Minnesota Safety Rest Area Programs

Commercial Truck Usage Nighttime Parking Demand Analysis

February 1995-October 1998

Minnesota Department of Transportation

Office of Technical Support
Site Development Unit

December 1998

Minnesota Safety Rest Area Programs
Market Research

Commercial Truck Usage
Nighttime Parking Demand Analysis

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Table of Contents

Preface

The Minnesota Department of Transportation (Mn/DOT) operates a network of 55 full-service safety rest areas along the Interstate and high-volume non-interstate highways. Since 1969, Mn/DOT has conducted Motorist Usage Surveys at safety rest areas throughout the state. This data has provided the basis for determining the size of buildings and parking lots and has also been used to document facility use and identify services that the public desires to have available at safety rest areas.

To supplement this information and to improve the level of understanding of safety rest area users as well as non-users, the Site Development Unit, Office of Technical Support with assistance from the Market Research Unit, conducted several market research studies during 1997 and 1998. Each of these studies were designed to expand Mn/DOT's understanding of a specific market segment in order to improve the delivery of safety rest area services.

The following studies were conducted:

1. Review of Motorists Usage Survey Historical Data

   The review of historical data assembled all of the information that Mn/DOT had already collected in order to identify trends and to provide a summary of existing information.

2. Focus Groups

   Focus Groups were held with Minnesota citizens to identify public attitudes towards rest areas, identify the kinds of services that rest area users expect and utilize at rest areas and to identify issues surrounding the maintenance and operation of rest areas.

3. Safety Rest Area Usage and Satisfaction Research Statewide Telephone Survey

   A statewide telephone survey was conducted to identify the proportion of Minnesota citizens who use rest areas and to identify reasons why some citizens do not use rest areas. This survey also included ratings of the importance and quality of the services currently available at safety rest areas.

4. Commercial Truck Usage, Nighttime Parking Demand Analysis

   The evaluation of nighttime truck parking identified where there is greater demand for nighttime truck parking at safety rest areas than there are available spaces.

Separate reports to document this research are available from the Mn/DOT Office of Technical Support, Site Development Unit. To request a copy you may contact the Mn/DOT Safety Rest Area Program Manager at (651) 296-1648.

This report summarizes the information gathered in the "Commercial Truck Usage, Nighttime Parking Demand Analysis".

Purpose of the Study

The objective of this study was to identify rest areas where there is a greater demand for nighttime truck parking than there are available spaces and to document the frequency of this occurrence. This is important because there is a growing industry and public concern about the availability of adequate safe off-highway parking opportunities for commercial vehicles. National trends indicate that more commercial drivers will operate on our highways each year. Because of this the need for adequate nighttime commercial vehicle parking facilities in Minnesota will also grow. Driver fatigue and the unsafe parking of commercial vehicles on highway shoulders and on interchange ramps are specific safety conditions that can be reduced when adequate off-highway parking facilities are available.

This study was initiated for two primary reasons:

1. It is part of an on-going effort by Mn/DOT to understand the needs of rest area users in general as well as the specific needs of commercial vehicle drivers.
2. It is in response to a FHWA study that concluded that there exists a severe shortage of nighttime truck parking at safety rest areas in Minnesota.

This report documents the analysis of data collected in this study and the finding that current commercial vehicle parking demand in several Mn/DOT safety rest areas frequently exceeds the available parking spaces.

Information generated from this study will permit Mn/DOT to:

1. Identify sites and highway corridors with a shortage of existing commercial vehicle parking spaces.
2. Consider commercial vehicle driver parking needs in the timing and prioritization of rest area rehabilitation projects in the Department's investment program.
3. Encourage private businesses to construct or expand commercial truck stops in the high demand corridor.
4. Establish baseline data to begin analysis to determine if nighttime commercial vehicle peak parking capacity needs should be considered in Minnesota's Safety Rest Area Capacity Calculations Formulas.
5. Establish baseline data at critical sites to measure changes in parking demand when roadway or facility improvements are made, both public and private, to reduce parking deficiencies at a site or in a corridor.

Background

Since 1969 the Minnesota Department of Transportation (Mn/DOT) has conducted on-site Motorist Usage Surveys in safety rest areas to gather information directly from all safety rest area user groups. Commercial vehicle drivers represent a segment of those motorists surveyed. To better understand the needs of commercial vehicle drivers as a specific user group, a series of separate, targeted market research studies must be conducted. This report describes research designed to evaluate the availability of nighttime truck parking spaces in Mn/DOT's safety rest areas.

