6.762673605
Houston	Ethyl Corp.	29.745	-95.1677	77001	29.76	-95.3583	15.43471463
Houston	Ethyl Corp.	29.745	-95.1677	77003	29.7483	-95.3383	13.7751144
Houston	Ethyl Corp.	29.745	-95.1677	77007	29.7733	-95.4033	19.15671189
Houston	Ethyl Corp.	29.745	-95.1677	77008	29.7983	-95.4117	20.16261286
Houston	Ethyl Corp.	29.745	-95.1677	77009	29.7933	-95.3667	16.53170048
Houston	Ethyl Corp.	29.745	-95.1677	77010	29.7533	-95.3583	15.40172052
Houston	Ethyl Corp.	29.745	-95.1677	77011	29.7417	-95.3067	11.22463196
Houston	Ethyl Corp.	29.745	-95.1677	77012	29.715	-95.2817	9.516557044
Houston	Ethyl Corp.	29.745	-95.1677	77013	29.785	-95.2283	5.861887519
Houston	Ethyl Corp.	29.745	-95.1677	77015	29.785	-95.185	3.51828157
Houston	Ethyl Corp.	29.745	-95.1677	77016	29.8567	-95.3033	14.18282736
Houston	Ethyl Corp.	29.745	-95.1677	77017	29.6867	-95.255	8.474796852
Houston	Ethyl Corp.	29.745	-95.1677	77018	29.8267	-95.425	21.79383767
Houston	Ethyl Corp.	29.745	-95.1677	77020	29.775	-95.3117	11.87472167
Houston	Ethyl Corp.	29.745	-95.1677	77021	29.695	-95.3567	15.78286985
Houston	Ethyl Corp.	29.745	-95.1677	77022	29.8283	-95.3783	18.28338456
Houston	Ethyl Corp.	29.745	-95.1677	77023	29.725	-95.3167	12.13664867
Houston	Ethyl Corp.	29.745	-95.1677	77024	29.7683	-95.52	28.5033131
Houston	Ethyl Corp.	29.745	-95.1677	77025	29.69	-95.435	22.03119925
Houston	Ethyl Corp.	29.745	-95.1677	77026	29.7983	-95.3283	13.66061573
Houston	Ethyl Corp.	29.745	-95.1677	77027	29.74	-95.4467	22.52728665
Houston	Ethyl Corp.	29.745	-95.1677	77028	29.8317	-95.2883	11.99085111
Houston	Ethyl Corp.	29.745	-95.1677	77029	29.7583	-95.255	7.129048679
Houston	Ethyl Corp.	29.745	-95.1677	77030	29.705	-95.4067	19.56282968
Houston	Ethyl Corp.	29.745	-95.1677	77031	29.6583	-95.5417	30.99368534
Houston	Ethyl Corp.	29.745	-95.1677	77032	29.9367	-95.3283	20.18915913
Houston	Ethyl Corp.	29.745	-95.1677	77033	29.6683	-95.3383	15.10044885
Houston	Ethyl Corp.	29.745	-95.1677	77034	29.6383	-95.2233	9.71321473
Houston	Ethyl Corp.	29.745	-95.1677	77036	29.6983	-95.54	30.2913096
Houston	Ethyl Corp.	29.745	-95.1677	77037	29.8883	-95.3983	21.91804633
Houston	Ethyl Corp.	29.745	-95.1677	77038	29.9183	-95.4383	25.94150868
Houston	Ethyl Corp.	29.745	-95.1677	77040	29.875	-95.52	30.31573171
Houston	Ethyl Corp.	29.745	-95.1677	77041	29.865	-95.5783	34.53436156
Houston	Ethyl Corp.	29.745	-95.1677	77042	29.7417	-95.56	31.67149949
Houston	Ethyl Corp.	29.745	-95.1677	77043	29.8067	-95.5617	32.19527076
Houston	Ethyl Corp.	29.745	-95.1677	77044	29.86	-95.1983	9.606992112
Houston	Ethyl Corp.	29.745	-95.1677	77045	29.63	-95.4383	23.7364542
Houston	Ethyl Corp.	29.745	-95.1677	77049	29.8167	-95.1883	6.022506698
Houston	Ethyl Corp.	29.745	-95.1677	77051	29.6567	-95.3683	17.69391844
Houston	Ethyl Corp.	29.745	-95.1677	77052	29.76	-95.3583	15.43471463
Houston	Ethyl Corp.	29.745	-95.1677	77054	29.6833	-95.4017	19.53647485
Houston	Ethyl Corp.	29.745	-95.1677	77055	29.7983	-95.4967	26.90646124
Houston	Ethyl Corp.	29.745	-95.1677	77060	29.9333	-95.3983	24.03440027
Houston	Ethyl Corp.	29.745	-95.1677	77061	29.6667	-95.2783	10.93980865
Houston	Ethyl Corp.	29.745	-95.1677	77063	29.7333	-95.5217	28.59402468
Houston	Ethyl Corp.	29.745	-95.1677	77065	29.93	-95.605	38.33241052
Houston	Ethyl Corp.	29.745	-95.1677	77066	29.9617	-95.495	31.68939721
Houston	Ethyl Corp.	29.745	-95.1677	77070	29.9783	-95.5817	38.36373268
Houston	Ethyl Corp.	29.745	-95.1677	77073	30.0183	-95.4117	29.57726088
Houston	Ethyl Corp.	29.745	-95.1677	77074	29.69	-95.5117	28.12383399
Houston	Ethyl Corp.	29.745	-95.1677	77075	29.62	-95.26	12.54417696
Houston	Ethyl Corp.	29.745	-95.1677	77076	29.8567	-95.3833	19.6026421
Houston	Ethyl Corp.	29.745	-95.1677	77078	29.85	-95.26	11.28612618
Houston	Ethyl Corp.	29.745	-95.1677	77079	29.775	-95.6	34.98351346
Houston	Ethyl Corp.	29.745	-95.1677	77080	29.8183	-95.5233	29.31113306
Houston	Ethyl Corp.	29.745	-95.1677	77081	29.7117	-95.4833	25.61982163
Houston	Ethyl Corp.	29.745	-95.1677	77084	29.8433	-95.66	40.5279218

Houston	Ethyl Corp.	29.745	-95.1677	77087	29.6867	-95.3017	11.79732712
Houston	Ethyl Corp.	29.745	-95.1677	77090	30.0183	-95.4433	31.33408362
Houston	Ethyl Corp.	29.745	-95.1677	77091	29.8567	-95.445	24.13437899
Houston	Ethyl Corp.	29.745	-95.1677	77094	29.7733	-95.71	43.83945109
Houston	Ethyl Corp.	29.745	-95.1677	77095	29.8933	-95.65	40.73515967
Houston	Ethyl Corp.	29.745	-95.1677	77201	29.76	-95.3583	15.43471463
Houston	Ethyl Corp.	29.745	-95.1677	77221	29.6967	-95.3583	15.87350738
Houston	Ethyl Corp.	29.745	-95.1677	77224	29.7683	-95.52	28.5033131
Houston	Ethyl Corp.	29.745	-95.1677	77226	29.8	-95.3283	13.70446381
Houston	Ethyl Corp.	29.745	-95.1677	77234	29.6383	-95.2233	9.71321473
Houston	Ethyl Corp.	29.745	-95.1677	77255	29.795	-95.49	26.33051864
Houston	Ethyl Corp.	29.745	-95.1677	77270	29.7983	-95.4167	20.55714433
Houston	Ethyl Corp.	29.745	-95.1677	77280	29.86	-95.58	34.55548516
Houston	Ethyl Corp.	29.745	-95.1677	77287	29.6783	-95.245	8.24244207
Houston	Kerley	29.7449	-95.1855	77001	29.76	-95.3583	14.00330442
Houston	Kerley	29.7449	-95.1855	77003	29.7483	-95.3383	12.33859741
Houston	Kerley	29.7449	-95.1855	77007	29.7733	-95.4033	17.73184418
Houston	Kerley	29.7449	-95.1855	77008	29.7983	-95.4117	18.76308313
Houston	Kerley	29.7449	-95.1855	77009	29.7933	-95.3667	15.14112618
Houston	Kerley	29.7449	-95.1855	77010	29.7533	-95.3583	13.96661665
Houston	Kerley	29.7449	-95.1855	77011	29.7417	-95.3067	9.787885782
Houston	Kerley	29.7449	-95.1855	77012	29.715	-95.2817	8.132701093
Houston	Kerley	29.7449	-95.1855	77013	29.785	-95.2283	4.734833426
Houston	Kerley	29.7449	-95.1855	77015	29.785	-95.185	3.237524642
Houston	Kerley	29.7449	-95.1855	77016	29.8567	-95.3033	13.11112863
Houston	Kerley	29.7449	-95.1855	77017	29.6867	-95.255	7.318204557
Houston	Kerley	29.7449	-95.1855	77018	29.8267	-95.425	20.43146796
Houston	Kerley	29.7449	-95.1855	77020	29.775	-95.3117	10.47390472
Houston	Kerley	29.7449	-95.1855	77021	29.695	-95.3567	14.39609675
Houston	Kerley	29.7449	-95.1855	77022	29.8283	-95.3783	16.95856585
Houston	Kerley	29.7449	-95.1855	77023	29.725	-95.3167	10.71291967
Houston	Kerley	29.7449	-95.1855	77024	29.7683	-95.52	27.07017987
Houston	Kerley	29.7449	-95.1855	77025	29.69	-95.435	20.62398868
Houston	Kerley	29.7449	-95.1855	77026	29.7983	-95.3283	12.30792328
Houston	Kerley	29.7449	-95.1855	77027	29.74	-95.4467	21.0903861
Houston	Kerley	29.7449	-95.1855	77028	29.8317	-95.2883	10.86173474
Houston	Kerley	29.7449	-95.1855	77029	29.7583	-95.255	5.714070312
Houston	Kerley	29.7449	-95.1855	77030	29.705	-95.4067	18.14566362
Houston	Kerley	29.7449	-95.1855	77031	29.6583	-95.5417	29.59368447
Houston	Kerley	29.7449	-95.1855	77032	29.9367	-95.3283	19.30427671
Houston	Kerley	29.7449	-95.1855	77033	29.6683	-95.3383	13.79878573
Houston	Kerley	29.7449	-95.1855	77034	29.6383	-95.2233	9.130844944
Houston	Kerley	29.7449	-95.1855	77036	29.6983	-95.54	28.86498977
Houston	Kerley	29.7449	-95.1855	77037	29.8883	-95.3983	20.71592205
Houston	Kerley	29.7449	-95.1855	77038	29.9183	-95.4383	24.74811036
Houston	Kerley	29.7449	-95.1855	77040	29.875	-95.52	28.97478989
Houston	Kerley	29.7449	-95.1855	77041	29.865	-95.5783	33.15987575
Houston	Kerley	29.7449	-95.1855	77042	29.7417	-95.56	30.23448869
Houston	Kerley	29.7449	-95.1855	77043	29.8067	-95.5617	30.77768968
Houston	Kerley	29.7449	-95.1855	77044	29.86	-95.1983	9.349304319
Houston	Kerley	29.7449	-95.1855	77045	29.63	-95.4383	22.41763953
Houston	Kerley	29.7449	-95.1855	77049	29.8167	-95.1883	5.800819869
Houston	Kerley	29.7449	-95.1855	77051	29.6567	-95.3683	16.38542188
Houston	Kerley	29.7449	-95.1855	77052	29.76	-95.3583	14.00330442
Houston	Kerley	29.7449	-95.1855	77054	29.6833	-95.4017	18.14845593
Houston	Kerley	29.7449	-95.1855	77055	29.7983	-95.4967	25.49036167
Houston	Kerley	29.7449	-95.1855	77060	29.9333	-95.3983	22.94471015
Houston	Kerley	29.7449	-95.1855	77061	29.6667	-95.2783	9.797003777
Houston	Kerley	29.7449	-95.1855	77063	29.7333	-95.5217	27.1575768
Houston	Kerley	29.7449	-95.1855	77065	29.93	-95.605	37.01646658
Houston	Kerley	29.7449	-95.1855	77066	29.9617	-95.495	30.50616647
Houston	Kerley	29.7449	-95.1855	77070	29.9783	-95.5817	37.12263517
Houston	Kerley	29.7449	-95.1855	77073	30.0183	-95.4117	28.64652605
Houston	Kerley	29.7449	-95.1855	77074	29.69	-95.5117	26.70448462
Houston	Kerley	29.7449	-95.1855	77075	29.62	-95.26	11.74066801
Houston	Kerley	29.7449	-95.1855	77076	29.8567	-95.3833	18.34260928
Houston	Kerley	29.7449	-95.1855	77078	29.85	-95.26	10.40016112
Houston	Kerley	29.7449	-95.1855	77079	29.775	-95.6	33.55069841
Houston	Kerley	29.7449	-95.1855	77080	29.8183	-95.5233	27.9069493
Houston	Kerley	29.7449	-95.1855	77081	29.7117	-95.4833	24.19033465

Houston	Kerley	29.7449	-95.1855	77084	29.8433	-95.66	39.12139566
Houston	Kerley	29.7449	-95.1855	77087	29.6867	-95.3017	10.49169515
Houston	Kerley	29.7449	-95.1855	77090	30.0183	-95.4433	30.33648218
Houston	Kerley	29.7449	-95.1855	77091	29.8567	-95.445	22.810974
Houston	Kerley	29.7449	-95.1855	77094	29.7733	-95.71	42.40491163
Houston	Kerley	29.7449	-95.1855	77095	29.8933	-95.65	39.36635277
Houston	Kerley	29.7449	-95.1855	77201	29.76	-95.3583	14.00330442
Houston	Kerley	29.7449	-95.1855	77221	29.6967	-95.3583	14.482674
Houston	Kerley	29.7449	-95.1855	77224	29.7683	-95.52	27.07017987
Houston	Kerley	29.7449	-95.1855	77226	29.8	-95.3283	12.35666207
Houston	Kerley	29.7449	-95.1855	77234	29.6383	-95.2233	9.130844944
Houston	Kerley	29.7449	-95.1855	77255	29.795	-95.49	24.91279403
Houston	Kerley	29.7449	-95.1855	77270	29.7983	-95.4167	19.15615903
Houston	Kerley	29.7449	-95.1855	77280	29.86	-95.58	33.17583217
Houston	Kerley	29.7449	-95.1855	77287	29.6783	-95.245	7.209785636
Houston	Lone Star	29.7239	-95.2683	77001	29.76	-95.3583	7.828400213
Houston	Lone Star	29.7239	-95.2683	77003	29.7483	-95.3383	5.984571039
Houston	Lone Star	29.7239	-95.2683	77007	29.7733	-95.4033	11.60530183
Houston	Lone Star	29.7239	-95.2683	77008	29.7983	-95.4117	13.0420608
Houston	Lone Star	29.7239	-95.2683	77009	29.7933	-95.3667	9.720817267
Houston	Lone Star	29.7239	-95.2683	77010	29.7533	-95.3583	7.643540957
Houston	Lone Star	29.7239	-95.2683	77011	29.7417	-95.3067	3.416891885
Houston	Lone Star	29.7239	-95.2683	77012	29.715	-95.2817	1.298649389
Houston	Lone Star	29.7239	-95.2683	77013	29.785	-95.2283	5.89561744
Houston	Lone Star	29.7239	-95.2683	77015	29.785	-95.185	8.3398818
Houston	Lone Star	29.7239	-95.2683	77016	29.8567	-95.3033	11.08703626
Houston	Lone Star	29.7239	-95.2683	77017	29.6867	-95.255	3.189325474
Houston	Lone Star	29.7239	-95.2683	77018	29.8267	-95.425	15.12965709
Houston	Lone Star	29.7239	-95.2683	77020	29.775	-95.3117	5.412385093
Houston	Lone Star	29.7239	-95.2683	77021	29.695	-95.3567	7.508224197
Houston	Lone Star	29.7239	-95.2683	77022	29.8283	-95.3783	12.24314035
Houston	Lone Star	29.7239	-95.2683	77023	29.725	-95.3167	3.908340995
Houston	Lone Star	29.7239	-95.2683	77024	29.7683	-95.52	20.63346514
Houston	Lone Star	29.7239	-95.2683	77025	29.69	-95.435	13.73314353
Houston	Lone Star	29.7239	-95.2683	77026	29.7983	-95.3283	7.716098903
Houston	Lone Star	29.7239	-95.2683	77027	29.74	-95.4467	14.46076224
Houston	Lone Star	29.7239	-95.2683	77028	29.8317	-95.2883	8.851204213
Houston	Lone Star	29.7239	-95.2683	77029	29.7583	-95.255	2.977448921
Houston	Lone Star	29.7239	-95.2683	77030	29.705	-95.4067	11.27673271
Houston	Lone Star	29.7239	-95.2683	77031	29.6583	-95.5417	22.69804312
Houston	Lone Star	29.7239	-95.2683	77032	29.9367	-95.3283	17.84915288
Houston	Lone Star	29.7239	-95.2683	77033	29.6683	-95.3383	7.216810476
Houston	Lone Star	29.7239	-95.2683	77034	29.6383	-95.2233	7.807204591
Houston	Lone Star	29.7239	-95.2683	77036	29.6983	-95.54	22.03148916
Houston	Lone Star	29.7239	-95.2683	77037	29.8883	-95.3983	16.92008359
Houston	Lone Star	29.7239	-95.2683	77038	29.9183	-95.4383	20.84825639
Houston	Lone Star	29.7239	-95.2683	77040	29.875	-95.52	23.70000992
Houston	Lone Star	29.7239	-95.2683	77041	29.865	-95.5783	27.49673873
Houston	Lone Star	29.7239	-95.2683	77042	29.7417	-95.56	23.5927441
Houston	Lone Star	29.7239	-95.2683	77043	29.8067	-95.5617	24.61131872
Houston	Lone Star	29.7239	-95.2683	77044	29.86	-95.1983	12.35543836
Houston	Lone Star	29.7239	-95.2683	77045	29.63	-95.4383	15.67850802
Houston	Lone Star	29.7239	-95.2683	77049	29.8167	-95.1883	9.891266791
Houston	Lone Star	29.7239	-95.2683	77051	29.6567	-95.3683	9.726487629
Houston	Lone Star	29.7239	-95.2683	77052	29.76	-95.3583	7.828400213
Houston	Lone Star	29.7239	-95.2683	77054	29.6833	-95.4017	11.25710884
Houston	Lone Star	29.7239	-95.2683	77055	29.7983	-95.4967	19.39233409
Houston	Lone Star	29.7239	-95.2683	77060	29.9333	-95.3983	19.89767035
Houston	Lone Star	29.7239	-95.2683	77061	29.6667	-95.2783	4.687793059
Houston	Lone Star	29.7239	-95.2683	77063	29.7333	-95.5217	20.47105234
Houston	Lone Star	29.7239	-95.2683	77065	29.93	-95.605	31.86985849
Houston	Lone Star	29.7239	-95.2683	77066	29.9617	-95.495	26.52342716
Houston	Lone Star	29.7239	-95.2683	77070	29.9783	-95.5817	32.58722425
Houston	Lone Star	29.7239	-95.2683	77073	30.0183	-95.4117	26.43644591
Houston	Lone Star	29.7239	-95.2683	77074	29.69	-95.5117	19.83934946
Houston	Lone Star	29.7239	-95.2683	77075	29.62	-95.26	8.414568103
Houston	Lone Star	29.7239	-95.2683	77076	29.8567	-95.3833	14.18204385
Houston	Lone Star	29.7239	-95.2683	77078	29.85	-95.26	10.20208107
Houston	Lone Star	29.7239	-95.2683	77079	29.775	-95.6	27.0940392
Houston	Lone Star	29.7239	-95.2683	77080	29.8183	-95.5233	21.95148905

Houston	Lone Star	29.7239	-95.2683	77081	29.7117	-95.4833	17.38487139
Houston	Lone Star	29.7239	-95.2683	77084	29.8433	-95.66	33.05844214
Houston	Lone Star	29.7239	-95.2683	77087	29.6867	-95.3017	4.036015591
Houston	Lone Star	29.7239	-95.2683	77090	30.0183	-95.4433	27.6488594
Houston	Lone Star	29.7239	-95.2683	77091	29.8567	-95.445	17.84456804
Houston	Lone Star	29.7239	-95.2683	77094	29.7733	-95.71	35.8807616
Houston	Lone Star	29.7239	-95.2683	77095	29.8933	-95.65	33.71299202
Houston	Lone Star	29.7239	-95.2683	77201	29.76	-95.3583	7.828400213
Houston	Lone Star	29.7239	-95.2683	77221	29.6967	-95.3583	7.590268774
Houston	Lone Star	29.7239	-95.2683	77224	29.7683	-95.52	20.63346514
Houston	Lone Star	29.7239	-95.2683	77226	29.8	-95.3283	7.823403473
Houston	Lone Star	29.7239	-95.2683	77234	29.6383	-95.2233	7.807204591
Houston	Lone Star	29.7239	-95.2683	77255	29.795	-95.49	18.79572289
Houston	Lone Star	29.7239	-95.2683	77270	29.7983	-95.4167	13.40164686
Houston	Lone Star	29.7239	-95.2683	77280	29.86	-95.58	27.45770787
Houston	Lone Star	29.7239	-95.2683	77287	29.6783	-95.245	4.134014538
Houston	Lyondell Chemical	29.7179	-95.2382	77001	29.76	-95.3583	10.27411607
Houston	Lyondell Chemical	29.7179	-95.2382	77003	29.7483	-95.3383	8.445519475
Houston	Lyondell Chemical	29.7179	-95.2382	77007	29.7733	-95.4033	14.05888555
Houston	Lyondell Chemical	29.7179	-95.2382	77008	29.7983	-95.4117	15.43746958
Houston	Lyondell Chemical	29.7179	-95.2382	77009	29.7933	-95.3667	12.02779741
Houston	Lyondell Chemical	29.7179	-95.2382	77010	29.7533	-95.3583	10.1080827
Houston	Lyondell Chemical	29.7179	-95.2382	77011	29.7417	-95.3067	5.854283333
Houston	Lyondell Chemical	29.7179	-95.2382	77012	29.715	-95.2817	3.519550248
Houston	Lyondell Chemical	29.7179	-95.2382	77013	29.785	-95.2283	5.475624952
Houston	Lyondell Chemical	29.7179	-95.2382	77015	29.785	-95.185	6.912982069
Houston	Lyondell Chemical	29.7179	-95.2382	77016	29.8567	-95.3033	12.37658305
Houston	Lyondell Chemical	29.7179	-95.2382	77017	29.6867	-95.255	2.860713998
Houston	Lyondell Chemical	29.7179	-95.2382	77018	29.8267	-95.425	17.45181697
Houston	Lyondell Chemical	29.7179	-95.2382	77020	29.775	-95.3117	7.513816542
Houston	Lyondell Chemical	29.7179	-95.2382	77021	29.695	-95.3567	9.743498985
Houston	Lyondell Chemical	29.7179	-95.2382	77022	29.8283	-95.3783	14.39988095
Houston	Lyondell Chemical	29.7179	-95.2382	77023	29.725	-95.3167	6.363173219
Houston	Lyondell Chemical	29.7179	-95.2382	77024	29.7683	-95.52	23.11070218
Houston	Lyondell Chemical	29.7179	-95.2382	77025	29.69	-95.435	16.04652687
Houston	Lyondell Chemical	29.7179	-95.2382	77026	29.7983	-95.3283	9.748684849
Houston	Lyondell Chemical	29.7179	-95.2382	77027	29.74	-95.4467	16.92649567
Houston	Lyondell Chemical	29.7179	-95.2382	77028	29.8317	-95.2883	10.03797287
Houston	Lyondell Chemical	29.7179	-95.2382	77029	29.7583	-95.255	3.532248873
Houston	Lyondell Chemical	29.7179	-95.2382	77030	29.705	-95.4067	13.64281109
Houston	Lyondell Chemical	29.7179	-95.2382	77031	29.6583	-95.5417	24.96951755
Houston	Lyondell Chemical	29.7179	-95.2382	77032	29.9367	-95.3283	19.10274638
Houston	Lyondell Chemical	29.7179	-95.2382	77033	29.6683	-95.3383	9.018726215
Houston	Lyondell Chemical	29.7179	-95.2382	77034	29.6383	-95.2233	6.537719565
Houston	Lyondell Chemical	29.7179	-95.2382	77036	29.6983	-95.54	24.41564038
Houston	Lyondell Chemical	29.7179	-95.2382	77037	29.8883	-95.3983	18.87566324
Houston	Lyondell Chemical	29.7179	-95.2382	77038	29.9183	-95.4383	22.86244096
Houston	Lyondell Chemical	29.7179	-95.2382	77040	29.875	-95.52	26.04611171
Houston	Lyondell Chemical	29.7179	-95.2382	77041	29.865	-95.5783	29.91440537
Houston	Lyondell Chemical	29.7179	-95.2382	77042	29.7417	-95.56	26.04986853
Houston	Lyondell Chemical	29.7179	-95.2382	77043	29.8067	-95.5617	27.0822006
Houston	Lyondell Chemical	29.7179	-95.2382	77044	29.86	-95.1983	11.91538154
Houston	Lyondell Chemical	29.7179	-95.2382	77045	29.63	-95.4383	17.64396952
Houston	Lyondell Chemical	29.7179	-95.2382	77049	29.8167	-95.1883	8.935702443
Houston	Lyondell Chemical	29.7179	-95.2382	77051	29.6567	-95.3683	11.60701172
Houston	Lyondell Chemical	29.7179	-95.2382	77052	29.76	-95.3583	10.27411607
Houston	Lyondell Chemical	29.7179	-95.2382	77054	29.6833	-95.4017	13.49167383
Houston	Lyondell Chemical	29.7179	-95.2382	77055	29.7983	-95.4967	21.85479195
Houston	Lyondell Chemical	29.7179	-95.2382	77060	29.9333	-95.3983	21.66651978
Houston	Lyondell Chemical	29.7179	-95.2382	77061	29.6667	-95.2783	5.250212723
Houston	Lyondell Chemical	29.7179	-95.2382	77063	29.7333	-95.5217	22.92069719
Houston	Lyondell Chemical	29.7179	-95.2382	77065	29.93	-95.605	34.20596406
Houston	Lyondell Chemical	29.7179	-95.2382	77066	29.9617	-95.495	28.58625019
Houston	Lyondell Chemical	29.7179	-95.2382	77070	29.9783	-95.5817	34.79832072
Houston	Lyondell Chemical	29.7179	-95.2382	77073	30.0183	-95.4117	28.0055628
Houston	Lyondell Chemical	29.7179	-95.2382	77074	29.69	-95.5117	22.19424074
Houston	Lyondell Chemical	29.7179	-95.2382	77075	29.62	-95.26	8.097041923
Houston	Lyondell Chemical	29.7179	-95.2382	77076	29.8567	-95.3833	16.21034478
Houston	Lyondell Chemical	29.7179	-95.2382	77078	29.85	-95.26	10.80867376
Houston	Lyondell Chemical	29.7179	-95.2382	77079	29.775	-95.6	29.56963139

