



ENERCON SERVICES, INC.

# CALCULATION COVER SHEET

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 1 of 16

Title:

Transportation Routing

Client: Luminant

Project: MITS003

Item	Cover Sheet Items	Yes	No
1	Does this calculation contain any open assumptions that require confirmation? (If YES, identify the assumptions)_____		X
2	Does this calculation serve as an "Alternate Calculation"? (If YES, identify the design verified calculation.) Design Verified Calculation No. _____		X
3	Does this calculation supersede an existing calculation? (If YES, identify the superseded calculation.) Superseded Calculation No. _____		X

Scope of Revision: N/A

Revision Impact on Results: N/A

Study Calculation ☐

Final Calculation ☒

Safety-Related ☐

Non-Safety Related ☒

(Print Name and Sign)

Originator: Audrey Thompson

*Audrey Thompson*

Date: 04/11/08

Reviewer: Joanne G. Morris

*Joanne G. Morris*

Date: 04/11/08

Approver: Marvin Morris

*Marvin Morris*

Date: 4/11/08



ENERCON SERVICES, INC.

**CALCULATION  
REVISION STATUS SHEET**

**CALC. NO.**  
TXUT-001-ER-3.8-CALC-009

**REV. 0**

**PAGE NO. 2 of 16**

**CALCULATION REVISION STATUS**


<b><u>REVISION</u></b>	<b><u>DATE</u></b>	<b><u>DESCRIPTION</u></b>
0		Initial Issue

**PAGE REVISION STATUS**

<b><u>PAGE NO.</u></b>	<b><u>REVISION</u></b>	<b><u>PAGE NO.</u></b>	<b><u>REVISION</u></b>
1 - 16	0		

**APPENDIX REVISION STATUS**

<b><u>APPENDIX NO.</u></b>	<b><u>PAGE NO.</u></b>	<b><u>REVISION NO.</u></b>	<b><u>APPENDIX NO.</u></b>	<b><u>PAGE NO.</u></b>	<b><u>REVISION NO.</u></b>
A	1 - 22	0			
B	1 - 3	0			
C	1 - 10	0			

 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV. 0</b>
		<b>PAGE NO. 3 of 16</b>

## Table of Contents

<u>Section</u>	<u>Page No.</u>
1.0 Purpose and Scope	4
2.0 Summary of Results and Conclusions	4
3.0 References	5
4.0 Assumptions	5
5.0 Design Inputs	6
6.0 Methodology	9
7.0 Calculations	13

### List of Appendices

Appendix A TRAGIS Output Files.....	22 pages
Appendix B RADTRAN Input Files.....	3 pages
Appendix C Sample Cases .....	10 pages

### List of Tables

Table 2-1 Preferred Route Characteristics	
Table 5-1 TRAGIS Input and Setting Descriptions	
Table 6-1 TRAGIS Inputs and Settings for Transport of New Fuel	
Table 6-2 TRAGIS Inputs and Settings for Transport of Spent Fuel	
Table 7-1 Routing Characteristics for Transport of New Fuel from Port to CPNPP Units 3 & 4	
Table 7-2 Routing Characteristics for Transport of Spent Fuel from CPNPP Units 3 & 4 to Yucca Mountain Repository	
Table 7-3 Routing Characteristics for Transport of New Fuel from Port to Alternative Sites	
Table 7-4 Routing Characteristics for Transport of Spent Fuel from Alternative Sites to Yucca Mountain Repository	

### List of Figures

Figure 6-1 Nevada HRCQ Routes to Yucca Mountain (Ref. 3.1)	
Figure 7-1 Transportation Route from Port at San Diego to CPNPP Units 3 & 4	
Figure 7-2 Transportation Route F from CPNPP Units 3 & 4 to Yucca Mountain Repository	

 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV.</b> 0
		<b>PAGE NO.</b> 4 of 16

## 1.0 Purpose and Scope

The purpose of this calculation is to identify route and population data for new and spent fuel shipments for the proposed Luminant nuclear plants, Comanche Peak Nuclear Power Plant (CPNPP) Units 3 & 4. This calculation is intended to provide supplemental inputs for Calculation TXUT-001-ER-3.8-CALC-008, Transportation Analysis (Ref. 3.7).


This calculation is performed using the Transportation Routing Analysis Geographic Information System (TRAGIS). The TRAGIS model is used to calculate highway, rail, or waterway routes within the United States. TRAGIS also provides population data along the chosen route. TRAGIS is a client-server application with the user interface (WebTRAGIS, Version 4.6.2) and map data files residing on the user's personal computer and the routing engine and network data files on a network server. Details about this code are provided in the WebTRAGIS User's Manual (Ref. 3.1).

This calculation describes the site-specific inputs and results. TRAGIS is used to identify the appropriate route for shipment of new fuel to CPNPP Units 3 and 4 and shipment of spent fuel to the Yucca Mountain Repository. The code is also used to identify route characteristics for distance, trip time, and population. This calculation also considers transportation of new and spent fuel for alternate sites identified in Section 6.3.4.

## 2.0 Summary of Results and Conclusions

The route characteristics for the most logical routes are summarized in Table 2-1. The routes for use in this analysis were calculated and are identified in Section 7.2 and 7.3. It was also determined that CPNPP Units 3 & 4 provided a more advantageous route for the transport of both new and spent fuel, as compared to the alternative sites described in Sections 6.4 and 7.3.

<b>Table 2-1 – Preferred Route Characteristics</b>									
	Population				Distance				Time
	Rural (person / sq. km.)	Suburban (person / sq. km.)	Urban (person / sq. km.)	Total (within 800m of route)	Rural (km)	Suburban (km)	Urban (km)	Total (km)	Total (hours:minutes)
Port at San Diego to CPNPP Units 3 & 4	8.6	334.2	2571.7	387287	1754.5	308.8	60.3	2123.6	24:12
CPNPP Units 3 & 4 to Yucca Mountain Repository	8.1	344.6	2268.0	347748	2198.3	316.6	52.6	2567.5	32:23


 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV. 0</b>
		<b>PAGE NO. 5 of 16</b>

### 3.0 References

- 3.1 ORNL/NTRC-006, Rev. 0, Transportation Routing Analysis Geographic Information System (TRAGIS) User's Manual
- 3.2 Luminant Power Nuclear Power Plant Siting Report (proprietary), dated 08/28/2007
- 3.3 SAND2006-6315, RADCat 2.3 User Guide, December 2007
- 3.4 49 CFR 173, Transportation
- 3.5 Grand Gulf Nuclear Station Environmental Impact Statement
- 3.6 Paul Johnson Email dated 3/24/08 (Attachment C)
- 3.7 TXTU-001-ER-3.8-CALC-008, Transportation Analysis, Revision 0
- 3.8 Clark County Nevada Website:  
[http://www.co.clark.nv.us/PUBWORKS/county\\_projects/beltway.htm](http://www.co.clark.nv.us/PUBWORKS/county_projects/beltway.htm)
- 3.9 DOE/EIS-0250, *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada*, dated February 2002

### 4.0 Assumptions

- 4.1 The origin of new fuel for CPNPP Units 3 & 4 is currently undetermined. It was assumed for this calculation that the source of the fuel will be outside of the United States and that the fuel will be transported to one of the coastal ports via ship before being transported by land to the CPNPP Units 3 & 4. The coastal port at San Diego was selected as an appropriate port for use in the calculation. Sections 6.2 and 7.1 of this calculation provide the justification and methodology for this selection.
- 4.2 The Yucca Mountain Repository was determined to be the most appropriate site for the shipment of spent fuel from CPNPP Units 3 & 4. The proposed repository at Yucca Mountain, Nevada is a reasonable bounding estimate of the transportation impacts to a storage or disposal facility because of the distances involved and the representativeness of the distribution of members of the public in urban, suburban, and rural areas (i.e., population distributions) along the shipping routes. It was assumed that the Yucca Mountain facility would be operational and able to accept spent fuel from CPNPP Units 3 & 4.
- 4.3 It was assumed for this calculation that the primary mode of shipment for new and spent fuel within the United States would be via highway (truck) transportation. There are no direct water (river) routes available to or from any of the locations used in this calculation. There are rail routes available to and from some of the sites used in this calculation; however, the choice to conduct this calculation using only highway routes is conservative because rail transportation would reduce the overall

 ENERCON SERVICES, INC.	Transportation Routing	CALC. NO.
		TXUT-001-ER-3.8-CALC-009
		REV. 0
		PAGE NO. 6 of 16

number of spent fuel shipments. As such, it was assumed that highway transportation is the most conservative mode of transportation.

4.4 Title 49 of the Code of Federal Regulations, "Transportation", Part 173 (Ref. 3.4), provides guidance on classifying shipments of radioactive materials. For a shipment to be considered a Highway Route Controlled Quantity (HRCQ), it must exceed one of these 3 specifications:

- (1) 3,000 times the A1 value of the radionuclides as specified in §173.435 for special form Class 7 (radioactive) material;
- (2) 3,000 times the A2 value of the radionuclides as specified in §173.435 for normal form Class 7 (radioactive) material;
- (3) 1,000 TBq (27,000 Ci) of total radioactivity

For the spent fuel shipment considered in Calculation TXUT-001-ER-3.8-CALC-008, the total activity is approximately  $1.0\text{E}+08$  Ci (Ref. 3.7). This means the spent fuel is classified as a HRCQ. For the new fuel shipment considered, the guidance states that an unlimited amount of Uranium-235 and Uranium-238 are acceptable for the shipment to not be considered a HRCQ (barring other restrictions such as truck weight and criticality). As such, shipment via the HRCQ route is considered unnecessary. However, the new fuel is considered radioactive material per 49 CFR 173.146 (Ref. 3.4). Commercial shipment methods will be used for the shipment of new fuel, as described in Sections 5.0 and 6.2.

## 5.0 Design Inputs

TRAGIS is designed to calculate a route based on only a few key characteristics and preset routing configurations. The only specific design inputs required are the node locations, which for the purposes of this calculation include the CPNPP Units 3 & 4, the Yucca Mountain Repository, three coastal ports, and the three alternative sites identified in Section 6.3.4. Additional customization for the transportation mode and type of route is allowed through TRAGIS. The TRAGIS inputs and settings are identified and described in Table 5-1 and in detail provided in Sections 6.2 and 6.3.

Table 5-1 - TRAGIS Input and Setting Descriptions	
Mode	Allows for selection of highway, rail, or water transportation. Only highway routing is used in this calculation per Assumption 4.4.
Origin State	State of origin node
Origin Node Name	Origin node location
Destination State	State of destination node
Destination Node Name	Destination node location



ENERCON SERVICES, INC.

## Transportation Routing

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 7 of 16

**Table 5-1 - TRAGIS Input and Setting Descriptions**

Route Type	Allows for selection of route type based factors such as distance, speed, and Highway Route Controlled Quantities (HRCQ) of fuel. As summarized in the TRAGIS User's Manual (Ref. 3.1), the DOT regulations state that HRCQ shipments shall operate only over preferred routes, which primarily follow Interstate System highways, Interstate System bypass or beltway around a city, and state designated preferred routes. State routing agencies may designate preferred routes as an alternative to, or in addition to, one or more Interstate highways. In making this determination, the state must show that the alternative preferred route is as safe as the Interstate route that it is replacing and must register all such designated preferred routes with DOT. This calculation will use only "HRCQ + Nevada" routes for the transportation of spent fuel to the Yucca Mountain Repository. This calculation will use the commercial route for transportation of new fuel, which does not require HRCQ routes. The commercial transportation mode, which calculates the route based on incorporating both the quickest and shortest routes.
Preferred Route (Penalty)	Allows for use of a penalty when sections of the calculated route deviate from the required HRCQ routes. TRAGIS is designed to calculate the optimal HRCQ route, and as such, the default value is retained for this calculation.
Nevada Route Options	For shipments of spent fuel to the Yucca Mountain Repository, the "HRCQ + Nevada" route type is used to conform to one of the six routes within Nevada that have been evaluated for shipment of HRCQ of radioactive material into the facility. These routes were summarized in the WebTRAGIS Users Manual (Ref. 3.1).
Alternative Route Penalty	Allows for use of a penalty when TRAGIS is prompted to calculate an alternate route from the initially calculated routes. TRAGIS is designed to calculate the optimal HRCQ route and no alternate routes are necessary. As such, the default value is retained for this calculation.
Date	Allows for modification of the start date for the transportation along the route. The default uses the current date in which the program is run. The default is retained for this calculation as it should have virtually no impact on the calculated route.
Time	Allows for modification of the start time for the transportation along the route. The default uses the current time in which the program is run. The default is retained for this calculation as it should have virtually no impact on the calculated route.
Population Buffer Zone	Establishes the distance from the highway used in the route from which the population is calculated. 800 m is used by RADCat/RADTRAN (Ref. 3.3).
Drivers	Establishes the number of driver to be used for highway transportation. Two drivers are used in this calculation to minimize the number of required stops and rest breaks and to minimize the amount of time the fuel is on the highway.



ENERCON SERVICES, INC.

## Transportation Routing

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 8 of 16

**Table 5-1 - TRAGIS Input and Setting Descriptions**

Highway Inspection	Establishes a stop time at weigh stations at state lines for inspection of the vehicle and its cargo. A conservative stop time of 30 minutes, which is the default value, is used in this calculation.
Toll Bias Factor	Allows for a use of a low or high bias in the calculation to allow or prevent use of toll roads. A toll bias factor of 0 is used in this calculation to avoid unnecessary detours from the quickest and shortest routes.
Nevada County Population Details	Includes detailed information for population densities in the Nevada counties proximate to the HRCQ routes. This is included in this calculation for completeness.
Other Constraints	
Prohibit roads that restrict commercial trucks	This constraint is used for highway (truck) routing.
Prohibit ferry crossings	This constraint is used for highway (truck) routing due to potential delays and typical weight restrictions.
Prohibit roads with Hazmat restrictions	This constraint is used in this calculation due to the content of the fuel. Radioactive material is a Class 7 hazardous material per 49 CFR 173 (Ref. 3.4).
Prohibit roads with radioactive restrictions	This constraint is used in this calculation due to the content of the fuel. Both new and spent fuel shipments are considered radioactive material (Assumption 4.4).
Avoid roads in urban areas	This constraint is not used to prevent unnecessary impedance and delay. HRCQ routes are approved routes that may or may not avoid urban areas.
Avoid roads inside of beltways	This constraint is not used to prevent unnecessary delay. HRCQ routes are approved routes that may or may not avoid roads inside beltways.
Prohibit roads with low clearances	This constraint is used for conservatism to allow for varying sizes of the truck and its cargo.
Prohibit roads with narrow clearances	This constraint is used for conservatism to allow for varying sizes of the truck and its cargo.
Prohibit roads with tunnels	This constraint is not used as it may be a requirement of the HRCQ route and any size limitations should be accounted for with the use of other constraints.
Las Vegas beltway is a preferred route	This constraint is used for the calculation of the "HRCQ + Nevada" routes for spent fuel. This route was evaluated for use in the <i>Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada</i> (Ref. 3.9) and is anticipated to be completed for use in time for the first spent fuel shipments from CPNPP Units 3 & 4 (Ref. 3.8). Because preferred routes are not required for use with non HRCQ shipments, this constraint is not used for calculation of commercial routes for new fuel.



 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV.</b> 0
		<b>PAGE NO.</b> 9 of 16

Table 5-1 - TRAGIS Input and Setting Descriptions	
Road Lane Type Penalty	Allows for use of a penalty to avoid use of certain types of roads. No penalties are used in this calculation as the HRCQ and "HRCQ + Nevada" routes should select the most efficient approved route.

## 6.0 Methodology

### 6.1 Description of Code

The model utilizes a client-server interface in which routing parameters are transmitted from the user PC over the internet to a routing engine on the TRAGIS server. The engine calculates the route and transmits an output text file back to the user's PC. The text file can then be viewed and displayed on a routing map from the user's PC.

After installation of the TRAGIS code, a verification was run to ensure that the code was properly installed and ran as expected. Two of the sample cases provided via email by Paul Johnson of Oak Ridge National Laboratory (ORNL) [Appendix C and Ref. 3.6] were run and the output files were compared to the output files supplied with the sample cases. The associated files were determined to be identical in terms of output created.

Case 1, "Testing Basic Route Types - Commercial", and Case 2, "HRCQ Route Type Test", were run. The output files from these sample cases are provided in Appendix C.

### 6.2 Routing for New Fuel Transportation from Selected Ports to Comanche Peak

There are multiple ports along the Gulf of Mexico and the East and West Coasts of the United States capable of accepting nuclear fuel for CPNPP Units 3 & 4. While the closest ports are located along the Gulf of Mexico, TRAGIS was used in this calculation to determine the route characteristics from three major commercial ports along the coast of California to CPNPP Units 3 & 4. The ports used for this analysis include those proximate to the cities of San Francisco, Los Angeles, and San Diego. These ports provide three of the closest coastal nodes along the West Coast, but allow for slightly longer, more populous, and more conservative route characteristics than would be expected along the Gulf of Mexico. Because the source of the fuel has not yet been identified, this conservatism was considered appropriate.

The highway mode and HRCQ routing option described in Section 5.0 were used for this component of the calculation (See Assumption 4.4). The following inputs and settings were established for transportation of new fuel from a costal port to the CPNPP Units 3 & 4:

Table 6-1 - TRAGIS Inputs and Settings for Transport of New Fuel	
Variable	Value
Mode	Highway



ENERCON SERVICES, INC.