The 1996 research report entitled, "Executive Summary of Commercial Driver Rest Area Requirements: No Room at the Inn, prepared by the FHWA, Office of Motor Carriers and the Trucking Research Institute, Apogee Research, Inc. and Wilbur Smith Associates, documented a current truck parking space shortfall of 813 stalls in Minnesota's 35 Interstate rest areas. (US DOT et. al.,1996, p.14) The FHWA study considered the, "adequacy of places for truck drivers to stop and rest, both public and private." A component of the FHWA research included a survey of commercial drivers of which over 90% of those sampled "perceive that their is a shortage of truck parking facilities particularly for long-term or overnight parking." In addition, two-thirds of the commercial drivers surveyed indicated they prefer using private truck stops for overnight or long-term rest needs. (US DOT et. al.,1996, p.3) The report also documented that many truck stops and rest areas are full or overcrowded at night. (US DOT et. al.,1996, p.24)

The FHWA report, that identified a shortage of 813 commercial vehicle parking spaces within Minnesota's Interstate rest areas, used a Truck Parking Demand Model, a macro-level mathematically constructed model, to estimate the total demand for truck parking spaces on an individual rest area basis nationwide. The number of currently available parking stalls was subtracted from the calculated demand for each rest area. The net result is the calculated unmet demand for commercial vehicle parking spaces at individual rest areas. The report recognized that nationally, some rest areas have a surplus of commercial vehicle parking spaces however, due to location they were not considered to reduce a shortage of spaces at other sites.

To measure actual conditions in Minnesota's rest areas Mn/DOT began collecting nighttime parking data for oversized vehicles in 1995 at 50 full service rest areas.

Other Truck Usage Data

Mn/DOT has excellent historical data about the daytime use of rest area by commercial vehicle drivers. Mn/DOT's rest area Motorists Usage Surveys, conducted since 1969, focused on collecting information directly from rest area user between 9 a.m. and 5 p.m. and during the same time collecting traffic classification information about the mainline traffic that did not enter the rest area. This information was collected annually at select rest areas, Thursday through Monday, during one non-holiday weekend in July or August. This collection of motorist usage data is periodically evaluated to identify trends that affect the sizing of facilities and type of services provided at Minnesota's rest areas.

Motorist Usage Survey data has also been used to validate the formula for calculating projected 20 year daytime vehicular parking capacity needs for all vehicle types that use rest areas, including commercial vehicles. The Minnesota Safety Rest Area Capacity Calculations formulas appear to be adequate for the calculation of daytime commercial and other oversized vehicle parking needs. However, the current Mn/DOT rest area capacity calculation formula does not consider nighttime commercial vehicle peak parking demand.

Prior to 1995 Mn/DOT did not measure nighttime commercial vehicle parking use in existing rest areas. Because the FHWA study applied a single formula uniformly nationwide and because a surplus of parking stalls at one site cannot fulfill the demand at another it is critical that regional and corridor specific highway demands are documented and studied to determine site specific parking shortages.

Methodology

To evaluate current truck nighttime parking demand against current parking capacity at Mn/DOT's full-service safety rest areas a multi phase study was designed. Analysis of Phase I and II data of this multi phase study are described in this report.

As part of Phase I, nighttime parking data was collected from February 1995 through February 1997 for 50 (35 Interstate and 15 of the 20 non-interstate) rest areas. On-site custodial staff recorded nightly (midnight) and early morning vehicle counts for oversized vehicles parked in each rest area. This data was analyzed to identify rest areas with possible commercial vehicles nighttime parking capacity deficiencies. Through preliminary analysis, 15 of the 50 rest areas were identified as having occasional to frequent commercial vehicle parking capacity deficiencies. As part of Phase II, data was collected for the 15 rest areas identified in Phase I to quantify the scale of the potential deficiency. Five months of data was available for the 15 sites at the time of this analysis. Analysis of additional data is planned in fall of 1999 when over one year of data is available and again in fall of 2000.

Data Collection Methods

Phase I

Each full-service safety rest area has custodial staff on the site every day from early morning until midnight or later. Most of Mn/DOT's full-service rest areas are open year around and include pull through parking stalls suitable for WB 50 or WB 62 commercial trucks. Phase I of this study includes nighttime parking data collected at 50 of Minnesota's 55 full-service safety rest areas.

Data was collected from February 1995 through February 1997. On-site custodial staff provided two vehicle counts each night, one at midnight and a second at 6, 7, or 8 a.m. The number of days data was collected at each site varied due to site closures resulting from: roadway closures due to severe weather; seasonal site closures; on-site equipment failures such as sewer, water well or power; and construction on the mainline or in the rest area. The maximum number of observation days for any site in Phase I of this study was 759 days.

Data was entered into a computerized database and sorted to identify sites with the greatest capacity deficiencies. Several sites were documented to have significant nightly capacity deficiencies while other sites were seldom full.

Preliminary analysis documented the percent of observations in which the number of oversized vehicles parked at each site met or exceeded capacity. Fifteen rest areas were identified to have occasional to high level nighttime parking capacity problems for oversized vehicles.

In addition to these 15 rest areas another three showed a seasonal high volume for nighttime use of the truck stalls however, the custodial staff making the observations have validated that the vast majority of the oversized vehicles parked in these stalls are recreational vehicles. These rest areas are: 1) Garrison, 2) Lake Pepin, and 3) Thompson Hill T.I.C. Both the Garrison and Lake Pepin rest areas are located along recreational travel routes and on popular fishing lakes. The Garrison rest area includes a water access ramp within the rest area property limits. The Thompson Hill T.I.C. rest area had a high mix of recreational vehicles in its oversized vehicle counts. Although the

custodial staff making the observations at Thompson Hill T.I.C. stated that on Sunday nights, the peak capacity demand night, the majority of the oversized vehicles observed were commercial trucks. For these reasons these three rest areas were not included in the Phase II analysis.