Houston	Lyondell Chemical	29.7179	-95.2382	77080	29.8183	-95.5233	24.40159168
Houston	Lyondell Chemical	29.7179	-95.2382	77081	29.7117	-95.4833	19.79325259
Houston	Lyondell Chemical	29.7179	-95.2382	77084	29.8433	-95.66	35.52490605
Houston	Lyondell Chemical	29.7179	-95.2382	77087	29.6867	-95.3017	5.711720242
Houston	Lyondell Chemical	29.7179	-95.2382	77090	30.0183	-95.4433	29.36466166
Houston	Lyondell Chemical	29.7179	-95.2382	77091	29.8567	-95.445	20.10674287
Houston	Lyondell Chemical	29.7179	-95.2382	77094	29.7733	-95.71	38.35009802
Houston	Lyondell Chemical	29.7179	-95.2382	77095	29.8933	-95.65	36.13462535
Houston	Lyondell Chemical	29.7179	-95.2382	77201	29.76	-95.3583	10.27411607
Houston	Lyondell Chemical	29.7179	-95.2382	77221	29.6967	-95.3583	9.845568801
Houston	Lyondell Chemical	29.7179	-95.2382	77224	29.7683	-95.52	23.11070218
Houston	Lyondell Chemical	29.7179	-95.2382	77226	29.8	-95.3283	9.840592945
Houston	Lyondell Chemical	29.7179	-95.2382	77234	29.6383	-95.2233	6.537719565
Houston	Lyondell Chemical	29.7179	-95.2382	77255	29.795	-95.49	21.25939136
Houston	Lyondell Chemical	29.7179	-95.2382	77270	29.7983	-95.4167	15.80461872
Houston	Lyondell Chemical	29.7179	-95.2382	77280	29.86	-95.58	29.88315032
Houston	Lyondell Chemical	29.7179	-95.2382	77287	29.6783	-95.245	3.243698851
Houston	Pacific Molasses	29.7431	-95.2839	77001	29.76	-95.3583	6.159318087
Houston	Pacific Molasses	29.7431	-95.2839	77003	29.7483	-95.3383	4.411730156
Houston	Pacific Molasses	29.7431	-95.2839	77007	29.7733	-95.4033	9.94271152
Houston	Pacific Molasses	29.7431	-95.2839	77008	29.7983	-95.4117	11.23855549
Houston	Pacific Molasses	29.7431	-95.2839	77009	29.7933	-95.3667	7.817015491
Houston	Pacific Molasses	29.7431	-95.2839	77010	29.7533	-95.3583	6.062495126
Houston	Pacific Molasses	29.7431	-95.2839	77011	29.7417	-95.3067	1.844110709
Houston	Pacific Molasses	29.7431	-95.2839	77012	29.715	-95.2817	2.275454926
Houston	Pacific Molasses	29.7431	-95.2839	77013	29.785	-95.2283	5.620437443
Houston	Pacific Molasses	29.7431	-95.2839	77015	29.785	-95.185	8.671176192
Houston	Pacific Molasses	29.7431	-95.2839	77016	29.8567	-95.3033	9.303697318
Houston	Pacific Molasses	29.7431	-95.2839	77017	29.6867	-95.255	5.116123227
Houston	Pacific Molasses	29.7431	-95.2839	77018	29.8267	-95.425	13.24025409
Houston	Pacific Molasses	29.7431	-95.2839	77020	29.775	-95.3117	3.415985757
Houston	Pacific Molasses	29.7431	-95.2839	77021	29.695	-95.3567	7.044103078
Houston	Pacific Molasses	29.7431	-95.2839	77022	29.8283	-95.3783	10.26585992
Houston	Pacific Molasses	29.7431	-95.2839	77023	29.725	-95.3167	3.024359578
Houston	Pacific Molasses	29.7431	-95.2839	77024	29.7683	-95.52	19.16861559
Houston	Pacific Molasses	29.7431	-95.2839	77025	29.69	-95.435	12.92961458
Houston	Pacific Molasses	29.7431	-95.2839	77026	29.7983	-95.3283	5.718966989
Houston	Pacific Molasses	29.7431	-95.2839	77027	29.74	-95.4467	13.14522651
Houston	Pacific Molasses	29.7431	-95.2839	77028	29.8317	-95.2883	7.161492731
Houston	Pacific Molasses	29.7431	-95.2839	77029	29.7583	-95.255	2.636115742
Houston	Pacific Molasses	29.7431	-95.2839	77030	29.705	-95.4067	10.37983444
Houston	Pacific Molasses	29.7431	-95.2839	77031	29.6583	-95.5417	21.90921771
Houston	Pacific Molasses	29.7431	-95.2839	77032	29.9367	-95.3283	16.03508351
Houston	Pacific Molasses	29.7431	-95.2839	77033	29.6683	-95.3383	7.466717656
Houston	Pacific Molasses	29.7431	-95.2839	77034	29.6383	-95.2233	9.773132588
Houston	Pacific Molasses	29.7431	-95.2839	77036	29.6983	-95.54	20.98890729
Houston	Pacific Molasses	29.7431	-95.2839	77037	29.8883	-95.3983	14.92313212
Houston	Pacific Molasses	29.7431	-95.2839	77038	29.9183	-95.4383	18.85255525
Houston	Pacific Molasses	29.7431	-95.2839	77040	29.875	-95.52	21.83307291
Houston	Pacific Molasses	29.7431	-95.2839	77041	29.865	-95.5783	25.72374644
Houston	Pacific Molasses	29.7431	-95.2839	77042	29.7417	-95.56	22.28983954
Houston	Pacific Molasses	29.7431	-95.2839	77043	29.8067	-95.5617	23.00703023
Houston	Pacific Molasses	29.7431	-95.2839	77044	29.86	-95.1983	11.69693011
Houston	Pacific Molasses	29.7431	-95.2839	77045	29.63	-95.4383	15.45109142
Houston	Pacific Molasses	29.7431	-95.2839	77049	29.8167	-95.1883	9.740040207
Houston	Pacific Molasses	29.7431	-95.2839	77051	29.6567	-95.3683	9.750740377
Houston	Pacific Molasses	29.7431	-95.2839	77052	29.76	-95.3583	6.159318087
Houston	Pacific Molasses	29.7431	-95.2839	77054	29.6833	-95.4017	10.66518772
Houston	Pacific Molasses	29.7431	-95.2839	77055	29.7983	-95.4967	17.74791352
Houston	Pacific Molasses	29.7431	-95.2839	77060	29.9333	-95.3983	17.91831403
Houston	Pacific Molasses	29.7431	-95.2839	77061	29.6667	-95.2783	6.184318475
Houston	Pacific Molasses	29.7431	-95.2839	77063	29.7333	-95.5217	19.21388925
Houston	Pacific Molasses	29.7431	-95.2839	77065	29.93	-95.605	29.99386451
Houston	Pacific Molasses	29.7431	-95.2839	77066	29.9617	-95.495	24.53304473
Houston	Pacific Molasses	29.7431	-95.2839	77070	29.9783	-95.5817	30.63529378
Houston	Pacific Molasses	29.7431	-95.2839	77073	30.0183	-95.4117	24.49565315
Houston	Pacific Molasses	29.7431	-95.2839	77074	29.69	-95.5117	18.88330613
Houston	Pacific Molasses	29.7431	-95.2839	77075	29.62	-95.26	10.12343256
Houston	Pacific Molasses	29.7431	-95.2839	77076	29.8567	-95.3833	12.18603773
Houston	Pacific Molasses	29.7431	-95.2839	77078	29.85	-95.26	8.843093596

Computation of Average Dray Cost

Houston	Pacific Molasses	29.7431	-95.2839	77079	29.775	-95.6	25.6483695
Houston	Pacific Molasses	29.7431	-95.2839	77080	29.8183	-95.5233	20.25782584
Houston	Pacific Molasses	29.7431	-95.2839	77081	29.7117	-95.4833	16.29592992
Houston	Pacific Molasses	29.7431	-95.2839	77084	29.8433	-95.66	31.42163121
Houston	Pacific Molasses	29.7431	-95.2839	77087	29.6867	-95.3017	4.774549928
Houston	Pacific Molasses	29.7431	-95.2839	77090	30.0183	-95.4433	25.6746024
Houston	Pacific Molasses	29.7431	-95.2839	77091	29.8567	-95.445	15.91388167
Houston	Pacific Molasses	29.7431	-95.2839	77094	29.7733	-95.71	34.48534349
Houston	Pacific Molasses	29.7431	-95.2839	77095	29.8933	-95.65	31.9459586
Houston	Pacific Molasses	29.7431	-95.2839	77201	29.76	-95.3583	6.159318087
Houston	Pacific Molasses	29.7431	-95.2839	77221	29.6967	-95.3583	7.078653889
Houston	Pacific Molasses	29.7431	-95.2839	77224	29.7683	-95.52	19.16861559
Houston	Pacific Molasses	29.7431	-95.2839	77226	29.8	-95.3283	5.82654199
Houston	Pacific Molasses	29.7431	-95.2839	77234	29.6383	-95.2233	9.773132588
Houston	Pacific Molasses	29.7431	-95.2839	77255	29.795	-95.49	17.15789239
Houston	Pacific Molasses	29.7431	-95.2839	77270	29.7983	-95.4167	11.61022025
Houston	Pacific Molasses	29.7431	-95.2839	77280	29.86	-95.58	25.69964709
Houston	Pacific Molasses	29.7431	-95.2839	77287	29.6783	-95.245	6.101527256
Little Rock	Pentzien	34.6143	-92.1744	72201	34.7483	-92.2817	13.85861368
Little Rock	Pentzien	34.6143	-92.1744	72202	34.7367	-92.275	12.79057749
Little Rock	Pentzien	34.6143	-92.1744	72203	34.7367	-92.275	12.79057749
Little Rock	Pentzien	34.6143	-92.1744	72204	34.7283	-92.345	16.56448192
Little Rock	Pentzien	34.6143	-92.1744	72205	34.7517	-92.3467	17.79104031
Little Rock	Pentzien	34.6143	-92.1744	72206	34.69	-92.2683	9.737155839
Little Rock	Pentzien	34.6143	-92.1744	72208	34.7817	-92.5833	35.66968696
Little Rock	Pentzien	34.6143	-92.1744	72209	34.6733	-92.3517	15.08512796
Little Rock	Pentzien	34.6143	-92.1744	72211	34.7567	-92.43	23.62081993
Little Rock	Pentzien	34.6143	-92.1744	72212	34.7867	-92.4233	24.44306166
Little Rock	Pentzien	34.6143	-92.1744	72214	34.73	-92.3467	16.75488477
Little Rock	Pentzien	34.6143	-92.1744	72219	34.68	-92.345	14.75855024
Little Rock	Pentzien	34.6143	-92.1744	72220	34.74	-92.3705	18.80432021
Little Rock	Oil Pier	34.7197	-92.1781	72201	34.7483	-92.2817	8.676473416
Little Rock	Oil Pier	34.7197	-92.1781	72202	34.7367	-92.275	7.942211492
Little Rock	Oil Pier	34.7197	-92.1781	72203	34.7367	-92.275	7.942211492
Little Rock	Oil Pier	34.7197	-92.1781	72204	34.7283	-92.345	13.49171247
Little Rock	Oil Pier	34.7197	-92.1781	72205	34.7517	-92.3467	13.85406775
Little Rock	Oil Pier	34.7197	-92.1781	72206	34.69	-92.2683	7.666430417
Little Rock	Oil Pier	34.7197	-92.1781	72208	34.7817	-92.5833	33.09251011
Little Rock	Oil Pier	34.7197	-92.1781	72209	34.6733	-92.3517	14.50669356
Little Rock	Oil Pier	34.7197	-92.1781	72211	34.7567	-92.43	20.55408789
Little Rock	Oil Pier	34.7197	-92.1781	72212	34.7867	-92.4233	20.52067674
Little Rock	Oil Pier	34.7197	-92.1781	72214	34.73	-92.3467	13.63645365
Little Rock	Oil Pier	34.7197	-92.1781	72219	34.68	-92.345	13.84977208
Little Rock	Oil Pier	34.7197	-92.1781	72220	34.74	-92.3705	15.61866809
Little Rock	Power and Light	34.7444	-92.2044	72201	34.7483	-92.2817	6.248366406
Little Rock	Power and Light	34.7444	-92.2044	72202	34.7367	-92.275	5.733336383
Little Rock	Power and Light	34.7444	-92.2044	72203	34.7367	-92.275	5.733336383
Little Rock	Power and Light	34.7444	-92.2044	72204	34.7283	-92.345	11.42481251
Little Rock	Power and Light	34.7444	-92.2044	72205	34.7517	-92.3467	11.50298538
Little Rock	Power and Light	34.7444	-92.2044	72206	34.69	-92.2683	6.774863332
Little Rock	Power and Light	34.7444	-92.2044	72208	34.7817	-92.5833	30.73645664
Little Rock	Power and Light	34.7444	-92.2044	72209	34.6733	-92.3517	13.20435339
Little Rock	Power and Light	34.7444	-92.2044	72211	34.7567	-92.43	18.23973715
Little Rock	Power and Light	34.7444	-92.2044	72212	34.7867	-92.4233	17.99871684
Little Rock	Power and Light	34.7444	-92.2044	72214	34.73	-92.3467	11.54654918
Little Rock	Power and Light	34.7444	-92.2044	72219	34.68	-92.345	12.48465894
Little Rock	Power and Light	34.7444	-92.2044	72220	34.74	-92.3705	13.41395697
Little Rock	Bruce Oakley	34.7486	-92.2222	72201	34.7483	-92.2817	4.803496056
Little Rock	Bruce Oakley	34.7486	-92.2222	72202	34.7367	-92.275	4.369462308
Little Rock	Bruce Oakley	34.7486	-92.2222	72203	34.7367	-92.275	4.369462308
Little Rock	Bruce Oakley	34.7486	-92.2222	72204	34.7283	-92.345	10.04818715
Little Rock	Bruce Oakley	34.7486	-92.2222	72205	34.7517	-92.3467	10.05400024
Little Rock	Bruce Oakley	34.7486	-92.2222	72206	34.69	-92.2683	6.019216024
Little Rock	Bruce Oakley	34.7486	-92.2222	72208	34.7817	-92.5833	29.27381787
Little Rock	Bruce Oakley	34.7486	-92.2222	72209	34.6733	-92.3517	12.09343484
Little Rock	Bruce Oakley	34.7486	-92.2222	72211	34.7567	-92.43	16.78843386
Little Rock	Bruce Oakley	34.7486	-92.2222	72212	34.7867	-92.4233	16.52360294
Little Rock	Bruce Oakley	34.7486	-92.2222	72214	34.73	-92.3467	10.16243208
Little Rock	Bruce Oakley	34.7486	-92.2222	72219	34.68	-92.345	11.35564376
Little Rock	Bruce Oakley	34.7486	-92.2222	72220	34.74	-92.3705	11.99237289

Little Rock	Jeffrey Sand	34.7489	-92.2411	72201	34.7483	-92.2817	3.277995897
Little Rock	Jeffrey Sand	34.7489	-92.2411	72202	34.7367	-92.275	2.908577654
Little Rock	Jeffrey Sand	34.7489	-92.2411	72203	34.7367	-92.275	2.908577654
Little Rock	Jeffrey Sand	34.7489	-92.2411	72204	34.7283	-92.345	8.551121136
Little Rock	Jeffrey Sand	34.7489	-92.2411	72205	34.7517	-92.3467	8.528084269
Little Rock	Jeffrey Sand	34.7489	-92.2411	72206	34.69	-92.2683	5.237535684
Little Rock	Jeffrey Sand	34.7489	-92.2411	72208	34.7817	-92.5833	27.75241908
Little Rock	Jeffrey Sand	34.7489	-92.2411	72209	34.6733	-92.3517	10.81532552
Little Rock	Jeffrey Sand	34.7489	-92.2411	72211	34.7567	-92.43	15.26289203
Little Rock	Jeffrey Sand	34.7489	-92.2411	72212	34.7867	-92.4233	15.02221966
Little Rock	Jeffrey Sand	34.7489	-92.2411	72214	34.73	-92.3467	8.660553209
Little Rock	Jeffrey Sand	34.7489	-92.2411	72219	34.68	-92.345	10.06454794
Little Rock	Jeffrey Sand	34.7489	-92.2411	72220	34.74	-92.3705	10.47114159
Little Rock	Petroleum Fuel	34.7483	-92.23	72201	34.7483	-92.2817	4.173741
Little Rock	Petroleum Fuel	34.7483	-92.23	72202	34.7367	-92.275	3.75160918
Little Rock	Petroleum Fuel	34.7483	-92.23	72203	34.7367	-92.275	3.75160918
Little Rock	Petroleum Fuel	34.7483	-92.23	72204	34.7283	-92.345	9.423304132
Little Rock	Petroleum Fuel	34.7483	-92.23	72205	34.7517	-92.3467	9.425188604
Little Rock	Petroleum Fuel	34.7483	-92.23	72206	34.69	-92.2683	5.631332709
Little Rock	Petroleum Fuel	34.7483	-92.23	72208	34.7817	-92.5833	28.64907972
Little Rock	Petroleum Fuel	34.7483	-92.23	72209	34.6733	-92.3517	11.54068881
Little Rock	Petroleum Fuel	34.7483	-92.23	72211	34.7567	-92.43	16.1602345
Little Rock	Petroleum Fuel	34.7483	-92.23	72212	34.7867	-92.4233	15.91004794
Little Rock	Petroleum Fuel	34.7483	-92.23	72214	34.73	-92.3467	9.53632159
Little Rock	Petroleum Fuel	34.7483	-92.23	72219	34.68	-92.345	10.79788723
Little Rock	Petroleum Fuel	34.7483	-92.23	72220	34.74	-92.3705	11.36233954
Memphis	ADM	35.0944	-90.1047	37501	35.05	-89.9267	14.81023919
Memphis	ADM	35.0944	-90.1047	38101	35.125	-90.0417	5.654189961
Memphis	ADM	35.0944	-90.1047	38104	35.1333	-90.005	8.639731993
Memphis	ADM	35.0944	-90.1047	38106	35.1017	-90.0333	5.794170441
Memphis	ADM	35.0944	-90.1047	38107	35.1833	-90.02	9.912809054
Memphis	ADM	35.0944	-90.1047	38108	35.18	-89.9683	13.00036778
Memphis	ADM	35.0944	-90.1047	38109	35.04	-90.0733	5.070795188
Memphis	ADM	35.0944	-90.1047	38110	35.05	-89.9267	14.81023919
Memphis	ADM	35.0944	-90.1047	38111	35.1067	-89.945	12.93076379
Memphis	ADM	35.0944	-90.1047	38114	35.0983	-89.9833	9.805677958
Memphis	ADM	35.0944	-90.1047	38115	35.0533	-89.8617	19.896008
Memphis	ADM	35.0944	-90.1047	38116	35.03	-90.0117	9.132258101
Memphis	ADM	35.0944	-90.1047	38117	35.1117	-89.9033	16.31889607
Memphis	ADM	35.0944	-90.1047	38118	35.05	-89.9267	14.81023919
Memphis	ADM	35.0944	-90.1047	38122	35.1583	-89.9267	15.26783595
Memphis	ADM	35.0944	-90.1047	38125	35.0283	-89.81	24.3822376
Memphis	ADM	35.0944	-90.1047	38127	35.25	-90.0333	13.82094771
Memphis	ADM	35.0944	-90.1047	38133	35.2117	-89.8	26.35823744
Memphis	ADM	35.0944	-90.1047	38134	35.1917	-89.8633	21.01171762
Memphis	ADM	35.0944	-90.1047	38138	35.0883	-89.8067	24.06257968
Memphis	ADM	35.0944	-90.1047	38140	35.1333	-90.005	8.639731993
Memphis	ADM	35.0944	-90.1047	38141	35.0233	-89.8483	21.48027486
Memphis	ADM	35.0944	-90.1047	38181	35.05	-89.9267	14.81023919
Memphis	ADM	35.0944	-90.1047	38182	35.1467	-89.9767	11.1627406
Memphis	ADM	35.0944	-90.1047	38186	35.03	-90.0117	9.132258101
Memphis	Cargill	35.0802	-90.1342	37501	35.05	-89.9267	16.92796453
Memphis	Cargill	35.0802	-90.1342	38101	35.125	-90.0417	8.297257224
Memphis	Cargill	35.0802	-90.1342	38104	35.1333	-90.005	11.27687141
Memphis	Cargill	35.0802	-90.1342	38106	35.1017	-90.0333	8.328527186
Memphis	Cargill	35.0802	-90.1342	38107	35.1833	-90.02	12.42068502
Memphis	Cargill	35.0802	-90.1342	38108	35.18	-89.9683	15.62972205
Memphis	Cargill	35.0802	-90.1342	38109	35.04	-90.0733	5.89099483
Memphis	Cargill	35.0802	-90.1342	38110	35.05	-89.9267	16.92796453
Memphis	Cargill	35.0802	-90.1342	38111	35.1067	-89.945	15.42321032
Memphis	Cargill	35.0802	-90.1342	38114	35.0983	-89.9833	12.26947809
Memphis	Cargill	35.0802	-90.1342	38115	35.0533	-89.8617	22.10585236
Memphis	Cargill	35.0802	-90.1342	38116	35.03	-90.0117	10.68759404
Memphis	Cargill	35.0802	-90.1342	38117	35.1117	-89.9033	18.81321846
Memphis	Cargill	35.0802	-90.1342	38118	35.05	-89.9267	16.92796453
Memphis	Cargill	35.0802	-90.1342	38122	35.1583	-89.9267	17.89874587
Memphis	Cargill	35.0802	-90.1342	38125	35.0283	-89.81	26.50591629
Memphis	Cargill	35.0802	-90.1342	38127	35.25	-90.0333	15.94552385
Memphis	Cargill	35.0802	-90.1342	38133	35.2117	-89.8	28.99341158
Memphis	Cargill	35.0802	-90.1342	38134	35.1917	-89.8633	23.64976497