## Transportation Routing

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0


PAGE NO. 10 of 16

**Table 6-1 - TRAGIS Inputs and Settings for Transport of New Fuel**

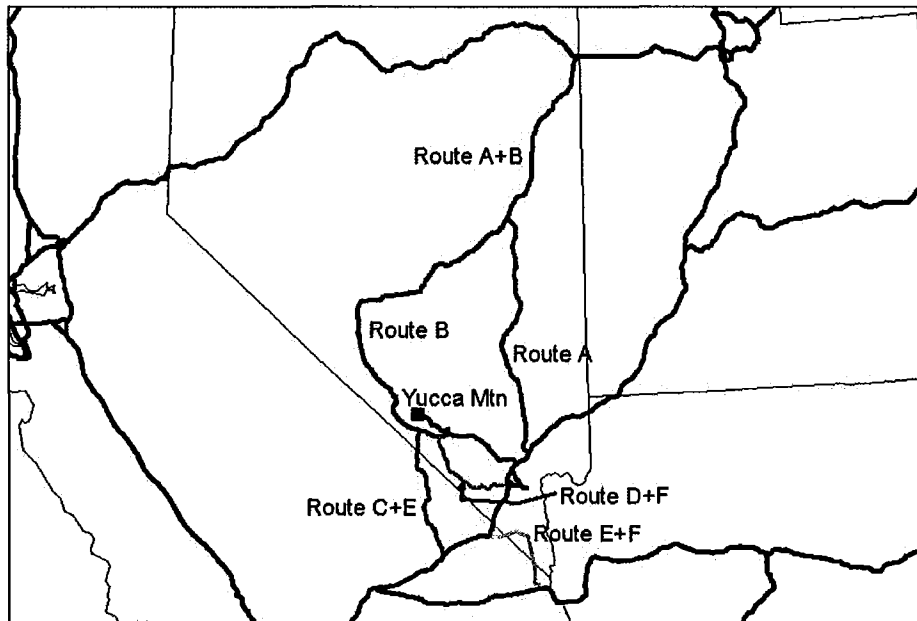
Origin State	CA
Origin Node Name	See Table 7-1
Destination State	TX
Destination Node Name	Comanche Peak NP
Route Type	Commercial
Preferred Route (Link Penalty)	30 (default)
Nevada Route Options	Not Applicable
Alternative Route Penalty	10 (default)
Date	Current (default)
Time	Current (default)
Population Buffer Zone	800 m
Drivers	2
Highway Inspection	Yes - 30 minute (default)
Toll Bias Factor	0
Nevada County Population Details	Yes
Other Constraints	
Prohibit roads that restrict commercial trucks	Yes (default)
Prohibit ferry crossings	Yes (default)
Prohibit roads with Hazmat restrictions	Yes
Prohibit roads with radioactive restrictions	Yes
Avoid roads in urban areas	No
Avoid roads inside of beltways	No
Prohibit roads with low clearances	Yes
Prohibit roads with narrow clearances	Yes
Prohibit roads with tunnels	No
Las Vegas beltway is a preferred route	No
Road Lane Type Penalty	None (default)

### 6.3 Routing for Spent Fuel Transportation From Comanche Peak to Yucca Mountain

For transportation of spent fuel from CPNPP Units 3 & 4 to Yucca Mountain, a specialized routing type for of HRCQ, "HRCQ + Nevada", was used. When using the "HRCQ + Nevada" route setting, TRAGIS calculates six potential routes through Nevada based upon routes evaluated in the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (Ref. 3.9). These routes are summarized in the WebTRAGIS Users Manual (Ref. 3.1). Two routes (A and B) approach Yucca Mountain from the north and four routes (C through F) approach Yucca Mountain from California, as shown in Figure 6-1.

 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV.</b> 0
		<b>PAGE NO.</b> 11 of 16

- Route A begins at I-80 in Wendover and follows US 93A, US 93, US 6, State 318, State 375, US 93, I-15, State 215, and US 95 (via Ely, Hiko, and Las Vegas) to Yucca Mountain.
- Route B also begins at I-80 in Wendover and follows US 93A, US 93, US 6, and US 95 (via Ely, Tonopah, and Amargosa Valley) to Yucca Mountain.
- Route C begins at I-15 in Baker, California, and follows State 127, State 373, and US 95 (via Amargosa Valley) to Yucca Mountain.
- Route D also begins at Baker, California, and follows I-15, State 160, and US 95 (via Arden and Pahrump) to Yucca Mountain.
- Route E begins at I-40 near Needles, California, and follows US 95, State 164, I-15, State 127, and US 95 (via Searchlight, Baker, and Amargosa Valley) to Yucca Mountain.
- Route F also begins at I-40 near Needles, California, and follows US 95, State 164, I-15, State 160, and US 95 (via Searchlight, Arden, and Pahrump) to Yucca Mountain.



**Figure 6-1 – Nevada HRCQ Routes to Yucca Mountain (Ref. 3.1)**

Each of these six routes were evaluated in this calculation to determine the optimal route for transportation of fuel from CPNPP Units 3 & 4 to the Yucca Mountain Repository. The following inputs and settings were established for transportation of spent fuel from CPNPP Units 3 & 4 to the Yucca Mountain Repository:

<b>Table 6-2 - TRAGIS Inputs and Settings for Transport of Spent Fuel</b>
---



ENERCON SERVICES, INC.

## Transportation Routing

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0


PAGE NO. 12 of 16

**Table 6-2 - TRAGIS Inputs and Settings for Transport of Spent Fuel**

Variable	Value
Mode	Highway
Origin State	TX
Origin Node Name	Comanche Peak NP
Destination State	NV
Destination Node Name	Yucca Mountain
Route Type	HRCQ + Nevada
Preferred Route (Link Penalty)	30 (default)
Nevada Route Options	Routes A through F are evaluated
Alternative Route Penalty	10 (default)
Date	Current (default)
Time	Current (default)
Population Buffer Zone	800 m
Drivers	2
Highway Inspection	Yes - 30 minute (default)
Toll Bias Factor	0
Nevada County Population Details	Yes
Other Constraints	
Prohibit roads that restrict commercial trucks	Yes (default)
Prohibit ferry crossings	Yes (default)
Prohibit roads with Hazmat restrictions	Yes
Prohibit roads with radioactive restrictions	Yes (default)
Avoid roads in urban areas	No
Avoid roads inside of beltways	No
Prohibit roads with low clearances	Yes
Prohibit roads with narrow clearances	Yes
Prohibit roads with tunnels	No
Las Vegas beltway is a preferred route	Yes
Road Lane Type Penalty	None (default)

### 6.4 Analysis of Alternative Sites

Prior to the selection of CPNPP Units 3 & 4, several other sites were evaluated as potential locations for the new facility. Of these, three primary alternate sites were selected. Luminant Power Nuclear Power Plant Siting Report, dated 08/28/2007, contains the specific locations of these alternative sites, which is considered proprietary information. Herein, these sites are referred to as Site A, Site B, and Site C. Specific information regarding the site locations will not be provided.

 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV.</b> 0
		<b>PAGE NO.</b> 13 of 16

TRAGIS was used to evaluate the differences between the routing characteristics of those routes selected in Sections 7.1 and 7.2, as compared to the routing characteristics of the alternative sites. TRAGIS allows the user to select from a predetermined set of locations (nodes) for the origin and destination. However, the three alternative sites do not correspond directly with any of the nodes available in the TRAGIS database. As such, the closest available node was used.

Using the same settings identified in the corresponding Section 6.2 and 6.3, above, the output results were compared to those determined for CPNPP Units 3 & 4.

## 7.0 Calculations


A description of the inputs and settings for TRAGIS, as well as justification for their selection, is detailed in Sections 6.2 and 6.3, above.

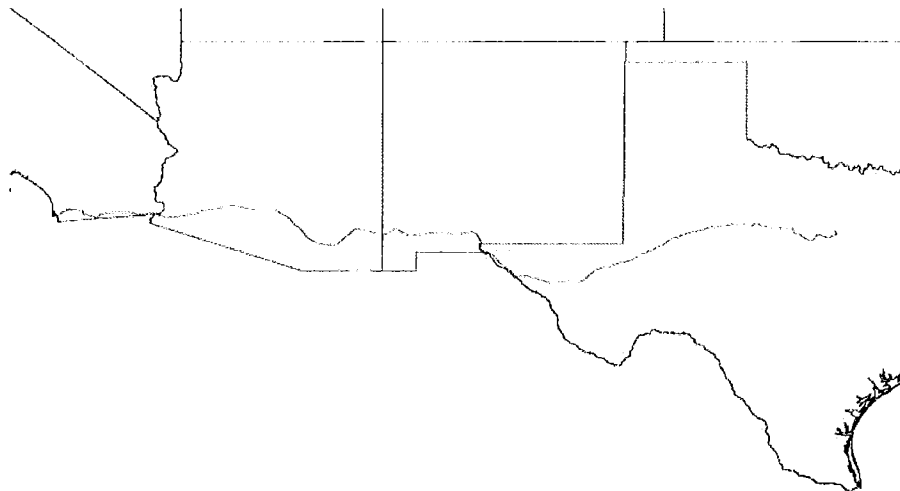
### 7.1 Routing for New Fuel Transportation from Selected Port to Comanche Peak

In order to determine the most probable route for the shipment of new fuel from a coastal port to CPNPP Units 3 & 4, TRAGIS was used to calculate the route and the distance and population characteristics for each of the three major commercial ports (nodes) identified for California including Los Angeles, San Diego, and San Francisco. The specific inputs and settings are documented in Section 6.2. The TRAGIS outputs are documented in Appendix A, and the results of the analysis are summarized in Table 7-1.

<b>Table 7-1 – Routing Characteristics for Transport of New Fuel from Port to CPNPP Units 3 &amp; 4</b>									
Port Node	Population				Distance				Time
	Rural (person / sq. km.)	Suburban (person / sq. km.)	Urban (person / sq. km.)	Total (within 800m of route)	Rural (km)	Suburban (km)	Urban (km)	Total (km)	Total (hours:minutes)
Port of Los Angeles	8.8	364.2	2757.9	799280	1754.7	393.4	123.7	2271.6	26:27
Port of San Diego	8.6	334.2	2571.7	387287	1754.5	308.8	60.3	2123.6	24:12
Port of San Francisco	7.7	368.6	2757.4	540487	2372.0	308.2	77.2	2757.4	33:48

The route commencing at the port at San Diego was determined to be the most efficient and least populous route to the CPNPP Units 3 & 4. As such, this route was chosen as the best route for transportation of new fuel. A RADTRAN input data file for this route (Appendix B) has been created for use in Calculation TXUT-001-ER-3.8-CALC-008 (Ref. 3.7). The route is illustrated in Figure 7-1.

 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV.</b> 0
		<b>PAGE NO.</b> 14 of 16




**Figure 7-1 – Transportation Route from Port at San Diego to  
CPNPP Units 3 & 4**

## 7.2 Routing for Spent Fuel Transportation From Comanche Peak to Yucca Mountain

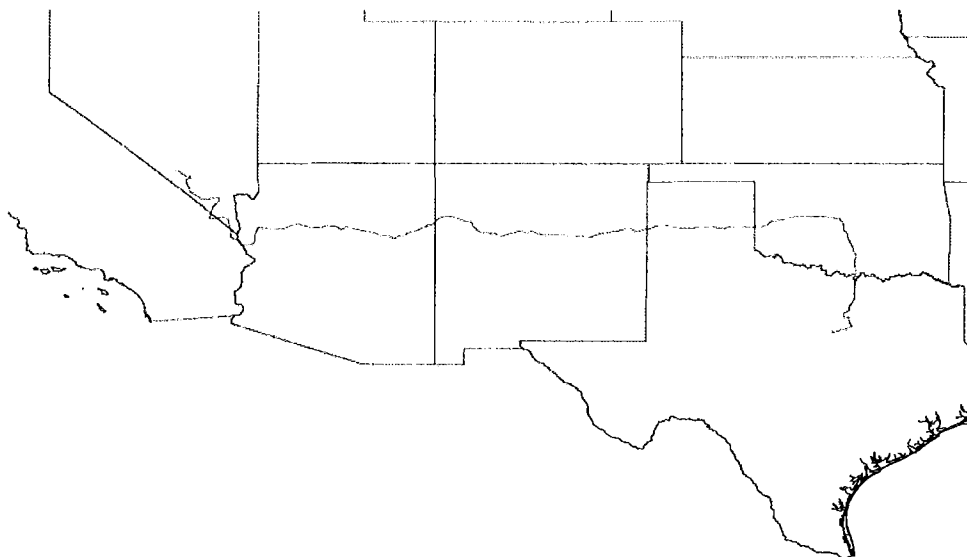
TRAGIS was used to calculate the route and the distance and population characteristics for each of the six potential Nevada routes described in Section 6.3. The outputs are documented in Appendix A, and the results are summarized in Table 7-2.

<b>Table 7-2 – Routing Characteristics for Transportation of Spent Fuel from Comanche Peak to Yucca Mountain Repository</b>									
Yucca Mountain Routes	Population				Distance				Time
	Rural (person / sq. km.)	Suburban (person / sq. km.)	Urban (person / sq. km.)	Total (within 800m of route)	Rural (km)	Suburban (km)	Urban (km)	Total (km)	Total (hours:minutes)
Route A	7.0	355.1	2277.2	393676	2909.6	364.5	64.1	3338.1	40:40
Route B	6.8	357.3	2274.1	390607	2940.4	360.6	64.0	3364.9	40:45
Route C	7.3	354.2	2261.2	345888	2404.1	302.5	53.4	2760.0	33:51
Route D	7.6	346.6	2263.9	358969	2441.0	327.0	54.4	2822.4	34:32
Route E	7.5	351.0	2265.3	335609	2286.7	294.6	51.6	2632.8	33:09
Route F	8.1	344.6	2268.0	347748	2198.3	316.6	52.6	2567.5	32:23

The TRAGIS outputs, shown in detail in Appendix A, indicate that Route F provides the shortest route and quickest transportation time, while Route E provides the lowest population within the 800 m buffer zone of the route. However, there is less than a 5% difference between the values obtained for population and distance. As such, it was determined that for the purpose of this calculation Route F would be the optimal route for transportation to minimize the number of miles and amount of time the spent fuel remains in transport. A RADTRAN input data file for this

 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV.</b> 0
		<b>PAGE NO.</b> 15 of 16

route (Appendix B) was created for use in Calculation TXUT-001-ER-3.8-CALC-008 (Ref. 3.7). The route is illustrated in Figure 7-2.




**Figure 7-2 – Transportation Route F from CPNPP Units 3 & 4 to Yucca Mountain Repository**

### 7.3 Analysis of Alternative Sites

TRAGIS was used to examine the three additional sites identified in Section 6.4 for comparison with the CPNPP Units 3 & 4. The purpose of this analysis is to identify any advantages or disadvantages of the CPNPP Units 3 & 4 location compared to its alternatives. TRAGIS was run with exactly the same settings for each alternative site as given in Section 6.2 and 6.3.

<b>Table 7-3 – Routing Characteristics for Transport of New Fuel from Port at San Diego to Alternative Sites</b>									
Port Node	Population				Distance				Time
	Rural (person / sq. km.)	Suburban (person / sq. km.)	Urban (person / sq. km.)	Total (within 800m of route)	Rural (km)	Suburban (km)	Urban (km)	Total (km)	Total (hours:minutes)
Comanche Peak	8.6	334.2	2571.7	387287	1754.5	308.8	60.3	2123.6	24:12
Site A	8.0	359.6	2528.8	443332	1880.7	300.3	73.4	2254.4	25:56
Site B	8.6	358.1	2477.5	548075	2078.3	409.7	86.7	2574.6	29:29
Site C	8.6	335.6	2577.1	400900	1812.1	324.5	61.5	2198.1	25:16

 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV. 0</b>
		<b>PAGE NO. 16 of 16</b>

The TRAGIS outputs cannot be provided due to the proprietary nature of the alternate sites. However, the outputs indicate that CPNPP Units 3 and 4 have the lowest population within the 800 m buffer zone, shortest total distance, and quickest time for transportation of new fuel from the Port at San Diego to the site. As such, it was confirmed by this analysis that the location of CPNPP Units 3 & 4 is more advantageous than the alternative sites in relation to the route characteristics.

<b>Table 7-4 – Routing Characteristics for Transport of Spent Fuel from Alternative Sites to Yucca Mountain Repository</b>									
Site Node	Population				Distance				Time
	Rural (person / sq. km.)	Suburban (person / sq. km.)	Urban (person / sq. km.)	Total (within 800m of route)	Rural (km)	Suburban (km)	Urban (km)	Total (km)	Total (hours:minutes)
Comanche Peak	8.1	344.6	2268.0	347748	2198.3	316.6	52.6	2567.5	32:23
Site A	7.3	346.5	2362.5	350545	2479.7	316.0	52.6	2848.4	34:14
Site B	8.5	380.3	2393.3	674606	2501.8	488.6	104.8	3095.2	37:53
Site C	8.1	341.7	2243.7	353191	2226.9	324.0	54.4	2605.3	32:30


The TRAGIS outputs, indicate that CPNPP Units 3 & 4 have the lowest population within the 800 m buffer zone, shortest total distance, and quickest time for transportation of spent fuel from the site to the Yucca Mountain Repository. As such, it was confirmed by this analysis that CPNPP Units 3 & 4 is more advantageous than the alternative sites in relation to the route characteristics.

RADTRAN input files were created for each of the alternative site locations for both new and spent fuel transportation. These files were provided to the preparer of TXUT-001-ER-3.8-CALC-008 (Ref. 3.7) for analysis. However, the RADTRAN files contain the location of the alternative sites, and as such, are not included in this calculation.

#### 7.4 Results and Conclusions

As identified in Sections 7.1 through 7.3, TRAGIS was used to identify the most logical routes for transportation of new and spent fuel to/from CPNPP Units 3 & 4. The detailed information obtained from the analysis of the routes is provided as input for Calculation TXUT-001-ER-3.8-CALC-008 (Ref. 3.7).