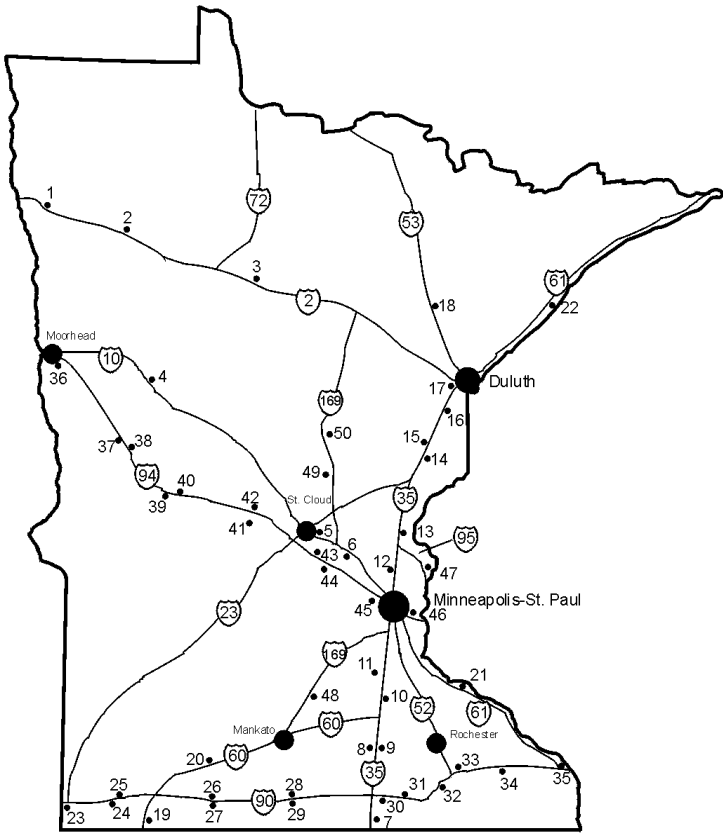
For a few rest areas, an additional vehicle count was taken at 2:00 a.m. The 2:00 a.m. counts indicated that peak loading in the rest area may occur sometime between midnight and 6:00 a.m. Comments received in a separate study which included a focus group with Minnesota based commercial truck drivers indicated that, in Minnesota, commercial drivers were unable to find adequate parking stalls in some rest areas after 10:00 p.m. They commented that if they do not stop early in the evening they may not find a parking space. This information was used along with the data from Phase I of this study to design Phase II.

Phase II

Data collection for Phase II of the study began in May 1998 and is ongoing for fifteen rest areas. The purpose of data collection at rest areas having the highest nighttime use is to determine the extent and frequency of the capacity deficiencies at these sites. The Phase II data collection form includes columns to count commercial and other oversized vehicles separately each night at 10:00 p.m.; midnight; 1:00, 2:00 or 3:00 a.m. depending on the end of shift for custodians; and 6:00, 7:00, or 8:00 a.m. depending on the start of the new shift for the custodians.

Phase II data was collected for the following 15 rest areas:

Map Key Number	Route	Mile Post	Safety Rest Area Name
3	T.H. 2	131	Cass Lake
7	I-35	2	Albert Lea TIC (NB)
8	I-35	35	Straight River (SB)
9	I-35	35	Straight River (NB)
10	I-35	68	Heath Creek (NB)
11	I-35	75	New Market (SB)
33	I-90	220	Marion (WB)
34	I-90	244	Enterprise (EB)
35	I-90	277	Dresbach TIC (WB)
37	I-94	60	Lake Iverson (EB)
38	I-94	69	Hansel Lake (WB)
39	I-94	99	Lake Latoka (EB)
40	I-94	105	Burgen Lake (WB)
45	I-94	215	Elm Creek RA (EB)
46	I-94	258	St. Croix TIC (WB)



Minnesota Safety Rest Area locations where commercial truck parking data was collected.

DS201-P.CDR

Map 1. Minnesota Safety Rest Area Locations Where Commercial Truck Parking Data was Collected.

Map Key Number	Route	Mile Post	Safety Rest Area Name
1	T.H. 2	12	Fisher's Landing TIC
2	T.H. 2	59	Oak Lake
3	T.H. 2	131	Cass Lake
4	T.H. 10	55	Frazee
5	T.H. 10	181	Central Minnesota TIC
6	T.H. 10	219	Daytonport
7	I-35	2	Albert Lea TIC (NB)
8	I-35	35	Straight River (SB)
9	I-35	35	Straight River (NB)
10	I-35	68	Heath Creek (NB)
11	I-35	75	New Market (SB)
12	I-35	131	Forest Lake (SB)
13	I-35	154	Goose Creek (NB)
14	I-35	198	Kettle River (NB)
15	I-35	208	General Andrews (SB)
16	I-35	226	Culkin (N.B.)
17	I-35	250	Thompson Hill TIC (SB)
18	T.H. 53	50	Anchor Lake TIC
19	T.H. 60	8	Worthington TIC
20	T.H. 60	68	Watonwan
21	T.H. 61	78	Lake Pepin
22	T.H. 61	359	Baptism River
23	I-90	0	Beaver Creek TIC (EB)
24	I-90	24	Adrian (EB)
25	I-90	25	Adrian (WB)