Memphis	Cargill	35.0802	-90.1342	38138	35.0883	-89.8067	26.44716032
Memphis	Cargill	35.0802	-90.1342	38140	35.1333	-90.005	11.27687141
Memphis	Cargill	35.0802	-90.1342	38141	35.0233	-89.8483	23.53337243
Memphis	Cargill	35.0802	-90.1342	38181	35.05	-89.9267	16.92796453
Memphis	Cargill	35.0802	-90.1342	38182	35.1467	-89.9767	13.80187903
Memphis	Cargill	35.0802	-90.1342	38186	35.03	-90.0117	10.68759404
Memphis	Chemtec	35.0611	-90.1383	37501	35.05	-89.9267	17.1059555
Memphis	Chemtec	35.0611	-90.1383	38101	35.125	-90.0417	9.350322019
Memphis	Chemtec	35.0611	-90.1383	38104	35.1333	-90.005	12.238447
Memphis	Chemtec	35.0611	-90.1383	38106	35.1017	-90.0333	9.088261995
Memphis	Chemtec	35.0611	-90.1383	38107	35.1833	-90.02	13.73068267
Memphis	Chemtec	35.0611	-90.1383	38108	35.18	-89.9683	16.74777074
Memphis	Chemtec	35.0611	-90.1383	38109	35.04	-90.0733	5.517002201
Memphis	Chemtec	35.0611	-90.1383	38110	35.05	-89.9267	17.1059555
Memphis	Chemtec	35.0611	-90.1383	38111	35.1067	-89.945	16.03344343
Memphis	Chemtec	35.0611	-90.1383	38114	35.0983	-89.9833	12.86848355
Memphis	Chemtec	35.0611	-90.1383	38115	35.0533	-89.8617	22.33879478
Memphis	Chemtec	35.0611	-90.1383	38116	35.03	-90.0117	10.52428495
Memphis	Chemtec	35.0611	-90.1383	38117	35.1117	-89.9033	19.40635019
Memphis	Chemtec	35.0611	-90.1383	38118	35.05	-89.9267	17.1059555
Memphis	Chemtec	35.0611	-90.1383	38122	35.1583	-89.9267	18.79854865
Memphis	Chemtec	35.0611	-90.1383	38125	35.0283	-89.81	26.63560677
Memphis	Chemtec	35.0611	-90.1383	38127	35.25	-90.0333	17.44743402
Memphis	Chemtec	35.0611	-90.1383	38133	35.2117	-89.8	29.89488147
Memphis	Chemtec	35.0611	-90.1383	38134	35.1917	-89.8633	24.57712914
Memphis	Chemtec	35.0611	-90.1383	38138	35.0883	-89.8067	26.85997625
Memphis	Chemtec	35.0611	-90.1383	38140	35.1333	-90.005	12.238447
Memphis	Chemtec	35.0611	-90.1383	38141	35.0233	-89.8483	23.60974212
Memphis	Chemtec	35.0611	-90.1383	38181	35.05	-89.9267	17.1059555
Memphis	Chemtec	35.0611	-90.1383	38182	35.1467	-89.9767	14.76320173
Memphis	Chemtec	35.0611	-90.1383	38186	35.03	-90.0117	10.52428495
Memphis	Elf Asphalt	35.1003	-90.0097	37501	35.05	-89.9267	7.835007667
Memphis	Elf Asphalt	35.1003	-90.0097	38101	35.125	-90.0417	3.263419758
Memphis	Elf Asphalt	35.1003	-90.0097	38104	35.1333	-90.005	2.690974435
Memphis	Elf Asphalt	35.1003	-90.0097	38106	35.1017	-90.0333	1.908577403
Memphis	Elf Asphalt	35.1003	-90.0097	38107	35.1833	-90.02	6.751987129
Memphis	Elf Asphalt	35.1003	-90.0097	38108	35.18	-89.9683	7.250457436
Memphis	Elf Asphalt	35.1003	-90.0097	38109	35.04	-90.0733	7.075306345
Memphis	Elf Asphalt	35.1003	-90.0097	38110	35.05	-89.9267	7.835007667
Memphis	Elf Asphalt	35.1003	-90.0097	38111	35.1067	-89.945	5.248722896
Memphis	Elf Asphalt	35.1003	-90.0097	38114	35.0983	-89.9833	2.137379159
Memphis	Elf Asphalt	35.1003	-90.0097	38115	35.0533	-89.8617	12.53604596
Memphis	Elf Asphalt	35.1003	-90.0097	38116	35.03	-90.0117	5.677615264
Memphis	Elf Asphalt	35.1003	-90.0097	38117	35.1117	-89.9033	8.638834276
Memphis	Elf Asphalt	35.1003	-90.0097	38118	35.05	-89.9267	7.835007667
Memphis	Elf Asphalt	35.1003	-90.0097	38122	35.1583	-89.9267	8.174485563
Memphis	Elf Asphalt	35.1003	-90.0097	38125	35.0283	-89.81	17.13761
Memphis	Elf Asphalt	35.1003	-90.0097	38127	35.25	-90.0333	12.23453761
Memphis	Elf Asphalt	35.1003	-90.0097	38133	35.2117	-89.8	19.16960156
Memphis	Elf Asphalt	35.1003	-90.0097	38134	35.1917	-89.8633	13.93309993
Memphis	Elf Asphalt	35.1003	-90.0097	38138	35.0883	-89.8067	16.41679833
Memphis	Elf Asphalt	35.1003	-90.0097	38140	35.1333	-90.005	2.690974435
Memphis	Elf Asphalt	35.1003	-90.0097	38141	35.0233	-89.8483	14.43667303
Memphis	Elf Asphalt	35.1003	-90.0097	38181	35.05	-89.9267	7.835007667
Memphis	Elf Asphalt	35.1003	-90.0097	38182	35.1467	-89.9767	4.596621865
Memphis	Elf Asphalt	35.1003	-90.0097	38186	35.03	-90.0117	5.677615264
Memphis	Ergon	35.0906	-90.1072	37501	35.05	-89.9267	14.93583764
Memphis	Ergon	35.0906	-90.1072	38101	35.125	-90.0417	5.972716177
Memphis	Ergon	35.0906	-90.1072	38104	35.1333	-90.005	8.941783227
Memphis	Ergon	35.0906	-90.1072	38106	35.1017	-90.0333	6.032870311
Memphis	Ergon	35.0906	-90.1072	38107	35.1833	-90.02	10.27434126
Memphis	Ergon	35.0906	-90.1072	38108	35.18	-89.9683	13.33525939
Memphis	Ergon	35.0906	-90.1072	38109	35.04	-90.0733	4.916960708
Memphis	Ergon	35.0906	-90.1072	38110	35.05	-89.9267	14.93583764
Memphis	Ergon	35.0906	-90.1072	38111	35.1067	-89.945	13.15875474
Memphis	Ergon	35.0906	-90.1072	38114	35.0983	-89.9833	10.02174429
Memphis	Ergon	35.0906	-90.1072	38115	35.0533	-89.8617	20.04666514
Memphis	Ergon	35.0906	-90.1072	38116	35.03	-90.0117	9.13091989
Memphis	Ergon	35.0906	-90.1072	38117	35.1117	-89.9033	16.54874816
Memphis	Ergon	35.0906	-90.1072	38118	35.05	-89.9267	14.93583764

Computation of Average Dray Cost

Memphis	Ergon	35.0906	-90.1072	38122	35.1583	-89.9267	15.5630062
Memphis	Ergon	35.0906	-90.1072	38125	35.0283	-89.81	24.51443649
Memphis	Ergon	35.0906	-90.1072	38127	35.25	-90.0333	14.18404964
Memphis	Ergon	35.0906	-90.1072	38133	35.2117	-89.8	26.65765844
Memphis	Ergon	35.0906	-90.1072	38134	35.1917	-89.8633	21.31461891
Memphis	Ergon	35.0906	-90.1072	38138	35.0883	-89.8067	24.26007557
Memphis	Ergon	35.0906	-90.1072	38140	35.1333	-90.005	8.941783227
Memphis	Ergon	35.0906	-90.1072	38141	35.0233	-89.8483	21.59561452
Memphis	Ergon	35.0906	-90.1072	38181	35.05	-89.9267	14.93583764
Memphis	Ergon	35.0906	-90.1072	38182	35.1467	-89.9767	11.46748551
Memphis	Ergon	35.0906	-90.1072	38186	35.03	-90.0117	9.13091989
Memphis	Helm	35.0986	-90.0983	37501	35.05	-89.9267	14.39814967
Memphis	Helm	35.0986	-90.0983	38101	35.125	-90.0417	5.041922979
Memphis	Helm	35.0986	-90.0983	38104	35.1333	-90.005	8.036175792
Memphis	Helm	35.0986	-90.0983	38106	35.1017	-90.0333	5.25341442
Memphis	Helm	35.0986	-90.0983	38107	35.1833	-90.02	9.311980664
Memphis	Helm	35.0986	-90.0983	38108	35.18	-89.9683	12.38250835
Memphis	Helm	35.0986	-90.0983	38109	35.04	-90.0733	5.143305702
Memphis	Helm	35.0986	-90.0983	38110	35.05	-89.9267	14.39814967
Memphis	Helm	35.0986	-90.0983	38111	35.1067	-89.945	12.39317255
Memphis	Helm	35.0986	-90.0983	38114	35.0983	-89.9833	9.28398159
Memphis	Helm	35.0986	-90.0983	38115	35.0533	-89.8617	19.44766263
Memphis	Helm	35.0986	-90.0983	38116	35.03	-90.0117	8.918936991
Memphis	Helm	35.0986	-90.0983	38117	35.1117	-89.9033	15.77783328
Memphis	Helm	35.0986	-90.0983	38118	35.05	-89.9267	14.39814967
Memphis	Helm	35.0986	-90.0983	38122	35.1583	-89.9267	14.66769905
Memphis	Helm	35.0986	-90.0983	38125	35.0283	-89.81	23.95641224
Memphis	Helm	35.0986	-90.0983	38127	35.25	-90.0333	13.30134488
Memphis	Helm	35.0986	-90.0983	38133	35.2117	-89.8	25.75457818
Memphis	Helm	35.0986	-90.0983	38134	35.1917	-89.8633	20.40611206
Memphis	Helm	35.0986	-90.0983	38138	35.0883	-89.8067	23.55554903
Memphis	Helm	35.0986	-90.0983	38140	35.1333	-90.005	8.036175792
Memphis	Helm	35.0986	-90.0983	38141	35.0233	-89.8483	21.07812066
Memphis	Helm	35.0986	-90.0983	38181	35.05	-89.9267	14.39814967
Memphis	Helm	35.0986	-90.0983	38182	35.1467	-89.9767	10.55686983
Memphis	Helm	35.0986	-90.0983	38186	35.03	-90.0117	8.918936991
Memphis	MAPCO Petroleum	35.0861	-90.0089	37501	35.05	-89.9267	7.247760278
Memphis	MAPCO Petroleum	35.0861	-90.0089	38101	35.125	-90.0417	4.107761038
Memphis	MAPCO Petroleum	35.0861	-90.0089	38104	35.1333	-90.005	3.823441324
Memphis	MAPCO Petroleum	35.0861	-90.0089	38106	35.1017	-90.0333	2.337994322
Memphis	MAPCO Petroleum	35.0861	-90.0089	38107	35.1833	-90.02	7.897956638
Memphis	MAPCO Petroleum	35.0861	-90.0089	38108	35.18	-89.9683	8.25878948
Memphis	MAPCO Petroleum	35.0861	-90.0089	38109	35.04	-90.0733	6.393780324
Memphis	MAPCO Petroleum	35.0861	-90.0089	38110	35.05	-89.9267	7.247760278
Memphis	MAPCO Petroleum	35.0861	-90.0089	38111	35.1067	-89.945	5.420086186
Memphis	MAPCO Petroleum	35.0861	-90.0089	38114	35.0983	-89.9833	2.289375268
Memphis	MAPCO Petroleum	35.0861	-90.0089	38115	35.0533	-89.8617	12.1748977
Memphis	MAPCO Petroleum	35.0861	-90.0089	38116	35.03	-90.0117	4.534590518
Memphis	MAPCO Petroleum	35.0861	-90.0089	38117	35.1117	-89.9033	8.77201942
Memphis	MAPCO Petroleum	35.0861	-90.0089	38118	35.05	-89.9267	7.247760278
Memphis	MAPCO Petroleum	35.0861	-90.0089	38122	35.1583	-89.9267	8.832349023
Memphis	MAPCO Petroleum	35.0861	-90.0089	38125	35.0283	-89.81	16.72145155
Memphis	MAPCO Petroleum	35.0861	-90.0089	38127	35.25	-90.0333	13.37746768
Memphis	MAPCO Petroleum	35.0861	-90.0089	38133	35.2117	-89.8	19.67802154
Memphis	MAPCO Petroleum	35.0861	-90.0089	38134	35.1917	-89.8633	14.52034475
Memphis	MAPCO Petroleum	35.0861	-90.0089	38138	35.0883	-89.8067	16.32457218
Memphis	MAPCO Petroleum	35.0861	-90.0089	38140	35.1333	-90.005	3.823441324
Memphis	MAPCO Petroleum	35.0861	-90.0089	38141	35.0233	-89.8483	13.92123251
Memphis	MAPCO Petroleum	35.0861	-90.0089	38181	35.05	-89.9267	7.247760278
Memphis	MAPCO Petroleum	35.0861	-90.0089	38182	35.1467	-89.9767	5.539984124
Memphis	MAPCO Petroleum	35.0861	-90.0089	38186	35.03	-90.0117	4.534590518
Memphis	Mid-South	35.1017	-90.0902	37501	35.05	-89.9267	13.84352146
Memphis	Mid-South	35.1017	-90.0902	38101	35.125	-90.0417	4.343799163
Memphis	Mid-South	35.1017	-90.0902	38104	35.1333	-90.005	7.336043086
Memphis	Mid-South	35.1017	-90.0902	38106	35.1017	-90.0333	4.593537
Memphis	Mid-South	35.1017	-90.0902	38107	35.1833	-90.02	8.6898636
Memphis	Mid-South	35.1017	-90.0902	38108	35.18	-89.9683	11.69624197
Memphis	Mid-South	35.1017	-90.0902	38109	35.04	-90.0733	5.164512067
Memphis	Mid-South	35.1017	-90.0902	38110	35.05	-89.9267	13.84352146
Memphis	Mid-South	35.1017	-90.0902	38111	35.1067	-89.945	11.72894384

Memphis	Mid-South	35.1017	-90.0902	38114	35.0983	-89.9833	8.634400905
Memphis	Mid-South	35.1017	-90.0902	38115	35.0533	-89.8617	18.85608279
Memphis	Mid-South	35.1017	-90.0902	38116	35.03	-90.0117	8.582908959
Memphis	Mid-South	35.1017	-90.0902	38117	35.1117	-89.9033	15.11001868
Memphis	Mid-South	35.1017	-90.0902	38118	35.05	-89.9267	13.84352146
Memphis	Mid-South	35.1017	-90.0902	38122	35.1583	-89.9267	13.96787884
Memphis	Mid-South	35.1017	-90.0902	38125	35.0283	-89.81	23.38378976
Memphis	Mid-South	35.1017	-90.0902	38127	35.25	-90.0333	12.82324326
Memphis	Mid-South	35.1017	-90.0902	38133	35.2117	-89.8	25.05441471
Memphis	Mid-South	35.1017	-90.0902	38134	35.1917	-89.8633	19.70599456
Memphis	Mid-South	35.1017	-90.0902	38138	35.0883	-89.8067	22.91250666
Memphis	Mid-South	35.1017	-90.0902	38140	35.1333	-90.005	7.336043086
Memphis	Mid-South	35.1017	-90.0902	38141	35.0233	-89.8483	20.5286358
Memphis	Mid-South	35.1017	-90.0902	38181	35.05	-89.9267	13.84352146
Memphis	Mid-South	35.1017	-90.0902	38182	35.1467	-89.9767	9.856749509
Memphis	Mid-South	35.1017	-90.0902	38186	35.03	-90.0117	8.582908959
Memphis	Peavey	35.105	-90.0856	37501	35.05	-89.9267	13.57469849
Memphis	Peavey	35.105	-90.0856	38101	35.125	-90.0417	3.89450925
Memphis	Peavey	35.105	-90.0856	38104	35.1333	-90.005	6.896274901
Memphis	Peavey	35.105	-90.0856	38106	35.1017	-90.0333	4.230575524
Memphis	Peavey	35.105	-90.0856	38107	35.1833	-90.02	8.246422304
Memphis	Peavey	35.105	-90.0856	38108	35.18	-89.9683	11.23983412
Memphis	Peavey	35.105	-90.0856	38109	35.04	-90.0733	5.340574763
Memphis	Peavey	35.105	-90.0856	38110	35.05	-89.9267	13.57469849
Memphis	Peavey	35.105	-90.0856	38111	35.1067	-89.945	11.35146766
Memphis	Peavey	35.105	-90.0856	38114	35.0983	-89.9833	8.276372508
Memphis	Peavey	35.105	-90.0856	38115	35.0533	-89.8617	18.55106192
Memphis	Peavey	35.105	-90.0856	38116	35.03	-90.0117	8.500148303
Memphis	Peavey	35.105	-90.0856	38117	35.1117	-89.9033	14.72701522
Memphis	Peavey	35.105	-90.0856	38118	35.05	-89.9267	13.57469849
Memphis	Peavey	35.105	-90.0856	38122	35.1583	-89.9267	13.53042989
Memphis	Peavey	35.105	-90.0856	38125	35.0283	-89.81	23.09474224
Memphis	Peavey	35.105	-90.0856	38127	35.25	-90.0333	12.44402345
Memphis	Peavey	35.105	-90.0856	38133	35.2117	-89.8	24.61302007
Memphis	Peavey	35.105	-90.0856	38134	35.1917	-89.8633	19.2628919
Memphis	Peavey	35.105	-90.0856	38138	35.0883	-89.8067	22.55592444
Memphis	Peavey	35.105	-90.0856	38140	35.1333	-90.005	6.896274901
Memphis	Peavey	35.105	-90.0856	38141	35.0233	-89.8483	20.26084656
Memphis	Peavey	35.105	-90.0856	38181	35.05	-89.9267	13.57469849
Memphis	Peavey	35.105	-90.0856	38182	35.1467	-89.9767	9.413997265
Memphis	Peavey	35.105	-90.0856	38186	35.03	-90.0117	8.500148303
Memphis	Suburban Propane	35.0892	-90.1081	37501	35.05	-89.9267	14.98245274
Memphis	Suburban Propane	35.0892	-90.1081	38101	35.125	-90.0417	6.08995358
Memphis	Suburban Propane	35.0892	-90.1081	38104	35.1333	-90.005	9.052716784
Memphis	Suburban Propane	35.0892	-90.1081	38106	35.1017	-90.0333	6.122341998
Memphis	Suburban Propane	35.0892	-90.1081	38107	35.1833	-90.02	10.4064759
Memphis	Suburban Propane	35.0892	-90.1081	38108	35.18	-89.9683	13.45764015
Memphis	Suburban Propane	35.0892	-90.1081	38109	35.04	-90.0733	4.865066037
Memphis	Suburban Propane	35.0892	-90.1081	38110	35.05	-89.9267	14.98245274
Memphis	Suburban Propane	35.0892	-90.1081	38111	35.1067	-89.945	13.24263876
Memphis	Suburban Propane	35.0892	-90.1081	38114	35.0983	-89.9833	10.10185235
Memphis	Suburban Propane	35.0892	-90.1081	38115	35.0533	-89.8617	20.10189482
Memphis	Suburban Propane	35.0892	-90.1081	38116	35.03	-90.0117	9.13270056
Memphis	Suburban Propane	35.0892	-90.1081	38117	35.1117	-89.9033	16.63298393
Memphis	Suburban Propane	35.0892	-90.1081	38118	35.05	-89.9267	14.98245274
Memphis	Suburban Propane	35.0892	-90.1081	38122	35.1583	-89.9267	15.67093239
Memphis	Suburban Propane	35.0892	-90.1081	38125	35.0283	-89.81	24.5626806
Memphis	Suburban Propane	35.0892	-90.1081	38127	35.25	-90.0333	14.31715994
Memphis	Suburban Propane	35.0892	-90.1081	38133	35.2117	-89.8	26.76681767
Memphis	Suburban Propane	35.0892	-90.1081	38134	35.1917	-89.8633	21.4251534
Memphis	Suburban Propane	35.0892	-90.1081	38138	35.0883	-89.8067	24.33213048
Memphis	Suburban Propane	35.0892	-90.1081	38140	35.1333	-90.005	9.052716784
Memphis	Suburban Propane	35.0892	-90.1081	38141	35.0233	-89.8483	21.63787653
Memphis	Suburban Propane	35.0892	-90.1081	38181	35.05	-89.9267	14.98245274
Memphis	Suburban Propane	35.0892	-90.1081	38182	35.1467	-89.9767	11.57911659
Memphis	Suburban Propane	35.0892	-90.1081	38186	35.03	-90.0117	9.13270056
Memphis	Western Tar	35.0981	-90.0997	37501	35.05	-89.9267	14.49606233
Memphis	Western Tar	35.0981	-90.0997	38101	35.125	-90.0417	5.161425688
Memphis	Western Tar	35.0981	-90.0997	38104	35.1333	-90.005	8.156179508
Memphis	Western Tar	35.0981	-90.0997	38106	35.1017	-90.0333	5.368344689

Memphis	Western Tar	35.0981	-90.0997	38107	35.1833	-90.02	9.418506535
Memphis	Western Tar	35.0981	-90.0997	38108	35.18	-89.9683	12.49974946
Memphis	Western Tar	35.0981	-90.0997	38109	35.04	-90.0733	5.151921433
Memphis	Western Tar	35.0981	-90.0997	38110	35.05	-89.9267	14.49606233
Memphis	Western Tar	35.0981	-90.0997	38111	35.1067	-89.945	12.50821408
Memphis	Western Tar	35.0981	-90.0997	38114	35.0983	-89.9833	9.396985871
Memphis	Western Tar	35.0981	-90.0997	38115	35.0533	-89.8617	19.55117267
Memphis	Western Tar	35.0981	-90.0997	38116	35.03	-90.0117	8.983043705
Memphis	Western Tar	35.0981	-90.0997	38117	35.1117	-89.9033	15.89334034
Memphis	Western Tar	35.0981	-90.0997	38118	35.05	-89.9267	14.49606233
Memphis	Western Tar	35.0981	-90.0997	38122	35.1583	-89.9267	14.7877088
Memphis	Western Tar	35.0981	-90.0997	38125	35.0283	-89.81	24.05674488
Memphis	Western Tar	35.0981	-90.0997	38127	35.25	-90.0333	13.38331266
Memphis	Western Tar	35.0981	-90.0997	38133	35.2117	-89.8	25.87456952
Memphis	Western Tar	35.0981	-90.0997	38134	35.1917	-89.8633	20.52605615
Memphis	Western Tar	35.0981	-90.0997	38138	35.0883	-89.8067	23.6671172
Memphis	Western Tar	35.0981	-90.0997	38140	35.1333	-90.005	8.156179508
Memphis	Western Tar	35.0981	-90.0997	38141	35.0233	-89.8483	21.17481881
Memphis	Western Tar	35.0981	-90.0997	38181	35.05	-89.9267	14.49606233
Memphis	Western Tar	35.0981	-90.0997	38182	35.1467	-89.9767	10.67681643
Memphis	Western Tar	35.0981	-90.0997	38186	35.03	-90.0117	8.983043705
Memphis	Fleischman's Yeast	35.075	-90.09	37501	35.05	-89.9267	13.33680369
Memphis	Fleischman's Yeast	35.075	-90.09	38101	35.125	-90.0417	5.61226808
Memphis	Fleischman's Yeast	35.075	-90.09	38104	35.1333	-90.005	8.321023244
Memphis	Fleischman's Yeast	35.075	-90.09	38106	35.1017	-90.0333	5.059510828
Memphis	Fleischman's Yeast	35.075	-90.09	38107	35.1833	-90.02	10.41038001
Memphis	Fleischman's Yeast	35.075	-90.09	38108	35.18	-89.9683	12.97617416
Memphis	Fleischman's Yeast	35.075	-90.09	38109	35.04	-90.0733	3.130711065
Memphis	Fleischman's Yeast	35.075	-90.09	38110	35.05	-89.9267	13.33680369
Memphis	Fleischman's Yeast	35.075	-90.09	38111	35.1067	-89.945	11.9823256
Memphis	Fleischman's Yeast	35.075	-90.09	38114	35.0983	-89.9833	8.816876602
Memphis	Fleischman's Yeast	35.075	-90.09	38115	35.0533	-89.8617	18.51372837
Memphis	Fleischman's Yeast	35.075	-90.09	38116	35.03	-90.0117	7.290723574
Memphis	Fleischman's Yeast	35.075	-90.09	38117	35.1117	-89.9033	15.36073196
Memphis	Fleischman's Yeast	35.075	-90.09	38118	35.05	-89.9267	13.33680369
Memphis	Fleischman's Yeast	35.075	-90.09	38122	35.1583	-89.9267	14.79932619
Memphis	Fleischman's Yeast	35.075	-90.09	38125	35.0283	-89.81	22.91664211
Memphis	Fleischman's Yeast	35.075	-90.09	38127	35.25	-90.0333	14.85078545
Memphis	Fleischman's Yeast	35.075	-90.09	38133	35.2117	-89.8	25.88235654
Memphis	Fleischman's Yeast	35.075	-90.09	38134	35.1917	-89.8633	20.58405725
Memphis	Fleischman's Yeast	35.075	-90.09	38138	35.0883	-89.8067	22.89599868
Memphis	Fleischman's Yeast	35.075	-90.09	38140	35.1333	-90.005	8.321023244
Memphis	Fleischman's Yeast	35.075	-90.09	38141	35.0233	-89.8483	19.95383341
Memphis	Fleischman's Yeast	35.075	-90.09	38181	35.05	-89.9267	13.33680369
Memphis	Fleischman's Yeast	35.075	-90.09	38182	35.1467	-89.9767	10.82437883
Memphis	Fleischman's Yeast	35.075	-90.09	38186	35.03	-90.0117	7.290723574
Memphis	Ricelands Foods	35.1031	-90.1802	37501	35.05	-89.9267	20.90920403
Memphis	Ricelands Foods	35.1031	-90.1802	38101	35.125	-90.0417	11.32002151
Memphis	Ricelands Foods	35.1031	-90.1802	38104	35.1333	-90.005	14.35248628
Memphis	Ricelands Foods	35.1031	-90.1802	38106	35.1017	-90.0333	11.85977555
Memphis	Ricelands Foods	35.1031	-90.1802	38107	35.1833	-90.02	14.46308536
Memphis	Ricelands Foods	35.1031	-90.1802	38108	35.18	-89.9683	18.19834347
Memphis	Ricelands Foods	35.1031	-90.1802	38109	35.04	-90.0733	10.02132808
Memphis	Ricelands Foods	35.1031	-90.1802	38110	35.05	-89.9267	20.90920403
Memphis	Ricelands Foods	35.1031	-90.1802	38111	35.1067	-89.945	18.98992006
Memphis	Ricelands Foods	35.1031	-90.1802	38114	35.0983	-89.9833	15.90045956
Memphis	Ricelands Foods	35.1031	-90.1802	38115	35.0533	-89.8617	26.02491421
Memphis	Ricelands Foods	35.1031	-90.1802	38116	35.03	-90.0117	14.82794086
Memphis	Ricelands Foods	35.1031	-90.1802	38117	35.1117	-89.9033	22.36491589
Memphis	Ricelands Foods	35.1031	-90.1802	38118	35.05	-89.9267	20.90920403
Memphis	Ricelands Foods	35.1031	-90.1802	38122	35.1583	-89.9267	20.94461865
Memphis	Ricelands Foods	35.1031	-90.1802	38125	35.0283	-89.81	30.49020233
Memphis	Ricelands Foods	35.1031	-90.1802	38127	35.25	-90.0333	16.7714938
Memphis	Ricelands Foods	35.1031	-90.1802	38133	35.2117	-89.8	31.92113609
Memphis	Ricelands Foods	35.1031	-90.1802	38134	35.1917	-89.8633	26.56441105
Memphis	Ricelands Foods	35.1031	-90.1802	38138	35.0883	-89.8067	30.17631787
Memphis	Ricelands Foods	35.1031	-90.1802	38140	35.1333	-90.005	14.35248628
Memphis	Ricelands Foods	35.1031	-90.1802	38141	35.0233	-89.8483	27.5578746
Memphis	Ricelands Foods	35.1031	-90.1802	38181	35.05	-89.9267	20.90920403
Memphis	Ricelands Foods	35.1031	-90.1802	38182	35.1467	-89.9767	16.8013871