 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b> <b>APPENDIX A</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV. 0</b>
		<b>PAGE NO. 1 of 22</b>

### Appendix A – TRAGIS Output Files

#### New Fuel Route – Port at Los Angeles, CA to CPNPP Units 3 & 4

TRAGIS Routing Engine Version 1.5.4      -- Highway Data Network    4.0

FROM:    PORT OF LA                      CA                      Leaving : 04/07/08 13:11  
 TO :    COMANCHE PEAK NP              TX                      Arriving : 04/08/08 17:38

Routing parameters used to calculate the route-

Routing type: Commercial with 2 driver(s)  
 Time bias: 0.70 Mile bias: 0.30, Toll bias: 1.00


Constraints used on route:  
 Prohibit use of links prohibiting truck use  
 Prohibit use of ferry crossing  
 Prohibit low height clearance  
 Prohibit narrow width clearance  
 Prohibit use of roads with hazardous materials prohibition  
 Prohibit use of roads with Radioactive materials prohibition

Miles	Hwy Sign	City	Dir	Junction	State	Dist	Time	Date	Hour
0.0		PORT OF LA			CA	0.0	0:00	04/07/08	13:11
2.0	S47	SAN PEDRO		I110X1A	CA	2.0	0:02	04/07/08	13:13
9.0	I110	GARDENA	SE	I110X10	CA	11.0	0:12	04/07/08	13:23
58.6	S91	RIVERSIDE	NE	I215X34	CA	69.6	1:16	04/07/08	14:27
5.1	I215	SUNNYMEAD	NW	I215X29	CA	74.7	1:21	04/07/08	14:32
17.9	S60	BEAUMONT	W	I10 X93	CA	92.6	1:41	04/07/08	14:52
		Rest 30 minutes							
145.9	I10	BLYTHE	SE	I10 X241	CA	238.5	4:50	04/07/08	18:01
2.3	I10	crossing state border AZ/CA			BD	240.8	5:23	04/07/08	18:34
		State Inspection took 30 minutes							
142.4	I10	PHOENIX	W	I10 I17	AZ	383.2	7:20	04/07/08	20:31
6.3	I17	PHOENIX	SE	I10 I17	AZ	389.5	7:27	04/07/08	20:38
		Rest 30 minutes							
207.5	I10	BOWIE	W	I10 X355	AZ	597.0	10:52	04/08/08	00:03
35.2	I10	crossing state border AZ/NM			BD	632.1	11:50	04/08/08	01:01
		State Inspection took 30 minutes							
		Rest 30 minutes							
144.2	I10	LAS CRUCES	SE	I10 I25	NM	776.3	14:18	04/08/08	04:29
19.8	I10	crossing state border NM/TX			BD	796.1	15:04	04/08/08	05:15
		State Inspection took 30 minutes							
		Rest 30 minutes							
187.0	I10	KENT	E	I10 I20	TX	983.0	18:25	04/08/08	09:36
		Rest 30 minutes							
339.4	I20	EASTLAND	S	I20 X340	TX	1322.4	24:02	04/08/08	15:13
		Rest 30 minutes							
40.3	S6	DUBLIN		U67 S6	TX	1362.7	24:55	04/08/08	16:06
13.6	U67	STEPHENVILLE	E	U281U377	TX	1376.3	25:42	04/08/08	16:53
0.3	U281	STEPHENVILLE	SE	U281U67	TX	1376.7	25:42	04/08/08	16:53
28.6	U67	GLEN ROSE		U67 F201	TX	1405.2	26:16	04/08/08	17:27
5.4	F201	HILL CITY	SE	F201LOCL	TX	1410.6	26:26	04/08/08	17:37
1.0	LOCAL	COMANCHE PEAK	NP		TX	1411.6	26:27	04/08/08	17:38

Total elapsed time: 26:27      Total trip mileage: 1411.6      Impedance: 1345.9

Mileage by State :  
 AZ: 391.3    CA: 240.8    NM: 163.9    TX: 615.5

Mileage by Sign Type:

 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b> <b>APPENDIX A</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV. 0</b>
		<b>PAGE NO. 2 of 22</b>

1-INTERSTATE: 1243.9      2-US: 42.5      3-STATE: 118.8      6-LOCAL: 1.0  
 7-OTHER: 5.4

Mileage by Lane Type:

1-Multi-Lane Controlled Access:	1320.4	3-Multi-Lane Divided Highway:	2.0
5-Principle Road:	42.5	6-Through Road:	40.3
7-Other:	6.4		

Mileage by Tribal Lands:

Total Outside Tribal Lands	: 1380.2
Total Inside Tribal Lands	: 31.3

Agua Caliente Reservation	: 2.2	Cabazon Reservation	: 0.9
Gila River Reservation	: 24.2	Morongo Reservation	: 4.1

Mileage by Nevada Counties:

TRAGIS Routing Engine Version 1.5.4      -- 2000 Census Data

POPULATION DENSITY within 800 meter Buffer Zone:

FROM: PORT OF LA CA  
 TO : COMANCHE PEAK NP TX

ST	MILES	0	>0.0	22.7	59.7	139	326	821	1861	3326	5815	
		-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	>9996	
AZ	391.3	113.77	71.27	99.82	26.82	25.46	17.88	12.42	9.52	6.65	4.98	2.74
CA	240.8	48.39	31.57	33.17	12.95	18.02	15.96	18.12	14.69	19.29	13.97	14.77
NM	163.9	52.11	36.96	44.44	9.84	6.98	5.84	3.95	1.76	1.54	0.50	0.00
TX	615.5	203.00	141.55	131.60	33.08	35.32	25.24	21.19	12.10	7.58	3.53	1.33

TOTALS

1411.6	417.27	281.35	309.03	82.69	85.78	64.92	55.68	38.07	35.06	22.98	18.84
--------	--------	--------	--------	-------	-------	-------	-------	-------	-------	-------	-------

PERCENTAGES

29.56	19.93	21.89	5.86	6.08	4.60	3.94	2.70	2.48	1.63	1.33
-------	-------	-------	------	------	------	------	------	------	------	------

BASIS: 2000 Census data

RADTRAN Input Data	RURAL	SUBURBAN	URBAN
WEIGHTED POPULATION			
People/sq. mi.	22.8	943.2	7143.0
People/sq. km.	8.8	364.2	2757.9

DISTANCE				TOTALS
Miles	1090.3	244.5	76.9	1411.6
Kilometers	1754.7	393.4	123.7	2271.6
Percentages	77.2	17.3	5.4	

BASIS (people/sq mi.)      <139      139-3326      >3326

Population within 800 meter Buffer Zone by State:

AZ 163740 CA 469445 NM 23593 TX 142502

Total Population within 800 meter Buffer Zone: 799280

## New Fuel Route – Port at San Diego, CA to CPNPP Units 3 & 4

TRAGIS Routing Engine Version 1.5.4      -- Highway Data Network 4.0

FROM: PORT OF SAN DIEGO	I5 X10 CA	Leaving : 04/08/08 06:26
TO : COMANCHE PEAK NP	TX	Arriving : 04/09/08 08:38



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 3 of 22

Routing parameters used to calculate the route-

Routing type: Commercial with 2 driver(s)  
Time bias: 0.70 Mile bias: 0.30, Toll bias: 1.00

Constraints used on route:

Prohibit use of links prohibiting truck use  
Prohibit use of ferry crossing  
Prohibit low height clearance  
Prohibit narrow width clearance  
Prohibit use of roads with hazardous materials prohibition  
Prohibit use of roads with Radioactive materials prohibition

Miles	Hwy Sign	City	Dir	Junction	State	Dist	Time	Date	Hour
0.0		PORT OF SAN DIEGO	I5	X10	CA	0.0	0:00	04/08/08	06:26
2.6	I5	SAN DIEGO	S	I15 I5	CA	2.6	0:02	04/08/08	06:28
1.7	I15	SAN DIEGO	E	S15 X2BC	CA	4.2	0:04	04/08/08	06:30
7.1	S94	LEMON GROVE	NE	S125S94	CA	11.4	0:12	04/08/08	06:38
1.9	S125	LA MESA	E	I8 X14A	CA	13.3	0:14	04/08/08	06:40
157.2	I8	OLD IRB			CA	170.4	3:06	04/08/08	09:32
0.0	I8	crossing state border AZ/CA			BD	170.4	3:36	04/08/08	10:02
		State Inspection took 30 minutes							
		Rest 30 minutes							
177.5	I8	CASA GRANDE	SE	I10 I8	AZ	347.9	6:28	04/08/08	12:54
		Rest 30 minutes							
157.1	I10	BOWIE	W	I10 X355	AZ	505.0	9:06	04/08/08	15:32
35.2	I10	crossing state border AZ/NM			BD	540.2	10:04	04/08/08	16:30
		State Inspection took 30 minutes							
144.2	I10	LAS CRUCES	SE	I10 I25	NM	684.3	12:03	04/08/08	19:29
19.8	I10	crossing state border NM/TX			BD	704.1	12:48	04/08/08	20:14
		Rest 30 minutes							
		State Inspection took 30 minutes							
187.0	I10	KENT	E	I10 I20	TX	891.1	16:10	04/09/08	00:36
		Rest 30 minutes							
		Rest 30 minutes							
339.4	I20	EASTLAND	S	I20 X340	TX	1230.4	22:16	04/09/08	06:42
40.3	S6	DUBLIN		U67 S6	TX	1270.7	23:10	04/09/08	07:36
13.6	U67	STEPHENVILLE	E	U281U377	TX	1284.3	23:26	04/09/08	07:52
0.3	U281	STEPHENVILLE	SE	U281U67	TX	1284.7	23:26	04/09/08	07:52
28.6	U67	GLEN ROSE		U67 F201	TX	1313.2	24:01	04/09/08	08:27
5.4	F201	HILL CITY	SE	F201LOCL	TX	1318.6	24:10	04/09/08	08:36
1.0	LOCAL	COMANCHE PEAK	NP		TX	1319.6	24:12	04/09/08	08:38

Total elapsed time: 24:12      Total trip mileage: 1319.6      Impedance: 1244.3

Mileage by State :

AZ: 369.7    CA: 170.4    NM: 163.9    TX: 615.5

Mileage by Sign Type:

1-INTERSTATE: 1221.4      2-US: 42.5      3-STATE: 49.3      6-LOCAL: 1.0  
7-OTHER: 5.4

Mileage by Lane Type:

1-Multi-Lane Controlled Access: 1230.4      5-Principle Road: 42.5  
6-Through Road: 40.3      7-Other: 6.4

Mileage by Tribal Lands:

Total Outside Tribal Lands : 1308.7  
Total Inside Tribal Lands : 10.9

Campo Reservation : 3.1    Fort Yuma Reservation : 6.5  
La Posta Reservation : 1.2

Mileage by Nevada Counties:



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 4 of 22

TRAGIS Routing Engine Version 1.5.4 -- 2000 Census Data

POPULATION DENSITY within 800 meter Buffer Zone:

FROM: PORT OF SAN DIEGO I5 X10 CA  
TO : COMANCHE PEAK NP TX

ST	MILES	>0.0	22.7	59.7	139	326	821	1861	3326	5815	
		0	-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996 >9996
AZ	369.7	118.46	78.97	88.23	27.04	21.44	13.24	9.31	6.76	3.74	2.15 0.33
CA	170.4	49.95	34.44	28.42	12.15	11.95	6.99	4.86	4.97	6.72	5.64 4.38
NM	163.9	52.11	36.96	44.44	9.84	6.98	5.84	3.95	1.76	1.54	0.50 0.00
TX	615.5	203.00	141.55	131.60	33.08	35.32	25.24	21.19	12.10	7.58	3.53 1.33
TOTALS											
	1319.6	423.52	291.92	292.69	82.11	75.69	51.31	39.31	25.59	19.58	11.82 6.04
PERCENTAGES											
		32.10	22.12	22.18	6.22	5.74	3.89	2.98	1.94	1.48	0.90 0.46

BASIS: 2000 Census data

RADTRAN Input Data	RURAL	SUBURBAN	URBAN
WEIGHTED POPULATION			
People/sq. mi.	22.3	865.6	6660.6
People/sq. km.	8.6	334.2	2571.7

DISTANCE				TOTALS
Miles	1090.2	191.9	37.4	1319.6
Kilometers	1754.5	308.8	60.3	2123.6
Percentages	82.6	14.5	2.8	

BASIS (people/sq mi.) <139 139-3326 >3326

Population within 800 meter Buffer Zone by State:

AZ 77337 CA 143855 NM 23593 TX 142502

Total Population within 800 meter Buffer Zone: 387287

## New Fuel Route – Port at San Francisco, CA to CPNPP Units 3 & 4

TRAGIS Routing Engine Version 1.5.4 -- Highway Data Network 4.0

FROM: PORT OF SF CA Leaving : 04/08/08 06:29  
TO : COMANCHE PEAK NP TX Arriving : 04/09/08 18:17

Routing parameters used to calculate the route-

Routing type: Commercial with 2 driver(s)  
Time bias: 0.70 Mile bias: 0.30, Toll bias: 1.00

Constraints used on route:

- Prohibit use of links prohibiting truck use
- Prohibit use of ferry crossing
- Prohibit low height clearance
- Prohibit narrow width clearance
- Prohibit use of roads with hazardous materials prohibition
- Prohibit use of roads with Radioactive materials prohibition

Miles	Hwy Sign	City	Dir	Junction	State	Dist	Time	Date	Hour
0.0		PORT OF SF			CA	0.0	0:00	04/08/08	06:29
1.2	LOCAL	SAN FRANCISCO	S	I280X55	CA	1.2	0:02	04/08/08	06:31



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

**CALC. NO.**

**TXUT-001-ER-3.8-CALC-009**

**REV. 0**

**PAGE NO. 5 of 22**

1.3	I280	SAN FRANCISCO	SE	I280X54	CA	2.6	0:04	04/08/08	06:33
74.7	U101	GILROY	E	U101X356	CA	77.3	1:26	04/08/08	07:55
40.8	S152	LOS BANOS	W	I5 X403	CA	118.1	2:27	04/08/08	08:56
		Rest 30 minutes							
150.5	I5	STOCKDALE HWY	W	I5 X253	CA	268.6	5:41	04/08/08	12:10
16.8	LOCAL	BAKERSFIELD	SW	S58 S99	CA	285.4	6:10	04/08/08	12:39
58.6	S58	MOJAVE	N	S14 S58	CA	344.0	7:14	04/08/08	13:43
1.2	S14	S58	MOJAVE	S14 S58	CA	345.3	7:16	04/08/08	13:45
		Rest 30 minutes							
65.8	S58	BARSTOW	SW	I15 X179	CA	411.0	8:44	04/08/08	15:13
4.3	I15	BARSTOW		I15 I40	CA	415.4	9:18	04/08/08	15:47
143.0	I40	NEEDLES		I40 X144	CA	558.3	11:54	04/08/08	18:23
10.9	I40	crossing state border AZ/CA				BD	569.2	12:36	04/08/08 19:05
		Rest 30 minutes							
		State Inspection took 30 minutes							
		Rest 30 minutes							
338.1	I40	OLD IRB			AZ	907.3	18:07	04/09/08	00:36
19.0	I40	crossing state border AZ/NM				BD	926.4	18:52	04/09/08 01:21
		State Inspection took 30 minutes							
		Rest 30 minutes							
275.1	I40	SANTA ROSA	E	I40 X277	NM	1201.5	23:05	04/09/08	06:34
41.9	U84	FT SUMNER		U60 U84	NM	1243.4	23:55	04/09/08	07:24
60.9	U60	U84	CLOVIS	U60 U70	NM	1304.3	25:08	04/09/08	08:37
8.6	U60	U70	TEXICO	U60 U70	NM	1312.9	25:19	04/09/08	08:48
0.1	U70	U84	crossing state border NM/TX				BD	1313.0	25:49 04/09/08 09:18
		Rest 30 minutes							
		State Inspection took 30 minutes							
21.8	U70	U84	MULESHOE	U70 U84	TX	1334.8	26:40	04/09/08	11:09
65.2	U84		LUBBOCK	U84 L289	TX	1400.0	27:46	04/09/08	12:15
3.0	L289		LUBBOCK	N I27 X6B	TX	1403.0	27:49	04/09/08	12:18
6.4	I27		LUBBOCK	S I27 U87	TX	1409.4	27:56	04/09/08	12:25
1.4	L289		LUBBOCK	SE U84 L289	TX	1410.8	27:57	04/09/08	12:26
111.7	U84		ROSCOE	E I20 X239	TX	1522.5	29:49	04/09/08	14:18
		Rest 30 minutes							
101.8	I20		EASTLAND	S I20 X340	TX	1624.3	31:52	04/09/08	16:21
40.3	S6		DUBLIN	U67 S6	TX	1664.5	32:46	04/09/08	17:15
13.6	U67	U377	STEPHENVILLE	E U281U377	TX	1678.2	33:02	04/09/08	17:31
0.3	U281		STEPHENVILLE	SE U281U67	TX	1678.5	33:03	04/09/08	17:32
28.6	U67		GLEN ROSE	U67 F201	TX	1707.1	33:37	04/09/08	18:06
5.4	F201		HILL CITY	SE F201LOCL	TX	1712.5	33:46	04/09/08	18:15
1.0	LOCAL		COMANCHE PEAK	NP	TX	1713.4	33:48	04/09/08	18:17

Total elapsed time: 33:48      Total trip mileage: 1713.4      Impedance: 1724.0

**Mileage by State :**

AZ: 357.2    CA: 569.2    NM: 386.7    TX: 400.4

**Mileage by Sign Type:**

1-INTERSTATE: 1050.5      2-US: 427.5      3-STATE: 206.7      6-LOCAL: 23.4  
7-OTHER: 5.4

**Mileage by Lane Type:**


1-Multi-Lane Controlled Access:	1186.7	3-Multi-Lane Divided Highway:	232.1
5-Principle Road:	230.0	6-Through Road:	40.3
7-Other:	24.4		

**Mileage by Tribal Lands:**

Total Outside Tribal Lands : 1632.3  
Total Inside Tribal Lands : 81.1

Acoma Pueblo	: 6.9	Laguna Pueblo	: 35.5
Navajo Nation Reservation	: 29.3	Navajo Nation Trust Land	: 9.4

**Mileage by Nevada Counties:**

 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b> <b>APPENDIX A</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV. 0</b>
		<b>PAGE NO. 6 of 22</b>

TRAGIS Routing Engine Version 1.5.4      --      2000 Census Data

POPULATION DENSITY within      800 meter Buffer Zone:

FROM: PORT OF SF      CA

TO : COMANCHE PEAK NP      TX

ST	MILES	0	>0.0	22.7	59.7	139	326	821	1861	3326	5815	
			-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	>9996
AZ	357.2	141.91	96.83	77.58	15.03	9.88	4.67	4.62	4.40	1.53	0.45	0.26
CA	569.2	236.58	93.43	95.21	38.63	25.79	20.55	16.08	10.87	11.55	10.05	10.56
NM	386.7	147.83	87.04	71.35	24.45	18.09	12.83	8.58	6.41	6.05	2.88	1.10
TX	400.4	128.71	93.75	106.57	19.03	14.22	11.28	13.64	9.62	2.92	0.64	0.00

TOTALS

1713.4    655.03    371.05    350.71    97.14    67.98    49.33    42.92    31.30    22.05    14.02    11.92

PERCENTAGES

38.23    21.66    20.47    5.67    3.97    2.88    2.50    1.83    1.29    0.82    0.70

BASIS:      2000 Census data

RADTRAN Input Data      RURAL      SUBURBAN      URBAN

WEIGHTED POPULATION

People/sq. mi.      19.8      954.6      7141.8

People/sq. km.      7.7      368.6      2757.4

DISTANCE

Miles      1473.9      191.5      48.0      TOTALS      1713.4

Kilometers      2372.0      308.2      77.2      2757.4

Percentages      86.0      11.2      2.8

BASIS (people/sq mi.)      <139      139-3326      >3326

Population within      800 meter Buffer Zone by State:

AZ 36032    CA 344822    NM 99198    TX 60435

Total Population within      800 meter Buffer Zone:      540487

## Spent Fuel Route – CPNPP Units 3 & 4 to Yucca Mountain – Route A

TRAGIS Routing Engine Version 1.5.4      -- Highway Data Network      4.0

FROM:      COMANCHE PEAK NP      TX

Leaving : 04/08/08 09:47

TO :      YUCCA MOUNTAIN      NV

Arriving : 04/10/08 00:27

Routing parameters used to calculate the route-

Routing type: HRCQ NEVADA Preferred Route AN with 2 driver(s)

Preferred roads      Time bias: 1.00      Mile bias: 0.00, Toll bias: 1.00

Nonpreferred roads      Time bias: 0.00      Mile bias: 1.00, Toll bias: 1.00, Penalty factor: 30.0

Constraints used on route:

Prohibit use of links prohibiting truck use

Prohibit use of ferry crossing

Prohibit low height clearance

Prohibit narrow width clearance

Prohibit use of roads with hazardous materials prohibition

Prohibit use of roads with Radioactive materials prohibition

Las Vegas Beltway is considered a preferred route

Miles	Hwy Sign	City	Dir	Junction	State	Dist	Time	Date	Hour
0.0		COMANCHE PEAK	NP		TX	0.0	0:00	04/08/08	09:47



ENERCON SERVICES, INC.