Map Key Number	Route	Mile Post	Safety Rest Area Name
26	I-90	72	Des Moines River (WB)
27	I-90	69	Clear Lake (EB)
28	I-90	119	Blue Earth (WB)
29	I-90	119	Blue Earth (EB)
30	I-90	163	Hayward (EB)
31	I-90	171	Oakland Woods (WB)
32	I-90	202	High Forest (EB)
33	I-90	220	Marion (WB)
34	I-90	244	Enterprise (EB)
35	I-90	277	Dresbach TIC (WB)
36	I-94	2	Moorhead TIC (EB)
37	I-94	60	Lake Iverson (EB)
38	I-94	69	Hansel Lake (WB)
39	I-94	99	Lake Latoka (EB)
40	I-94	105	Burgen Lake (WB)
41	I-94	152	Big Spunk Lake (EB)
42	I-94	152	Middle Spunk Lake (WB)
43	I-94	178	Fuller Lake (WB)
44	I-94	187	Enfield (EB)
45	I-94	215	Elm Creek RA (EB)
46	I-94	258	St. Croix TIC (WB)
47	T.H. 95	101	Stillwater Boom Site
48	T.H. 169	80	Minnesota Valley
49	T.H. 169	203	Rum River
50	T.H. 169	233	Garrison

Data Analysis

Phase I

Truck parking data collected from February 1995 through February 1997 was analyzed to determine the utilization of truck parking stalls at full service safety rest areas. Table 1 presents the summary of that analysis.

Table 1 includes information on each of the 50 sites where detailed data was collected. The sites are numbered to correspond to the map depicting site locations. Included in the rest area title is the direction of travel that the site serves. If no direction is noted, the site serves both directions of travel. Also included is the highway that the rest area serves.

The number of existing truck parking stalls is shown for each site along with the observed maximum number of trucks parked at midnight throughout the data collection period. Data collected at midnight was considered more representative of overall parking demand than the 8:00 a.m. data because of the tendency for commercial vehicle drivers to get an early start. The highest truck parking capacity is at the St. Croix T.I.C. (W.B.) with 35 stalls while the lowest is at Daytonport with 4 stalls. The maximum number of trucks observed at any site was 55 at St. Croix T.I.C. (W.B.).

Table 1 also shows the average number of trucks parked at midnight on weekdays (Monday through Friday), Saturdays and Sundays. The highest weekday averages were at St. Croix T.I.C. (W.B.) with 25.9 trucks, and Marion (W.B.) with 23.5 trucks. The highest Saturday averages were at Marion (W.B.) with 15.8 trucks and Garrison with 11.7 trucks or most likely, recreation vehicles. The highest Sunday averages were at Garrison with 16.1 oversized vehicles, and Lake Latoka (E.B.) with 12.3 trucks.

Also shown in Table 1 is the day of the week observed to have the highest occupancy of truck parking stalls. That data is summarized below:

Day of the Week	Number of Sites with This Critical Day
Monday	2
Tuesday	19
Wednesday	13
Thursday	11
Friday	2
Saturday	2
Sunday	1