Computation of Average Dray Cost

Memphis	Ricelands Foods	35.1031	-90.1802	38186	35.03	-90.0117	14.82794086
Memphis	Exxon	35.1217	-90.0792	37501	35.05	-89.9267	13.60417637
Memphis	Exxon	35.1217	-90.0792	38101	35.125	-90.0417	3.03907439
Memphis	Exxon	35.1217	-90.0792	38104	35.1333	-90.005	6.062925121
Memphis	Exxon	35.1217	-90.0792	38106	35.1017	-90.0333	4.041993974
Memphis	Exxon	35.1217	-90.0792	38107	35.1833	-90.02	6.897196264
Memphis	Exxon	35.1217	-90.0792	38108	35.18	-89.9683	10.11469904
Memphis	Exxon	35.1217	-90.0792	38109	35.04	-90.0733	6.612816991
Memphis	Exxon	35.1217	-90.0792	38110	35.05	-89.9267	13.60417637
Memphis	Exxon	35.1217	-90.0792	38111	35.1067	-89.945	10.90143198
Memphis	Exxon	35.1217	-90.0792	38114	35.0983	-89.9833	7.969146955
Memphis	Exxon	35.1217	-90.0792	38115	35.0533	-89.8617	18.4065834
Memphis	Exxon	35.1217	-90.0792	38116	35.03	-90.0117	9.192286629
Memphis	Exxon	35.1217	-90.0792	38117	35.1117	-89.9033	14.22333619
Memphis	Exxon	35.1217	-90.0792	38118	35.05	-89.9267	13.60417637
Memphis	Exxon	35.1217	-90.0792	38122	35.1583	-89.9267	12.66092736
Memphis	Exxon	35.1217	-90.0792	38125	35.0283	-89.81	23.00340402
Memphis	Exxon	35.1217	-90.0792	38127	35.25	-90.0333	11.00054008
Memphis	Exxon	35.1217	-90.0792	38133	35.2117	-89.8	23.68192775
Memphis	Exxon	35.1217	-90.0792	38134	35.1917	-89.8633	18.32283088
Memphis	Exxon	35.1217	-90.0792	38138	35.0883	-89.8067	22.16355515
Memphis	Exxon	35.1217	-90.0792	38140	35.1333	-90.005	6.062925121
Memphis	Exxon	35.1217	-90.0792	38141	35.0233	-89.8483	20.26264623
Memphis	Exxon	35.1217	-90.0792	38181	35.05	-89.9267	13.60417637
Memphis	Exxon	35.1217	-90.0792	38182	35.1467	-89.9767	8.517397598
Memphis	Exxon	35.1217	-90.0792	38186	35.03	-90.0117	9.192286629
Memphis	Lion Oil	35.1197	-90.0814	37501	35.05	-89.9267	13.69799939
Memphis	Lion Oil	35.1197	-90.0814	38101	35.125	-90.0417	3.233415391
Memphis	Lion Oil	35.1197	-90.0814	38104	35.1333	-90.005	6.264731226
Memphis	Lion Oil	35.1197	-90.0814	38106	35.1017	-90.0333	4.146104489
Memphis	Lion Oil	35.1197	-90.0814	38107	35.1833	-90.02	7.13669638
Memphis	Lion Oil	35.1197	-90.0814	38108	35.18	-89.9683	10.34721169
Memphis	Lion Oil	35.1197	-90.0814	38109	35.04	-90.0733	6.46732459
Memphis	Lion Oil	35.1197	-90.0814	38110	35.05	-89.9267	13.69799939
Memphis	Lion Oil	35.1197	-90.0814	38111	35.1067	-89.945	11.06147129
Memphis	Lion Oil	35.1197	-90.0814	38114	35.0983	-89.9833	8.105858859
Memphis	Lion Oil	35.1197	-90.0814	38115	35.0533	-89.8617	18.52873096
Memphis	Lion Oil	35.1197	-90.0814	38116	35.03	-90.0117	9.170650842
Memphis	Lion Oil	35.1197	-90.0814	38117	35.1117	-89.9033	14.3925108
Memphis	Lion Oil	35.1197	-90.0814	38118	35.05	-89.9267	13.69799939
Memphis	Lion Oil	35.1197	-90.0814	38122	35.1583	-89.9267	12.87182826
Memphis	Lion Oil	35.1197	-90.0814	38125	35.0283	-89.81	23.11923408
Memphis	Lion Oil	35.1197	-90.0814	38127	35.25	-90.0333	11.21295818
Memphis	Lion Oil	35.1197	-90.0814	38133	35.2117	-89.8	23.90071062
Memphis	Lion Oil	35.1197	-90.0814	38134	35.1917	-89.8633	18.54183927
Memphis	Lion Oil	35.1197	-90.0814	38138	35.0883	-89.8067	22.32093987
Memphis	Lion Oil	35.1197	-90.0814	38140	35.1333	-90.005	6.264731226
Memphis	Lion Oil	35.1197	-90.0814	38141	35.0233	-89.8483	20.36390367
Memphis	Lion Oil	35.1197	-90.0814	38181	35.05	-89.9267	13.69799939
Memphis	Lion Oil	35.1197	-90.0814	38182	35.1467	-89.9767	8.728959015
Memphis	Lion Oil	35.1197	-90.0814	38186	35.03	-90.0117	9.170650842
Memphis	CONOCO	35.1906	-90.0589	37501	35.05	-89.9267	15.58009523
Memphis	CONOCO	35.1906	-90.0589	38101	35.125	-90.0417	5.474898855
Memphis	CONOCO	35.1906	-90.0589	38104	35.1333	-90.005	6.350788506
Memphis	CONOCO	35.1906	-90.0589	38106	35.1017	-90.0333	7.468537329
Memphis	CONOCO	35.1906	-90.0589	38107	35.1833	-90.02	3.195215484
Memphis	CONOCO	35.1906	-90.0589	38108	35.18	-89.9683	7.364027581
Memphis	CONOCO	35.1906	-90.0589	38109	35.04	-90.0733	12.21338981
Memphis	CONOCO	35.1906	-90.0589	38110	35.05	-89.9267	15.58009523
Memphis	CONOCO	35.1906	-90.0589	38111	35.1067	-89.945	11.4204905
Memphis	CONOCO	35.1906	-90.0589	38114	35.0983	-89.9833	9.631819805
Memphis	CONOCO	35.1906	-90.0589	38115	35.0533	-89.8617	19.39858581
Memphis	CONOCO	35.1906	-90.0589	38116	35.03	-90.0117	13.5135847
Memphis	CONOCO	35.1906	-90.0589	38117	35.1117	-89.9033	14.08422021
Memphis	CONOCO	35.1906	-90.0589	38118	35.05	-89.9267	15.58009523
Memphis	CONOCO	35.1906	-90.0589	38122	35.1583	-89.9267	10.98643949
Memphis	CONOCO	35.1906	-90.0589	38125	35.0283	-89.81	23.98815572
Memphis	CONOCO	35.1906	-90.0589	38127	35.25	-90.0333	5.221752196
Memphis	CONOCO	35.1906	-90.0589	38133	35.2117	-89.8	20.97029464
Memphis	CONOCO	35.1906	-90.0589	38134	35.1917	-89.8633	15.7910377

Memphis	CONOCO	35.1906	-90.0589	38138	35.0883	-89.8067	21.97133804
Memphis	CONOCO	35.1906	-90.0589	38140	35.1333	-90.005	6.350788506
Memphis	CONOCO	35.1906	-90.0589	38141	35.0233	-89.8483	21.71346623
Memphis	CONOCO	35.1906	-90.0589	38181	35.05	-89.9267	15.58009523
Memphis	CONOCO	35.1906	-90.0589	38182	35.1467	-89.9767	7.523087449
Memphis	CONOCO	35.1906	-90.0589	38186	35.03	-90.0117	13.5135847
Mobile	Brookley	30.65778	-88.0059	36601	30.695	-88.0433	4.259674979
Mobile	Brookley	30.65778	-88.0059	36602	30.69	-88.045	4.090182403
Mobile	Brookley	30.65778	-88.0059	36603	30.6917	-88.055	4.817745902
Mobile	Brookley	30.65778	-88.0059	36604	30.6817	-88.0683	5.394991108
Mobile	Brookley	30.65778	-88.0059	36605	30.6367	-88.09	6.999424338
Mobile	Brookley	30.65778	-88.0059	36607	30.6967	-88.1033	8.467621269
Mobile	Brookley	30.65778	-88.0059	36608	30.6933	-88.1883	15.00176081
Mobile	Brookley	30.65778	-88.0059	36610	30.7383	-88.0833	9.01657985
Mobile	Brookley	30.65778	-88.0059	36612	30.7517	-88.115	11.62169307
Mobile	Brookley	30.65778	-88.0059	36617	30.7133	-88.0917	8.250317832
Mobile	Brookley	30.65778	-88.0059	36619	30.5933	-88.195	16.12913485
Mobile	Brookley	30.65778	-88.0059	36652	30.69	-88.0433	3.985224328
Mobile	Brookley	30.65778	-88.0059	36693	30.6317	-88.1583	12.48210241
Mobile	Brookley	30.65778	-88.0059	36695	30.645	-88.2283	17.98397123
Mobile	Army	30.65778	-88.0054	36601	30.695	-88.0433	4.28838064
Mobile	Army	30.65778	-88.0054	36602	30.69	-88.045	4.121413488
Mobile	Army	30.65778	-88.0054	36603	30.6917	-88.055	4.851010818
Mobile	Army	30.65778	-88.0054	36604	30.6817	-88.0683	5.432700982
Mobile	Army	30.65778	-88.0054	36605	30.6367	-88.09	7.03858495
Mobile	Army	30.65778	-88.0054	36607	30.6967	-88.1033	8.505117725
Mobile	Army	30.65778	-88.0054	36608	30.6933	-88.1883	15.04138352
Mobile	Army	30.65778	-88.0054	36610	30.7383	-88.0833	9.044599664
Mobile	Army	30.65778	-88.0054	36612	30.7517	-88.115	11.65231394
Mobile	Army	30.65778	-88.0054	36617	30.7133	-88.0917	8.284235681
Mobile	Army	30.65778	-88.0054	36619	30.5933	-88.195	16.16734511
Mobile	Army	30.65778	-88.0054	36652	30.69	-88.0433	4.015892245
Mobile	Army	30.65778	-88.0054	36693	30.6317	-88.1583	12.52189089
Mobile	Army	30.65778	-88.0054	36695	30.645	-88.2283	18.0242699
Mobile	Coast Guard	30.6578	-88.0568	36601	30.695	-88.0433	3.194797315
Mobile	Coast Guard	30.6578	-88.0568	36602	30.69	-88.045	2.768556461
Mobile	Coast Guard	30.6578	-88.0568	36603	30.6917	-88.055	2.740602178
Mobile	Coast Guard	30.6578	-88.0568	36604	30.6817	-88.0683	2.141187288
Mobile	Coast Guard	30.6578	-88.0568	36605	30.6367	-88.09	3.175727759
Mobile	Coast Guard	30.6578	-88.0568	36607	30.6967	-88.1033	4.894302441
Mobile	Coast Guard	30.6578	-88.0568	36608	30.6933	-88.1883	10.9960365
Mobile	Coast Guard	30.6578	-88.0568	36610	30.7383	-88.0833	6.841837732
Mobile	Coast Guard	30.6578	-88.0568	36612	30.7517	-88.115	8.918546042
Mobile	Coast Guard	30.6578	-88.0568	36617	30.7133	-88.0917	5.292748937
Mobile	Coast Guard	30.6578	-88.0568	36619	30.5933	-88.195	12.31218256
Mobile	Coast Guard	30.6578	-88.0568	36652	30.69	-88.0433	2.818725841
Mobile	Coast Guard	30.6578	-88.0568	36693	30.6317	-88.1583	8.460665767
Mobile	Coast Guard	30.6578	-88.0568	36695	30.645	-88.2283	13.88370356
Mobile	A & A Marine	30.7836	-88.0683	36601	30.695	-88.0433	7.431967144
Mobile	A & A Marine	30.7836	-88.0683	36602	30.69	-88.045	7.78693057
Mobile	A & A Marine	30.7836	-88.0683	36603	30.6917	-88.055	7.496379321
Mobile	A & A Marine	30.7836	-88.0683	36604	30.6817	-88.0683	8.226387
Mobile	A & A Marine	30.7836	-88.0683	36605	30.6367	-88.09	11.98792931
Mobile	A & A Marine	30.7836	-88.0683	36607	30.6967	-88.1033	7.563074051
Mobile	A & A Marine	30.7836	-88.0683	36608	30.6933	-88.1883	12.12404688
Mobile	A & A Marine	30.7836	-88.0683	36610	30.7383	-88.0833	3.852343906
Mobile	A & A Marine	30.7836	-88.0683	36612	30.7517	-88.115	4.565707971
Mobile	A & A Marine	30.7836	-88.0683	36617	30.7133	-88.0917	5.981461072
Mobile	A & A Marine	30.7836	-88.0683	36619	30.5933	-88.195	18.45647064
Mobile	A & A Marine	30.7836	-88.0683	36652	30.69	-88.0433	7.821216396
Mobile	A & A Marine	30.7836	-88.0683	36693	30.6317	-88.1583	14.25372913
Mobile	A & A Marine	30.7836	-88.0683	36695	30.645	-88.2283	17.0892196
Mobile	Black Bayou	30.7822	-88.0653	36601	30.695	-88.0433	7.260244192
Mobile	Black Bayou	30.7822	-88.0653	36602	30.69	-88.045	7.621583295
Mobile	Black Bayou	30.7822	-88.0653	36603	30.6917	-88.055	7.353231237
Mobile	Black Bayou	30.7822	-88.0653	36604	30.6817	-88.0683	8.116978971
Mobile	Black Bayou	30.7822	-88.0653	36605	30.6367	-88.09	11.91426567
Mobile	Black Bayou	30.7822	-88.0653	36607	30.6967	-88.1033	7.553433758
Mobile	Black Bayou	30.7822	-88.0653	36608	30.6933	-88.1883	12.25188067
Mobile	Black Bayou	30.7822	-88.0653	36610	30.7383	-88.0833	3.830389667

Computation of Average Dray Cost

Mobile	Black Bayou	30.7822	-88.0653	36612	30.7517	-88.115	4.707562825
Mobile	Black Bayou	30.7822	-88.0653	36617	30.7133	-88.0917	5.956632291
Mobile	Black Bayou	30.7822	-88.0653	36619	30.5933	-88.195	18.49850046
Mobile	Black Bayou	30.7822	-88.0653	36652	30.69	-88.0433	7.652267202
Mobile	Black Bayou	30.7822	-88.0653	36693	30.6317	-88.1583	14.28242388
Mobile	Black Bayou	30.7822	-88.0653	36695	30.645	-88.2283	17.20000725
Mobile	Chickasaw Terminal	30.7769	-88.068	36601	30.695	-88.0433	6.905931289
Mobile	Chickasaw Terminal	30.7769	-88.068	36602	30.69	-88.045	7.256998374
Mobile	Chickasaw Terminal	30.7769	-88.068	36603	30.6917	-88.055	6.957802058
Mobile	Chickasaw Terminal	30.7769	-88.068	36604	30.6817	-88.0683	7.68553416
Mobile	Chickasaw Terminal	30.7769	-88.068	36605	30.6367	-88.09	11.45684709
Mobile	Chickasaw Terminal	30.7769	-88.068	36607	30.6967	-88.1033	7.073961356
Mobile	Chickasaw Terminal	30.7769	-88.068	36608	30.6933	-88.1883	11.82661436
Mobile	Chickasaw Terminal	30.7769	-88.068	36610	30.7383	-88.0833	3.352045314
Mobile	Chickasaw Terminal	30.7769	-88.068	36612	30.7517	-88.115	4.305293888
Mobile	Chickasaw Terminal	30.7769	-88.068	36617	30.7133	-88.0917	5.47933131
Mobile	Chickasaw Terminal	30.7769	-88.068	36619	30.5933	-88.195	18.02250195
Mobile	Chickasaw Terminal	30.7769	-88.068	36652	30.69	-88.0433	7.293319953
Mobile	Chickasaw Terminal	30.7769	-88.068	36693	30.6317	-88.1583	13.80391645
Mobile	Chickasaw Terminal	30.7769	-88.068	36695	30.645	-88.2283	16.75875857
Mobile	Delta Hardwoods	30.7647	-88.0752	36601	30.695	-88.0433	6.188205953
Mobile	Delta Hardwoods	30.7647	-88.0752	36602	30.69	-88.045	6.504719244
Mobile	Delta Hardwoods	30.7647	-88.0752	36603	30.6917	-88.055	6.114752615
Mobile	Delta Hardwoods	30.7647	-88.0752	36604	30.6817	-88.0683	6.723704081
Mobile	Delta Hardwoods	30.7647	-88.0752	36605	30.6367	-88.09	10.40228527
Mobile	Delta Hardwoods	30.7647	-88.0752	36607	30.6967	-88.1033	5.93989045
Mobile	Delta Hardwoods	30.7647	-88.0752	36608	30.6933	-88.1883	10.79779066
Mobile	Delta Hardwoods	30.7647	-88.0752	36610	30.7383	-88.0833	2.22933231
Mobile	Delta Hardwoods	30.7647	-88.0752	36612	30.7517	-88.115	3.380110245
Mobile	Delta Hardwoods	30.7647	-88.0752	36617	30.7133	-88.0917	4.35808177
Mobile	Delta Hardwoods	30.7647	-88.0752	36619	30.5933	-88.195	16.88203091
Mobile	Delta Hardwoods	30.7647	-88.0752	36652	30.69	-88.0433	6.557393329
Mobile	Delta Hardwoods	30.7647	-88.0752	36693	30.6317	-88.1583	12.6606185
Mobile	Delta Hardwoods	30.7647	-88.0752	36695	30.645	-88.2283	15.68899849
Mobile	Diamond Shamrock	30.7508	-88.0636	36601	30.695	-88.0433	4.793574462
Mobile	Diamond Shamrock	30.7508	-88.0636	36602	30.69	-88.045	5.132929961
Mobile	Diamond Shamrock	30.7508	-88.0636	36603	30.6917	-88.055	4.82139269
Mobile	Diamond Shamrock	30.7508	-88.0636	36604	30.6817	-88.0683	5.591332058
Mobile	Diamond Shamrock	30.7508	-88.0636	36605	30.6367	-88.09	9.454641139
Mobile	Diamond Shamrock	30.7508	-88.0636	36607	30.6967	-88.1033	5.417277759
Mobile	Diamond Shamrock	30.7508	-88.0636	36608	30.6933	-88.1883	11.08571356
Mobile	Diamond Shamrock	30.7508	-88.0636	36610	30.7383	-88.0833	1.88351931
Mobile	Diamond Shamrock	30.7508	-88.0636	36612	30.7517	-88.115	4.150158053
Mobile	Diamond Shamrock	30.7508	-88.0636	36617	30.7133	-88.0917	3.783008145
Mobile	Diamond Shamrock	30.7508	-88.0636	36619	30.5933	-88.195	16.55894315
Mobile	Diamond Shamrock	30.7508	-88.0636	36652	30.69	-88.0433	5.174742622
Mobile	Diamond Shamrock	30.7508	-88.0636	36693	30.6317	-88.1583	12.28393898
Mobile	Diamond Shamrock	30.7508	-88.0636	36695	30.645	-88.2283	15.80324135
Mobile	Halter Marine	30.7622	-88.0569	36601	30.695	-88.0433	5.535040966
Mobile	Halter Marine	30.7622	-88.0569	36602	30.69	-88.045	5.907345694
Mobile	Halter Marine	30.7622	-88.0569	36603	30.6917	-88.055	5.693531542
Mobile	Halter Marine	30.7622	-88.0569	36604	30.6817	-88.0683	6.563607172
Mobile	Halter Marine	30.7622	-88.0569	36605	30.6367	-88.09	10.47807605
Mobile	Halter Marine	30.7622	-88.0569	36607	30.6967	-88.1033	6.48016547
Mobile	Halter Marine	30.7622	-88.0569	36608	30.6933	-88.1883	11.97777764
Mobile	Halter Marine	30.7622	-88.0569	36610	30.7383	-88.0833	2.87490627
Mobile	Halter Marine	30.7622	-88.0569	36612	30.7517	-88.115	4.766393822
Mobile	Halter Marine	30.7622	-88.0569	36617	30.7133	-88.0917	4.845313451
Mobile	Halter Marine	30.7622	-88.0569	36619	30.5933	-88.195	17.61298826
Mobile	Halter Marine	30.7622	-88.0569	36652	30.69	-88.0433	5.931210629
Mobile	Halter Marine	30.7622	-88.0569	36693	30.6317	-88.1583	13.34176768
Mobile	Halter Marine	30.7622	-88.0569	36695	30.645	-88.2283	16.76266647
Mobile	International Paper	30.7489	-88.05194	36601	30.695	-88.0433	4.406896528
Mobile	International Paper	30.7489	-88.05194	36602	30.69	-88.045	4.787890421
Mobile	International Paper	30.7489	-88.05194	36603	30.6917	-88.055	4.624359001
Mobile	International Paper	30.7489	-88.05194	36604	30.6817	-88.0683	5.583510916
Mobile	International Paper	30.7489	-88.05194	36605	30.6367	-88.09	9.564854014
Mobile	International Paper	30.7489	-88.05194	36607	30.6967	-88.1033	5.911889153
Mobile	International Paper	30.7489	-88.05194	36608	30.6933	-88.1883	11.88827294
Mobile	International Paper	30.7489	-88.05194	36610	30.7383	-88.0833	2.672406398