## Transportation Routing

### APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 7 of 22

1.0	LOCAL	HILL CITY	SE	F201LOCL	TX	1.0	0:01	04/08/08	09:48
5.4	F201	GLEN ROSE		U67 F201	TX	6.4	0:10	04/08/08	09:57
34.2	U67	ALVARADO	NW	I35WX26	TX	40.6	0:51	04/08/08	10:38
19.0	I35W	FT WORTH	S	I20 I35W	TX	59.6	1:08	04/08/08	10:55
9.2	I20	BENBROOK	N	I20 I820	TX	68.8	1:19	04/08/08	11:06
16.7	I820	FT WORTH	N	I35WI820	TX	85.5	1:37	04/08/08	11:24
28.0	I35W	DENTON	S	I35EI35W	TX	113.5	2:02	04/08/08	11:49
30.6	I35	GAINESVILLE	NW	I35 X498	TX	144.1	2:30	04/08/08	12:17
6.2	I35	crossing state border OK/TX			BD	150.4	3:05	04/08/08	12:52
State Inspection took 30 minutes									
Rest 30 minutes									
122.6	I35	OKLAHOMA CITY	S	I240I35	OK	273.0	5:21	04/08/08	15:08
4.5	I240	OKLAHOMA CITY	SW	I240I44	OK	277.5	5:26	04/08/08	15:13
15.9	I44	OKLAHOMA CITY	NE	I35 I44	OK	293.4	5:42	04/08/08	15:29
4.4	I35	EDMOND	SE	I35 I44	OK	297.8	5:47	04/08/08	15:34
94.9	I35	BRAMAN	NW	I35 X231	OK	392.7	7:09	04/08/08	16:56
4.0	I35	crossing state border KS/OK			BD	396.8	7:42	04/08/08	17:29
State Inspection took 30 minutes									
4.1	I35	SOUTH HAVEN	E	I35 X4	KS	400.9	7:46	04/08/08	17:33
38.4	I35 \$	WICHITA	S	I135I35	KS	439.2	8:18	04/08/08	18:05
0.9	I135	WICHITA	S	I135I235	KS	440.1	8:20	04/08/08	18:07
Rest 30 minutes									
16.5	I235	WICHITA	N	I135I235	KS	456.6	9:08	04/08/08	18:55
84.5	I135	SALINA	NW	I135I70	KS	541.1	10:20	04/08/08	20:07
Rest 30 minutes									
231.7	I70	GOODLAND		I70 X17	KS	772.8	14:09	04/08/08	22:56
17.1	I70	crossing state border CO/KS			BD	789.9	14:54	04/08/08	23:41
State Inspection took 30 minutes									
169.5	I70	DENVER	NE	I270I70	CO	959.4	17:16	04/09/08	02:03
Rest 30 minutes									
4.9	I270	COMMERCE CITY	NW	I270I76	CO	964.3	17:52	04/09/08	02:39
1.2	I76	COMMERCE CITY	W	I25 I76	CO	965.5	17:53	04/09/08	02:40
53.6	I25	FT COLLINS	E	I25 X269	CO	1019.1	18:41	04/09/08	03:28
29.8	I25	crossing state border CO/WY			BD	1048.8	19:34	04/09/08	04:21
State Inspection took 30 minutes									
8.9	I25	CHEYENNE	SW	I25 I80	WY	1057.7	19:43	04/09/08	04:30
Rest 30 minutes									
339.5	I80	EVANSTON	NE	I80 X18	WY	1397.2	24:44	04/09/08	09:31
18.2	I80	crossing state border UT/WY			BD	1415.4	25:29	04/09/08	10:16
State Inspection took 30 minutes									
Rest 30 minutes									
68.4	I80	HOLLADAY	N	I215I80	UT	1483.7	26:24	04/09/08	11:11
21.2	I215	SALT LAKE CITY	W	I215I80	UT	1505.0	27:13	04/09/08	12:00
115.9	I80	WENDOVER		I80 X2	UT	1620.8	28:48	04/09/08	13:35
1.0	I80	crossing state border NV/UT			BD	1621.8	29:18	04/09/08	14:05
State Inspection took 30 minutes									
0.5	I80	WENDOVER		I80 X410	NV	1622.3	29:19	04/09/08	13:06
59.2	U93A	LAGES		U93 U93A	NV	1681.5	30:30	04/09/08	14:17
Rest 30 minutes									
59.8	U93	ELY	E	U50 U93	NV	1741.3	32:12	04/09/08	15:59
0.7	U50	ELY	SE	U50 U6	NV	1742.0	32:13	04/09/08	16:00
24.1	U6	PRESTON	NW	U6 S318	NV	1766.1	32:42	04/09/08	16:29
Rest 30 minutes									
113.7	S318	HIKO	SW	S318S375	NV	1879.7	35:14	04/09/08	19:01
0.7	S375	HIKO	S	U93 S375	NV	1880.5	35:45	04/09/08	19:32
85.8	U93	GARNET		I15 X64	NV	1966.3	37:28	04/09/08	21:15
14.0	I15	N LAS VEGAS	NE	I15 S215	NV	1980.3	37:40	04/09/08	21:27
14.8	C215	LAS VEGAS	NW	U95 C215	NV	1995.1	38:10	04/09/08	21:57
Rest 30 minutes									
46.1	U95	MERCURY	S	U95 LOCL	NV	2041.2	39:26	04/09/08	23:13
33.1	LOCAL	YUCCA MOUNTAIN			NV	2074.3	40:40	04/10/08	00:27

Total elapsed time: 40:40

Total trip mileage: 2074.3

Impedance: 3127.4

#### Mileage by State :

CO: 258.9 KS: 393.1 NV: 452.5 OK: 246.4 TX: 150.4 UT: 206.4  
WY: 366.5

**ENERCON SERVICES, INC.**

# Transportation Routing

## APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

**PAGE NO.** 8 of 22

## Mileage by Sign Type:

1-INTERSTATE:	1595.8	2-US:	309.9	3-STATE:	114.4	5-COUNTY:	14.8
6-LOCAL:	34.0	7-OTHER:	5.4				

## Mileage by Lane Type:

1-Multi-Lane Controlled Access:	1595.8	3-Multi-Lane Divided Highway:	60.9
5-Principle Road:	263.8	6-Through Road:	114.4
7-Other:	39.4		

Mileage by Tribal Lands:

Total Outside Tribal Lands	:	2071.4
Total Inside Tribal Lands	:	2.8

Las Vegas Colony : 2.8

Mileage by Nevada Counties:

Clark: 105.3      Elko: 59.7      Lincoln: 99.0      Nye: 37.4  
White Pine: 151.1

TRAGIS Routing Engine Version 1.5.4                      --      2000 Census Data

POPULATION DENSITY within 800 meter Buffer Zone:

FROM: COMANCHE PEAK NP TX  
TO : YUCCA MOUNTAIN NV

ST	MILES	0	>0.0	22.7	59.7	139	326	821	1861	3326	5815	
			-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	
CO	258.9	84.37	69.94	44.83	21.44	13.50	9.38	5.90	3.52	3.41	2.12	0.53
KS	393.1	139.68	94.66	78.04	31.57	19.74	11.38	8.15	5.98	3.10	0.91	0.00
NV	452.5	322.39	96.69	17.93	6.12	3.31	2.95	1.51	1.02	0.40	0.16	0.00
OK	246.4	45.18	48.61	65.26	31.64	13.72	11.76	10.90	9.51	6.59	2.90	0.49
TX	150.4	3.51	21.73	36.48	25.71	20.81	14.39	11.28	7.90	6.18	1.65	0.67
UT	206.4	102.92	37.36	20.25	12.91	7.90	5.40	5.53	4.92	5.08	3.66	0.50
WY	366.5	196.64	99.25	43.38	9.62	5.48	4.79	3.35	2.52	1.31	0.12	0.06

## TOTALS

2074.3	894.69	468.14	306.17	139.01	84.46	60.05	46.62	35.37	26.07	11.52	2.25
--------	--------	--------	--------	--------	-------	-------	-------	-------	-------	-------	------

## PERCENTAGES

43.13	22.57	14.76	6.70	4.07	2.89	2.25	1.71	1.26	0.56	0.11
-------	-------	-------	------	------	------	------	------	------	------	------

BASIS: 2000 Census data

RADTRAN Input Data	RURAL	SUBURBAN	URBAN
--------------------	-------	----------	-------

WEIGHTED POPULATION

People/sq. mi.	18.2	919.8	5897.9
----------------	------	-------	--------

People/sq. km.	10.2	313.0	3837.3
People/sq. km.	7.0	355.1	2277.2

## DISTANCE

Miles	1808.0	226.5	39.8	2074.3
Kilometers	2909.6	364.5	64.1	3338.1
Percentages	87.2	10.9	1.9	

BASIS (people/sq mi.)	<139	139-3326	>3326
-----------------------	------	----------	-------

Population within 800 meter Buffer Zone by State:  
CO 57333 KS 52134 NV 10733 OK 94438 TX 86766 UT 70059 WY 22213

Total Population within 800 meter Buffer Zone: 393676

BASIS: 2000 Census data

NEVADA COUNTIES POPULATION DENSITY within 800 meter Buffer Zone:

FROM: COMANCHE PEAK NP TX  
TO : YUCCA MOUNTAIN NV

NV	>0.0	22.7	59.7	139	326	821	1861	3326	5815
----	------	------	------	-----	-----	-----	------	------	------





ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 9 of 22

CTY	MILES	0	-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	>9996
3	105.3	65.69	19.06	10.87	4.72	2.17	1.90	0.50	0.19	0.06	0.13	0.00
7	59.7	35.29	21.80	2.10	0.03	0.44	0.00	0.00	0.03	0.00	0.03	0.00
17	99.0	82.81	15.03	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	37.4	37.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	151.1	101.21	40.80	3.84	1.37	0.70	1.05	1.01	0.80	0.34	0.00	0.00

**TOTALS**

452.5 1217.08 564.83 324.10 145.13 87.77 63.00 48.13 36.39 26.47 11.68 2.25

**PERCENTAGES**

48.17 22.35 12.83 5.74 3.47 2.49 1.90 1.44 1.05 0.46 0.09

**Population within 800 meter Buffer Zone by NV County:**

3-	4620														
7-	723	17-	217	33-	5173	96-	84	98-	70	99-	45	100-	21	101-	14
102-	9	103-	6	104-	4	105-	3	106-	2	107-	1	240-	140	242-	95
243-	78	244-	32	245-	20	246-	11	247-	8	248-	6	249-	3	250-	1
384-	322	386-	97	387-	18	388-	6	389-	3	390-	3	391-	2	392-	1
393-	0	394-	0	480-	45	482-	49	483-	65	484-	32	485-	14	486-	12
487-	11	488-	10	489-	7	490-	3	491-	0						

Total Population within 800 meter Buffer Zone: 12084

**Legend for Nevada County Numbers:**

1 - Churchill, 3 - Clark, 5 - Douglas, 7 - Elko  
 9 - Esmeralda, 11 - Eureka, 13 - Humboldt, 15 - Lander  
 17 - Lincoln, 19 - Lyon, 21 - Mineral, 23 - Nye  
 27 - Pershing, 29 - Storey, 31 - Washoe, 33 - White Pine  
 510 - Carson City

### Spent Fuel Route – CPNPP Units 3 & 4 to Yucca Mountain – Route B

TRAGIS Routing Engine Version 1.5.4

-- Highway Data Network 4.0

FROM: COMANCHE PEAK NP TX Leaving : 04/08/08 09:47  
 TO : YUCCA MOUNTAIN NV Arriving : 04/10/08 00:32

Routing parameters used to calculate the route-

Routing type: HRCQ NEVADA Preferred Route BN with 2 driver(s)

Preferred roads Time bias: 1.00 Mile bias: 0.00, Toll bias: 1.00

Nonpreferred roads Time bias: 0.00 Mile bias: 1.00, Toll bias: 1.00, Penalty factor: 30.0

**Constraints used on route:**

Prohibit use of links prohibiting truck use  
 Prohibit use of ferry crossing  
 Prohibit low height clearance  
 Prohibit narrow width clearance  
 Prohibit use of roads with hazardous materials prohibition  
 Prohibit use of roads with Radioactive materials prohibition  
 Las Vegas Beltway is considered a preferred route

Miles	Hwy Sign	City	Dir	Junction	State	Dist	Time	Date	Hour
0.0		COMANCHE PEAK	NP		TX	0.0	0:00	04/08/08	09:47
1.0	LOCAL	HILL CITY	SE	F201LOCL	TX	1.0	0:01	04/08/08	09:48
5.4	F201	GLEN ROSE		U67 F201	TX	6.4	0:10	04/08/08	09:57
34.2	U67	ALVARADO	NW	I35WX26	TX	40.6	0:51	04/08/08	10:38
19.0	I35W	FT WORTH	S	I20 I35W	TX	59.6	1:08	04/08/08	10:55
9.2	I20	BENBROOK	N	I20 I820	TX	68.8	1:19	04/08/08	11:06
16.7	I820	FT WORTH	N	I35WI820	TX	85.5	1:37	04/08/08	11:24
28.0	I35W	DENTON	S	I35EI35W	TX	113.5	2:02	04/08/08	11:49



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 10 of 22

30.6	I35		GAINESVILLE	NW	I35 X498	TX	144.1	2:30	04/08/08	12:17
6.2	I35		crossing state border	OK/TX	BD		150.4	3:05	04/08/08	12:52
			State Inspection took 30 minutes							
			Rest 30 minutes							
122.6	I35		OKLAHOMA CITY	S	I240I35	OK	273.0	5:21	04/08/08	15:08
4.5	I240		OKLAHOMA CITY	SW	I240I44	OK	277.5	5:26	04/08/08	15:13
15.9	I44		OKLAHOMA CITY	NE	I35 I44	OK	293.4	5:42	04/08/08	15:29
4.4	I35	I44	EDMOND	SE	I35 I44	OK	297.8	5:47	04/08/08	15:34
94.9	I35		BRAMAN	NW	I35 X231	OK	392.7	7:09	04/08/08	16:56
4.0	I35		crossing state border	KS/OK	BD		396.8	7:42	04/08/08	17:29
			State Inspection took 30 minutes							
4.1	I35		SOUTH HAVEN	E	I35 X4	KS	400.9	7:46	04/08/08	17:33
38.4	I35	\$	WICHITA	S	I135I35	KS	439.2	8:18	04/08/08	18:05
0.9	I135	TKST\$	WICHITA	S	I135I235	KS	440.1	8:20	04/08/08	18:07
			Rest 30 minutes							
16.5	I235		WICHITA	N	I135I235	KS	456.6	9:08	04/08/08	18:55
84.5	I135		SALINA	NW	I135I70	KS	541.1	10:20	04/08/08	20:07
			Rest 30 minutes							
231.7	I70		GOODLAND		I70 X17	KS	772.8	14:09	04/08/08	22:56
17.1	I70		crossing state border	CO/KS	BD		789.9	14:54	04/08/08	23:41
			State Inspection took 30 minutes							
169.5	I70		DENVER	NE	I270I70	CO	959.4	17:16	04/09/08	02:03
			Rest 30 minutes							
4.9	I270		COMMERCE CITY	NW	I270I76	CO	964.3	17:52	04/09/08	02:39
1.2	I76		COMMERCE CITY	W	I25 I76	CO	965.5	17:53	04/09/08	02:40
53.6	I25		FT COLLINS	E	I25 X269	CO	1019.1	18:41	04/09/08	03:28
29.8	I25		crossing state border	CO/WY	BD		1048.8	19:34	04/09/08	04:21
			State Inspection took 30 minutes							
8.9	I25		CHEYENNE	SW	I25 I80	WY	1057.7	19:43	04/09/08	04:30
			Rest 30 minutes							
339.5	I80		EVANSTON	NE	I80 X18	WY	1397.2	24:44	04/09/08	09:31
18.2	I80		crossing state border	UT/WY	BD		1415.4	25:29	04/09/08	10:16
			State Inspection took 30 minutes							
			Rest 30 minutes							
68.4	I80		HOLLADAY	N	I215I80	UT	1483.7	26:24	04/09/08	11:11
21.2	I215		SALT LAKE CITY	W	I215I80	UT	1505.0	27:13	04/09/08	12:00
115.9	I80		WENDOVER		I80 X2	UT	1620.8	28:48	04/09/08	13:35
1.0	I80		crossing state border	NV/UT	BD		1621.8	29:18	04/09/08	14:05
			State Inspection took 30 minutes							
0.5	I80		WENDOVER		I80 X410	NV	1622.3	29:19	04/09/08	13:06
59.2	U93A		LAGES		U93 U93A	NV	1681.5	30:30	04/09/08	14:17
			Rest 30 minutes							
59.8	U93		ELY	E	U50 U93	NV	1741.3	32:12	04/09/08	15:59
0.7	U50	U6	ELY	SE	U50 U6	NV	1742.0	32:13	04/09/08	16:00
			Rest 30 minutes							
167.8	U6		TONOPAH			NV	1909.8	36:05	04/09/08	19:52
148.1	U95		MERCURY	S	U95 LOCL	NV	2057.8	39:01	04/09/08	22:48
			Rest 30 minutes							
33.1	LOCAL		YUCCA MOUNTAIN			NV	2090.9	40:45	04/10/08	00:32

Total elapsed time: 40:45      Total trip mileage: 2090.9      Impedance: 3161.4

Mileage by State :

CO: 258.9    KS: 393.1    NV: 469.1    OK: 246.4    TX: 150.4    UT: 206.4  
WY: 366.5

Mileage by Sign Type:

1-INTERSTATE: 1581.7      2-US: 469.7      6-LOCAL: 34.0      7-OTHER: 5.4

Mileage by Lane Type:

1-Multi-Lane Controlled Access: 1581.7      3-Multi-Lane Divided Highway: 9.5  
5-Principle Road: 460.3      7-Other: 39.4

Mileage by Tribal Lands:

Total Outside Tribal Lands : 2090.9  
Total Inside Tribal Lands : 0.0



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 11 of 22

Mileage by Nevada Counties:

Elko: 59.7

Nye: 310.1

White Pine: 99.3

TRAGIS Routing Engine Version 1.5.4

-- 2000 Census Data

POPULATION DENSITY within 800 meter Buffer Zone:

FROM: COMANCHE PEAK NP

TX

TO : YUCCA MOUNTAIN

NV

ST	MILES	0	>0.0	22.7	59.7	139	326	821	1861	3326	5815	
			-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	>9996
CO	258.9	84.37	69.94	44.83	21.44	13.50	9.38	5.90	3.52	3.41	2.12	0.53
KS	393.1	139.68	94.66	78.04	31.57	19.74	11.38	8.15	5.98	3.10	0.91	0.00
NV	469.1	373.68	68.58	16.13	3.85	2.20	1.70	1.33	1.12	0.44	0.03	0.00
OK	246.4	45.18	48.51	65.26	31.64	13.72	11.76	10.90	9.51	6.59	2.90	0.49
TX	150.4	3.51	21.73	36.48	25.71	20.81	14.39	11.28	7.90	6.18	1.65	0.67
UT	206.4	102.92	37.36	20.25	12.91	7.90	5.40	5.53	4.92	5.08	3.66	0.50
WY	366.5	196.64	99.25	43.38	9.62	5.48	4.79	3.35	2.52	1.31	0.12	0.06

TOTALS

2090.9 945.98 440.03 304.37 136.74 83.35 58.80 46.44 35.47 26.11 11.39 2.25

PERCENTAGES

45.24 21.04 14.56 6.54 3.99 2.81 2.22 1.70 1.25 0.54 0.11

BASIS: 2000 Census data

RADTRAN Input Data

RURAL

SUBURBAN

URBAN

WEIGHTED POPULATION

People/sq. mi.