TABLE 1 - TRUCK PARKING DEMAND AT MIDNIGHT AND CRITICAL DAYS

Map Key No.	Safety Rest Area Name	Roadway	Existing Truck Parking Stalls	Max. Number of Trucks Observed at Midnight	Average Number of Trucks Observed at Midnight *(1)*			Critical Day *(1) (2)*
					Weekdays	Saturday	Sunday	
1	FISHER'S LANDING T.I.C.	TH 2	10	7	1.5	1.3	1.3	TUE
2	OAK LAKE	TH 2	7	8	1.7	1.5	1.4	WED
3	CASS LAKE	TH 2	10	13	5.0	4.8	4.7	TUE
4	FRAZEE	TH 10	6	12	1.7	1.3	1.4	THU
5	CENTRAL MINNESOTA T.I.C.	TH 10	18	7	1.4	0.5	1.0	TUE
6	DAYTONPORT	TH 10	4	3	0.2	0.1	0.1	WED
7	ALBERT LEA T.I.C. (N.B.)	I - 35	12	41	13.6	6.5	6.0	WED
8	STRAIGHT RIVER (S.B.)	I - 35	13	20	10.2	4.0	4.7	TUE
9	STRAIGHT RIVER (N.B.)	I - 35	12	23	9.7	2.9	10.2	THU
10	HEATH CREEK (N.B.)	I - 35	20	27	14.1	4.9	2.7	WED
11	NEW MARKET (S.B.)	I - 35	15	26	9.3	9.0	4.0	TUE
12	FOREST LAKE (S.B.)	I - 35	15	17	6.5	3.6	1.7	TUE
13	GOOSE CREEK (N.B.)	I - 35	12	14	4.3	3.2	1.9	FRI
14	KETTLE RIVER (N.B.)	I - 35	10	9	2.5	0.8	2.0	MON
15	GENERAL ANDREWS (S.B.)	I - 35	10	10	3.2	1.2	2.2	TUE
16	CULKIN (N.B.)	I - 35	11	9	2.1	1.7	1.0	THU
17	THOMPSON HILL T.I.C. (S.B.)	I - 35	10	40	2.7	4.3	3.4	SAT
18	ANCHOR LAKE T.I.C.	TH 53	8	10	2.4	0.9	1.6	TUE
19	WORTHINGTON T.I.C.	TH 60	8	11	3.5	1.8	0.7	TUE
20	WATONWAN	TH 60	11	12	4.3	3.4	1.3	WED
21	LAKE PEPIN	TH 61	6	10	1.5	2.8	2.2	SAT
22	BAPTISM RIVER	TH 61	11	15	1.7	1.3	1.2	MON
23	BEAVER CREEK T.I.C. (E.B.)	I - 90	16	23	4.2	3.1	3.2	THU
24	ADRIAN (E.B.)	I - 90	6	12	3.9	3.1	3.1	TUE
25	ADRIAN (W.B.)	I - 90	6	16	4.4	4.9	3.3	WED
26	DES MOINES RIVER (W.B.)	I - 90	9	17	4.0	3.9	2.4	TUE
27	CLEAR LAKE (E.B.)	I - 90	7	12	4.5	3.8	3.0	TUE
28	BLUE EARTH (W.B.)	I - 90	9	14	6.7	6.1	4.2	WED
29	BLUE EARTH (E.B.)	I - 90	9	14	6.1	5.3	4.4	THU
30	HAYWARD (E.B.)	I - 90	10	19	6.7	4.6	3.9	TUE
31	OAKLAND WOODS (W.B.)	I - 90	10	18	8.0	6.7	4.4	WED
32	HIGHFOREST (E.B.)	I - 90	20	13	6.2	4.8	4.6	WED
33	MARION (W.B,)	I - 90	10	44	23.5	15.8	10.6	THU
34	ENTERPRISE (E.B.)	I - 90	13	22	8.9	7.0	3.9	TUE
35	DRESBACH T.I.C. (W.B.)	I - 90	6	14	4.6	3.0	3.9	TUE
36	MOORHEAD T.I.C. (E.B.)	I - 94	12	12	3.4	2.4	2.5	THU
37	LAKE IVERSON (E.B.)	I - 94	11	21	9.0	7.7	7.3	THU
38	HANSEL LAKE (W.B.)	I - 94	10	18	6.7	6.5	4.9	WED
39	LAKE LATOKA (E.B.)	I - 94	18	36	13.7	9.7	12.3	WED
40	BURGEN LAKE (W.B.)	I - 94	12	23	9.4	7.7	6.7	THU
41	BIG SPUNK LAKE (E.B.)	I - 94	17	18	9.1	5.7	6.9	TUE
42	MIDDLE SPUNK LAKE (W.B)	I - 94	18	18	9.4	5.8	7.9	THU
43	FULLER LAKE (W.B.)	I - 94	17	21	7.8	5.9	4.3	THU
44	ENFIELD (E.B.)	I - 94	18	19	7.3	4.2	3.8	TUE
45	ELM CREEK R.A. (E.B.)	I - 94	10	25	10.6	7.0	6.6	TUE
46	ST CROIX T.I.C. (W.B.)	I - 94	35	55	25.9	8.9	6.3	WED
47	STILLWATER BOOMSITE	TH 95	7	2	0.2	0.4	0.2	FRI
48	MINNESOTA VALLEY	TH 169	16	11	4.6	2.6	1.3	WED
49	RUM RIVER	TH 169	9	7	1.8	0.6	1.1	TUE
50	GARRISON	TH 169	19	30	5.2	11.7	16.1	SUN

(1) Based on field data collected from February 1995 through February 1997

(2) Day of the week with the highest average occupancy

Additional analysis of the complete dataset is summarized in Table 2. This table shows the number of observations at each site over the two-year period and then presents some critical utilization information. Following the number of observations is an assessment of the amount of truck parking capacity that is used on average. The sites are classified as being Low Use (less than 50 percent of capacity is typically used), Medium Use (between 50 percent and 80 percent of capacity is used), and High Use (over 80 percent of capacity is used). This data is summarized below:

Degree of Truck Parking	Number of Sites in Each Use Category
High Use	7
Medium Use	16
Low Use	27

Table 2 also presents the number of days and the percentage of days that the truck parking capacity is met or exceeded. Since the number of observations varied at each site, the next column showing the percentage of days at or above capacity is the best indicator of current demand. That data is summarized as follows:

Percent of Days Truck Parking Capacity Met or Exceeded at Midnight	Number of Sites in Each Use Category
More than 50 percent	2
10 percent to 50 percent	16
Less than 10 percent	32

Finally, Table 2 identifies those sites that potentially have a truck parking capacity problem. This preliminary determination was based on a site meeting one of the two following conditions:

- The average truck parking capacity used is greater than 80 percent, or
- Truck parking capacity is met or exceeded at least 3 percent of the times.

As a result, the following was determined:

- Sites with potential truck parking capacity problems = 26.
- Sites without truck parking capacity problems = 24.