Computation of Average Dray Cost

Mobile	International Paper	30.7489	-88.05194	36612	30.7517	-88.115	5.095849749
Mobile	International Paper	30.7489	-88.05194	36617	30.7133	-88.0917	4.308454743
Mobile	International Paper	30.7489	-88.05194	36619	30.5933	-88.195	17.06394721
Mobile	International Paper	30.7489	-88.05194	36652	30.69	-88.0433	4.805883141
Mobile	International Paper	30.7489	-88.05194	36693	30.6317	-88.1583	12.77685571
Mobile	International Paper	30.7489	-88.05194	36695	30.645	-88.2283	16.52463622
Mobile	Mobile Bay	30.7639	-88.0522	36601	30.695	-88.0433	5.608510128
Mobile	Mobile Bay	30.7639	-88.0522	36602	30.69	-88.045	5.994195705
Mobile	Mobile Bay	30.7639	-88.0522	36603	30.6917	-88.055	5.833087478
Mobile	Mobile Bay	30.7639	-88.0522	36604	30.6817	-88.0683	6.762095348
Mobile	Mobile Bay	30.7639	-88.0522	36605	30.6367	-88.09	10.71268545
Mobile	Mobile Bay	30.7639	-88.0522	36607	30.6967	-88.1033	6.815376545
Mobile	Mobile Bay	30.7639	-88.0522	36608	30.6933	-88.1883	12.37766777
Mobile	Mobile Bay	30.7639	-88.0522	36610	30.7383	-88.0833	3.251896192
Mobile	Mobile Bay	30.7639	-88.0522	36612	30.7517	-88.115	5.164625641
Mobile	Mobile Bay	30.7639	-88.0522	36617	30.7133	-88.0917	5.182218359
Mobile	Mobile Bay	30.7639	-88.0522	36619	30.5933	-88.195	17.96060168
Mobile	Mobile Bay	30.7639	-88.0522	36652	30.69	-88.0433	6.009056627
Mobile	Mobile Bay	30.7639	-88.0522	36693	30.6317	-88.1583	13.68463991
Mobile	Mobile Bay	30.7639	-88.0522	36695	30.645	-88.2283	17.1536376
Mobile	Scott Paper	30.6833	-88.0569	36601	30.695	-88.0433	1.4483106
Mobile	Scott Paper	30.6833	-88.0569	36602	30.69	-88.045	1.102489268
Mobile	Scott Paper	30.6833	-88.0569	36603	30.6917	-88.055	0.695262958
Mobile	Scott Paper	30.6833	-88.0569	36604	30.6817	-88.0683	0.929342217
Mobile	Scott Paper	30.6833	-88.0569	36605	30.6367	-88.09	4.614459289
Mobile	Scott Paper	30.6833	-88.0569	36607	30.6967	-88.1033	3.898949773
Mobile	Scott Paper	30.6833	-88.0569	36608	30.6933	-88.1883	10.63859683
Mobile	Scott Paper	30.6833	-88.0569	36610	30.7383	-88.0833	4.925165211
Mobile	Scott Paper	30.6833	-88.0569	36612	30.7517	-88.115	7.245116088
Mobile	Scott Paper	30.6833	-88.0569	36617	30.7133	-88.0917	3.709225046
Mobile	Scott Paper	30.6833	-88.0569	36619	30.5933	-88.195	13.30738245
Mobile	Scott Paper	30.6833	-88.0569	36652	30.69	-88.0433	1.223931766
Mobile	Scott Paper	30.6833	-88.0569	36693	30.6317	-88.1583	9.184973929
Mobile	Scott Paper	30.6833	-88.0569	36695	30.645	-88.2283	14.17836929
Mobile	Ven Oil	30.7794	-88.0594	36601	30.695	-88.0433	6.936473625
Mobile	Ven Oil	30.7794	-88.0594	36602	30.69	-88.045	7.310287609
Mobile	Ven Oil	30.7794	-88.0594	36603	30.6917	-88.055	7.088926077
Mobile	Ven Oil	30.7794	-88.0594	36604	30.6817	-88.0683	7.919979198
Mobile	Ven Oil	30.7794	-88.0594	36605	30.6367	-88.09	11.78205881
Mobile	Ven Oil	30.7794	-88.0594	36607	30.6967	-88.1033	7.558716747
Mobile	Ven Oil	30.7794	-88.0594	36608	30.6933	-88.1883	12.5140406
Mobile	Ven Oil	30.7794	-88.0594	36610	30.7383	-88.0833	3.838216986
Mobile	Ven Oil	30.7794	-88.0594	36612	30.7517	-88.115	5.014788789
Mobile	Ven Oil	30.7794	-88.0594	36617	30.7133	-88.0917	5.939281465
Mobile	Ven Oil	30.7794	-88.0594	36619	30.5933	-88.195	18.58904799
Mobile	Ven Oil	30.7794	-88.0594	36652	30.69	-88.0433	7.333364074
Mobile	Ven Oil	30.7794	-88.0594	36693	30.6317	-88.1583	14.35008394
Mobile	Ven Oil	30.7794	-88.0594	36695	30.645	-88.2283	17.42544848
Mobile	Warrior and Gulf	30.7567	-88.0489	36601	30.695	-88.0433	5.001515071
Mobile	Warrior and Gulf	30.7567	-88.0489	36602	30.69	-88.045	5.393887819
Mobile	Warrior and Gulf	30.7567	-88.0489	36603	30.6917	-88.055	5.270506755
Mobile	Warrior and Gulf	30.7567	-88.0489	36604	30.6817	-88.0683	6.25402758
Mobile	Warrior and Gulf	30.7567	-88.0489	36605	30.6367	-88.09	10.24005555
Mobile	Warrior and Gulf	30.7567	-88.0489	36607	30.6967	-88.1033	6.538312682
Mobile	Warrior and Gulf	30.7567	-88.0489	36608	30.6933	-88.1883	12.36300812
Mobile	Warrior and Gulf	30.7567	-88.0489	36610	30.7383	-88.0833	3.149422056
Mobile	Warrior and Gulf	30.7567	-88.0489	36612	30.7517	-88.115	5.351497865
Mobile	Warrior and Gulf	30.7567	-88.0489	36617	30.7133	-88.0917	4.920822965
Mobile	Warrior and Gulf	30.7567	-88.0489	36619	30.5933	-88.195	17.69530334
Mobile	Warrior and Gulf	30.7567	-88.0489	36652	30.69	-88.0433	5.40363588
Mobile	Warrior and Gulf	30.7567	-88.0489	36693	30.6317	-88.1583	13.41026148
Mobile	Warrior and Gulf	30.7567	-88.0489	36695	30.645	-88.2283	17.06083919
Mobile	Alabama State Docks	30.7889	-88.0694	36601	30.695	-88.0433	7.867932712
Mobile	Alabama State Docks	30.7889	-88.0694	36602	30.69	-88.045	8.223597817
Mobile	Alabama State Docks	30.7889	-88.0694	36603	30.6917	-88.055	7.932600621
Mobile	Alabama State Docks	30.7889	-88.0694	36604	30.6817	-88.0683	8.6547116
Mobile	Alabama State Docks	30.7889	-88.0694	36605	30.6367	-88.09	12.39913986
Mobile	Alabama State Docks	30.7889	-88.0694	36607	30.6967	-88.1033	7.930484749
Mobile	Alabama State Docks	30.7889	-88.0694	36608	30.6933	-88.1883	12.3167023
Mobile	Alabama State Docks	30.7889	-88.0694	36610	30.7383	-88.0833	4.236263962

Mobile	Alabama State Docks	30.7889	-88.0694	36612	30.7517	-88.115	4.750876477
Mobile	Alabama State Docks	30.7889	-88.0694	36617	30.7133	-88.0917	6.363168098
Mobile	Alabama State Docks	30.7889	-88.0694	36619	30.5933	-88.195	18.76598674
Mobile	Alabama State Docks	30.7889	-88.0694	36652	30.69	-88.0433	8.257546493
Mobile	Alabama State Docks	30.7889	-88.0694	36693	30.6317	-88.1583	14.57954521
Mobile	Alabama State Docks	30.7889	-88.0694	36695	30.645	-88.2283	17.30645221
Mobile	Buchannan	30.7136	-88.0514	36601	30.695	-88.0433	1.637784693
Mobile	Buchannan	30.7136	-88.0514	36602	30.69	-88.045	1.974042474
Mobile	Buchannan	30.7136	-88.0514	36603	30.6917	-88.055	1.791715007
Mobile	Buchannan	30.7136	-88.0514	36604	30.6817	-88.0683	2.914364181
Mobile	Buchannan	30.7136	-88.0514	36605	30.6367	-88.09	6.94633215
Mobile	Buchannan	30.7136	-88.0514	36607	30.6967	-88.1033	4.406423552
Mobile	Buchannan	30.7136	-88.0514	36608	30.6933	-88.1883	11.17278117
Mobile	Buchannan	30.7136	-88.0514	36610	30.7383	-88.0833	3.257032816
Mobile	Buchannan	30.7136	-88.0514	36612	30.7517	-88.115	5.985229862
Mobile	Buchannan	30.7136	-88.0514	36617	30.7133	-88.0917	3.253509144
Mobile	Buchannan	30.7136	-88.0514	36619	30.5933	-88.195	15.12326318
Mobile	Buchannan	30.7136	-88.0514	36652	30.69	-88.0433	2.014322701
Mobile	Buchannan	30.7136	-88.0514	36693	30.6317	-88.1583	10.87167264
Mobile	Buchannan	30.7136	-88.0514	36695	30.645	-88.2283	15.31734905
Mobile	Harding	30.7082	-88.0497	36601	30.695	-88.0433	1.184284611
Mobile	Harding	30.7082	-88.0497	36602	30.69	-88.045	1.517487803
Mobile	Harding	30.7082	-88.0497	36603	30.6917	-88.055	1.399076754
Mobile	Harding	30.7082	-88.0497	36604	30.6817	-88.0683	2.613720245
Mobile	Harding	30.7082	-88.0497	36605	30.6367	-88.09	6.625931656
Mobile	Harding	30.7082	-88.0497	36607	30.6967	-88.1033	4.425602106
Mobile	Harding	30.7082	-88.0497	36608	30.6933	-88.1883	11.25364907
Mobile	Harding	30.7082	-88.0497	36610	30.7383	-88.0833	3.641782109
Mobile	Harding	30.7082	-88.0497	36612	30.7517	-88.115	6.334265326
Mobile	Harding	30.7082	-88.0497	36617	30.7133	-88.0917	3.415565995
Mobile	Harding	30.7082	-88.0497	36619	30.5933	-88.195	14.95447802
Mobile	Harding	30.7082	-88.0497	36652	30.69	-88.0433	1.557482361
Mobile	Harding	30.7082	-88.0497	36693	30.6317	-88.1583	10.72409553
Mobile	Harding	30.7082	-88.0497	36695	30.645	-88.2283	15.29448972
Mobile	ADDSO	30.685	-88.035	36601	30.695	-88.0433	1.049148394
Mobile	ADDSO	30.685	-88.035	36602	30.69	-88.045	0.902588839
Mobile	ADDSO	30.685	-88.035	36603	30.6917	-88.055	1.702790719
Mobile	ADDSO	30.685	-88.035	36604	30.6817	-88.0683	2.701477195
Mobile	ADDSO	30.685	-88.035	36605	30.6367	-88.09	5.909242995
Mobile	ADDSO	30.685	-88.035	36607	30.6967	-88.1033	5.594175433
Mobile	ADDSO	30.685	-88.035	36608	30.6933	-88.1883	12.39403496
Mobile	ADDSO	30.685	-88.035	36610	30.7383	-88.0833	5.806827586
Mobile	ADDSO	30.685	-88.035	36612	30.7517	-88.115	8.408675741
Mobile	ADDSO	30.685	-88.035	36617	30.7133	-88.0917	5.115874814
Mobile	ADDSO	30.685	-88.035	36619	30.5933	-88.195	14.88782246
Mobile	ADDSO	30.685	-88.035	36652	30.69	-88.0433	0.782248289
Mobile	ADDSO	30.685	-88.035	36693	30.6317	-88.1583	10.84422985
Mobile	ADDSO	30.685	-88.035	36695	30.645	-88.2283	15.93571961
Mobile	Alcoa	30.6683	-88.0353	36601	30.695	-88.0433	2.250166829
Mobile	Alcoa	30.6683	-88.0353	36602	30.69	-88.045	1.91889623
Mobile	Alcoa	30.6683	-88.0353	36603	30.6917	-88.055	2.469401249
Mobile	Alcoa	30.6683	-88.0353	36604	30.6817	-88.0683	2.875348296
Mobile	Alcoa	30.6683	-88.0353	36605	30.6367	-88.09	5.099842599
Mobile	Alcoa	30.6683	-88.0353	36607	30.6967	-88.1033	5.949182074
Mobile	Alcoa	30.6683	-88.0353	36608	30.6933	-88.1883	12.51549355
Mobile	Alcoa	30.6683	-88.0353	36610	30.7383	-88.0833	6.852070214
Mobile	Alcoa	30.6683	-88.0353	36612	30.7517	-88.115	9.312914966
Mobile	Alcoa	30.6683	-88.0353	36617	30.7133	-88.0917	5.824858315
Mobile	Alcoa	30.6683	-88.0353	36619	30.5933	-88.195	14.2435474
Mobile	Alcoa	30.6683	-88.0353	36652	30.69	-88.0433	1.867098336
Mobile	Alcoa	30.6683	-88.0353	36693	30.6317	-88.1583	10.36007181
Mobile	Alcoa	30.6683	-88.0353	36695	30.645	-88.2283	15.69402205
Mobile	Chevron	30.7072	-88.0364	36601	30.695	-88.0433	1.131516703
Mobile	Chevron	30.7072	-88.0364	36602	30.69	-88.045	1.552452803
Mobile	Chevron	30.7072	-88.0364	36603	30.6917	-88.055	1.954616515
Mobile	Chevron	30.7072	-88.0364	36604	30.6817	-88.0683	3.29696813
Mobile	Chevron	30.7072	-88.0364	36605	30.6367	-88.09	7.149602127
Mobile	Chevron	30.7072	-88.0364	36607	30.6967	-88.1033	5.466953105
Mobile	Chevron	30.7072	-88.0364	36608	30.6933	-88.1883	12.31412244
Mobile	Chevron	30.7072	-88.0364	36610	30.7383	-88.0833	4.543040851

Computation of Average Dray Cost

Mobile	Chevron	30.7072	-88.0364	36612	30.7517	-88.115	7.291760448
Mobile	Chevron	30.7072	-88.0364	36617	30.7133	-88.0917	4.491447487
Mobile	Chevron	30.7072	-88.0364	36619	30.5933	-88.195	15.763485
Mobile	Chevron	30.7072	-88.0364	36652	30.69	-88.0433	1.496120979
Mobile	Chevron	30.7072	-88.0364	36693	30.6317	-88.1583	11.57564046
Mobile	Chevron	30.7072	-88.0364	36695	30.645	-88.2283	16.28555427
Mobile	Exxon	30.7275	-88.04	36601	30.695	-88.0433	2.637215697
Mobile	Exxon	30.7275	-88.04	36602	30.69	-88.045	3.054166451
Mobile	Exxon	30.7275	-88.04	36603	30.6917	-88.055	3.133572153
Mobile	Exxon	30.7275	-88.04	36604	30.6817	-88.0683	4.346341557
Mobile	Exxon	30.7275	-88.04	36605	30.6367	-88.09	8.368177566
Mobile	Exxon	30.7275	-88.04	36607	30.6967	-88.1033	5.683030768
Mobile	Exxon	30.7275	-88.04	36608	30.6933	-88.1883	12.28649335
Mobile	Exxon	30.7275	-88.04	36610	30.7383	-88.0833	3.602702318
Mobile	Exxon	30.7275	-88.04	36612	30.7517	-88.115	6.362138666
Mobile	Exxon	30.7275	-88.04	36617	30.7133	-88.0917	4.328310172
Mobile	Exxon	30.7275	-88.04	36619	30.5933	-88.195	16.55154803
Mobile	Exxon	30.7275	-88.04	36652	30.69	-88.0433	3.03907439
Mobile	Exxon	30.7275	-88.04	36693	30.6317	-88.1583	12.2891453
Mobile	Exxon	30.7275	-88.04	36695	30.645	-88.2283	16.59647411
Mobile	Pacific Molasses	30.685	-88.0378	36601	30.695	-88.0433	0.921348257
Mobile	Pacific Molasses	30.685	-88.0378	36602	30.69	-88.045	0.707666489
Mobile	Pacific Molasses	30.685	-88.0378	36603	30.6917	-88.055	1.490184834
Mobile	Pacific Molasses	30.685	-88.0378	36604	30.6817	-88.0683	2.476635356
Mobile	Pacific Molasses	30.685	-88.0378	36605	30.6367	-88.09	5.74133348
Mobile	Pacific Molasses	30.685	-88.0378	36607	30.6967	-88.1033	5.371512373
Mobile	Pacific Molasses	30.685	-88.0378	36608	30.6933	-88.1883	12.16832768
Mobile	Pacific Molasses	30.685	-88.0378	36610	30.7383	-88.0833	5.657520154
Mobile	Pacific Molasses	30.685	-88.0378	36612	30.7517	-88.115	8.236331615
Mobile	Pacific Molasses	30.685	-88.0378	36617	30.7133	-88.0917	4.914660462
Mobile	Pacific Molasses	30.685	-88.0378	36619	30.5933	-88.195	14.69213474
Mobile	Pacific Molasses	30.685	-88.0378	36652	30.69	-88.0433	0.600068865
Mobile	Pacific Molasses	30.685	-88.0378	36693	30.6317	-88.1583	10.63712033
Mobile	Pacific Molasses	30.685	-88.0378	36695	30.645	-88.2283	15.71443199
Mobile	Texaco	30.6689	-88.0375	36601	30.695	-88.0433	2.15845209
Mobile	Texaco	30.6689	-88.0375	36602	30.69	-88.045	1.807811316
Mobile	Texaco	30.6689	-88.0375	36603	30.6917	-88.055	2.320324015
Mobile	Texaco	30.6689	-88.0375	36604	30.6817	-88.0683	2.692657146
Mobile	Texaco	30.6689	-88.0375	36605	30.6367	-88.09	4.972004651
Mobile	Texaco	30.6689	-88.0375	36607	30.6967	-88.1033	5.766676753
Mobile	Texaco	30.6689	-88.0375	36608	30.6933	-88.1883	12.33241584
Mobile	Texaco	30.6689	-88.0375	36610	30.7383	-88.0833	6.712737122
Mobile	Texaco	30.6689	-88.0375	36612	30.7517	-88.115	9.155682515
Mobile	Texaco	30.6689	-88.0375	36617	30.7133	-88.0917	5.656287405
Mobile	Texaco	30.6689	-88.0375	36619	30.5933	-88.195	14.1038822
Mobile	Texaco	30.6689	-88.0375	36652	30.69	-88.0433	1.76658565
Mobile	Texaco	30.6689	-88.0375	36693	30.6317	-88.1583	10.20411871
Mobile	Texaco	30.6689	-88.0375	36695	30.645	-88.2283	15.52365691
Mobile	Alamex	30.5411	-88.1167	36601	30.695	-88.0433	13.76506158
Mobile	Alamex	30.5411	-88.1167	36602	30.69	-88.045	13.34174081
Mobile	Alamex	30.5411	-88.1167	36603	30.6917	-88.055	13.13872999
Mobile	Alamex	30.5411	-88.1167	36604	30.6817	-88.0683	12.00434198
Mobile	Alamex	30.5411	-88.1167	36605	30.6367	-88.09	8.013138777
Mobile	Alamex	30.5411	-88.1167	36607	30.6967	-88.1033	12.60808254
Mobile	Alamex	30.5411	-88.1167	36608	30.6933	-88.1883	13.5788244
Mobile	Alamex	30.5411	-88.1167	36610	30.7383	-88.0833	16.14668619
Mobile	Alamex	30.5411	-88.1167	36612	30.7517	-88.115	17.00229191
Mobile	Alamex	30.5411	-88.1167	36617	30.7133	-88.0917	14.04744684
Mobile	Alamex	30.5411	-88.1167	36619	30.5933	-88.195	7.597087632
Mobile	Alamex	30.5411	-88.1167	36652	30.69	-88.0433	13.40185354
Mobile	Alamex	30.5411	-88.1167	36693	30.6317	-88.1583	8.048307294
Mobile	Alamex	30.5411	-88.1167	36695	30.645	-88.2283	12.3096097
Mobile	Halliburton	30.5269	-88.1016	36601	30.695	-88.0433	14.36370248
Mobile	Halliburton	30.5269	-88.1016	36602	30.69	-88.045	13.93736758
Mobile	Halliburton	30.5269	-88.1016	36603	30.6917	-88.055	13.82596414
Mobile	Halliburton	30.5269	-88.1016	36604	30.6817	-88.0683	12.78288364
Mobile	Halliburton	30.5269	-88.1016	36605	30.6367	-88.09	8.91348408
Mobile	Halliburton	30.5269	-88.1016	36607	30.6967	-88.1033	13.708641
Mobile	Halliburton	30.5269	-88.1016	36608	30.6933	-88.1883	15.14754912
Mobile	Halliburton	30.5269	-88.1016	36610	30.7383	-88.0833	17.130147

Mobile	Halliburton	30.5269	-88.1016	36612	30.7517	-88.115	18.18031713
Mobile	Halliburton	30.5269	-88.1016	36617	30.7133	-88.0917	15.06928116
Mobile	Halliburton	30.5269	-88.1016	36619	30.5933	-88.195	9.251432573
Mobile	Halliburton	30.5269	-88.1016	36652	30.69	-88.0433	13.98296269
Mobile	Halliburton	30.5269	-88.1016	36693	30.6317	-88.1583	9.619388562
Mobile	Halliburton	30.5269	-88.1016	36695	30.645	-88.2283	13.98296269
New Orleans	Sun Drilling	29.8986	-89.8992	70112	29.96	-90.075	15.03304456
New Orleans	Sun Drilling	29.8986	-89.8992	70115	29.9283	-90.1	16.38694321
New Orleans	Sun Drilling	29.8986	-89.8992	70117	29.97	-90.0317	12.15092705
New Orleans	Sun Drilling	29.8986	-89.8992	70119	29.9733	-90.085	16.16651862
New Orleans	Sun Drilling	29.8986	-89.8992	70121	29.9633	-90.1617	21.82583589
New Orleans	Sun Drilling	29.8986	-89.8992	70123	29.9533	-90.21	25.47651677
New Orleans	Sun Drilling	29.8986	-89.8992	70125	29.9517	-90.1033	17.02549956
New Orleans	Sun Drilling	29.8986	-89.8992	70126	30.015	-90.02	13.54282746
New Orleans	Sun Drilling	29.8986	-89.8992	70127	30.0317	-89.9833	12.7104046
New Orleans	Sun Drilling	29.8986	-89.8992	70129	30.0417	-89.9083	11.5757981
New Orleans	Sun Drilling	29.8986	-89.8992	70130	29.9317	-90.0733	14.3068548
New Orleans	Sun Drilling	29.8986	-89.8992	70140	29.96	-90.075	15.03304456
New Orleans	Sun Drilling	29.8986	-89.8992	70156	29.94	-90.085	15.36748086
New Orleans	Sun Drilling	29.8986	-89.8992	70160	29.9433	-90.0833	15.29421274
New Orleans	Sun Drilling	29.8986	-89.8992	70161	29.9433	-90.0833	15.29421274
New Orleans	Sun Drilling	29.8986	-89.8992	70181	29.9633	-90.1583	21.5594298
New Orleans	Sun Drilling	29.8986	-89.8992	70186	30.015	-90.02	13.54282746
New Orleans	Sun Drilling	29.8986	-89.8992	70195	29.9317	-90.0733	14.3068548
New Orleans	Textran	30.08	-89.8531	70112	29.96	-90.075	20.36567023
New Orleans	Textran	30.08	-89.8531	70115	29.9283	-90.1	23.39394659
New Orleans	Textran	30.08	-89.8531	70117	29.97	-90.0317	16.9336751
New Orleans	Textran	30.08	-89.8531	70119	29.9733	-90.085	20.60790395
New Orleans	Textran	30.08	-89.8531	70121	29.9633	-90.1617	26.63513207
New Orleans	Textran	30.08	-89.8531	70123	29.9533	-90.21	30.5742427
New Orleans	Textran	30.08	-89.8531	70125	29.9517	-90.1033	22.69948017
New Orleans	Textran	30.08	-89.8531	70126	30.015	-90.02	14.45959941
New Orleans	Textran	30.08	-89.8531	70127	30.0317	-89.9833	11.21099053
New Orleans	Textran	30.08	-89.8531	70129	30.0417	-89.9083	5.4239086
New Orleans	Textran	30.08	-89.8531	70130	29.9317	-90.0733	21.432398
New Orleans	Textran	30.08	-89.8531	70140	29.96	-90.075	20.36567023
New Orleans	Textran	30.08	-89.8531	70156	29.94	-90.085	21.86838613
New Orleans	Textran	30.08	-89.8531	70160	29.9433	-90.0833	21.61377914
New Orleans	Textran	30.08	-89.8531	70161	29.9433	-90.0833	21.61377914
New Orleans	Textran	30.08	-89.8531	70181	29.9633	-90.1583	26.3785729
New Orleans	Textran	30.08	-89.8531	70186	30.015	-90.02	14.45959941
New Orleans	Textran	30.08	-89.8531	70195	29.9317	-90.0733	21.432398
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70112	29.96	-90.075	14.30843999
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70115	29.9283	-90.1	16.79988972
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70117	29.97	-90.0317	10.74244537
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70119	29.9733	-90.085	15.01328194
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70121	29.9633	-90.1617	21.2449949
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70123	29.9533	-90.21	25.19946442
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70125	29.9517	-90.1033	16.6653315
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70126	30.015	-90.02	10.07456708
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70127	30.0317	-89.9833	7.826464355
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70129	30.0417	-89.9083	4.77028918
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70130	29.9317	-90.0733	14.65167433
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70140	29.96	-90.075	14.30843999
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70156	29.94	-90.085	15.39370597
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70160	29.9433	-90.0833	15.20126821
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70161	29.9433	-90.0833	15.20126821
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70181	29.9633	-90.1583	20.97131711
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70186	30.015	-90.02	10.07456708
New Orleans	Public Bulk Terminal	29.9833	-89.8993	70195	29.9317	-90.0733	14.65167433
New Orleans	American Steel	29.9767	-90.025	70112	29.96	-90.075	4.255696326
New Orleans	American Steel	29.9767	-90.025	70115	29.9283	-90.1	7.206055851
New Orleans	American Steel	29.9767	-90.025	70117	29.97	-90.0317	0.764935388
New Orleans	American Steel	29.9767	-90.025	70119	29.9733	-90.085	4.851570757
New Orleans	American Steel	29.9767	-90.025	70121	29.9633	-90.1617	11.08868501
New Orleans	American Steel	29.9767	-90.025	70123	29.9533	-90.21	15.05404761
New Orleans	American Steel	29.9767	-90.025	70125	29.9517	-90.1033	6.635539478
New Orleans	American Steel	29.9767	-90.025	70126	30.015	-90.02	3.118195597
New Orleans	American Steel	29.9767	-90.025	70127	30.0317	-89.9833	5.572060394
New Orleans	American Steel	29.9767	-90.025	70129	30.0417	-89.9083	10.78399608