17.6

925.5

5890.0

People/sq. km.

6.8

357.3

2274.1

DISTANCE

Miles

1827.1

224.1

39.7

TOTALS

2090.9

Kilometers

2940.4

360.6

64.0

3364.9

Percentages

87.4

10.7

1.9

BASIS (people/sq mi.) <139 139-3326 >3326

Population within 800 meter Buffer Zone by State:

CO 57333 KS 52134 NV 7664 OK 94438 TX 86766 UT 70059 WY 22213

Total Population within 800 meter Buffer Zone: 390607

BASIS: 2000 Census data

NEVADA COUNTIES POPULATION DENSITY within 800 meter Buffer Zone:

FROM: COMANCHE PEAK NP

TX

TO : YUCCA MOUNTAIN

NV

NV	CTY	MILES	0	>0.0	22.7	59.7	139	326	821	1861	3326	5815	
				-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	>9996
	7	59.7	35.29	21.80	2.10	0.03	0.44	0.00	0.00	0.03	0.00	0.03	0.00
	23	310.1	281.68	12.99	10.44	2.53	1.06	0.65	0.32	0.29	0.10	0.00	0.00
	33	99.3	56.71	33.79	3.59	1.29	0.70	1.05	1.01	0.80	0.34	0.00	0.00

TOTALS

469.1 1319.66 508.61 320.50 140.59 85.55 60.50 47.77 36.59 26.55 11.42 2.25

PERCENTAGES

51.55 19.87 12.52 5.49 3.34 2.36 1.87 1.43 1.04 0.45 0.09

Population within 800 meter Buffer Zone by NV County:

7- 723



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

**CALC. NO.**

TXUT-001-ER-3.8-CALC-009

**REV. 0**

**PAGE NO. 12 of 22**

23-	1864	33-	5077	96-	84	98-	70	99-	45	100-	21	101-	14	102-	9
103-	6	104-	4	105-	3	106-	2	107-	1	240-	140	242-	95	243-	78
244-	32	245-	20	246-	11	247-	8	248-	6	249-	3	250-	1	384-	374
386-	69	387-	16	388-	4	389-	2	390-	2	391-	1	392-	1	393-	0
394-	0	480-	45	482-	49	483-	65	484-	32	485-	14	486-	12	487-	11
488-	10	489-	7	490-	3	491-	0								

Total Population within 800 meter Buffer Zone: 9032

Legend for Nevada County Numbers:

1 - Churchill,	3 - Clark,	5 - Douglas,	7 - Elko
9 - Esmeralda,	11 - Eureka,	13 - Humboldt,	15 - Lander
17 - Lincoln,	19 - Lyon,	21 - Mineral,	23 - Nye
27 - Pershing,	29 - Storey,	31 - Washoe,	33 - White Pine
510 - Carson City			

### Spent Fuel Route - CPNPP Units 3 & 4 to Yucca Mountain - Route C

TRAGIS Routing Engine Version 1.5.4

-- Highway Data Network 4.0

FROM: COMANCHE PEAK NP  
TO : YUCCA MOUNTAIN

TX  
NV

Leaving : 04/08/08 09:48  
Arriving : 04/09/08 17:39

Routing parameters used to calculate the route-

Routing type: HRCQ NEVADA Preferred Route NC with 2 driver(s)


Preferred roads Time bias: 1.00 Mile bias: 0.00, Toll bias: 1.00

Nonpreferred roads Time bias: 0.00 Mile bias: 1.00, Toll bias: 1.00, Penalty factor: 30.0

Constraints used on route:

Prohibit use of links prohibiting truck use  
Prohibit use of ferry crossing  
Prohibit low height clearance  
Prohibit narrow width clearance  
Prohibit use of roads with hazardous materials prohibition  
Prohibit use of roads with Radioactive materials prohibition  
Las Vegas Beltway is considered a preferred route

Miles	Hwy Sign	City	Dir	Junction	State	Dist	Time	Date	Hour
0.0		COMANCHE PEAK	NP		TX	0.0	0:00	04/08/08	09:48
1.0	LOCAL	HILL CITY	SE	F201LOCL	TX	1.0	0:01	04/08/08	09:49
5.4	F201	GLEN ROSE		U67 F201	TX	6.4	0:10	04/08/08	09:58
34.2	U67	ALVARADO	NW	I35WX26	TX	40.6	0:51	04/08/08	10:39
19.0	I35W	FT WORTH	S	I20 I35W	TX	59.6	1:08	04/08/08	10:56
9.2	I20	BENBROOK	N	I20 I820	TX	68.8	1:19	04/08/08	11:07
16.7	I820	FT WORTH	N	I35WI820	TX	85.5	1:37	04/08/08	11:25
28.0	I35W	DENTON	S	I35EI35W	TX	113.5	2:02	04/08/08	11:50
30.6	I35	GAINESVILLE	NW	I35 X498	TX	144.1	2:30	04/08/08	12:18
6.2	I35			crossing state border OK/TX	BD	150.4	3:05	04/08/08	12:53
				State Inspection took 30 minutes					
				Rest 30 minutes					
122.6	I35	OKLAHOMA CITY	S	I240I35	OK	273.0	5:21	04/08/08	15:09
4.5	I240	OKLAHOMA CITY	SW	I240I44	OK	277.5	5:26	04/08/08	15:14
4.9	I44	OKLAHOMA CITY	W	I40 I44	OK	282.4	5:31	04/08/08	15:19
125.3	I40	SAYRE	S	I40 X20	OK	407.7	7:20	04/08/08	17:08
20.7	I40			crossing state border OK/TX	BD	428.4	8:08	04/08/08	17:56
				State Inspection took 30 minutes					
				Rest 30 minutes					
139.6	I40	VEGA	S	I40 X36	TX	568.0	10:45	04/08/08	20:33
36.2	I40			crossing state border NM/TX	BD	604.2	11:47	04/08/08	21:35
				State Inspection took 30 minutes					
				Rest 30 minutes					

 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b> <b>APPENDIX A</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV. 0</b>
		<b>PAGE NO. 13 of 22</b>

369.5	I40	Rest 30 minutes							
1.6	I40	IRB	NM	973.7	17:46	04/09/08	02:34		
		crossing state border AZ/NM	BD	975.2	18:17	04/09/08	03:05		
		State Inspection took 30 minutes							
		Rest 30 minutes							
356.6	I40	TOPOCK	I40 X1	AZ	1331.9	23:32	04/09/08	07:20	
0.5	I40	crossing state border AZ/CA	BD	1332.4	24:03	04/09/08	07:51		
		State Inspection took 30 minutes							
		Rest 30 minutes							
153.8	I40	BARSTOW	I15 I40	CA	1486.3	27:20	04/09/08	11:08	
62.0	I15	BAKER	I15 X246	CA	1548.3	28:28	04/09/08	12:16	
		Rest 30 minutes							
56.7	S127	SHOSHONE	S127S178	CA	1605.0	29:36	04/09/08	13:24	
34.5	S127	crossing state border CA/NV	BD	1639.5	31:18	04/09/08	15:06		
		State Inspection took 30 minutes							
		crossing state border CA/NV	BD	1639.5	31:18	04/09/08	15:06		
34.5	S127	AMARGOSA VALLY	U95 S373	NV	1656.0	31:37	04/09/08	15:25	
16.5	S373	MERCURY	S U95 LOCL	NV	1682.0	32:07	04/09/08	15:55	
26.0	U95	Rest 30 minutes							
33.1	LOCAL	YUCCA MOUNTAIN		NV	1715.0	33:51	04/09/08	17:39	

Total elapsed time: 33:51      Total trip mileage: 1715.0      Impedance: 2777.4

Mileage by State :

AZ: 357.2    CA: 307.1    NM: 371.0    NV: 75.5    OK: 278.1    TX: 326.1

Mileage by Sign Type:

1-INTERSTATE: 1507.7      2-US: 60.2      3-STATE: 107.7      6-LOCAL: 34.0  
 7-OTHER: 5.4

Mileage by Lane Type:

1-Multi-Lane Controlled Access:	1507.7	3-Multi-Lane Divided Highway:	9.5
5-Principle Road:	50.7	6-Through Road:	107.7
7-Other:	39.4		

Mileage by Tribal Lands:

Total Outside Tribal Lands : 1631.9  
 Total Inside Tribal Lands : 83.1

Acoma Pueblo	: 6.9	Cheyenne-Arapahoe Trust Land	: 2.0
Laguna Pueblo	: 35.5	Navajo Nation Reservation	: 29.3
Navajo Nation Trust Land	: 9.4		

Mileage by Nevada Counties:

Nye: 75.5

TRAGIS Routing Engine Version 1.5.4      --      2000 Census Data

POPULATION DENSITY within 800 meter Buffer Zone:

FROM: COMANCHE PEAK NP      TX  
 TO : YUCCA MOUNTAIN      NV

ST	MILES	0	>0.0	22.7	59.7	139	326	821	1861	3326	5815	
			-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	>9996
AZ	357.2	141.91	96.83	77.58	15.03	9.88	4.67	4.62	4.40	1.53	0.45	0.26
CA	307.1	190.81	70.83	28.18	4.63	4.07	3.12	2.44	1.66	0.99	0.33	0.00
NV	75.5	65.49	3.38	5.63	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NM	371.0	131.99	101.10	66.86	23.01	16.93	10.89	7.04	4.61	5.23	2.52	0.85
OK	278.1	60.11	61.24	74.75	26.43	16.28	11.71	11.19	8.32	5.31	2.39	0.36
TX	326.1	93.47	64.75	57.93	30.91	24.22	17.62	14.30	10.01	9.63	2.30	1.02

TOTALS

1715.0	683.78	398.13	310.93	101.05	71.38	48.01	39.59	29.00	22.69	7.99	2.49
PERCENTAGES	39.87	23.21	18.13	5.89	4.16	2.80	2.31	1.69	1.32	0.47	0.15



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 14 of 22

BASIS: 2000 Census data

RADTRAN Input Data	RURAL	SUBURBAN	URBAN
WEIGHTED POPULATION			
People/sq. mi.	19.0	917.3	5856.5
People/sq. km.	7.3	354.2	2261.2

DISTANCE				TOTALS
Miles	1493.9	188.0	33.2	1715.0
Kilometers	2404.1	302.5	53.4	2760.0
Percentages	87.1	11.0	1.9	

BASIS (people/sq mi.) <139 139-3326 >3326

Population within 800 meter Buffer Zone by State:  
AZ 36032 CA 15564 NV 265 NM 83907 OK 83598 TX 126522

Total Population within 800 meter Buffer Zone: 345888

BASIS: 2000 Census data

NEVADA COUNTIES POPULATION DENSITY within 800 meter Buffer Zone:  
FROM: COMANCHE PEAK NP TX  
TO : YUCCA MOUNTAIN NV

NV		>0.0	22.7	59.7	139	326	821	1861	3326	5815	
CTY	MILES	0	-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	>9996
23	75.5	65.49	3.38	5.63	1.04	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS											
75.5	749.27	401.51	316.56	102.09	71.38	48.01	39.59	29.00	22.69	7.99	2.49
PERCENTAGES											
	41.85	22.42	17.68	5.70	3.99	2.68	2.21	1.62	1.27	0.45	0.14

Population within 800 meter Buffer Zone by NV County:

23-	265	48-	142									
50-	97	51-	78	52-	15	53-	10	54-	5	55-	5	56-
58-	0	59-	0	72-	191	74-	71	75-	28	76-	5	77-
79-	2	80-	2	81-	1	82-	0	384-	65	386-	3	387-
420-	132	422-	101	423-	67	424-	23	425-	17	426-	11	427-
429-	5	430-	3	431-	1	480-	60	482-	61	483-	75	484-
486-	12	487-	11	488-	8	489-	5	490-	2	491-	0	

Total Population within 800 meter Buffer Zone: 1654

Legend for Nevada County Numbers:

1 - Churchill, 3 - Clark, 5 - Douglas, 7 - Elko  
9 - Esmeralda, 11 - Eureka, 13 - Humboldt, 15 - Lander  
17 - Lincoln, 19 - Lyon, 21 - Mineral, 23 - Nye  
27 - Pershing, 29 - Storey, 31 - Washoe, 33 - White Pine  
510 - Carson City

### Spent Fuel Route – CPNPP Units 3 & 4 to Yucca Mountain – Route D

TRAGIS Routing Engine Version 1.5.4 -- Highway Data Network 4.0

FROM: COMANCHE PEAK NP TX Leaving : 04/08/08 09:48  
TO : YUCCA MOUNTAIN NV Arriving : 04/09/08 18:20

Routing parameters used to calculate the route-



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 15 of 22

Routing type: HRCQ NEVADA Preferred Route ND with 2 driver(s)  
Preferred roads Time bias: 1.00 Mile bias: 0.00, Toll bias: 1.00  
Nonpreferred roads Time bias: 0.00 Mile bias: 1.00, Toll bias: 1.00, Penalty factor: 30.0

Constraints used on route:

Prohibit use of links prohibiting truck use  
Prohibit use of ferry crossing  
Prohibit low height clearance  
Prohibit narrow width clearance  
Prohibit use of roads with hazardous materials prohibition  
Prohibit use of roads with Radioactive materials prohibition  
Las Vegas Beltway is considered a preferred route

Miles	Hwy Sign	City	Dir	Junction	State	Dist	Time	Date	Hour
0.0		COMANCHE PEAK	NP		TX	0.0	0:00	04/08/08	09:48
1.0	LOCAL	HILL CITY	SE	F201LOCL	TX	1.0	0:01	04/08/08	09:49
5.4	F201	GLEN ROSE		U67 F201	TX	6.4	0:10	04/08/08	09:58
34.2	U67	ALVARADO	NW	I35WX26	TX	40.6	0:51	04/08/08	10:39
19.0	I35W	FT WORTH	S	I20 I35W	TX	59.6	1:08	04/08/08	10:56
9.2	I20	BENBROOK	N	I20 I820	TX	68.8	1:19	04/08/08	11:07
16.7	I820	FT WORTH	N	I35WI820	TX	85.5	1:37	04/08/08	11:25
28.0	I35W	DENTON	S	I35EI35W	TX	113.5	2:02	04/08/08	11:50
30.6	I35	GAINESVILLE	NW	I35 X498	TX	144.1	2:30	04/08/08	12:18
6.2	I35	crossing state border OK/TX			BD	150.4	3:05	04/08/08	12:53
		State Inspection took 30 minutes							
		Rest 30 minutes							
122.6	I35	OKLAHOMA CITY	S	I240I35	OK	273.0	5:21	04/08/08	15:09
4.5	I240	OKLAHOMA CITY	SW	I240I44	OK	277.5	5:26	04/08/08	15:14
4.9	I44	OKLAHOMA CITY	W	I40 I44	OK	282.4	5:31	04/08/08	15:19
125.3	I40	SAYRE	S	I40 X20	OK	407.7	7:20	04/08/08	17:08
20.7	I40	crossing state border OK/TX			BD	428.4	8:08	04/08/08	17:56
		State Inspection took 30 minutes							
		Rest 30 minutes							
139.6	I40	VEGA	S	I40 X36	TX	568.0	10:45	04/08/08	20:33
36.2	I40	crossing state border NM/TX			BD	604.2	11:47	04/08/08	21:35
		State Inspection took 30 minutes							
		Rest 30 minutes							
		Rest 30 minutes							
369.5	I40	IRB			NM	973.7	17:46	04/09/08	02:34
1.6	I40	crossing state border AZ/NM			BD	975.2	18:17	04/09/08	03:05
		State Inspection took 30 minutes							
		Rest 30 minutes							
356.6	I40	TOPOCK		I40 X1	AZ	1331.9	23:32	04/09/08	07:20
0.5	I40	crossing state border AZ/CA			BD	1332.4	24:03	04/09/08	07:51
		State Inspection took 30 minutes							
		Rest 30 minutes							
153.8	I40	BARSTOW		I15 I40	CA	1486.3	27:20	04/09/08	11:08
		Rest 30 minutes							
101.7	I15	NIPTON	W	I15 X286	CA	1588.0	29:11	04/09/08	12:59
9.7	I15	crossing state border CA/NV			BD	1597.6	30:22	04/09/08	14:10
		State Inspection took 30 minutes							
		Rest 30 minutes							
33.8	I15	ARDEN		I15 X33	NV	1631.4	30:53	04/09/08	14:41
79.8	S160	MERCURY	SW	U95 S160	NV	1711.3	32:38	04/09/08	16:26
9.5	U95	MERCURY	S	U95 LOCL	NV	1720.7	32:48	04/09/08	16:36
		Rest 30 minutes							
33.1	LOCAL	YUCCA MOUNTAIN			NV	1753.8	34:32	04/09/08	18:20

Total elapsed time: 34:32 Total trip mileage: 1753.8 Impedance: 2818.5

Mileage by State :

AZ: 357.2 CA: 265.2 NM: 371.0 NV: 156.1 OK: 278.1 TX: 326.1

Mileage by Sign Type:

1-INTERSTATE: 1590.8 2-US: 43.7 3-STATE: 79.8 6-LOCAL: 34.0  
7-OTHER: 5.4



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 16 of 22

**Mileage by Lane Type:**

1-Multi-Lane Controlled Access: 1590.8	3-Multi-Lane Divided Highway: 55.4
5-Principle Road: 34.2	6-Through Road: 33.9
7-Other: 39.4	

**Mileage by Tribal Lands:**

Total Outside Tribal Lands	: 1670.7
Total Inside Tribal Lands	: 83.1

Acoma Pueblo : 6.9	Cheyenne-Arapahoe Trust Land : 2.0
Laguna Pueblo : 35.5	Navajo Nation Reservation : 29.3
Navajo Nation Trust Land : 9.4	