TABLE 2 - UTILIZATION OF TRUCK PARKING SPACES

Map Key No.	Safety Rest Area Name	Roadway	Number of Observation Days *(1)*	Ave. Percent of Capacity Used *(2)*	Number of Days Capacity was Met or Exceeded *(3)*	Percent of Days Capacity was Met or Exceeded *(3)*	Potential Capacity Problem *(4)*
1	FISHER'S LANDING T.I.C.	TH 2	693	<50	0	0	NO
2	OAK LAKE	TH 2	692	<50	1	0	NO
3	CASS LAKE	TH 2	755	<50	26	3	YES
4	FRAZEE	TH 10	717	<50	6	0	NO
5	CENTRAL MINNESOTA T.I.C.	TH 10	758	<50	0	0	NO
6	DAYTONPORT	TH 10	521	<50	0	0	NO
7	ALBERT LEA T.I.C. (N.B.)	I - 35	755	>80	399	53	YES
8	STRAIGHT RIVER (S.B.)	I - 35	634	50-80	94	15	YES
9	STRAIGHT RIVER (N.B.)	I - 35	691	>80	230	33	YES
10	HEATH CREEK (N.B.)	I - 35	663	50-80	42	6	YES
11	NEW MARKET (S.B.)	I - 35	663	50-80	44	7	YES
12	FOREST LAKE (S.B.)	I - 35	726	<50	3	0	NO
13	GOOSE CREEK (N.B.)	I - 35	757	<50	13	2	NO
14	KETTLE RIVER (N.B.)	I - 35	758	<50	0	0	NO
15	GENERAL ANDREWS (S.B.)	I - 35	758	<50	1	0	NO
16	CULKIN (N.B.)	I - 35	755	<50	0	0	NO
17	THOMPSON HILL T.I.C. (S.B.)	I - 35	721	<50	50	7	YES
18	ANCHOR LAKE T.I.C.	TH 53	740	<50	4	1	NO
19	WORTHINGTON T.I.C.	TH 60	759	<50	26	3	YES
20	WATONWAN	TH 60	757	<50	5	1	NO
21	LAKE PEPIN	TH 61	277	<50	4	1	NO
22	BAPTISM RIVER	TH 61	752	<50	2	0	NO
23	BEAVER CREEK T.I.C. (E.B.)	I - 90	738	<50	1	0	NO
24	ADRIAN (E.B.)	I - 90	727	>80	130	18	YES
25	ADRIAN (W.B.)	I - 90	750	50-80	210	28	YES
26	DES MOINES RIVER (W.B.)	I - 90	678	<50	24	4	YES
27	CLEAR LAKE (E.B.)	I - 90	707	50-80	108	15	YES
28	BLUE EARTH (W.B.)	I - 90	753	50-80	159	21	YES
29	BLUE EARTH (E.B.)	I - 90	757	50-80	113	15	YES
30	HAYWARD (E.B.)	I - 90	742	50-80	90	12	YES
31	OAKLAND WOODS (W.B.)	I - 90	742	>80	191	26	YES
32	HIGHFOREST (E.B.)	I - 90	714	<50	0	0	NO
33	MARION (W.B)	I - 90	728	>80	646	89	YES
34	ENTERPRISE (E.B.)	I - 90	714	50-80	62	9	YES
35	DRESBACH T.I.C. (W.B.)	I - 90	750	50-80	207	28	YES
36	MOORHEAD T.I.C. (E.B.)	I - 94	759	<50	1	0	NO
37	LAKE IVERSON (E.B.)	I - 94	751	>80	191	25	YES
38	HANSEL LAKE (W.B.)	I - 94	753	50-80	100	13	YES
39	LAKE LATOKA (E.B.)	I - 94	724	50-80	144	20	YES
40	BURGEN LAKE (W.B.)	I - 94	708	50-80	175	25	YES
41	BIG SPUNK LAKE (E.B.)	I - 94	759	50-80	8	1	NO
42	MIDDLE SPUNK LAKE (W.B)	I - 94	755	50-80	6	1	NO
43	FULLER LAKE (W.B.)	I - 94	757	<50	4	1	NO
44	ENFIELD (E.B.)	I - 94	756	<50	2	0	NO
45	ELM CREEK R.A. (E.B.)	I - 94	746	>80	351	47	YES
46	ST CROIX T.I.C. (W.B.)	I - 94	759	50-80	50	7	YES
47	STILLWATER BOOMSITE	TH 95	274	<50	0	0	NO
48	MINNESOTA VALLEY	TH 169	474	<50	0	0	NO
49	RUM RIVER	TH 169	750	<50	0	0	NO
50	GARRISON	TH 169	100	<50	10	10	YES

(1) Based on field data collected from February 1995 through February 1997

(2) Average occupancy category of the rest area parking space (<50 = low, 50-80 =medium, >80 high)

(3) Number of days where the number of trucks met or exceeded capacity

(4) Capacity problem exists if either the average capacity used is greater than 80% or the % of days capacity is met or exceeded is at least 3%

Phase II

The 26 sites identified by this study as potentially having truck parking capacity problems were subjected to more detailed analysis as part of Phase II of this study in order to gauge the extent of the problems.