Computation of Average Dray Cost

New Orleans	American Steel	29.9767	-90.025	70130	29.9317	-90.0733	5.329335781
New Orleans	American Steel	29.9767	-90.025	70140	29.96	-90.075	4.255696326
New Orleans	American Steel	29.9767	-90.025	70156	29.94	-90.085	5.678074405
New Orleans	American Steel	29.9767	-90.025	70160	29.9433	-90.0833	5.424221005
New Orleans	American Steel	29.9767	-90.025	70161	29.9433	-90.0833	5.424221005
New Orleans	American Steel	29.9767	-90.025	70181	29.9633	-90.1583	10.81554546
New Orleans	American Steel	29.9767	-90.025	70186	30.015	-90.02	3.118195597
New Orleans	American Steel	29.9767	-90.025	70195	29.9317	-90.0733	5.329335781
New Orleans	Bariod	30.03	-90.03	70112	29.96	-90.075	6.718074898
New Orleans	Bariod	30.03	-90.03	70115	29.9283	-90.1	9.967095288
New Orleans	Bariod	30.03	-90.03	70117	29.97	-90.0317	4.845743857
New Orleans	Bariod	30.03	-90.03	70119	29.9733	-90.085	6.377102821
New Orleans	Bariod	30.03	-90.03	70121	29.9633	-90.1617	11.91794107
New Orleans	Bariod	30.03	-90.03	70123	29.9533	-90.21	15.79564302
New Orleans	Bariod	30.03	-90.03	70125	29.9517	-90.1033	8.658750711
New Orleans	Bariod	30.03	-90.03	70126	30.015	-90.02	1.455380772
New Orleans	Bariod	30.03	-90.03	70127	30.0317	-89.9833	3.772588136
New Orleans	Bariod	30.03	-90.03	70129	30.0417	-89.9083	9.870139734
New Orleans	Bariod	30.03	-90.03	70130	29.9317	-90.0733	8.671536956
New Orleans	Bariod	30.03	-90.03	70140	29.96	-90.075	6.718074898
New Orleans	Bariod	30.03	-90.03	70156	29.94	-90.085	8.515006078
New Orleans	Bariod	30.03	-90.03	70160	29.9433	-90.0833	8.216148755
New Orleans	Bariod	30.03	-90.03	70161	29.9433	-90.0833	8.216148755
New Orleans	Bariod	30.03	-90.03	70181	29.9633	-90.1583	11.67373107
New Orleans	Bariod	30.03	-90.03	70186	30.015	-90.02	1.455380772
New Orleans	Bariod	30.03	-90.03	70195	29.9317	-90.0733	8.671536956
New Orleans	Citaldel Cement	29.9778	-90.0258	70112	29.96	-90.075	4.223868898
New Orleans	Citaldel Cement	29.9778	-90.0258	70115	29.9283	-90.1	7.2007766
New Orleans	Citaldel Cement	29.9778	-90.0258	70117	29.97	-90.0317	0.789546004
New Orleans	Citaldel Cement	29.9778	-90.0258	70119	29.9733	-90.085	4.793003397
New Orleans	Citaldel Cement	29.9778	-90.0258	70121	29.9633	-90.1617	11.0334787
New Orleans	Citaldel Cement	29.9778	-90.0258	70123	29.9533	-90.21	15.0014262
New Orleans	Citaldel Cement	29.9778	-90.0258	70125	29.9517	-90.1033	6.601848459
New Orleans	Citaldel Cement	29.9778	-90.0258	70126	30.015	-90.02	3.039438935
New Orleans	Citaldel Cement	29.9778	-90.0258	70127	30.0317	-89.9833	5.541313316
New Orleans	Citaldel Cement	29.9778	-90.0258	70129	30.0417	-89.9083	10.79775746
New Orleans	Citaldel Cement	29.9778	-90.0258	70130	29.9317	-90.0733	5.343728418
New Orleans	Citaldel Cement	29.9778	-90.0258	70140	29.96	-90.075	4.223868898
New Orleans	Citaldel Cement	29.9778	-90.0258	70156	29.94	-90.085	5.670373137
New Orleans	Citaldel Cement	29.9778	-90.0258	70160	29.9433	-90.0833	5.413426584
New Orleans	Citaldel Cement	29.9778	-90.0258	70161	29.9433	-90.0833	5.413426584
New Orleans	Citaldel Cement	29.9778	-90.0258	70181	29.9633	-90.1583	10.76058525
New Orleans	Citaldel Cement	29.9778	-90.0258	70186	30.015	-90.02	3.039438935
New Orleans	Citaldel Cement	29.9778	-90.0258	70195	29.9317	-90.0733	5.343728418
New Orleans	Distributors Oil	29.9742	-90.0278	70112	29.96	-90.075	3.979161964
New Orleans	Distributors Oil	29.9742	-90.0278	70115	29.9283	-90.1	6.906851364
New Orleans	Distributors Oil	29.9742	-90.0278	70117	29.97	-90.0317	0.462703345
New Orleans	Distributors Oil	29.9742	-90.0278	70119	29.9733	-90.085	4.618327567
New Orleans	Distributors Oil	29.9742	-90.0278	70121	29.9633	-90.1617	10.84550389
New Orleans	Distributors Oil	29.9742	-90.0278	70123	29.9533	-90.21	14.80546162
New Orleans	Distributors Oil	29.9742	-90.0278	70125	29.9517	-90.1033	6.360017818
New Orleans	Distributors Oil	29.9742	-90.0278	70126	30.015	-90.02	3.35343519
New Orleans	Distributors Oil	29.9742	-90.0278	70127	30.0317	-89.9833	5.869742786
New Orleans	Distributors Oil	29.9742	-90.0278	70129	30.0417	-89.9083	11.07988002
New Orleans	Distributors Oil	29.9742	-90.0278	70130	29.9317	-90.0733	5.026374537
New Orleans	Distributors Oil	29.9742	-90.0278	70140	29.96	-90.075	3.979161964
New Orleans	Distributors Oil	29.9742	-90.0278	70156	29.94	-90.085	5.380204804
New Orleans	Distributors Oil	29.9742	-90.0278	70160	29.9433	-90.0833	5.12814092
New Orleans	Distributors Oil	29.9742	-90.0278	70161	29.9433	-90.0833	5.12814092
New Orleans	Distributors Oil	29.9742	-90.0278	70181	29.9633	-90.1583	10.57195029
New Orleans	Distributors Oil	29.9742	-90.0278	70186	30.015	-90.02	3.35343519
New Orleans	Distributors Oil	29.9742	-90.0278	70195	29.9317	-90.0733	5.026374537
New Orleans	Ideal Cement	30.0917	-90.0314	70112	29.96	-90.075	11.1996255
New Orleans	Ideal Cement	30.0917	-90.0314	70115	29.9283	-90.1	14.30664981
New Orleans	Ideal Cement	30.0917	-90.0314	70117	29.97	-90.0317	9.824870851
New Orleans	Ideal Cement	30.0917	-90.0314	70119	29.9733	-90.085	10.49226663
New Orleans	Ideal Cement	30.0917	-90.0314	70121	29.9633	-90.1617	14.76821805
New Orleans	Ideal Cement	30.0917	-90.0314	70123	29.9533	-90.21	18.24078584
New Orleans	Ideal Cement	30.0917	-90.0314	70125	29.9517	-90.1033	12.70558122
New Orleans	Ideal Cement	30.0917	-90.0314	70126	30.015	-90.02	6.260011592

Computation of Average Dray Cost

New Orleans	Ideal Cement	30.0917	-90.0314	70127	30.0317	-89.9833	6.208137
New Orleans	Ideal Cement	30.0917	-90.0314	70129	30.0417	-89.9083	10.72634389
New Orleans	Ideal Cement	30.0917	-90.0314	70130	29.9317	-90.0733	13.35236373
New Orleans	Ideal Cement	30.0917	-90.0314	70140	29.96	-90.075	11.1996255
New Orleans	Ideal Cement	30.0917	-90.0314	70156	29.94	-90.085	12.9887144
New Orleans	Ideal Cement	30.0917	-90.0314	70160	29.9433	-90.0833	12.69186779
New Orleans	Ideal Cement	30.0917	-90.0314	70161	29.9433	-90.0833	12.69186779
New Orleans	Ideal Cement	30.0917	-90.0314	70181	29.9633	-90.1583	14.57398323
New Orleans	Ideal Cement	30.0917	-90.0314	70186	30.015	-90.02	6.260011592
New Orleans	Ideal Cement	30.0917	-90.0314	70195	29.9317	-90.0733	13.35236373
New Orleans	Southern Scrap	29.9833	-90.0203	70112	29.96	-90.075	4.799858483
New Orleans	Southern Scrap	29.9833	-90.0203	70115	29.9283	-90.1	7.817519886
New Orleans	Southern Scrap	29.9833	-90.0203	70117	29.97	-90.0317	1.414158266
New Orleans	Southern Scrap	29.9833	-90.0203	70119	29.9733	-90.085	5.285250739
New Orleans	Southern Scrap	29.9833	-90.0203	70121	29.9633	-90.1617	11.52884324
New Orleans	Southern Scrap	29.9833	-90.0203	70123	29.9533	-90.21	15.50480338
New Orleans	Southern Scrap	29.9833	-90.0203	70125	29.9517	-90.1033	7.169787604
New Orleans	Southern Scrap	29.9833	-90.0203	70126	30.015	-90.02	2.559255598
New Orleans	Southern Scrap	29.9833	-90.0203	70127	30.0317	-89.9833	4.918279384
New Orleans	Southern Scrap	29.9833	-90.0203	70129	30.0417	-89.9083	10.1971162
New Orleans	Southern Scrap	29.9833	-90.0203	70130	29.9317	-90.0733	5.971597609
New Orleans	Southern Scrap	29.9833	-90.0203	70140	29.96	-90.075	4.799858483
New Orleans	Southern Scrap	29.9833	-90.0203	70156	29.94	-90.085	6.28501586
New Orleans	Southern Scrap	29.9833	-90.0203	70160	29.9433	-90.0833	6.024535411
New Orleans	Southern Scrap	29.9833	-90.0203	70161	29.9433	-90.0833	6.024535411
New Orleans	Southern Scrap	29.9833	-90.0203	70181	29.9633	-90.1583	11.257132
New Orleans	Southern Scrap	29.9833	-90.0203	70186	30.015	-90.02	2.559255598
New Orleans	Southern Scrap	29.9833	-90.0203	70195	29.9317	-90.0733	5.971597609
New Orleans	Dundee Cement	30.0197	-89.8953	70112	29.96	-90.075	15.28681332
New Orleans	Dundee Cement	30.0197	-89.8953	70115	29.9283	-90.1	18.09793933
New Orleans	Dundee Cement	30.0197	-89.8953	70117	29.97	-90.0317	11.7197746
New Orleans	Dundee Cement	30.0197	-89.8953	70119	29.9733	-90.085	15.76594067
New Orleans	Dundee Cement	30.0197	-89.8953	70121	29.9633	-90.1617	21.98316886
New Orleans	Dundee Cement	30.0197	-89.8953	70123	29.9533	-90.21	25.96508863
New Orleans	Dundee Cement	30.0197	-89.8953	70125	29.9517	-90.1033	17.66640988
New Orleans	Dundee Cement	30.0197	-89.8953	70126	30.015	-90.02	10.07417893
New Orleans	Dundee Cement	30.0197	-89.8953	70127	30.0317	-89.9833	7.169987581
New Orleans	Dundee Cement	30.0197	-89.8953	70129	30.0417	-89.9083	2.062963495
New Orleans	Dundee Cement	30.0197	-89.8953	70130	29.9317	-90.0733	16.03014041
New Orleans	Dundee Cement	30.0197	-89.8953	70140	29.96	-90.075	15.28681332
New Orleans	Dundee Cement	30.0197	-89.8953	70156	29.94	-90.085	16.61120144
New Orleans	Dundee Cement	30.0197	-89.8953	70160	29.9433	-90.0833	16.38261351
New Orleans	Dundee Cement	30.0197	-89.8953	70161	29.9433	-90.0833	16.38261351
New Orleans	Dundee Cement	30.0197	-89.8953	70181	29.9633	-90.1583	21.71471332
New Orleans	Dundee Cement	30.0197	-89.8953	70186	30.015	-90.02	10.07417893
New Orleans	Dundee Cement	30.0197	-89.8953	70195	29.9317	-90.0733	16.03014041
New Orleans	Lone Star	30.0275	-89.9053	70112	29.96	-90.075	14.74385762
New Orleans	Lone Star	30.0275	-89.9053	70115	29.9283	-90.1	17.64070205
New Orleans	Lone Star	30.0275	-89.9053	70117	29.97	-90.0317	11.21049058
New Orleans	Lone Star	30.0275	-89.9053	70119	29.9733	-90.085	15.15268552
New Orleans	Lone Star	30.0275	-89.9053	70121	29.9633	-90.1617	21.33817756
New Orleans	Lone Star	30.0275	-89.9053	70123	29.9533	-90.21	25.31728454
New Orleans	Lone Star	30.0275	-89.9053	70125	29.9517	-90.1033	17.11583383
New Orleans	Lone Star	30.0275	-89.9053	70126	30.015	-90.02	9.314555892
New Orleans	Lone Star	30.0275	-89.9053	70127	30.0317	-89.9833	6.306062093
New Orleans	Lone Star	30.0275	-89.9053	70129	30.0417	-89.9083	1.171670176
New Orleans	Lone Star	30.0275	-89.9053	70130	29.9317	-90.0733	15.61278127
New Orleans	Lone Star	30.0275	-89.9053	70140	29.96	-90.075	14.74385762
New Orleans	Lone Star	30.0275	-89.9053	70156	29.94	-90.085	16.13557035
New Orleans	Lone Star	30.0275	-89.9053	70160	29.9433	-90.0833	15.89656314
New Orleans	Lone Star	30.0275	-89.9053	70161	29.9433	-90.0833	15.89656314
New Orleans	Lone Star	30.0275	-89.9053	70181	29.9633	-90.1583	21.07202082
New Orleans	Lone Star	30.0275	-89.9053	70186	30.015	-90.02	9.314555892
New Orleans	Lone Star	30.0275	-89.9053	70195	29.9317	-90.0733	15.61278127
St. Louis	Street Industries	38.5319	-90.2075	63101	38.635	-90.1917	8.420433121
St. Louis	Street Industries	38.5319	-90.2075	63102	38.6317	-90.1867	8.229979057
St. Louis	Street Industries	38.5319	-90.2075	63103	38.6333	-90.2167	8.219646175
St. Louis	Street Industries	38.5319	-90.2075	63104	38.6133	-90.2183	6.62900964
St. Louis	Street Industries	38.5319	-90.2075	63105	38.6433	-90.325	13.07133382
St. Louis	Street Industries	38.5319	-90.2075	63106	38.645	-90.2083	9.130791411

St. Louis	Street Industries	38.5319	-90.2075	63108	38.6433	-90.2533	9.723726589
St. Louis	Street Industries	38.5319	-90.2075	63109	38.5867	-90.2933	8.218884959
St. Louis	Street Industries	38.5319	-90.2075	63110	38.6183	-90.2567	8.026689611
St. Louis	Street Industries	38.5319	-90.2075	63111	38.5633	-90.25	4.265883507
St. Louis	Street Industries	38.5319	-90.2075	63114	38.705	-90.3633	18.80112267
St. Louis	Street Industries	38.5319	-90.2075	63115	38.6767	-90.2383	11.95122514
St. Louis	Street Industries	38.5319	-90.2075	63116	38.5817	-90.2617	5.942122862
St. Louis	Street Industries	38.5319	-90.2075	63118	38.595	-90.2317	5.455849035
St. Louis	Street Industries	38.5319	-90.2075	63120	38.6933	-90.26	13.70181229
St. Louis	Street Industries	38.5319	-90.2075	63122	38.585	-90.41	16.90052423
St. Louis	Street Industries	38.5319	-90.2075	63123	38.55	-90.325	9.597659651
St. Louis	Street Industries	38.5319	-90.2075	63125	38.5217	-90.2967	7.248043526
St. Louis	Street Industries	38.5319	-90.2075	63126	38.55	-90.38	14.00237589
St. Louis	Street Industries	38.5319	-90.2075	63128	38.4967	-90.3717	13.5570358
St. Louis	Street Industries	38.5319	-90.2075	63129	38.47	-90.3217	10.48659084
St. Louis	Street Industries	38.5319	-90.2075	63132	38.6717	-90.3683	17.20149254
St. Louis	Street Industries	38.5319	-90.2075	63133	38.6767	-90.305	14.09271356
St. Louis	Street Industries	38.5319	-90.2075	63134	38.7383	-90.34	19.80062029
St. Louis	Street Industries	38.5319	-90.2075	63135	38.7483	-90.3017	19.05340882
St. Louis	Street Industries	38.5319	-90.2075	63137	38.7483	-90.2183	17.49171528
St. Louis	Street Industries	38.5319	-90.2075	63139	38.61	-90.2917	9.271393258
St. Louis	Street Industries	38.5319	-90.2075	63143	38.6133	-90.3183	11.09930344
St. Louis	Street Industries	38.5319	-90.2075	63144	38.6217	-90.35	13.59774336
St. Louis	Street Industries	38.5319	-90.2075	63146	38.6883	-90.4467	23.0720634
St. Louis	Street Industries	38.5319	-90.2075	63147	38.715	-90.2367	14.96845015
St. Louis	Street Industries	38.5319	-90.2075	63155	38.6333	-90.2167	8.219646175
St. Louis	Carondelet Coke	38.5156	-90.27	63101	38.635	-90.1917	11.52694648
St. Louis	Carondelet Coke	38.5156	-90.27	63102	38.6317	-90.1867	11.53566448
St. Louis	Carondelet Coke	38.5156	-90.27	63103	38.6333	-90.2167	10.43079712
St. Louis	Carondelet Coke	38.5156	-90.27	63104	38.6133	-90.2183	8.923561312
St. Louis	Carondelet Coke	38.5156	-90.27	63105	38.6433	-90.325	11.22474809
St. Louis	Carondelet Coke	38.5156	-90.27	63106	38.645	-90.2083	11.5732164
St. Louis	Carondelet Coke	38.5156	-90.27	63108	38.6433	-90.2533	10.39700229
St. Louis	Carondelet Coke	38.5156	-90.27	63109	38.5867	-90.2933	6.04025507
St. Louis	Carondelet Coke	38.5156	-90.27	63110	38.6183	-90.2567	8.360206405
St. Louis	Carondelet Coke	38.5156	-90.27	63111	38.5633	-90.25	4.17561439
St. Louis	Carondelet Coke	38.5156	-90.27	63114	38.705	-90.3633	17.04478741
St. Louis	Carondelet Coke	38.5156	-90.27	63115	38.6767	-90.2383	13.25499574
St. Louis	Carondelet Coke	38.5156	-90.27	63116	38.5817	-90.2617	5.378157226
St. Louis	Carondelet Coke	38.5156	-90.27	63118	38.595	-90.2317	7.116728413
St. Louis	Carondelet Coke	38.5156	-90.27	63120	38.6933	-90.26	14.36841829
St. Louis	Carondelet Coke	38.5156	-90.27	63122	38.585	-90.41	12.61465601
St. Louis	Carondelet Coke	38.5156	-90.27	63123	38.55	-90.325	5.237106365
St. Louis	Carondelet Coke	38.5156	-90.27	63125	38.5217	-90.2967	2.211029491
St. Louis	Carondelet Coke	38.5156	-90.27	63126	38.55	-90.38	9.304411811
St. Louis	Carondelet Coke	38.5156	-90.27	63128	38.4967	-90.3717	8.350815156
St. Louis	Carondelet Coke	38.5156	-90.27	63129	38.47	-90.3217	5.565248896
St. Louis	Carondelet Coke	38.5156	-90.27	63132	38.6717	-90.3683	14.89246421
St. Louis	Carondelet Coke	38.5156	-90.27	63133	38.6767	-90.305	13.30899854
St. Louis	Carondelet Coke .	38.5156	-90.27	63134	38.7383	-90.34	18.84579387
St. Louis	Carondelet Coke	38.5156	-90.27	63135	38.7483	-90.3017	18.95938163
St. Louis	Carondelet Coke	38.5156	-90.27	63137	38.7483	-90.2183	19.24393575
St. Louis	Carondelet Coke	38.5156	-90.27	63139	38.61	-90.2917	7.819670492
St. Louis	Carondelet Coke	38.5156	-90.27	63143	38.6133	-90.3183	8.798525633
St. Louis	Carondelet Coke	38.5156	-90.27	63144	38.6217	-90.35	10.72743752
St. Louis	Carondelet Coke	38.5156	-90.27	63146	38.6883	-90.4467	19.94671181
St. Louis	Carondelet Coke	38.5156	-90.27	63147	38.715	-90.2367	16.32049349
St. Louis	Carondelet Coke	38.5156	-90.27	63155	38.6333	-90.2167	10.43079712
St. Louis	Davis Street Sand	38.5397	-90.2553	63101	38.635	-90.1917	9.249505654
St. Louis	Davis Street Sand	38.5397	-90.2553	63102	38.6317	-90.1867	9.264610817
St. Louis	Davis Street Sand	38.5397	-90.2553	63103	38.6333	-90.2167	8.173656353
St. Louis	Davis Street Sand	38.5397	-90.2553	63104	38.6133	-90.2183	6.650290247
St. Louis	Davis Street Sand	38.5397	-90.2553	63105	38.6433	-90.325	10.0802809
St. Louis	Davis Street Sand	38.5397	-90.2553	63106	38.645	-90.2083	9.309219201
St. Louis	Davis Street Sand	38.5397	-90.2553	63108	38.6433	-90.2533	8.365186349
St. Louis	Davis Street Sand	38.5397	-90.2553	63109	38.5867	-90.2933	4.879325474
St. Louis	Davis Street Sand	38.5397	-90.2553	63110	38.6183	-90.2567	6.346384477
St. Louis	Davis Street Sand	38.5397	-90.2553	63111	38.5633	-90.25	1.952681647
St. Louis	Davis Street Sand	38.5397	-90.2553	63114	38.705	-90.3633	15.94046303
St. Louis	Davis Street Sand	38.5397	-90.2553	63115	38.6767	-90.2383	11.14483425

Computation of Average Dray Cost

St. Louis	Davis Street Sand	38.5397	-90.2553	63116	38.5817	-90.2617	3.429799585
St. Louis	Davis Street Sand	38.5397	-90.2553	63118	38.595	-90.2317	4.853914328
St. Louis	Davis Street Sand	38.5397	-90.2553	63120	38.6933	-90.26	12.40593174
St. Louis	Davis Street Sand	38.5397	-90.2553	63122	38.585	-90.41	13.01336049
St. Louis	Davis Street Sand	38.5397	-90.2553	63123	38.55	-90.325	5.68798854
St. Louis	Davis Street Sand	38.5397	-90.2553	63125	38.5217	-90.2967	3.644456579
St. Louis	Davis Street Sand	38.5397	-90.2553	63126	38.55	-90.38	10.10131363
St. Louis	Davis Street Sand	38.5397	-90.2553	63128	38.4967	-90.3717	10.01766596
St. Louis	Davis Street Sand	38.5397	-90.2553	63129	38.47	-90.3217	7.771515287
St. Louis	Davis Street Sand	38.5397	-90.2553	63132	38.6717	-90.3683	14.02775222
St. Louis	Davis Street Sand	38.5397	-90.2553	63133	38.6767	-90.305	11.76529728
St. Louis	Davis Street Sand	38.5397	-90.2553	63134	38.7383	-90.34	17.43021274
St. Louis	Davis Street Sand	38.5397	-90.2553	63135	38.7483	-90.3017	17.25185556
St. Louis	Davis Street Sand	38.5397	-90.2553	63137	38.7483	-90.2183	17.10313398
St. Louis	Davis Street Sand	38.5397	-90.2553	63139	38.61	-90.2917	6.390966371
St. Louis	Davis Street Sand	38.5397	-90.2553	63143	38.6133	-90.3183	7.821216396
St. Louis	Davis Street Sand	38.5397	-90.2553	63144	38.6217	-90.35	10.1128915
St. Louis	Davis Street Sand	38.5397	-90.2553	63146	38.6883	-90.4467	19.56198347
St. Louis	Davis Street Sand	38.5397	-90.2553	63147	38.715	-90.2367	14.23140763
St. Louis	Davis Street Sand	38.5397	-90.2553	63155	38.6333	-90.2167	8.173656353
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63101	38.635	-90.1917	7.48510345
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63102	38.6317	-90.1867	7.294459207
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63103	38.6333	-90.2167	7.322745027
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63104	38.6133	-90.2183	5.746257963
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63105	38.6433	-90.325	12.5856387
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63106	38.645	-90.2083	8.213578273
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63108	38.6433	-90.2533	8.95135536
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63109	38.5867	-90.2933	7.913998588
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63110	38.6183	-90.2567	7.335638853
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63111	38.5633	-90.25	3.946004444
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63114	38.705	-90.3633	18.24556939
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63115	38.6767	-90.2383	11.09206991
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63116	38.5817	-90.2617	5.501647328
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63118	38.595	-90.2317	4.682743633
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63120	38.6933	-90.26	12.88678402
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63122	38.585	-90.41	16.85692855
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63123	38.55	-90.325	9.670446507
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63125	38.5217	-90.2967	7.574113382
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63126	38.55	-90.38	14.1058321
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63128	38.4967	-90.3717	13.9425291
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63129	38.47	-90.3217	11.09812314
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63132	38.6717	-90.3683	16.74499979
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63133	38.6767	-90.305	13.43996182
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63134	38.7383	-90.34	19.12843816
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63135	38.7483	-90.3017	18.28471055
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63137	38.7483	-90.2183	16.58238416
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63139	38.61	-90.2917	8.805337713
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63143	38.6133	-90.3183	10.72415631
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63144	38.6217	-90.35	13.27897338
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63146	38.6883	-90.4467	22.7267052
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63147	38.715	-90.2367	14.08977431
St. Louis	Econo-Flo Flour	38.5433	-90.2054	63155	38.6333	-90.2167	7.322745027
St. Louis	Lone Star	38.5525	-90.2472	63101	38.635	-90.1917	8.027054984
St. Louis	Lone Star	38.5525	-90.2472	63102	38.6317	-90.1867	8.045865447
St. Louis	Lone Star	38.5525	-90.2472	63103	38.6333	-90.2167	6.972235595
St. Louis	Lone Star	38.5525	-90.2472	63104	38.6133	-90.2183	5.434664213
St. Louis	Lone Star	38.5525	-90.2472	63105	38.6433	-90.325	9.653053237
St. Louis	Lone Star	38.5525	-90.2472	63106	38.645	-90.2083	8.10098901
St. Louis	Lone Star	38.5525	-90.2472	63108	38.6433	-90.2533	7.346807026
St. Louis	Lone Star	38.5525	-90.2472	63109	38.5867	-90.2933	4.63396529
St. Louis	Lone Star	38.5525	-90.2472	63110	38.6183	-90.2567	5.367112307
St. Louis	Lone Star	38.5525	-90.2472	63111	38.5633	-90.25	0.900709498
St. Louis	Lone Star	38.5525	-90.2472	63114	38.705	-90.3633	15.47311288
St. Louis	Lone Star	38.5525	-90.2472	63115	38.6767	-90.2383	10.05237629
St. Louis	Lone Star	38.5525	-90.2472	63116	38.5817	-90.2617	2.63195896
St. Louis	Lone Star	38.5525	-90.2472	63118	38.595	-90.2317	3.65208458
St. Louis	Lone Star	38.5525	-90.2472	63120	38.6933	-90.26	11.41365753
St. Louis	Lone Star	38.5525	-90.2472	63122	38.585	-90.41	13.4021745
St. Louis	Lone Star	38.5525	-90.2472	63123	38.55	-90.325	6.284035853
St. Louis	Lone Star	38.5525	-90.2472	63125	38.5217	-90.2967	4.706559