**Mileage by Nevada Counties:**

Clark: 79.7	Nye: 76.4
-------------	-----------

TRAGIS Routing Engine Version 1.5.4      --      2000 Census Data

**POPULATION DENSITY within 800 meter Buffer Zone:**

FROM: COMANCHE PEAK NP TX  
TO : YUCCA MOUNTAIN NV

ST	MILES	0	>0.0	22.7	59.7	139	326	821	1861	3326	5815	
		-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	>9996	
AZ	357.2	141.91	96.83	77.58	15.03	9.88	4.67	4.62	4.40	1.53	0.45	0.26
CA	265.2	165.55	53.85	28.63	4.31	4.40	3.09	2.42	1.66	0.99	0.33	0.00
NV	156.1	86.75	19.76	24.03	10.03	7.63	3.88	2.30	1.10	0.40	0.19	0.07
NM	371.0	131.99	101.10	66.86	23.01	16.93	10.89	7.04	4.61	5.23	2.52	0.85
OK	278.1	60.11	61.24	74.75	26.43	16.28	11.71	11.19	8.32	5.31	2.39	0.36
TX	326.1	93.47	64.75	57.93	30.91	24.22	17.62	14.30	10.01	9.63	2.30	1.02

**TOTALS**

1753.8	679.78	397.53	329.78	109.72	79.34	51.86	41.87	30.10	23.09	8.18	2.56
--------	--------	--------	--------	--------	-------	-------	-------	-------	-------	------	------

**PERCENTAGES**

38.76	22.67	18.80	6.26	4.52	2.96	2.39	1.72	1.32	0.47	0.15
-------	-------	-------	------	------	------	------	------	------	------	------

BASIS: 2000 Census data

RADTRAN Input Data	RURAL	SUBURBAN	URBAN
WEIGHTED POPULATION			
People/sq. mi.	19.8	897.8	5863.4
People/sq. km.	7.6	346.6	2263.9

**DISTANCE**

Miles	1516.8	203.2	33.8	TOTALS
Kilometers	2441.0	327.0	54.4	1753.8
Percentages	86.5	11.6	1.9	2822.4

BASIS (people/sq mi.)      <139      139-3326      >3326

**Population within 800 meter Buffer Zone by State:**

AZ 36032 CA 15433 NV 13477 NM 83907 OK 83598 TX 126522

Total Population within 800 meter Buffer Zone: 358969

BASIS: 2000 Census data

**NEVADA COUNTIES POPULATION DENSITY within 800 meter Buffer Zone:**

FROM: COMANCHE PEAK NP TX  
TO : YUCCA MOUNTAIN NV

NV	CTY	MILES	0	>0.0	22.7	59.7	139	326	821	1861	3326	5815	
			-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	>9996	
3		79.7	27.90	14.21	21.37	7.59	4.59	1.65	1.20	0.67	0.40	0.13	0.07



**ENERCON SERVICES, INC.**

# Transportation Routing

## APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

**PAGE NO.** 17 of 22

23	76.4	58.85	5.55	2.66	2.44	3.04	2.23	1.10	0.43	0.00	0.06	0.00
----	------	-------	------	------	------	------	------	------	------	------	------	------

## TOTALS

156.1 766.53 417.29 353.81 119.75 86.97 55.74 44.17 31.20 23.49 8.37 2.63

## PERCENTAGES

40.13   21.85   18.52   6.27   4.55   2.92   2.31   1.63   1.23   0.44   0.14

Population within 800 meter Buffer Zone by NV County:

[illegible]

Total Population within 800 meter Buffer Zone: 14905

Legend for Nevada County Numbers:

1 - Churchill, 3 - Clark, 5 - Douglas, 7 - Elko  
9 - Esmeralda, 11 - Eureka, 13 - Humboldt, 15 - Lander  
17 - Lincoln, 19 - Lyon, 21 - Mineral, 23 - Nye  
27 - Pershing, 29 - Storey, 31 - Washoe, 33 - White Pine  
510 - Carson City

**Spent Fuel Route – CPNPP Units 3 & 4 to Yucca Mountain – Route E**

TRAGIS Routing Engine Version 1.5.4

-- Highway Data Network 4.0

FROM: COMANCHE PEAK NP  
TO : YUCCA MOUNTAIN

TX  
NV

Leaving : 04/08/08 09:48

Arriving : 04/09/08 16:57

Routing parameters used to calculate the route-

Routing type: HRCQ NEVADA Preferred Route NE with 2 driver(s)

Preferred roads Time bias: 1.00 Mile bias: 0.00, Toll bias: 1.00

Nonpreferred roads Time bias: 0.00 Mile bias: 1.00, Toll bias: 1.00, Penalty factor: 30.0

Constraints used on route:

Prohibit use of links prohibiting truck use

Prohibit use of ferry crossing

Prohibit low height clearance

Prohibit narrow width clearance

Prohibit use of roads with hazardous materials prohibition

Prohibit use of roads with Radioactive materials prohibition

Las Vegas Beltway is considered a preferred route

Miles	Hwy Sign	City	Dir	Junction	State	Dist	Time	Date	Hour	
0.0		COMANCHE PEAK	NP		TX	0.0	0:00	04/08/08	09:48	
1.0	LOCAL	HILL CITY	SE	F201LOCL	TX	1.0	0:01	04/08/08	09:49	
5.4	F201	GLEN ROSE		U67 F201	TX	6.4	0:10	04/08/08	09:58	
34.2	U67	ALVARADO	NW	I35WX26	TX	40.6	0:51	04/08/08	10:39	
19.0	I35W	FT WORTH	S	I20 I35W	TX	59.6	1:08	04/08/08	10:56	
9.2	I20	BENBROOK	N	I20 I820	TX	68.8	1:19	04/08/08	11:07	
16.7	I820	FT WORTH	N	I35WI820	TX	85.5	1:37	04/08/08	11:25	
28.0	I35W	DENTON	S	I35EI35W	TX	113.5	2:02	04/08/08	11:50	
30.6	I35	GAINESVILLE	NW	I35 X498	TX	144.1	2:30	04/08/08	12:18	
6.2	I35	crossing state border OK/TX				BD	150.4	3:05	04/08/08	12:53
		State Inspection took 30 minutes								
		Rest 30 minutes								
122.6	I35	OKLAHOMA CITY	S	I240I35	OK	273.0	5:21	04/08/08	15:09	



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

**CALC. NO.**

TXUT-001-ER-3.8-CALC-009

**REV. 0**

**PAGE NO. 18 of 22**

4.5	I240	OKLAHOMA CITY	SW	I240I44	OK	277.5	5:26	04/08/08	15:14
4.9	I44	OKLAHOMA CITY	W	I40 I44	OK	282.4	5:31	04/08/08	15:19
125.3	I40	SAYRE	S	I40 X20	OK	407.7	7:20	04/08/08	17:08
20.7	I40	crossing state border OK/TX				BD	428.4	8:08	04/08/08 17:56
State Inspection took 30 minutes									
Rest 30 minutes									
139.6	I40	VEGA	S	I40 X36	TX	568.0	10:45	04/08/08	20:33
36.2	I40	crossing state border NM/TX				BD	604.2	11:47	04/08/08 21:35
State Inspection took 30 minutes									
Rest 30 minutes									
Rest 30 minutes									
369.5	I40	IRB			NM	973.7	17:46	04/09/08	02:34
1.6	I40	crossing state border AZ/NM				BD	975.2	18:17	04/09/08 03:05
State Inspection took 30 minutes									
Rest 30 minutes									
356.6	I40	TOPOCK		I40 X1	AZ	1331.9	23:32	04/09/08	07:20
0.5	I40	crossing state border AZ/CA				BD	1332.4	24:03	04/09/08 07:51
State Inspection took 30 minutes									
21.9	I40	NEEDLES	NW	I40 X133	CA	1354.3	24:26	04/09/08	08:14
23.1	U95	crossing state border CA/NV				BD	1377.4	25:24	04/09/08 09:12
Rest 30 minutes									
State Inspection took 30 minutes									
20.6	U95	SEARCHLIGHT		U95 S164	NV	1398.0	26:15	04/09/08	10:03
18.6	S164	crossing state border CA/NV				BD	1416.5	27:13	04/09/08 11:01
State Inspection took 30 minutes									
13.1	S164	NIPTON	W	I15 X286	CA	1429.6	27:32	04/09/08	11:20
39.7	I15	BAKER		I15 X246	CA	1469.3	28:16	04/09/08	12:04
56.7	S127	SHOSHONE		S127S178	CA	1526.0	29:24	04/09/08	13:12
34.5	S127	crossing state border CA/NV				BD	1560.5	30:35	04/09/08 14:23
Rest 30 minutes									
State Inspection took 30 minutes									
34.5	S127	crossing state border CA/NV				BD	1560.5	30:35	04/09/08 14:23
16.5	S373	AMARGOSA VALLY		U95 S373	NV	1577.0	31:25	04/09/08	15:13
26.0	U95	MERCURY	S	U95 LOCL	NV	1603.0	31:54	04/09/08	15:42
33.1	LOCAL	YUCCA MOUNTAIN			NV	1636.0	33:09	04/09/08	16:57

Total elapsed time: 33:09      Total trip mileage: 1636.0      Impedance: 2705.0

**Mileage by State :**

AZ: 357.2    CA: 189.0    NM: 371.0    NV: 114.7    OK: 278.1    TX: 326.1

**Mileage by Sign Type:**

1-INTERSTATE: 1353.4      2-US: 103.8      3-STATE: 139.3      6-LOCAL: 34.0  
7-OTHER: 5.4

**Mileage by Lane Type:**

1-Multi-Lane Controlled Access:	1353.4	3-Multi-Lane Divided Highway:	9.5
5-Principle Road:	94.4	6-Through Road:	139.3
7-Other:	39.4		

**Mileage by Tribal Lands:**

Total Outside Tribal Lands	: 1552.9
Total Inside Tribal Lands	: 83.1

Acoma Pueblo	: 6.9	Cheyenne-Arapahoe Trust Land	: 2.0
Laguna Pueblo	: 35.5	Navajo Nation Reservation	: 29.3
Navajo Nation Trust Land	: 9.4		

**Mileage by Nevada Counties:**

Clark: 39.1      Nye: 75.5

TRAGIS Routing Engine Version 1.5.4      --      2000 Census Data

**POPULATION DENSITY within 800 meter Buffer Zone:**

FROM: COMANCHE PEAK NP	TX
TO : YUCCA MOUNTAIN	NV

**ENERCON SERVICES, INC.**

# Transportation Routing

## APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

**PAGE NO.** 19 of 22

ST	MILES	MILES										
		0	>0.0 -22.7	22.7 -59.7	59.7 -139	139 -326	326 -821	821 -1861	1861 -3326	3326 -5815	5815 -9996	>9996
AZ	357.2	141.91	96.83	77.58	15.03	9.88	4.67	4.62	4.40	1.53	0.45	0.26
CA	189.0	127.47	41.49	12.77	1.67	2.22	1.74	1.04	0.34	0.20	0.00	0.00
NV	114.7	85.56	14.76	11.59	1.71	0.59	0.30	0.15	0.00	0.00	0.00	0.00
NM	371.0	131.99	101.10	66.86	23.01	16.93	10.89	7.04	4.61	5.23	2.52	0.85
OK	278.1	60.11	61.24	74.75	26.43	16.28	11.71	11.19	8.32	5.31	2.39	0.36
TX	326.1	93.47	64.75	57.93	30.91	24.22	17.62	14.30	10.01	9.63	2.30	1.02

TOTALS

1636.0	640.51	380.17	301.48	98.76	70.12	46.93	38.34	27.68	21.90	7.66	2.49
--------	--------	--------	--------	-------	-------	-------	-------	-------	-------	------	------

### PERCENTAGES

39.15   23.24   18.43   6.04   4.29   2.87   2.34   1.69   1.34   0.47   0.15

BASIS: 2000 Census data

RADTRAN Input Data	RURAL	SUBURBAN	URBAN
--------------------	-------	----------	-------

WEIGHTED POPULATION

People/sq. mi.	19.4	909.0	5867.1
----------------	------	-------	--------

People/sq. km.	7.5	351.0	2265.3
----------------	-----	-------	--------

## DISTANCE

Miles	1420.9	183.1	32.0	1636.0
-------	--------	-------	------	--------

Kilometers	2286.7	294.6	51.6	2632.8
------------	--------	-------	------	--------

Percentages	86.9	11.2	2.0
-------------	------	------	-----

BASIS (people/sq mi.)	<139	139-3326	>3326
-----------------------	------	----------	-------

Population within 800 meter Buffer Zone by State:

AZ 36032 CA 4681 NV 869 NM 83907 OK 83598 TX 126522

Total Population within 800 meter Buffer Zone: 335609

BASIS: 2000 Census data

NEVADA COUNTIES POPULATION DENSITY within 800 meter Buffer Zone:

FROM: COMANCHE PEAK NP

TX

TO : YUCCA MOUNTAIN

NV

NV			>0.0	22.7	59.7	139	326	821	1861	3326	5815	
CTY	MILES	0	-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	>9996
3	39.1	20.07	11.38	5.96	0.67	0.59	0.30	0.15	0.00	0.00	0.00	0.00
23	75.5	65.49	3.38	5.63	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00

## TOTALS

114.7	726.07	394.93	313.07	100.47	70.71	47.23	38.49	27.68	21.90	7.66	2.49
-------	--------	--------	--------	--------	-------	-------	-------	-------	-------	------	------

## PERCENTAGES

41.47 22.56 17.88 5.74 4.04 2.70 2.20 1.58 1.25 0.44 0.14

Population within 800 meter Buffer Zone by NV County:

[illegible]

Total Population within 800 meter Buffer Zone: 2179

Legend for Nevada County Numbers:

1 - Churchill, 3 - Clark, 5 - Douglas, 7 - Elko  
9 - Esmeralda, 11 - Eureka, 13 - Humboldt, 15 - Lander  
17 - Lincoln, 19 - Lyon, 21 - Mineral, 23 - Nye



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 20 of 22

27 - Pershing, 29 - Storey, 31 - Washoe, 33 - White Pine  
510 - Carson City

### Spent Fuel Route - CPNPP Units 3 & 4 to Yucca Mountain - Route F

TRAGIS Routing Engine Version 1.5.4 -- Highway Data Network 4.0

FROM: COMANCHE PEAK NP TX Leaving : 04/08/08 09:48  
TO : YUCCA MOUNTAIN NV Arriving : 04/09/08 16:11

Routing parameters used to calculate the route-

Routing type: HRCQ NEVADA Preferred Route NF with 2 driver(s)  
Preferred roads Time bias: 1.00 Mile bias: 0.00, Toll bias: 1.00  
Nonpreferred roads Time bias: 0.00 Mile bias: 1.00, Toll bias: 1.00, Penalty factor: 30.0

Constraints used on route:

Prohibit use of links prohibiting truck use  
Prohibit use of ferry crossing  
Prohibit low height clearance  
Prohibit narrow width clearance  
Prohibit use of roads with hazardous materials prohibition  
Prohibit use of roads with Radioactive materials prohibition  
Las Vegas Beltway is considered a preferred route

Miles	Hwy Sign	City	Dir	Junction	State	Dist	Time	Date	Hour
0.0		COMANCHE PEAK	NP		TX	0.0	0:00	04/08/08	09:48
1.0	LOCAL	HILL CITY	SE	F201LOCL	TX	1.0	0:01	04/08/08	09:49
5.4	F201	GLEN ROSE		U67 F201	TX	6.4	0:10	04/08/08	09:58
34.2	U67	ALVARADO	NW	I35WX26	TX	40.6	0:51	04/08/08	10:39
19.0	I35W	FT WORTH	S	I20 I35W	TX	59.6	1:08	04/08/08	10:56
9.2	I20	BENBROOK	N	I20 I820	TX	68.8	1:19	04/08/08	11:07
16.7	I820	FT WORTH	N	I35WI820	TX	85.5	1:37	04/08/08	11:25
28.0	I35W	DENTON	S	I35EI35W	TX	113.5	2:02	04/08/08	11:50
30.6	I35	GAINESVILLE	NW	I35 X498	TX	144.1	2:30	04/08/08	12:18
6.2	I35	crossing state border OK/TX			BD	150.4	3:05	04/08/08	12:53
		State Inspection took 30 minutes							
		Rest 30 minutes							
122.6	I35	OKLAHOMA CITY	S	I240I35	OK	273.0	5:21	04/08/08	15:09
4.5	I240	OKLAHOMA CITY	SW	I240I44	OK	277.5	5:26	04/08/08	15:14
4.9	I44	OKLAHOMA CITY	W	I40 I44	OK	282.4	5:31	04/08/08	15:19
125.3	I40	SAYRE	S	I40 X20	OK	407.7	7:20	04/08/08	17:08
20.7	I40	crossing state border OK/TX			BD	428.4	8:08	04/08/08	17:56
		State Inspection took 30 minutes							
		Rest 30 minutes							
139.6	I40	VEGA	S	I40 X36	TX	568.0	10:45	04/08/08	20:33
36.2	I40	crossing state border NM/TX			BD	604.2	11:47	04/08/08	21:35
		State Inspection took 30 minutes							
		Rest 30 minutes							
		Rest 30 minutes							
369.5	I40	IRB			NM	973.7	17:46	04/09/08	02:34
1.6	I40	crossing state border AZ/NM			BD	975.2	18:17	04/09/08	03:05
		State Inspection took 30 minutes							
		Rest 30 minutes							
356.6	I40	TOPOCK		I40 X1	AZ	1331.9	23:32	04/09/08	07:20
0.5	I40	crossing state border AZ/CA			BD	1332.4	24:03	04/09/08	07:51
		State Inspection took 30 minutes							
21.9	I40	NEEDLES	NW	I40 X133	CA	1354.3	24:26	04/09/08	08:14
23.1	U95	crossing state border CA/NV			BD	1377.4	25:24	04/09/08	09:12
		Rest 30 minutes							
		State Inspection took 30 minutes							
20.6	U95	SEARCHLIGHT		U95 S164	NV	1398.0	26:15	04/09/08	10:03



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 21 of 22

18.6	S164	crossing state border CA/NV	BD	1416.5	27:13	04/09/08	11:01
		State Inspection took 30 minutes					
13.1	S164	NIPTON W I15 X286	CA	1429.6	27:32	04/09/08	11:20
9.7	I15	crossing state border CA/NV	BD	1439.2	28:13	04/09/08	12:01
		State Inspection took 30 minutes					
33.8	I15	ARDEN I15 X33	NV	1473.0	28:44	04/09/08	12:32
		Rest 30 minutes					
79.8	S160	MERCURY SW U95 S160	NV	1552.9	30:59	04/09/08	14:47
9.5	U95	MERCURY S U95 LOCL	NV	1562.3	31:09	04/09/08	14:57
33.1	LOCAL	YUCCA MOUNTAIN	NV	1595.4	32:23	04/09/08	16:11

Total elapsed time: 32:23      Total trip mileage: 1595.4      Impedance: 2659.5

### Mileage by State :

AZ: 357.2    CA: 67.7    NM: 371.0    NV: 195.3    OK: 278.1    TX: 326.1

### Mileage by Sign Type:

1-INTERSTATE: 1357.2      2-US: 87.3      3-STATE: 111.5      6-LOCAL: 34.0  
7-OTHER: 5.4

### Mileage by Lane Type:

1-Multi-Lane Controlled Access:	1357.2	3-Multi-Lane Divided Highway:	55.4
5-Principle Road:	77.9	6-Through Road:	65.5
7-Other:	39.4		

### Mileage by Tribal Lands:

Total Outside Tribal Lands : 1512.3  
Total Inside Tribal Lands : 83.1

Acoma Pueblo	: 6.9	Cheyenne-Arapahoe Trust Land	: 2.0
Laguna Pueblo	: 35.5	Navajo Nation Reservation	: 29.3
Navajo Nation Trust Land	: 9.4		

### Mileage by Nevada Counties:

Clark: 118.9      Nye: 76.4

TRAGIS Routing Engine Version 1.5.4      --      2000 Census Data

### POPULATION DENSITY within 800 meter Buffer Zone:

FROM: COMANCHE PEAK NP      TX  
TO : YUCCA MOUNTAIN      NV

ST	MILES	0	>0.0	22.7	59.7	139	326	821	1861	3326	5815	
			-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	>9996
AZ	357.2	141.91	96.83	77.58	15.03	9.88	4.67	4.62	4.40	1.53	0.45	0.26
CA	67.7	48.35	9.11	4.62	1.35	1.71	1.29	0.74	0.34	0.20	0.00	0.00
NV	195.3	106.82	31.14	29.99	10.70	8.22	4.18	2.45	1.10	0.40	0.19	0.07
NM	371.0	131.99	101.10	66.86	23.01	16.93	10.89	7.04	4.61	5.23	2.52	0.85
OK	278.1	60.11	61.24	74.75	26.43	16.28	11.71	11.19	8.32	5.31	2.39	0.36
TX	326.1	93.47	64.75	57.93	30.91	24.22	17.62	14.30	10.01	9.63	2.30	1.02

### TOTALS

1595.4    582.65    364.17    311.73    107.43    77.24    50.36    40.34    28.78    22.30    7.85    2.56

### PERCENTAGES

36.52    22.83    19.54    6.73    4.84    3.16    2.53    1.80    1.40    0.49    0.16

BASIS: 2000 Census data

RADTRAN Input Data	RURAL	SUBURBAN	URBAN
WEIGHTED POPULATION			
People/sq. mi.	20.9	892.5	5874.1
People/sq. km.	8.1	344.6	2268.0

DISTANCE

TOTALS



ENERCON SERVICES, INC.