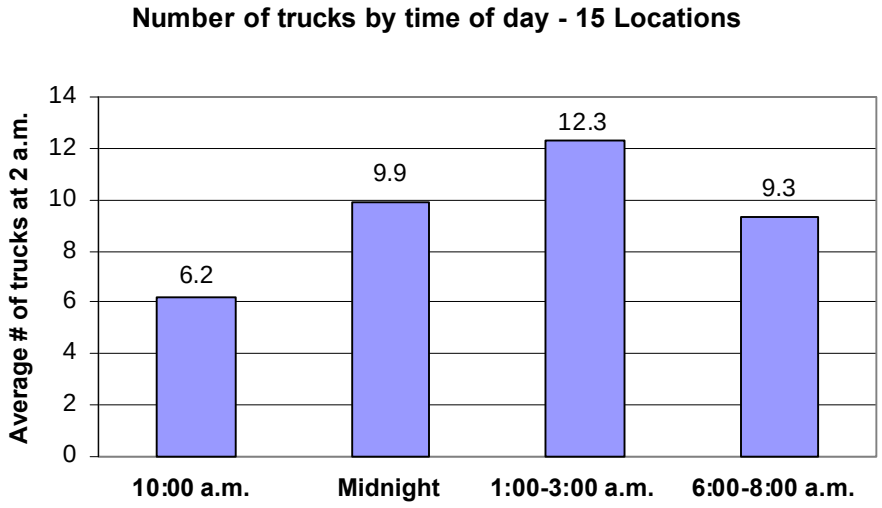
As part of Phase II, data was collected for 15 of the highest use sites. These 15 sites were selected based on the actual percent of days the rest areas met or exceeded truck parking capacity at midnight or 6, 7, or 8 a.m. These 15 sites were selected prior to starting Phase I data analysis documented in this study. The number of trucks parked at each of these 15 sites was recorded at four time points:

1. 10:00 p.m.
2. 12:00 a.m. (midnight)
3. 1:00, 2:00 or 3:00 a.m.
4. 6:00, 7:00 or 8:00 a.m.

The data analyzed in this report was collected every day May 1998 through September 1998. Data collection is ongoing.

The first component of the detailed analysis was to determine at what time the maximum accumulation of trucks occurred during the night. The results of this analysis are shown in Figure 1. This figure plots the average number of trucks present during specific time-points for the 15 sites. The maximum accumulation occurred during the 1:00 to 3:00 a.m. time-point. This value was about 25 percent higher than the midnight value.

Figure 1.



This analysis demonstrated that in order to determine how much of the truck parking capacity was being used at a specific site, the number of trucks parking at that site needed to be estimated for the 1:00 - 3:00 a.m. time period. In order to conduct further analysis of the 26 sites identified in Phase I as having potential capacity problems, a method was developed to factor up the midnight data to represent the peak demand occurring between 1:00 - 3:00 a.m.

The detailed analysis of data also looked at how truck parking demand varied by day of week and month of year. Figure 2 shows the weekly distribution of parking demand at the 15 Phase II sites. The highest demand occurred on Tuesdays, followed closely by Wednesdays, Thursdays and Mondays. The demand on Fridays is about 75 percent of the average of the other weekdays and the demand on Saturdays and Sundays is significantly below the other levels. The conclusion was that using weekday averages to represent the highest use periods should be reasonable.

Figure 2

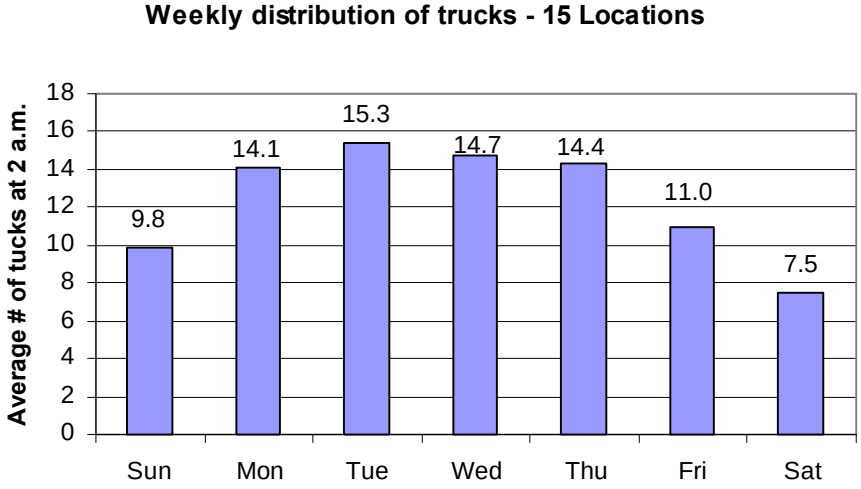
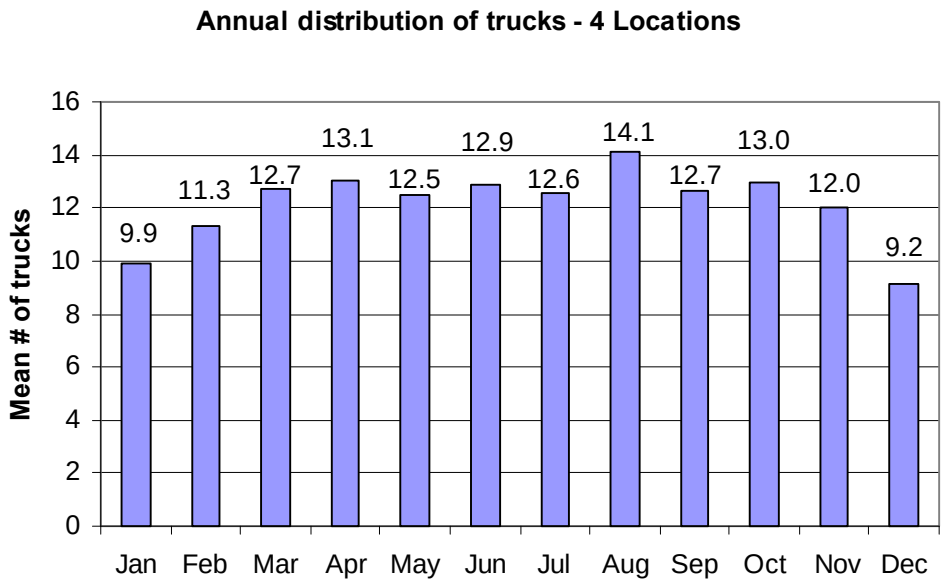