St. Louis	Lone Star	38.5525	-90.2472	63126	38.55	-90.38	10.72284354
St. Louis	Lone Star	38.5525	-90.2472	63128	38.4967	-90.3717	11.01421435
St. Louis	Lone Star	38.5525	-90.2472	63129	38.47	-90.3217	8.973930241
St. Louis	Lone Star	38.5525	-90.2472	63132	38.6717	-90.3683	13.71788951
St. Louis	Lone Star	38.5525	-90.2472	63133	38.6767	-90.305	11.05926749
St. Louis	Lone Star	38.5525	-90.2472	63134	38.7383	-90.34	16.76649183
St. Louis	Lone Star	38.5525	-90.2472	63135	38.7483	-90.3017	16.40784174
St. Louis	Lone Star	38.5525	-90.2472	63137	38.7483	-90.2183	15.97818839
St. Louis	Lone Star	38.5525	-90.2472	63139	38.61	-90.2917	5.869742786
St. Louis	Lone Star	38.5525	-90.2472	63143	38.6133	-90.3183	7.552398291
St. Louis	Lone Star	38.5525	-90.2472	63144	38.6217	-90.35	10.00416375
St. Louis	Lone Star	38.5525	-90.2472	63146	38.6883	-90.4467	19.48285877
St. Louis	Lone Star	38.5525	-90.2472	63147	38.715	-90.2367	13.14598257
St. Louis	Lone Star	38.5525	-90.2472	63155	38.6333	-90.2167	6.972235595
St. Louis	Chemtech	38.5544	-90.2456	63101	38.635	-90.1917	7.827717514
St. Louis	Chemtech	38.5544	-90.2456	63102	38.6317	-90.1867	7.84556885
St. Louis	Chemtech	38.5544	-90.2456	63103	38.6333	-90.2167	6.783443635
St. Louis	Chemtech	38.5544	-90.2456	63104	38.6133	-90.2183	5.240925444
St. Louis	Chemtech	38.5544	-90.2456	63105	38.6433	-90.325	9.622653656
St. Louis	Chemtech	38.5544	-90.2456	63106	38.645	-90.2083	7.909748085
St. Louis	Chemtech	38.5544	-90.2456	63108	38.6433	-90.2533	7.203767293
St. Louis	Chemtech	38.5544	-90.2456	63109	38.5867	-90.2933	4.650622605
St. Louis	Chemtech	38.5544	-90.2456	63110	38.6183	-90.2567	5.235899107
St. Louis	Chemtech	38.5544	-90.2456	63111	38.5633	-90.25	0.801507021
St. Louis	Chemtech	38.5544	-90.2456	63114	38.705	-90.3633	15.43055278
St. Louis	Chemtech	38.5544	-90.2456	63115	38.6767	-90.2383	9.890851676
St. Louis	Chemtech	38.5544	-90.2456	63116	38.5817	-90.2617	2.558644348
St. Louis	Chemtech	38.5544	-90.2456	63118	38.595	-90.2317	3.464408283
St. Louis	Chemtech	38.5544	-90.2456	63120	38.6933	-90.26	11.27349575
St. Louis	Chemtech	38.5544	-90.2456	63122	38.585	-90.41	13.49995824
St. Louis	Chemtech	38.5544	-90.2456	63123	38.55	-90.325	6.419796602
St. Louis	Chemtech	38.5544	-90.2456	63125	38.5217	-90.2967	4.897656964
St. Louis	Chemtech	38.5544	-90.2456	63126	38.55	-90.38	10.85592493
St. Louis	Chemtech	38.5544	-90.2456	63128	38.4967	-90.3717	11.19515834
St. Louis	Chemtech	38.5544	-90.2456	63129	38.47	-90.3217	9.174342045
St. Louis	Chemtech	38.5544	-90.2456	63132	38.6717	-90.3683	13.70380277
St. Louis	Chemtech	38.5544	-90.2456	63133	38.6767	-90.305	10.97620767
St. Louis	Chemtech	38.5544	-90.2456	63134	38.7383	-90.34	16.68800017
St. Louis	Chemtech	38.5544	-90.2456	63135	38.7483	-90.3017	16.29554997
St. Louis	Chemtech	38.5544	-90.2456	63137	38.7483	-90.2183	15.80793588
St. Louis	Chemtech	38.5544	-90.2456	63139	38.61	-90.2917	5.830790966
St. Louis	Chemtech	38.5544	-90.2456	63143	38.6133	-90.3183	7.553541611
St. Louis	Chemtech	38.5544	-90.2456	63144	38.6217	-90.35	10.0276442
St. Louis	Chemtech	38.5544	-90.2456	63146	38.6883	-90.4467	19.50434461
St. Louis	Chemtech	38.5544	-90.2456	63147	38.715	-90.2367	12.98513128
St. Louis	Chemtech	38.5544	-90.2456	63155	38.6333	-90.2167	6.783443635
St. Louis	Mobile Oil	38.5783	-90.2128	63101	38.635	-90.1917	4.88406492
St. Louis	Mobile Oil	38.5783	-90.2128	63102	38.6317	-90.1867	4.79835786
St. Louis	Mobile Oil	38.5783	-90.2128	63103	38.6333	-90.2167	4.451298761
St. Louis	Mobile Oil	38.5783	-90.2128	63104	38.6133	-90.2183	2.860224139
St. Louis	Mobile Oil	38.5783	-90.2128	63105	38.6433	-90.325	10.46811314
St. Louis	Mobile Oil	38.5783	-90.2128	63106	38.645	-90.2083	5.396931828
St. Louis	Mobile Oil	38.5783	-90.2128	63108	38.6433	-90.2533	6.182700607
St. Louis	Mobile Oil	38.5783	-90.2128	63109	38.5867	-90.2933	6.53405001
St. Louis	Mobile Oil	38.5783	-90.2128	63110	38.6183	-90.2567	4.794580459
St. Louis	Mobile Oil	38.5783	-90.2128	63111	38.5633	-90.25	3.238108377
St. Louis	Mobile Oil	38.5783	-90.2128	63114	38.705	-90.3633	15.88210464
St. Louis	Mobile Oil	38.5783	-90.2128	63115	38.6767	-90.2383	8.206239246
St. Louis	Mobile Oil	38.5783	-90.2128	63116	38.5817	-90.2617	3.957227814
St. Louis	Mobile Oil	38.5783	-90.2128	63118	38.595	-90.2317	2.036093185
St. Louis	Mobile Oil	38.5783	-90.2128	63120	38.6933	-90.26	10.03550211
St. Louis	Mobile Oil	38.5783	-90.2128	63122	38.585	-90.41	15.92914191
St. Louis	Mobile Oil	38.5783	-90.2128	63123	38.55	-90.325	9.341591291
St. Louis	Mobile Oil	38.5783	-90.2128	63125	38.5217	-90.2967	8.170406471
St. Louis	Mobile Oil	38.5783	-90.2128	63126	38.55	-90.38	13.69003954
St. Louis	Mobile Oil	38.5783	-90.2128	63128	38.4967	-90.3717	14.42059497
St. Louis	Mobile Oil	38.5783	-90.2128	63129	38.47	-90.3217	12.39885076
St. Louis	Mobile Oil	38.5783	-90.2128	63132	38.6717	-90.3683	14.64394358
St. Louis	Mobile Oil	38.5783	-90.2128	63133	38.6767	-90.305	10.88610449
St. Louis	Mobile Oil	38.5783	-90.2128	63134	38.7383	-90.34	16.50130679

St. Louis	Mobile Oil	38.5783	-90.2128	63135	38.7483	-90.3017	15.48737458
St. Louis	Mobile Oil	38.5783	-90.2128	63137	38.7483	-90.2183	13.73128072
St. Louis	Mobile Oil	38.5783	-90.2128	63139	38.61	-90.2917	6.864471473
St. Louis	Mobile Oil	38.5783	-90.2128	63143	38.6133	-90.3183	8.973476323
St. Louis	Mobile Oil	38.5783	-90.2128	63144	38.6217	-90.35	11.6171003
St. Louis	Mobile Oil	38.5783	-90.2128	63146	38.6883	-90.4467	20.86666869
St. Louis	Mobile Oil	38.5783	-90.2128	63147	38.715	-90.2367	11.20318922
St. Louis	Mobile Oil	38.5783	-90.2128	63155	38.6333	-90.2167	4.451298761
St. Louis	Savannah Foods	38.5864	-90.2108	63101	38.635	-90.1917	4.215598158
St. Louis	Savannah Foods	38.5864	-90.2108	63102	38.6317	-90.1867	4.14240097
St. Louis	Savannah Foods	38.5864	-90.2108	63103	38.6333	-90.2167	3.816079006
St. Louis	Savannah Foods	38.5864	-90.2108	63104	38.6133	-90.2183	2.254463847
St. Louis	Savannah Foods	38.5864	-90.2108	63105	38.6433	-90.325	10.30035396
St. Louis	Savannah Foods	38.5864	-90.2108	63106	38.645	-90.2083	4.735081184
St. Louis	Savannah Foods	38.5864	-90.2108	63108	38.6433	-90.2533	5.73345574
St. Louis	Savannah Foods	38.5864	-90.2108	63109	38.5867	-90.2933	6.660269034
St. Louis	Savannah Foods	38.5864	-90.2108	63110	38.6183	-90.2567	4.512525375
St. Louis	Savannah Foods	38.5864	-90.2108	63111	38.5633	-90.25	3.673215
St. Louis	Savannah Foods	38.5864	-90.2108	63114	38.705	-90.3633	15.596194
St. Louis	Savannah Foods	38.5864	-90.2108	63115	38.6767	-90.2383	7.62047584
St. Louis	Savannah Foods	38.5864	-90.2108	63116	38.5817	-90.2617	4.126637752
St. Louis	Savannah Foods	38.5864	-90.2108	63118	38.595	-90.2317	1.824515861
St. Louis	Savannah Foods	38.5864	-90.2108	63120	38.6933	-90.26	9.500192384
St. Louis	Savannah Foods	38.5864	-90.2108	63122	38.585	-90.41	16.08181316
St. Louis	Savannah Foods	38.5864	-90.2108	63123	38.55	-90.325	9.676358553
St. Louis	Savannah Foods	38.5864	-90.2108	63125	38.5217	-90.2967	8.681722367
St. Louis	Savannah Foods	38.5864	-90.2108	63126	38.55	-90.38	13.97202858
St. Louis	Savannah Foods	38.5864	-90.2108	63128	38.4967	-90.3717	14.87161861
St. Louis	Savannah Foods	38.5864	-90.2108	63129	38.47	-90.3217	12.97915721
St. Louis	Savannah Foods	38.5864	-90.2108	63132	38.6717	-90.3683	14.45998928
St. Louis	Savannah Foods	38.5864	-90.2108	63133	38.6767	-90.305	10.53448551
St. Louis	Savannah Foods	38.5864	-90.2108	63134	38.7383	-90.34	16.09875428
St. Louis	Savannah Foods	38.5864	-90.2108	63135	38.7483	-90.3017	14.98937196
St. Louis	Savannah Foods	38.5864	-90.2108	63137	38.7483	-90.2183	13.08420377
St. Louis	Savannah Foods	38.5864	-90.2108	63139	38.61	-90.2917	6.803278568
St. Louis	Savannah Foods	38.5864	-90.2108	63143	38.6133	-90.3183	8.946056985
St. Louis	Savannah Foods	38.5864	-90.2108	63144	38.6217	-90.35	11.59332552
St. Louis	Savannah Foods	38.5864	-90.2108	63146	38.6883	-90.4467	20.74500574
St. Louis	Savannah Foods	38.5864	-90.2108	63147	38.715	-90.2367	10.59033913
St. Louis	Savannah Foods	38.5864	-90.2108	63155	38.6333	-90.2167	3.816079006
St. Louis	Texaco	38.5786	-90.2222	63101	38.635	-90.1917	5.176304105
St. Louis	Texaco	38.5786	-90.2222	63102	38.6317	-90.1867	5.156530404
St. Louis	Texaco	38.5786	-90.2222	63103	38.6333	-90.2167	4.438197372
St. Louis	Texaco	38.5786	-90.2222	63104	38.6133	-90.2183	2.818968607
St. Louis	Texaco	38.5786	-90.2222	63105	38.6433	-90.325	9.805930522
St. Louis	Texaco	38.5786	-90.2222	63106	38.645	-90.2083	5.476666317
St. Louis	Texaco	38.5786	-90.2222	63108	38.6433	-90.2533	5.795323255
St. Louis	Texaco	38.5786	-90.2222	63109	38.5867	-90.2933	5.777031129
St. Louis	Texaco	38.5786	-90.2222	63110	38.6183	-90.2567	4.246075682
St. Louis	Texaco	38.5786	-90.2222	63111	38.5633	-90.25	2.561737304
St. Louis	Texaco	38.5786	-90.2222	63114	38.705	-90.3633	15.29320491
St. Louis	Texaco	38.5786	-90.2222	63115	38.6767	-90.2383	8.025560911
St. Louis	Texaco	38.5786	-90.2222	63116	38.5817	-90.2617	3.198640372
St. Louis	Texaco	38.5786	-90.2222	63118	38.595	-90.2317	1.530062466
St. Louis	Texaco	38.5786	-90.2222	63120	38.6933	-90.26	9.749607384
St. Louis	Texaco	38.5786	-90.2222	63122	38.585	-90.41	15.16989523
St. Louis	Texaco	38.5786	-90.2222	63123	38.55	-90.325	8.614235249
St. Louis	Texaco	38.5786	-90.2222	63125	38.5217	-90.2967	7.567919734
St. Louis	Texaco	38.5786	-90.2222	63126	38.55	-90.38	12.94673632
St. Louis	Texaco	38.5786	-90.2222	63128	38.4967	-90.3717	13.76153142
St. Louis	Texaco	38.5786	-90.2222	63129	38.47	-90.3217	11.89068495
St. Louis	Texaco	38.5786	-90.2222	63132	38.6717	-90.3683	13.98583352
St. Louis	Texaco	38.5786	-90.2222	63133	38.6767	-90.305	10.36349659
St. Louis	Texaco	38.5786	-90.2222	63134	38.7383	-90.34	16.02056899
St. Louis	Texaco	38.5786	-90.2222	63135	38.7483	-90.3017	15.12871153
St. Louis	Texaco	38.5786	-90.2222	63137	38.7483	-90.2183	13.70349839
St. Louis	Texaco	38.5786	-90.2222	63139	38.61	-90.2917	6.156799232
St. Louis	Texaco	38.5786	-90.2222	63143	38.6133	-90.3183	8.248417627
St. Louis	Texaco	38.5786	-90.2222	63144	38.6217	-90.35	10.88821465
St. Louis	Texaco	38.5786	-90.2222	63146	38.6883	-90.4467	20.17189575

Computation of Average Dray Cost

St. Louis	Texaco	38.5786	-90.2222	63147	38.715	-90.2367	11.07361672
St. Louis	Texaco	38.5786	-90.2222	63155	38.6333	-90.2167	4.438197372
St. Louis	Valvoline	38.5875	-90.2089	63101	38.635	-90.1917	4.07833546
St. Louis	Valvoline	38.5875	-90.2089	63102	38.6317	-90.1867	3.993059553
St. Louis	Valvoline	38.5875	-90.2089	63103	38.6333	-90.2167	3.750670969
St. Louis	Valvoline	38.5875	-90.2089	63104	38.6133	-90.2183	2.216769949
St. Louis	Valvoline	38.5875	-90.2089	63105	38.6433	-90.325	10.39909261
St. Louis	Valvoline	38.5875	-90.2089	63106	38.645	-90.2083	4.642227713
St. Louis	Valvoline	38.5875	-90.2089	63108	38.6433	-90.2533	5.756790581
St. Louis	Valvoline	38.5875	-90.2089	63109	38.5867	-90.2933	6.813918078
St. Louis	Valvoline	38.5875	-90.2089	63110	38.6183	-90.2567	4.590606233
St. Louis	Valvoline	38.5875	-90.2089	63111	38.5633	-90.25	3.850448642
St. Louis	Valvoline	38.5875	-90.2089	63114	38.705	-90.3633	15.6636194
St. Louis	Valvoline	38.5875	-90.2089	63115	38.6767	-90.2383	7.582176041
St. Louis	Valvoline	38.5875	-90.2089	63116	38.5817	-90.2617	4.288184281
St. Louis	Valvoline	38.5875	-90.2089	63118	38.595	-90.2317	1.937671363
St. Louis	Valvoline	38.5875	-90.2089	63120	38.6933	-90.26	9.485294043
St. Louis	Valvoline	38.5875	-90.2089	63122	38.585	-90.41	16.23605746
St. Louis	Valvoline	38.5875	-90.2089	63123	38.55	-90.325	9.849543045
St. Louis	Valvoline	38.5875	-90.2089	63125	38.5217	-90.2967	8.857696189
St. Louis	Valvoline	38.5875	-90.2089	63126	38.55	-90.38	14.14076691
St. Louis	Valvoline	38.5875	-90.2089	63128	38.4967	-90.3717	15.04883424
St. Louis	Valvoline	38.5875	-90.2089	63129	38.47	-90.3217	13.14935087
St. Louis	Valvoline	38.5875	-90.2089	63132	38.6717	-90.3683	14.55335991
St. Louis	Valvoline	38.5875	-90.2089	63133	38.6767	-90.305	10.58513154
St. Louis	Valvoline	38.5875	-90.2089	63134	38.7383	-90.34	16.13143175
St. Louis	Valvoline	38.5875	-90.2089	63135	38.7483	-90.3017	14.98808055
St. Louis	Valvoline	38.5875	-90.2089	63137	38.7483	-90.2183	13.00354575
St. Louis	Valvoline	38.5875	-90.2089	63139	38.61	-90.2917	6.926845701
St. Louis	Valvoline	38.5875	-90.2089	63143	38.6133	-90.3183	9.074138188
St. Louis	Valvoline	38.5875	-90.2089	63144	38.6217	-90.35	11.72083114
St. Louis	Valvoline	38.5875	-90.2089	63146	38.6883	-90.4467	20.85108843
St. Louis	Valvoline	38.5875	-90.2089	63147	38.715	-90.2367	10.53490619
St. Louis	Valvoline	38.5875	-90.2089	63155	38.6333	-90.2167	3.750670969
St. Louis	Slay Bulk	38.5792	-90.1975	63101	38.635	-90.1917	4.529003366
St. Louis	Slay Bulk	38.5792	-90.1975	63102	38.6317	-90.1867	4.327075284
St. Louis	Slay Bulk	38.5792	-90.1975	63103	38.6333	-90.2167	4.634387198
St. Louis	Slay Bulk	38.5792	-90.1975	63104	38.6133	-90.2183	3.224605212
St. Louis	Slay Bulk	38.5792	-90.1975	63105	38.6433	-90.325	11.52067166
St. Louis	Slay Bulk	38.5792	-90.1975	63106	38.645	-90.2083	5.383111268
St. Louis	Slay Bulk	38.5792	-90.1975	63108	38.6433	-90.2533	6.860838943
St. Louis	Slay Bulk	38.5792	-90.1975	63109	38.5867	-90.2933	7.757598539
St. Louis	Slay Bulk	38.5792	-90.1975	63110	38.6183	-90.2567	5.727536057
St. Louis	Slay Bulk	38.5792	-90.1975	63111	38.5633	-90.25	4.428436037
St. Louis	Slay Bulk	38.5792	-90.1975	63114	38.705	-90.3633	16.80178858
St. Louis	Slay Bulk	38.5792	-90.1975	63115	38.6767	-90.2383	8.532549966
St. Louis	Slay Bulk	38.5792	-90.1975	63116	38.5817	-90.2617	5.186794126
St. Louis	Slay Bulk	38.5792	-90.1975	63118	38.595	-90.2317	3.041368152
St. Louis	Slay Bulk	38.5792	-90.1975	63120	38.6933	-90.26	10.50267825
St. Louis	Slay Bulk	38.5792	-90.1975	63122	38.585	-90.41	17.16151383
St. Louis	Slay Bulk	38.5792	-90.1975	63123	38.55	-90.325	10.55956115
St. Louis	Slay Bulk	38.5792	-90.1975	63125	38.5217	-90.2967	9.256492788
St. Louis	Slay Bulk	38.5792	-90.1975	63126	38.55	-90.38	14.92061854
St. Louis	Slay Bulk	38.5792	-90.1975	63128	38.4967	-90.3717	15.56056667
St. Louis	Slay Bulk	38.5792	-90.1975	63129	38.47	-90.3217	13.35106287
St. Louis	Slay Bulk	38.5792	-90.1975	63132	38.6717	-90.3683	15.68093543
St. Louis	Slay Bulk	38.5792	-90.1975	63133	38.6767	-90.305	11.71628457
St. Louis	Slay Bulk	38.5792	-90.1975	63134	38.7383	-90.34	17.24281301
St. Louis	Slay Bulk	38.5792	-90.1975	63135	38.7483	-90.3017	16.03510993
St. Louis	Slay Bulk	38.5792	-90.1975	63137	38.7483	-90.2183	13.75432859
St. Louis	Slay Bulk	38.5792	-90.1975	63139	38.61	-90.2917	8.000941732
St. Louis	Slay Bulk	38.5792	-90.1975	63143	38.6133	-90.3183	10.13328736
St. Louis	Slay Bulk	38.5792	-90.1975	63144	38.6217	-90.35	12.78047948
St. Louis	Slay Bulk	38.5792	-90.1975	63146	38.6883	-90.4467	21.9614462
St. Louis	Slay Bulk	38.5792	-90.1975	63147	38.715	-90.2367	11.410745
St. Louis	Slay Bulk	38.5792	-90.1975	63155	38.6333	-90.2167	4.634387198
St. Paul	North Star Steel	44.9017	-93.0231	55101	44.9683	-93.0833	7.24755795
St. Paul	North Star Steel	44.9017	-93.0231	55104	44.9517	-93.1583	11.6371784
St. Paul	North Star Steel	44.9017	-93.0231	55108	44.9833	-93.175	13.92028914
St. Paul	North Star Steel	44.9017	-93.0231	55109	45.01	-93.0183	8.751642133