## Transportation Routing APPENDIX A

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 22 of 22

Miles	1366.0	196.7	32.7	1595.4
Kilometers	2198.3	316.6	52.6	2567.5
Percentages	85.6	12.3	2.1	

BASIS (people/sq mi.) <139 139-3326 >3326

Population within 800 meter Buffer Zone by State:  
AZ 36032 CA 3608 NV 14081 NM 83907 OK 83598 TX 126522

Total Population within 800 meter Buffer Zone: 347748

BASIS: 2000 Census data

NEVADA COUNTIES POPULATION DENSITY within 800 meter Buffer Zone:  
FROM: COMANCHE PEAK NP TX  
TO : YUCCA MOUNTAIN NV

NV			>0.0	22.7	59.7	139	326	821	1861	3326	5815	
CTY	MILES	0	-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	>9996
3	118.9	47.97	25.59	27.33	8.26	5.18	1.95	1.35	0.67	0.40	0.13	0.07
23	76.4	58.85	5.55	2.66	2.44	3.04	2.23	1.10	0.43	0.00	0.06	0.00

### TOTALS

195.3	689.47	395.31	341.72	118.13	85.46	54.54	42.79	29.88	22.70	8.04	2.63
PERCENTAGES	38.50	22.08	19.08	6.60	4.77	3.05	2.39	1.67	1.27	0.45	0.15


Population within 800 meter Buffer Zone by NV County:

3-	10148	23-	3933													
48-	142	50-	97	51-	78	52-	15	53-	10	54-	5	55-	5	56-	4	
57-	2	58-	0	59-	0	72-	48	74-	9	75-	5	76-	1	77-	2	
78-	1	79-	1	80-	0	81-	0	384-	107	386-	31	387-	30	388-	11	
389-	8	390-	4	391-	2	392-	1	393-	0	394-	0	395-	0	420-	132	
422-	101	423-	67	424-	23	425-	17	426-	11	427-	7	428-	5	429-	5	
430-	3	431-	1	480-	60	482-	61	483-	75	484-	26	485-	16	486-	12	
487-	11	488-	8	489-	5	490-	2	491-	0							

Total Population within 800 meter Buffer Zone: 15350

Legend for Nevada County Numbers:

1 - Churchill,	3 - Clark,	5 - Douglas,	7 - Elko
9 - Esmeralda,	11 - Eureka,	13 - Humboldt,	15 - Lander
17 - Lincoln,	19 - Lyon,	21 - Mineral,	23 - Nye
27 - Pershing,	29 - Storey,	31 - Washoe,	33 - White Pine
510 - Carson City			

 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing APPENDIX B</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV. 0</b>
		<b>PAGE NO. 1 of 3</b>

## Appendix B – RADTRAN Input Files

### New Fuel Route – Port at San Diego, CA to CPNPP Units 3 & 4

```

[TRAGIS]
TRAGIS Version=1.5.4
Mode=H
Network Version=4.0
Census Data=2000
Buffer Zone=800
[ROUTEINFO]
From CITY=PORT OF SAN DIEGO   I5   X10
From STATE=CA
From SUBNET=
To CITY=COMANCHE PEAK   NP
To STATE=TX
To SUBNET=
[AZ]
Rural - KM= 503.2
Suburban - KM= 81.7
Urban - KM= 10.0
Total - KM= 595.0
Rural Pop Density= 9.2
Suburban Pop Density= 324.1
Urban Pop Density=2341.5
[CA]
Rural - KM= 201.1
Suburban - KM= 46.3
Urban - KM= 26.9
Total - KM= 274.3
Rural Pop Density= 8.8
Suburban Pop Density= 351.5
Urban Pop Density=2848.0
[NM]
Rural - KM= 230.7
Suburban - KM= 29.8
Urban - KM= 3.3
Total - KM= 263.8
Rural Pop Density= 8.9
Suburban Pop Density= 309.1
Urban Pop Density=2080.3
[TX]
Rural - KM= 819.5
Suburban - KM= 151.0
Urban - KM= 20.0
Total - KM= 990.5
Rural Pop Density= 8.1
Suburban Pop Density= 339.3
Urban Pop Density=2395.5
[Total]
Rural - KM=1754.5
Suburban - KM= 308.8
Urban - KM= 60.3
Total - KM=2123.6
Rural Pop Density= 8.6
Suburban Pop Density= 334.2
Urban Pop Density=2571.7

```



ENERCON SERVICES, INC.

Transportation Routing  
APPENDIX B

CALC. NO.

TXUT-001-ER-3.8-CALC-009


REV. 0

PAGE NO. 2 of 3


Spent Fuel Route – CPNPP Units 3 & 4 to Yucca Mountain – Route F

[TRAGIS]  
TRAGIS Version=1.5.4  
Mode=H  
Network Version=4.0  
Census Data=2000  
Buffer Zone=800  
[ROUTEINFO]  
From CITY=COMANCHE PEAK NP  
From STATE=TX  
From SUBNET=  
To CITY=YUCCA MOUNTAIN  
To STATE=NV  
To SUBNET=  
[AZ]  
Rural - KM= 533.2  
Suburban - KM= 37.9  
Urban - KM= 3.6  
Total - KM= 574.8  
Rural Pop Density= 7.0  
Suburban Pop Density= 369.9  
Urban Pop Density=2311.5  
[CA]  
Rural - KM= 102.1  
Suburban - KM= 6.6  
Urban - KM= 0.3  
Total - KM= 109.0  
Rural Pop Density= 2.7  
Suburban Pop Density= 285.0  
Urban Pop Density=1764.7  
[NV]  
Rural - KM= 287.5  
Suburban - KM= 25.7  
Urban - KM= 1.1  
Total - KM= 314.2  
Rural Pop Density= 5.9  
Suburban Pop Density= 252.9  
Urban Pop Density=2398.6  
[NM]  
Rural - KM= 519.7  
Suburban - KM= 63.5  
Urban - KM= 13.8  
Total - KM= 597.1  
Rural Pop Density= 7.7  
Suburban Pop Density= 308.9  
Urban Pop Density=2387.3  
[OK]  
Rural - KM= 358.1  
Suburban - KM= 76.4  
Urban - KM= 13.0  
Total - KM= 447.5  
Rural Pop Density= 11.4  
Suburban Pop Density= 382.7  
Urban Pop Density=2257.4  
[TX]  
Rural - KM= 397.6  
Suburban - KM= 106.5  
Urban - KM= 20.8  
Total - KM= 524.9  
Rural Pop Density= 9.9  
Suburban Pop Density= 355.3  
Urban Pop Density=2188.9  
[Total]  
Rural - KM=2198.3  
Suburban - KM= 316.6



 <b>ENERCON SERVICES, INC.</b>	<b>Transportation Routing</b> <b>APPENDIX B</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV. 0</b>
		<b>PAGE NO. 3 of 3</b>

Urban - KM= 52.6  
Total - KM=2567.5  
Rural Pop Density= 8.1  
Suburban Pop Density= 344.6  
Urban Pop Density=2268.0

 <b>ENERCON SERVICES, INC.</b>	<b>TRANSPORTATION ROUTING APPENDIX C</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV.</b> 0
		<b>PAGE NO.</b> 1 of 10

### Appendix C – Code Verification

The following email from Paul Johnson of the Oak Ridge National Laboratory to Marvin Morris of Enercon Services, Inc., dated 03/24/08, and it Appendix, contain sample cases for verification of installation and operation of the TRAGIS software.

#### Audrey Thompson

---

**From:** Johnson, Paul E. [johnsonpe@ornl.gov]  
**Sent:** Monday, March 24, 2008 10:08 AM  
**To:** Marvin Morris  
**Cc:** Audrey Thompson; Joanne Morris  
**Subject:** RE: TRAGIS: Request for access  
**Attachments:** V&V Runs for TRAGIS.doc


Marvin,

The attached document has a number of TRAGIS runs that I have provided to other people with a similar request as yours. Let me know if you have further questions.

Thanks,  
Paul

**Paul E. Johnson**     [JohnsonPE@ornl.gov](mailto:JohnsonPE@ornl.gov)  
Oak Ridge National Laboratory  
P.O. Box 2008, MS 6472  
Oak Ridge, TN 37831-6472  
Phone: (865) 574-7450 (alternate 865-946-1269)  
Cell: (865) 766-9696  
Fax: (865) 574-3431 (alternate 865-946-1279)  
Actual location (for express mail deliveries)  
National Transportation Research Center  
2360 Cherahala Blvd., Room B20  
Knoxville, TN 37932-1563

-----  
ORNL is operated by UT-Battelle, LLC for the U.S. Department of Energy  
under Contract DE-AC05-00OR22725

 <b>ENERCON SERVICES, INC.</b>	<b>TRANSPORTATION ROUTING</b> <b>APPENDIX C</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV. 0</b>
		<b>PAGE NO. 2 of 10</b>

## Verification and Validation Runs for TRAGIS

### Highway Runs

The following calculations are for the TRAGIS Routing Engine Version 1.5.4 using Highway Data Network 4.0. For each of the tests, a map of the calculated route can be viewed on the **Route Maps** tab by clicking on the **Show Route** button.

#### 1. Testing basic route types (Commercial, Quickest, and Shortest)

From the **Select Origin/Destination** tab, click on **MI** as the origin state and then select **MARQUETTE** as the node name. Then click on **NE** as the destination state and select **GRAND ISLAND W U281U30** as the node name. Next select **Shortest** for the Route Type. Press the **Calculate Route** button.

The results of the Shortest route should have the following attributes:

- Total elapsed time of 19:33
- Total trip mileage of 831.1
- Impedance of 831.1

Verification of impedance is calculated based on the following formula

$$L = \text{Min} \sum_i (a D_i + b T_i)$$

where

$L$  = total impedance of a route  
 $D_i$  = distance of segment  $i$  in miles  
 $T_i$  = travel time of segment  $i$  in minutes  
 $a$  = distance bias factor  
 $b$  = time bias factor

Shortest route has  $a = 1.0$  and  $b = 0.0$

Quickest route has  $a = 0.0$  and  $b = 1.0$


Commercial route has  $a = 0.3$  and  $b = 0.7$

So for the Shortest route, the impedance should be and is equal to the distance of the route.

Next, return to the **Select Origin/Destination** tab, select the **Quickest** route type, and then Press the **Calculate Route** button.

The results of the Quickest route should have the following attributes:

- Total elapsed time of 16:54
- Total trip mileage of 921.2
- Impedance of 924.1

 <b>ENERCON SERVICES, INC.</b>	<b>TRANSPORTATION ROUTING</b>  <b>APPENDIX C</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV. 0</b>
		<b>PAGE NO. 3 of 10</b>

So for this Quickest route, the elapsed driving time is a total of 1,014 minutes (16 hours times 60 minutes in hour is 960 plus 54 minutes). But upon examination of the route listing, there are three 30 minute rest periods embedded in the route (the first occurs between Tomahawk and Merrill, Wisconsin, the second occurs between Eagan and Burnsville, Minnesota, and the third occurs between Des Moines and Council Bluffs, Iowa). So subtract 90 minutes from the elapsed time of 1,014 minutes to obtain the total driving time of 924 minutes. The additional tenth of a mile in the impedance is model rounds to the nearest minute when reporting time.

The results of the Commercial route should have the following attributes:

- Total elapsed time of 17:02 (driving time is  $17 \times 60 + 2 - 90$ , or 932)
- Total trip mileage of 893.6
- Impedance of 920.7

Verification the impedance can be performed by applying the specific route values to the formula as such:

Impedance = distance times 0.3 plus total driving time times 0.7

Impedance =  $(893.6 \times 0.3) + (932 \times 0.7)$

Impedance =  $268.08 + 652.4$

Impedance = 920.48 (The model lists this as 920.7. The manual calculation is slightly less due because the model lists mileage to the nearest tenth of a mile and time to the minute. Internal to the model, link distances and time are handled with additional accuracy.)

Actual impedance values for each link can be viewed by clicking on the **Detailed Listing** button on the **Route Listings** tab.

## 2. HRCQ route type test


From the **Select Origin/Destination** tab, click on **FL** as the origin state and then select **TURKEY POINT NP** as the node name. Then click on **WA** as the destination state and select **HANFORD** as the node name. Next select HRCQ for the Route Type. Press the **Calculate Route** button.

The results of the HRCQ route should have the following attributes:

- Total elapsed time of 57:03
- Total trip mileage of 3288.8
- Impedance of 4343.1

## 3. Blocked node test

Click on the **Block Nodes/Links** tab. Within the **Block Nodes** section of the window, scroll through the states and click on **TN** and then scroll through the list of node names and click on **MANCHESTER I24 X111**. Go back to the **Select Origin/Destination** tab

 ENERCON SERVICES, INC.	TRANSPORTATION ROUTING APPENDIX C	CALC. NO. TXUT-001-ER-3.8-CALC-009
		REV. 0
		PAGE NO. 4 of 10

and verify that Turkey Point NP, FL is the origin, Hanford, WA is the destination, and that the route type is HRCQ. Then click on the **Calculate Route** button.

The results of the blocked node HRCQ route should have the following attributes:

- Total elapsed time of 58:27
- Total trip mileage of 3393.3
- Impedance of 4427.6

#### 4. Blocked state test

Click on the **Block Nodes/Links** tab. Within the **Block Nodes** section of the window, click on the **Clear All** button below the **Blocked Node Numbers** area. Now scroll through the list of states in the **Block States** area and click on TN. Go back to the **Select Origin/Destination** tab and verify that Turkey Point NP, FL is the origin, Hanford, WA is the destination, and that the route type is HRCQ. Then click on the **Calculate Route** button.

The results of the blocked state HRCQ route should have the following attributes:

- Total elapsed time of 58:54
- Total trip mileage of 3471.1
- Impedance of 4454.5

#### Rail Runs

The following calculations are for the TRAGIS Routing Engine Version 1.5.4 using Railroad Data Network 3.2. For each of the tests, a map of the calculated route can be viewed on the **Route Maps** tab by clicking on the **Show Route** button.


##### 1. Rail route with impedance calculation

From the **Select Origin/Destination** tab, activate the **Railroad** button. Scroll through the Origin State list and click on TN and then scroll through the Node Name list and click on **EAST TN TECH PARK**. (Only one railroad company is available at this location, so no further action is needed.) Next scroll through the Destination State list and click on UT, then scroll through the Node Name list and click on **CLIVE**, and then click on UP in the RR Company list. Then click on the **Calculate Route** button.

The results of the route should have the following attributes:

- Route length of 1995.3 miles
- Transit time of 194:53
- Impedance of 2633.0

The impedance for rail routes is based on several factors. First, the distance of each link is multiplied by a factor based on the mainline classification code shown in the Mileage Summary by Railroad table in the route listing. A-Mainline (A-M) links are multiplied by

 <b>ENERCON SERVICES, INC.</b>	<b>TRANSPORTATION ROUTING APPENDIX C</b>	<b>CALC. NO.</b> TXUT-001-ER-3.8-CALC-009
		<b>REV.</b> 0
		<b>PAGE NO.</b> 5 of 10

a factor of 1.0, B-Mainline (B-M) links are multiplied by 1.2, A-Branchline (A-Br) links are multiplied by 1.9, and B-Branchline (B-Br) links are multiplied by 4.0. The originating railroad has all link impedances multiplied by the originating railroad factor of 0.8. Finally each transfer (for this particular route) has a value of 300 units. (These various factors can be viewed on the **Rail Routing Parameters** tab.)

The route originates on the <C3> sub-network (Other Class III railroads) and operates over 5.1 miles of B-Branchline. This calculates to an impedance value of 16.32 (5.1 miles times the B-Br factor of 4.0 times the 0.8 originating railroad factor).

The portion of the route over the Norfolk Southern Railway (NS) involves 650.7 miles of A-Mainline and 132.1 miles of B-Mainline for a total impedance value of 809.22 (650.7 times 1.0 plus 132.1 miles times the B-M factor of 1.2).

The portion of the route over the Union Pacific Railroad (UP) is entirely over 1207.4 miles of A-Mainline line, so the impedance value is 1207.4.

Two transfers of 300 units each provide an impedance value of 600.

Adding the values together (16.32 plus 809.22 plus 1207.4 plus 600) gives a computed impedance value of 2632.94. This is slightly lower than the value listed by the program due to rounding of values. (Actual impedance values for each link can be viewed by clicking on the **Detailed Listing** button on the **Route Listings** tab. The link on the <C3> portion of the route actually computes to a value of 16.46 because the link distance is about 5.143 miles. This demonstrates the issue of rounding a link mileage to the nearest tenth of a mile.)


## 2. Changing route impedance values

Click on the **Rail Routing Parameters** tab. Click on the check mark in the **Originating Railroad Factor** box to deactivate this parameter. Next, click on the check mark box to activate the **Rail Line Type Weighting** feature. Change the B-Main value to 3.0, the A-Branch value to 5.0, and the B-Branch value to 10.0. Also change the value of the Yard Point Delay in Hours from 22 to 0 in the **Transfer Delay Times** box. Click on the **Select Origin/Destination** tab and verify that the origin and destination matches the value selected in the previous test case. Finally, click on the **Calculate Route** button.

The results of the route should have the following attributes:

- Route length of 2219.1 miles
- Transit time of 88:29
- Impedance of 2865.4

The calculation of the impedance for this route is somewhat easier to describe. For the portion of the route on <C3>, the distance (5.1 miles) is only multiplied by then higher B-Branch factor of 10 for an impedance of 51 units. (The originating railroad factor was removed so it is not involved in the impedance calculation.) The remainder of the route is

 ENERCON SERVICES, INC.	TRANSPORTATION ROUTING APPENDIX C	CALC. NO. TXUT-001-ER-3.8-CALC-009
		REV. 0
		PAGE NO. 6 of 10

all on A-Mainline so the distance of 2214.0 miles is the impedance value (because the weighting factor for A-Mainline is 1.0). Two transfers still occur for a total of 600 impedance units. Adding these together gives a total value of 2865.0, 0.4 less than reported by the model (caused by a rounding issue). The removal of the yard point delay dropped the transit time considerably.

### 3. Changing a transfer penalty

Click on the **Rail Routing Parameters** tab. Scroll through the **Railroad A** list and click on NS. Then scroll through the **Railroad B** list and click on UP. Next, click on the **KANSAS CITY, MO** name in the list. Change both the **A-B Penalty** and **B-A Penalty** value to 900 and then click on the **Enter New Penalty** button. Click on the **Select Origin/Destination** tab and verify that the origin and destination matches the value selected in the previous test case. Finally, click on the **Calculate Route** button.

The results of this route should have the following attributes:

- Route length of 2206.7 miles
- Transit time of 87:18
- Impedance of 2867.7

The previous routes interchanged at Kansas City, but for this case we increased the transfer penalty from 300 units to 900 units. This forced this route to pass through the Chicago area.

### 4. Blocking a state

Continue with the same parameter values but for this case click on the **Block Nodes/Links** tab and scroll through the **Block States** list and click on IL. Click on the **Select Origin/Destination** tab and click on the **Calculate Route** button.

The results of this route should have the following attributes:

- Route length of 2318.4 miles
- Transit time of 90:51
- Impedance of 2968.3

By blocking the state of Illinois, this forces the route to interchange between the NS and UP in Memphis.



ENERCON SERVICES, INC.

## TRANSPORTATION ROUTING APPENDIX C

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 7 of 10

### Commercial Route Verification

TRAGIS Routing Engine Version 1.5.4

-- Highway Data Network 4.0

FROM: MARQUETTE MI Leaving : 04/07/08 15:14  
TO : GRAND ISLAND W U281U30 NE Arriving : 04/08/08 07:16

Routing parameters used to calculate the route-

Routing type: Commercial with 2 driver(s)  
Time bias: 0.70 Mile bias: 0.30, Toll bias: 1.00

Constraints used on route:  
Prohibit use of links prohibiting truck use  
Prohibit use of ferry crossing

Miles	Hwy Sign	City	Dir	Junction	State	Dist	Time	Date	Hour
0.0		MARQUETTE			MI	0.0	0:00	04/07/08	15:14
50.8	U41	RAPID RIVER		U2 U41	MI	50.8	1:02	04/07/08	16:16
36.7	U2	POWERS		U2 U41	MI	87.4	1:46	04/07/08	17:00
41.8	U41	MENOMINEE		U41 LOCL	MI	129.3	2:37	04/07/08	16:51
0.5	U41	crossing state border		MI/WI	BD	129.8	2:39	04/07/08	16:53
34.0	U41	ABRAMS	E	U41 U141	WI	163.8	3:19	04/07/08	17:33
15.9	U41	HOWARD		I43 X192	WI	179.6	3:35	04/07/08	17:49
		Rest 30 minutes							
57.8	U41	OSHKOSH	S	U41 S26	WI	237.4	5:03	04/07/08	19:17
21.9	S26	WAUPUN	NE	U151S26	WI	259.3	5:36	04/07/08	19:50
50.8	U151	MADISON	NE	I90 X135	WI	310.1	6:32	04/07/08	20:46
6.5	I39	MADISON	SE	I90 X142	WI	316.5	6:39	04/07/08	20:53
6.1	U12	MADISON	S	U12 U14	WI	322.7	6:45	04/07/08	20:59
3.0	U12	MADISON	SW	U12 U18	WI	325.7	6:48	04/07/08	21:02
36.5	U18	DODGEVILLE	E	U18 U151	WI	362.2	7:24	04/07/08	21:38
39.2	U151	DICKEYVILLE		U61 U151	WI	401.4	8:11	04/07/08	22:25
7.7	U61	KIELER	S	U61 S11	WI	409.1	8:21	04/07/08	22:35
1.3	U61	crossing state border		IA/WI	BD	410.5	8:22	04/07/08	22:36
2.0	U61	DUBUQUE		U52 U61	IA	412.5	8:25	04/07/08	22:39
		Rest 30 minutes							
3.3	U52	DUBUQUE	S	U52 U61	IA	415.8	8:35	04/07/08	22:49
3.1	U61	DUBUQUE	S	U61 U151	IA	418.9	9:08	04/07/08	23:22
64.4	U151	BERTRAM	S	U151U30	IA	483.3	10:23	04/08/08	00:37
6.6	U151	CEDAR RAPIDS	S	I380X16	IA	489.9	10:30	04/08/08	00:44
16.5	I380	TIFFIN	E	I380I80	IA	506.3	10:45	04/08/08	00:59
100.7	I80	DES MOINES	N	I235I35	IA	607.0	12:18	04/08/08	02:32
14.2	I35	DES MOINES	W	I235I35	IA	621.2	12:32	04/08/08	02:46
		Rest 30 minutes							
119.5	I80	COUNCIL BLUFFS	SE	I29 I80	IA	740.7	14:52	04/08/08	05:06
2.8	I29	COUNCIL BLUFFS	SW	I29 I80	IA	743.5	14:55	04/08/08	05:09
0.9	I80	crossing state border		IA/NE	BD	744.4	14:56	04/08/08	05:10
142.6	I80	DONIPHAN	N	I80 X312	NE	887.0	16:55	04/08/08	07:09
6.6	U281	GRAND ISLAND	W	U281U30	NE	893.6	17:02	04/08/08	07:16

Total elapsed time: 17:02 Total trip mileage: 893.6 Impedance: 920.7

Mileage by State :

IA: 333.9 MI: 129.8 NE: 149.2 WI: 280.7

Mileage by Sign Type:

1-INTERSTATE: 403.6 2-US: 468.1 3-STATE: 21.9

Mileage by Lane Type:

1-Multi-Lane Controlled Access: 472.0 3-Multi-Lane Divided Highway: 177.5  
5-Principle Road: 244.0





ENERCON SERVICES, INC.

## TRANSPORTATION ROUTING APPENDIX C

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 8 of 10

Mileage by Tribal Lands:  
Total Outside Tribal Lands : 893.6  
Total Inside Tribal Lands : 0.0

TRAGIS Routing Engine Version 1.5.4 -- 2000 Census Data

POPULATION DENSITY within 800 meter Buffer Zone:

FROM: MARQUETTE MI  
TO : GRAND ISLAND W U281U30 NE

ST	MILES	0	>0.0	22.7	59.7	139	326	821	1861	3326	5815	
			-22.7	-59.7	-139	-326	-821	-1861	-3326	-5815	-9996	>9996
IA	333.9	25.32	70.70	94.24	65.02	38.01	22.77	10.22	4.18	2.35	0.91	0.20
MI	129.8	24.53	37.03	31.38	12.71	7.73	4.68	4.71	3.89	2.77	0.37	0.00
NE	149.2	30.76	29.81	25.96	25.33	14.49	6.81	6.55	4.50	2.98	1.48	0.53
WI	280.7	10.33	50.33	74.73	48.98	24.50	23.76	18.81	13.25	11.15	3.97	0.93
TOTALS												
	893.6	90.94	187.87	226.31	152.04	84.73	58.02	40.29	25.82	19.25	6.73	1.66
PERCENTAGES												
		10.18	21.02	25.32	17.01	9.48	6.49	4.51	2.89	2.15	0.75	0.19

BASIS: 2000 Census data

RADTRAN Input Data	RURAL	SUBURBAN	URBAN
WEIGHTED POPULATION			
People/sq. mi.	41.1	832.9	5768.7
People/sq. km.	15.9	321.6	2227.3

DISTANCE			TOTALS
Miles	657.2	208.9	893.6
Kilometers	1057.6	336.1	1438.0
Percentages	73.5	23.4	3.1

BASIS (people/sq mi.) <139 139-3326 >3326

Population within 800 meter Buffer Zone by State:

IA 63915 MI 27066 NE 53432 WI 137501

Total Population within 800 meter Buffer Zone: 281914

### HRCQ Route Verification

TRAGIS Routing Engine Version 1.5.4 -- Highway Data Network 4.0

FROM: TURKEY POINT NP FL Leaving : 03/27/08 16:47  
TO : HANFORD WA Arriving : 03/29/08 22:50

Routing parameters used to calculate the route-

Routing type: HRCQ Preferred Route with 2 driver(s)  
Preferred roads Time bias: 1.00 Mile bias: 0.00, Toll bias: 1.00  
Nonpreferred roads Time bias: 0.00 Mile bias: 1.00, Toll bias: 1.00, Penalty factor: 30.0

Constraints used on route:

Prohibit use of links prohibiting truck use  
Prohibit use of ferry crossing  
Prohibit use of roads with Radioactive materials prohibition  
Las Vegas Beltway is considered a preferred route



ENERCON SERVICES, INC.

# TRANSPORTATION ROUTING APPENDIX C

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 9 of 10

Miles	Hwy Sign	City	Dir	Junction	State	Dist	Time	Date	Hour
0.0		TURKEY POINT	NP		FL	0.0	0:00	03/27/08	16:47
9.4	LOCAL	FLORIDA CITY	E	U1 9336	FL	9.4	0:18	03/27/08	17:05
27.7	U1	MIAMI	S	I95 X1A	FL	37.0	0:58	03/27/08	17:45
		Rest 30 minutes							
337.6	I95	JACKSONVILLE	SE	I295I95	FL	374.6	6:37	03/27/08	23:24
20.3	I295	JACKSONVILLE	W	I10 I295	FL	395.0	7:00	03/27/08	23:47
60.5	I10	WINFIELD	W	I10 I75	FL	455.5	7:51	03/28/08	00:38
16.6	I75	SUWANNEE SPGS	N	I75 X451	FL	472.1	8:06	03/28/08	00:53
19.5	I75	crossing state border FL/GA			BD	491.6	8:22	03/28/08	01:09
		Rest 30 minutes							
157.1	I75	MACON	S	I475I75	GA	648.7	11:07	03/28/08	03:54
15.7	I475	SMARR	E	I475I75	GA	664.4	11:21	03/28/08	04:08
61.0	I75	HAPEVILLE	S	I285I75	GA	725.3	12:16	03/28/08	05:03
3.8	I285	COLLEGE PARK	S	I285I85	GA	729.2	12:20	03/28/08	05:07
1.2	I285	RED OAK	E	I285I85	GA	730.4	12:22	03/28/08	05:09
20.2	I285	ATLANTA	NW	I285I75	GA	750.7	12:44	03/28/08	05:31
		Rest 30 minutes							
77.2	I75	DALTON	NW	I75 X336	GA	827.9	14:24	03/28/08	07:11
19.2	I75	crossing state border GA/TN			BD	847.1	14:41	03/28/08	07:28
1.7	I75	EAST RIDGE	NE	I24 I75	TN	848.8	14:43	03/28/08	07:30
6.8	I24	CHATTANOOGA		I24 X178	TN	855.6	14:50	03/28/08	07:37
7.4	I24	crossing state border GA/TN			BD	863.0	14:58	03/28/08	07:45
2.9	I24	WILDWOOD	NW	I24 I59	GA	865.9	15:01	03/28/08	07:48
1.2	I24	crossing state border GA/TN			BD	867.0	15:02	03/28/08	07:49
115.7	I24	NASHVILLE	E	I24 I40	TN	982.7	16:45	03/28/08	08:32
1.8	I24	NASHVILLE	SE	I24 I40	TN	984.5	16:47	03/28/08	08:34
3.1	I24	NASHVILLE	N	I24 I65	TN	987.6	16:51	03/28/08	08:38
1.9	I24	INGLEWOOD	W	I24 I65	TN	989.5	16:53	03/28/08	08:40
		Rest 30 minutes							
40.2	I24	ST BETHLEHEM	NE	I24 X4	TN	1029.8	17:27	03/28/08	09:14
4.4	I24	crossing state border KY/TN			BD	1034.1	18:01	03/28/08	09:48
88.7	I24	PADUCAH	W	I24 X4	KY	1122.8	19:23	03/28/08	11:10
4.4	I24	crossing state border IL/KY			BD	1127.2	19:27	03/28/08	11:14
38.1	I24	PULLEYS MILL	W	I24 I57	IL	1165.3	20:09	03/28/08	11:56
48.4	I57	MT VERNON	SW	I57 I64	IL	1213.7	21:01	03/28/08	12:48
4.6	I57	MT VERNON	NW	I57 I64	IL	1218.3	21:06	03/28/08	12:53
		Rest 30 minutes							
65.9	I64	WASHINGTON PK	SE	I255I64	IL	1284.2	22:48	03/28/08	14:35
10.9	I255	EDWARDSVILLE	SW	I255I270	IL	1295.1	23:00	03/28/08	14:47
4.4	I270	GRANITE CITY	N	I270X3	IL	1299.5	23:05	03/28/08	14:52
2.7	I270	crossing state border IL/MO			BD	1302.2	23:08	03/28/08	14:55
15.3	I270	ST LOUIS	NW	I270I70	MO	1317.5	23:23	03/28/08	15:10
		Rest 30 minutes							
222.5	I70	KANSAS CITY	SE	I435I70	MO	1540.0	27:20	03/28/08	19:07
9.1	I435	GRANDVIEW	N	I435I470	MO	1549.1	27:29	03/28/08	19:16
3.9	I435	crossing state border KS/MO			BD	1553.0	27:33	03/28/08	19:20
20.7	I435	KANSAS CITY	W	I435I70	KS	1573.7	27:55	03/28/08	19:42
3.9	I70	BONNER SPRINGS	N	I70 X224	KS	1577.5	27:59	03/28/08	19:46
43.1	I70 \$	TOPEKA	E	I470S4	KS	1620.6	28:35	03/28/08	20:22
5.4	I470\$	TOPEKA	E	I335I470	KS	1626.0	28:41	03/28/08	20:28
6.8	I470	TOPEKA	W	I470I70	KS	1632.8	28:55	03/28/08	20:42
		Rest 30 minutes							
335.3	I70	GOODLAND		I70 X17	KS	1968.1	34:12	03/29/08	00:59
17.1	I70	crossing state border CO/KS			BD	1985.2	34:27	03/29/08	01:14
		Rest 30 minutes							
169.5	I70	DENVER	NE	I270I70	CO	2154.7	37:20	03/29/08	04:07
4.9	I270	COMMERCE CITY	NW	I270I76	CO	2159.6	37:25	03/29/08	04:12
1.2	I76	COMMERCE CITY	W	I25 I76	CO	2160.8	37:27	03/29/08	04:14
53.6	I25	FT COLLINS	E	I25 X269	CO	2214.4	38:14	03/29/08	05:01
29.8	I25	crossing state border CO/WY			BD	2244.2	38:38	03/29/08	05:25
8.9	I25	CHEYENNE	SW	I25 I80	WY	2253.0	38:46	03/29/08	05:33
		Rest 30 minutes							
		Rest 30 minutes							
339.5	I80	EVANSTON	NE	I80 X18	WY	2592.5	43:48	03/29/08	10:35
18.2	I80	crossing state border UT/WY			BD	2610.7	44:32	03/29/08	11:19



ENERCON SERVICES, INC.

TRANSPORTATION ROUTING  
APPENDIX C

CALC. NO.

TXUT-001-ER-3.8-CALC-009

REV. 0

PAGE NO. 10 of 10

29.4	I80	ECHO	I80 I84	UT	2640.1	44:56	03/29/08	11:43
38.5	I84	OGDEN	S I15 I84	UT	2678.6	45:27	03/29/08	12:14
39.4	I15	TREMONTON	W I15 I84	UT	2718.0	46:01	03/29/08	12:48
37.4	I84	SNOWVILLE	W I84 X5	UT	2755.4	46:32	03/29/08	13:19
4.4	I84	crossing state border ID/UT		BD	2759.8	46:36	03/29/08	13:23
		Rest 30 minutes						
272.8	I84	FRUITLAND	S I84 X3	ID	3032.6	51:18	03/29/08	18:05
2.9	I84	crossing state border ID/OR		BD	3035.4	51:21	03/29/08	18:08
		Rest 30 minutes						
197.9	I84	HERMISTON	SW I82 I84	OR	3233.3	55:27	03/29/08	21:14
9.6	I82	UMATILLA	I82 X1	OR	3242.9	55:37	03/29/08	21:24
1.0	I82	crossing state border OR/WA		BD	3243.9	55:38	03/29/08	21:25
30.3	I82	WEST RICHLAND	S I182I82	WA	3274.3	56:09	03/29/08	21:56
5.3	I182	RICHLAND	SE I182X5	WA	3279.6	56:14	03/29/08	22:01
		Rest 30 minutes						
5.2	S240	RICHLAND	N S240LR4S	WA	3284.8	56:55	03/29/08	22:42
4.0	LR4S	HANFORD		WA	3288.8	57:03	03/29/08	22:50

Total elapsed time: 57:03      Total trip mileage: 3288.8      Impedance: 4343.1

Mileage by State :

CO:	258.9	FL:	491.6	GA:	359.6	ID:	275.6	IL:	175.0	KS:	432.2
KY:	93.1	MO:	250.8	OR:	208.5	TN:	183.0	UT:	149.1	WA:	44.9
WY:	366.5										

Mileage by Sign Type:

1-INTERSTATE:	3242.6	2-US:	27.7	3-STATE:	5.2	6-LOCAL:	13.4
---------------	--------	-------	------	----------	-----	----------	------

Mileage by Lane Type:

1-Multi-Lane Controlled Access:	3242.6	3-Multi-Lane Divided Highway:	27.7
5-Principle Road:	5.2	7-Other:	13.4

Mileage by Tribal Lands:

Total Outside Tribal Lands	:	3261.9
Total Inside Tribal Lands	:	26.9

Umatilla Reservation	:	26.9
----------------------	---	------