Computation of Average Dray Cost

St. Paul	North Star Steel	44.9017	-93.0231	55110	45.0733	-93.0117	13.88380448
St. Paul	North Star Steel	44.9017	-93.0231	55111	44.9017	-93.205	14.684787
St. Paul	North Star Steel	44.9017	-93.0231	55112	45.0717	-93.2033	19.99955038
St. Paul	North Star Steel	44.9017	-93.0231	55113	45.0133	-93.1483	13.53993972
St. Paul	North Star Steel	44.9017	-93.0231	55114	44.9683	-93.1983	15.13135206
St. Paul	North Star Steel	44.9017	-93.0231	55116	44.9133	-93.175	12.29859219
St. Paul	North Star Steel	44.9017	-93.0231	55117	44.9917	-93.1033	9.731913604
St. Paul	North Star Steel	44.9017	-93.0231	55119	44.9567	-93.01	4.564358829
St. Paul	North Star Steel	44.9017	-93.0231	55120	44.8733	-93.13	8.92939856
St. Paul	North Star Steel	44.9017	-93.0231	55121	44.8433	-93.165	12.38782581
St. Paul	North Star Steel	44.9017	-93.0231	55122	44.8017	-93.1983	16.28567232
St. Paul	Barton Enterprises	44.9003	-93.0208	55101	44.9683	-93.0833	7.45617053
St. Paul	Barton Enterprises	44.9003	-93.0208	55104	44.9517	-93.1583	11.85060581
St. Paul	Barton Enterprises	44.9003	-93.0208	55108	44.9833	-93.175	14.1373513
St. Paul	Barton Enterprises	44.9003	-93.0208	55109	45.01	-93.0183	8.858380439
St. Paul	Barton Enterprises	44.9003	-93.0208	55110	45.0733	-93.0117	13.98559819
St. Paul	Barton Enterprises	44.9003	-93.0208	55111	44.9017	-93.205	14.8708955
St. Paul	Barton Enterprises	44.9003	-93.0208	55112	45.0717	-93.2033	20.21222066
St. Paul	Barton Enterprises	44.9003	-93.0208	55113	45.0133	-93.1483	13.75380735
St. Paul	Barton Enterprises	44.9003	-93.0208	55114	44.9683	-93.1983	15.34512519
St. Paul	Barton Enterprises	44.9003	-93.0208	55116	44.9133	-93.175	12.49272687
St. Paul	Barton Enterprises	44.9003	-93.0208	55117	44.9917	-93.1033	9.940026932
St. Paul	Barton Enterprises	44.9003	-93.0208	55119	44.9567	-93.01	4.635898723
St. Paul	Barton Enterprises	44.9003	-93.0208	55120	44.8733	-93.13	9.081188484
St. Paul	Barton Enterprises	44.9003	-93.0208	55121	44.8433	-93.165	12.51774295
St. Paul	Barton Enterprises	44.9003	-93.0208	55122	44.8017	-93.1983	16.39200932
St. Paul	Lafarge	44.8994	-93.0214	55101	44.9683	-93.0833	7.477367573
St. Paul	Lafarge	44.8994	-93.0214	55104	44.9517	-93.1583	11.83098081
St. Paul	Lafarge	44.8994	-93.0214	55108	44.9833	-93.175	14.12940371
St. Paul	Lafarge	44.8994	-93.0214	55109	45.01	-93.0183	8.932244614
St. Paul	Lafarge	44.8994	-93.0214	55110	45.0733	-93.0117	14.06076985
St. Paul	Lafarge	44.8994	-93.0214	55111	44.9017	-93.205	14.82319098
St. Paul	Lafarge	44.8994	-93.0214	55112	45.0717	-93.2033	20.22683665
St. Paul	Lafarge	44.8994	-93.0214	55113	45.0133	-93.1483	13.76602033
St. Paul	Lafarge	44.8994	-93.0214	55114	44.9683	-93.1983	15.32612221
St. Paul	Lafarge	44.8994	-93.0214	55116	44.9133	-93.175	12.4507987
St. Paul	Lafarge	44.8994	-93.0214	55117	44.9917	-93.1033	9.961866107
St. Paul	Lafarge	44.8994	-93.0214	55119	44.9567	-93.01	4.716490912
St. Paul	Lafarge	44.8994	-93.0214	55120	44.8733	-93.13	9.016919423
St. Paul	Lafarge	44.8994	-93.0214	55121	44.8433	-93.165	12.44608679
St. Paul	Lafarge	44.8994	-93.0214	55122	44.8017	-93.1983	16.31443246
St. Paul	Dakota	44.9035	-93.0219	55101	44.9683	-93.0833	7.206707007
St. Paul	Dakota	44.9035	-93.0219	55104	44.9517	-93.1583	11.67887179
St. Paul	Dakota	44.9035	-93.0219	55108	44.9833	-93.175	13.93794741
St. Paul	Dakota	44.9035	-93.0219	55109	45.01	-93.0183	8.60265562
St. Paul	Dakota	44.9035	-93.0219	55110	45.0733	-93.0117	13.73266421
St. Paul	Dakota	44.9035	-93.0219	55111	44.9017	-93.205	14.78237725
St. Paul	Dakota	44.9035	-93.0219	55112	45.0717	-93.2033	19.97104216
St. Paul	Dakota	44.9035	-93.0219	55113	45.0133	-93.1483	13.51667094
St. Paul	Dakota	44.9035	-93.0219	55114	44.9683	-93.1983	15.171227
St. Paul	Dakota	44.9035	-93.0219	55116	44.9133	-93.175	12.38505818
St. Paul	Dakota	44.9035	-93.0219	55117	44.9917	-93.1033	9.689348992
St. Paul	Dakota	44.9035	-93.0219	55119	44.9567	-93.01	4.400969868
St. Paul	Dakota	44.9035	-93.0219	55120	44.8733	-93.13	9.061074926
St. Paul	Dakota	44.9035	-93.0219	55121	44.8433	-93.165	12.53309525
St. Paul	Dakota	44.9035	-93.0219	55122	44.8017	-93.1983	16.44202762
St. Paul	Peavey	44.9072	-93.0208	55101	44.9683	-93.0833	7.056125282
St. Paul	Peavey	44.9072	-93.0208	55104	44.9517	-93.1583	11.66723076
St. Paul	Peavey	44.9072	-93.0208	55108	44.9833	-93.175	13.88200414
St. Paul	Peavey	44.9072	-93.0208	55109	45.01	-93.0183	8.301497735
St. Paul	Peavey	44.9072	-93.0208	55110	45.0733	-93.0117	13.4293621
St. Paul	Peavey	44.9072	-93.0208	55111	44.9017	-93.205	14.87709341
St. Paul	Peavey	44.9072	-93.0208	55112	45.0717	-93.2033	19.83503407
St. Paul	Peavey	44.9072	-93.0208	55113	45.0133	-93.1483	13.39083187
St. Paul	Peavey	44.9072	-93.0208	55114	44.9683	-93.1983	15.15477786
St. Paul	Peavey	44.9072	-93.0208	55116	44.9133	-93.175	12.45830267
St. Paul	Peavey	44.9072	-93.0208	55117	44.9917	-93.1033	9.533833609
St. Paul	Peavey	44.9072	-93.0208	55119	44.9567	-93.01	4.090143842
St. Paul	Peavey	44.9072	-93.0208	55120	44.8733	-93.13	9.230743888
St. Paul	Peavey	44.9072	-93.0208	55121	44.8433	-93.165	12.73305592

Computation of Average Dray Cost

St. Paul	Peavey	44.9072	-93.0208	55122	44.8017	-93.1983	16.669621
St. Paul	Hawkins Chemical	44.9239	-93.0583	55101	44.9683	-93.0833	4.113555937
St. Paul	Hawkins Chemical	44.9239	-93.0583	55104	44.9517	-93.1583	8.37915178
St. Paul	Hawkins Chemical	44.9239	-93.0583	55108	44.9833	-93.175	10.57139237
St. Paul	Hawkins Chemical	44.9239	-93.0583	55109	45.01	-93.0183	7.664338854
St. Paul	Hawkins Chemical	44.9239	-93.0583	55110	45.0733	-93.0117	12.63415989
St. Paul	Hawkins Chemical	44.9239	-93.0583	55111	44.9017	-93.205	11.97792999
St. Paul	Hawkins Chemical	44.9239	-93.0583	55112	45.0717	-93.2033	16.71517331
St. Paul	Hawkins Chemical	44.9239	-93.0583	55113	45.0133	-93.1483	10.24105792
St. Paul	Hawkins Chemical	44.9239	-93.0583	55114	44.9683	-93.1983	11.85696986
St. Paul	Hawkins Chemical	44.9239	-93.0583	55116	44.9133	-93.175	9.45997502
St. Paul	Hawkins Chemical	44.9239	-93.0583	55117	44.9917	-93.1033	6.569378638
St. Paul	Hawkins Chemical	44.9239	-93.0583	55119	44.9567	-93.01	4.713366968
St. Paul	Hawkins Chemical	44.9239	-93.0583	55120	44.8733	-93.13	7.084603729
St. Paul	Hawkins Chemical	44.9239	-93.0583	55121	44.8433	-93.165	10.79527947
St. Paul	Hawkins Chemical	44.9239	-93.0583	55122	44.8017	-93.1983	15.002067
St. Paul	Great Lakes Coal	44.9392	-93.0511	55101	44.9683	-93.0833	3.503765705
St. Paul	Great Lakes Coal	44.9392	-93.0511	55104	44.9517	-93.1583	8.712891608
St. Paul	Great Lakes Coal	44.9392	-93.0511	55108	44.9833	-93.175	10.61715217
St. Paul	Great Lakes Coal	44.9392	-93.0511	55109	45.01	-93.0183	6.299257973
St. Paul	Great Lakes Coal	44.9392	-93.0511	55110	45.0733	-93.0117	11.28349264
St. Paul	Great Lakes Coal	44.9392	-93.0511	55111	44.9017	-93.205	12.78786134
St. Paul	Great Lakes Coal	44.9392	-93.0511	55112	45.0717	-93.2033	16.29088394
St. Paul	Great Lakes Coal	44.9392	-93.0511	55113	45.0133	-93.1483	9.867124968
St. Paul	Great Lakes Coal	44.9392	-93.0511	55114	44.9683	-93.1983	12.11344167
St. Paul	Great Lakes Coal	44.9392	-93.0511	55116	44.9133	-93.175	10.21865148
St. Paul	Great Lakes Coal	44.9392	-93.0511	55117	44.9917	-93.1033	5.976795813
St. Paul	Great Lakes Coal	44.9392	-93.0511	55119	44.9567	-93.01	3.606255275
St. Paul	Great Lakes Coal	44.9392	-93.0511	55120	44.8733	-93.13	8.299114678
St. Paul	Great Lakes Coal	44.9392	-93.0511	55121	44.8433	-93.165	12.0203744
St. Paul	Great Lakes Coal	44.9392	-93.0511	55122	44.8017	-93.1983	16.26145294
St. Paul	Koch Materials	44.9306	-93.0478	55101	44.9683	-93.0833	4.18048907
St. Paul	Koch Materials	44.9306	-93.0478	55104	44.9517	-93.1583	9.081841544
St. Paul	Koch Materials	44.9306	-93.0478	55108	44.9833	-93.175	11.11530148
St. Paul	Koch Materials	44.9306	-93.0478	55109	45.01	-93.0183	6.838078809
St. Paul	Koch Materials	44.9306	-93.0478	55110	45.0733	-93.0117	11.88308854
St. Paul	Koch Materials	44.9306	-93.0478	55111	44.9017	-93.205	12.90343479
St. Paul	Koch Materials	44.9306	-93.0478	55112	45.0717	-93.2033	16.95127394
St. Paul	Koch Materials	44.9306	-93.0478	55113	45.0133	-93.1483	10.50717
St. Paul	Koch Materials	44.9306	-93.0478	55114	44.9683	-93.1983	12.52526405
St. Paul	Koch Materials	44.9306	-93.0478	55116	44.9133	-93.175	10.36339597
St. Paul	Koch Materials	44.9306	-93.0478	55117	44.9917	-93.1033	6.663751723
St. Paul	Koch Materials	44.9306	-93.0478	55119	44.9567	-93.01	3.708355199
St. Paul	Koch Materials	44.9306	-93.0478	55120	44.8733	-93.13	8.089182256
St. Paul	Koch Materials	44.9306	-93.0478	55121	44.8433	-93.165	11.79794584
St. Paul	Koch Materials	44.9306	-93.0478	55122	44.8017	-93.1983	15.99706455
St. Paul	Farmland	44.9442	-93.0764	55101	44.9683	-93.0833	2.023764399
St. Paul	Farmland	44.9442	-93.0764	55104	44.9517	-93.1583	6.639452335
St. Paul	Farmland	44.9442	-93.0764	55108	44.9833	-93.175	8.563002597
St. Paul	Farmland	44.9442	-93.0764	55109	45.01	-93.0183	7.086443348
St. Paul	Farmland	44.9442	-93.0764	55110	45.0733	-93.0117	11.65784248
St. Paul	Farmland	44.9442	-93.0764	55111	44.9017	-93.205	10.93413569
St. Paul	Farmland	44.9442	-93.0764	55112	45.0717	-93.2033	14.52239582
St. Paul	Farmland	44.9442	-93.0764	55113	45.0133	-93.1483	8.050533873
St. Paul	Farmland	44.9442	-93.0764	55114	44.9683	-93.1983	10.03146835
St. Paul	Farmland	44.9442	-93.0764	55116	44.9133	-93.175	8.341706323
St. Paul	Farmland	44.9442	-93.0764	55117	44.9917	-93.1033	4.406896824
St. Paul	Farmland	44.9442	-93.0764	55119	44.9567	-93.01	5.454630448
St. Paul	Farmland	44.9442	-93.0764	55120	44.8733	-93.13	7.1753349
St. Paul	Farmland	44.9442	-93.0764	55121	44.8433	-93.165	10.84031967
St. Paul	Farmland	44.9442	-93.0764	55122	44.8017	-93.1983	15.1389437
Pittsburgh	Exxon	40.4653	-79.9722	15122	40.3633	-79.895	10.32708056
Pittsburgh	Exxon	40.4653	-79.9722	15123	40.3633	-79.895	10.32708056
Pittsburgh	Exxon	40.4653	-79.9722	15203	40.425	-79.9783	3.290477951
Pittsburgh	Exxon	40.4653	-79.9722	15205	40.4383	-80.0733	8.447849661
Pittsburgh	Exxon	40.4653	-79.9722	15206	40.4683	-79.9183	4.35808177
Pittsburgh	Exxon	40.4653	-79.9722	15208	40.455	-79.8983	6.023615812
Pittsburgh	Exxon	40.4653	-79.9722	15213	40.4433	-79.955	2.254434938
Pittsburgh	Exxon	40.4653	-79.9722	15215	40.4967	-79.9183	5.035876315
Pittsburgh	Exxon	40.4653	-79.9722	15219	40.4467	-79.975	1.51849675

Pittsburgh	Exxon	40.4653	-79.9722	15221	40.4383	-79.87	8.533676526
Pittsburgh	Exxon	40.4653	-79.9722	15225	40.515	-80.135	13.74164281
Pittsburgh	Exxon	40.4653	-79.9722	15228	40.3717	-80.0433	9.489182225
Pittsburgh	Exxon	40.4653	-79.9722	15233	40.46	-80.03	4.685769769
Pittsburgh	Exxon	40.4653	-79.9722	15234	40.37	-80.0183	8.546443998
Pittsburgh	Exxon	40.4653	-79.9722	15235	40.4567	-79.825	11.90371994
Pittsburgh	Exxon	40.4653	-79.9722	15235	40.4567	-79.825	11.90371994
Pittsburgh	Exxon	40.4653	-79.9722	15237	40.5533	-80.0367	8.808175757
Pittsburgh	Exxon	40.4653	-79.9722	15238	40.5167	-79.8783	8.64194571
Pittsburgh	Exxon	40.4653	-79.9722	15275	40.4383	-80.0733	8.447849661
Pittsburgh	Penzoil	40.485	-79.9547	15122	40.3633	-79.895	10.94330214
Pittsburgh	Penzoil	40.485	-79.9547	15123	40.3633	-79.895	10.94330214
Pittsburgh	Penzoil	40.485	-79.9547	15203	40.425	-79.9783	5.205025665
Pittsburgh	Penzoil	40.485	-79.9547	15205	40.4383	-80.0733	10.29009864
Pittsburgh	Penzoil	40.485	-79.9547	15206	40.4683	-79.9183	3.233082797
Pittsburgh	Penzoil	40.485	-79.9547	15208	40.455	-79.8983	5.157225501
Pittsburgh	Penzoil	40.485	-79.9547	15213	40.4433	-79.955	3.366528118
Pittsburgh	Penzoil	40.485	-79.9547	15215	40.4967	-79.9183	3.086642691
Pittsburgh	Penzoil	40.485	-79.9547	15219	40.4467	-79.975	3.499419691
Pittsburgh	Penzoil	40.485	-79.9547	15221	40.4383	-79.87	7.808298082
Pittsburgh	Penzoil	40.485	-79.9547	15225	40.515	-80.135	14.75573258
Pittsburgh	Penzoil	40.485	-79.9547	15228	40.3717	-80.0433	11.61133447
Pittsburgh	Penzoil	40.485	-79.9547	15233	40.46	-80.03	6.405247627
Pittsburgh	Penzoil	40.485	-79.9547	15234	40.37	-80.0183	10.6091507
Pittsburgh	Penzoil	40.485	-79.9547	15235	40.4567	-79.825	10.71703445
Pittsburgh	Penzoil	40.485	-79.9547	15235	40.4567	-79.825	10.71703445
Pittsburgh	Penzoil	40.485	-79.9547	15237	40.5533	-80.0367	8.615404082
Pittsburgh	Penzoil	40.485	-79.9547	15238	40.5167	-79.8783	6.677620392
Pittsburgh	Penzoil	40.485	-79.9547	15275	40.4383	-80.0733	10.29009864
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15122	40.3633	-79.895	8.819655513
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15123	40.3633	-79.895	8.819655513
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15203	40.425	-79.9783	0.639756599
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15205	40.4383	-80.0733	7.138983616
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15206	40.4683	-79.9183	6.556016646
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15208	40.455	-79.8983	7.52774243
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15213	40.4433	-79.955	2.97202646
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15215	40.4967	-79.9183	8.04892675
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15219	40.4467	-79.975	2.068988786
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15221	40.4383	-79.87	9.44758325
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15225	40.515	-80.135	14.1047047
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15228	40.3717	-80.0433	6.23528857
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15233	40.46	-80.03	4.603854313
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15234	40.37	-80.0183	5.047917211
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15235	40.4567	-79.825	13.27728001
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15235	40.4567	-79.825	13.27728001
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15237	40.5533	-80.0367	11.23930065
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15238	40.5167	-79.8783	11.49898181
Pittsburgh	Davison Sand/Gravel	40.4236	-79.9861	15275	40.4383	-80.0733	7.138983616
Pittsburgh	LTV Steel	40.4208	-79.9519	15122	40.3633	-79.895	6.530582981
Pittsburgh	LTV Steel	40.4208	-79.9519	15123	40.3633	-79.895	6.530582981
Pittsburgh	LTV Steel	40.4208	-79.9519	15203	40.425	-79.9783	2.158074626
Pittsburgh	LTV Steel	40.4208	-79.9519	15205	40.4383	-80.0733	9.901925307
Pittsburgh	LTV Steel	40.4208	-79.9519	15206	40.4683	-79.9183	4.697077869
Pittsburgh	LTV Steel	40.4208	-79.9519	15208	40.455	-79.8983	5.132929961
Pittsburgh	LTV Steel	40.4208	-79.9519	15213	40.4433	-79.955	1.83358429
Pittsburgh	LTV Steel	40.4208	-79.9519	15215	40.4967	-79.9183	6.70096446
Pittsburgh	LTV Steel	40.4208	-79.9519	15219	40.4467	-79.975	2.801714848
Pittsburgh	LTV Steel	40.4208	-79.9519	15221	40.4383	-79.87	6.7610399
Pittsburgh	LTV Steel	40.4208	-79.9519	15225	40.515	-80.135	16.6231774
Pittsburgh	LTV Steel	40.4208	-79.9519	15228	40.3717	-80.0433	8.376012756
Pittsburgh	LTV Steel	40.4208	-79.9519	15233	40.46	-80.03	7.054642681
Pittsburgh	LTV Steel	40.4208	-79.9519	15234	40.37	-80.0183	6.749337007
Pittsburgh	LTV Steel	40.4208	-79.9519	15235	40.4567	-79.825	10.6466986
Pittsburgh	LTV Steel	40.4208	-79.9519	15235	40.4567	-79.825	10.6466986
Pittsburgh	LTV Steel	40.4208	-79.9519	15237	40.5533	-80.0367	12.6998554
Pittsburgh	LTV Steel	40.4208	-79.9519	15238	40.5167	-79.8783	9.759241979
Pittsburgh	LTV Steel	40.4208	-79.9519	15275	40.4383	-80.0733	9.901925307
Omaha	Cargill	41.21	-95.9275	68101	41.26	-95.9417	4.19612765
Omaha	Cargill	41.21	-95.9275	68102	41.26	-95.9417	4.19612765
Omaha	Cargill	41.21	-95.9275	68105	41.2433	-95.9617	3.853561798

Computation of Average Dray Cost

Omaha	Cargill	41.21	-95.9275	68110	41.2917	-95.935	6.623373776
Omaha	Cargill	41.21	-95.9275	68112	41.33	-95.9583	10.00160969
Omaha	Cargill	41.21	-95.9275	68114	41.265	-96.05	10.84046396
Omaha	Cargill	41.21	-95.9275	68117	41.2083	-95.995	5.451002946
Omaha	Cargill	41.21	-95.9275	68127	41.2017	-96.055	10.31486171
Omaha	Cargill	41.21	-95.9275	68137	41.2017	-96.125	15.95824851
Omaha	Cargill	41.21	-95.9275	68138	41.1767	-96.13	16.56738928
Omaha	Cargill	41.21	-95.9275	68144	41.235	-96.1167	15.40688004
Omaha	Cargill	41.21	-95.9275	68172	41.2633	-96.1217	16.2575328
Omaha	SCNO	41.2644	-95.9231	68101	41.26	-95.9417	1.543020432
Omaha	SCNO	41.2644	-95.9231	68102	41.26	-95.9417	1.543020432
Omaha	SCNO	41.2644	-95.9231	68105	41.2433	-95.9617	3.551358488
Omaha	SCNO	41.2644	-95.9231	68110	41.2917	-95.935	2.40420934
Omaha	SCNO	41.2644	-95.9231	68112	41.33	-95.9583	6.01013027
Omaha	SCNO	41.2644	-95.9231	68114	41.265	-96.05	10.24475151
Omaha	SCNO	41.2644	-95.9231	68117	41.2083	-95.995	7.362301584
Omaha	SCNO	41.2644	-95.9231	68127	41.2017	-96.055	11.79014596
Omaha	SCNO	41.2644	-95.9231	68137	41.2017	-96.125	17.06726522
Omaha	SCNO	41.2644	-95.9231	68138	41.1767	-96.13	18.14161356
Omaha	SCNO	41.2644	-95.9231	68144	41.235	-96.1167	15.80851719
Omaha	SCNO	41.2644	-95.9231	68172	41.2633	-96.1217	16.03322393
Omaha	Heartland	41.32	-95.9242	68101	41.26	-95.9417	5.045625
Omaha	Heartland	41.32	-95.9242	68102	41.26	-95.9417	5.045625
Omaha	Heartland	41.32	-95.9242	68105	41.2433	-95.9617	6.892441653
Omaha	Heartland	41.32	-95.9242	68110	41.2917	-95.935	2.445372866
Omaha	Heartland	41.32	-95.9242	68112	41.33	-95.9583	2.868824351
Omaha	Heartland	41.32	-95.9242	68114	41.265	-96.05	11.0840379
Omaha	Heartland	41.32	-95.9242	68117	41.2083	-95.995	10.67637997
Omaha	Heartland	41.32	-95.9242	68127	41.2017	-96.055	14.23769853
Omaha	Heartland	41.32	-95.9242	68137	41.2017	-96.125	18.8146855
Omaha	Heartland	41.32	-95.9242	68138	41.1767	-96.13	20.24513486
Omaha	Heartland	41.32	-95.9242	68144	41.235	-96.1167	16.98810312
Omaha	Heartland	41.32	-95.9242	68172	41.2633	-96.1217	16.58822549
Omaha	Pentzien	41.3242	-95.9328	68101	41.26	-95.9417	5.232431358
Omaha	Pentzien	41.3242	-95.9328	68102	41.26	-95.9417	5.232431358
Omaha	Pentzien	41.3242	-95.9328	68105	41.2433	-95.9617	6.935275564
Omaha	Pentzien	41.3242	-95.9328	68110	41.2917	-95.935	2.629729409
Omaha	Pentzien	41.3242	-95.9328	68112	41.33	-95.9583	2.11119369
Omaha	Pentzien	41.3242	-95.9328	68114	41.265	-96.05	10.60009186
Omaha	Pentzien	41.3242	-95.9328	68117	41.2083	-95.995	10.61888001
Omaha	Pentzien	41.3242	-95.9328	68127	41.2017	-96.055	13.96864404
Omaha	Pentzien	41.3242	-95.9328	68137	41.2017	-96.125	18.39990431
Omaha	Pentzien	41.3242	-95.9328	68138	41.1767	-96.13	19.88058658
Omaha	Pentzien	41.3242	-95.9328	68144	41.235	-96.1167	16.50051883
Omaha	Pentzien	41.3242	-95.9328	68172	41.2633	-96.1217	16.02282459
						Total:	58179.4198
						Average Dray Length:	14.67694753
						Average Dray Cost:	44.03084258