Figure 3 shows the annual distribution of parking demand at four of the highest use sites (Marion, Albert Lea, Elm Creek and Straight River, N.B.) using Phase I data. The highest use month was August, the lowest was December. The five month of Phase II data available for this study was May through September. This five month period had an average truck parking use about 7 percent higher than the annual average truck parking use for these four sample sites. The conclusion was that it would not be possible to simply factor the Phase I midnight data to represent 1:00 to 3:00 a.m. by using the Phase II information on time-points (with 1:00 to 3:00 a.m. being 25 percent higher than midnight) as the Phase II information was only available for a five month period, which was known to be higher than the annual average.

Instead of applying a simple factor to each observation, it was necessary to develop and apply adjustments to the site averages. The method used was to determine the 2:00 a.m. to midnight difference in the average number of trucks present for the five months at each of the 15 sites where 2:00 a.m. and midnight data existed. After this, the difference was applied to the 24 month average number of trucks present at midnight at each of the 15 sites. For the remaining 11 sites that did not have any 2:00 a.m. data, the adjustment factor was developed by averaging the 2:00 a.m. to midnight differences for the 15 known sites. The results of applying these adjustment factors to the 26 sites identified as potentially having capacity problems are shown in Table 3.

Figure 3



The results indicate that 12 of the sites have estimated 2:00 a.m. average number of trucks present at or above their truck parking capacity. This by itself should not be the final determinant of where capacity problems are a regular occurrence as extreme values greatly influence the interpretation of average values. As a result, a further examination was undertaken to determine the percentage of all days and more specifically, weekdays, where trucks parked were at or above the capacity of the lot. The results of that work are presented in Table 4.

The estimates in Table 4 were developed by using a method similar to that used to develop the estimated average number of trucks present at 2:00 a.m. That is, data from the 15 sites was used to determine the difference in the percentage of days per year that capacity was met or exceeded at midnight and at 2:00 a.m. at each site. This percentage difference was then applied to the 24 months of data at each of the 15 sites and then the result was normalized to represent one year. For the 11 sites where no Phase II data was available, the average percentage difference from the 15 sites was applied. From this estimated percentage, the number of days per year was calculated. The same method was applied to the weekday data to generate the percentage estimates for only the weekdays.

The weekday results are the most meaningful to evaluate for most sites. Including the weekends tends to downplay the significance of the weekday needs. The weekday results are as follows:

Percent of Weekdays Where Truck Parking Capacity is Met or Exceeded at 2:00 a.m.	Number of Sites In Each Category
More than 50 percent	6
10 percent to 50 percent	15
Less than 10 percent	5

The highest weekday values were found at:

Map Key No.	Safety Rest Area Name	Roadway	Percentage of Weekdays at or Above Capacity at 2:00 a.m.
33	Marion (W.B.)	I-90	99%
7	Albert Lea T.I.C. (N.B.)	I-35	88%
9	Straight River (N.B.)	I-35	78%
45	Elm Creek R.A. (E.B.)	I-94	70%
37	Lake Iverson (E.B.)	I-94	70%
40	Burgen Lake (W.B.)	I-94	51%

TABLE 3 -
ESTIMATED PEAK DEMAND AT REST AREAS WITH POTENTIAL CAPACITY PROBLEM AT 2 a.m.

Map Key No.	Safety Rest Area Name	Roadway	Rest Area Capacity	Estimated Average Number of Trucks at 2 a.m. Weekdays *(1)*
3	CASS LAKE	TH 2	10	5.2
7	ALBERT LEA T.I.C. (N.B.)	I - 35	12	17.5
8	STRAIGHT RIVER (S.B.)	I - 35	13	12.8
9	STRAIGHT RIVER (N.B.)	I - 35	12	13.4
10	HEATH CREEK (N.B.)	I - 35	20	16.2
11	NEW MARKET (S.B.)	I - 35	15	11.5
17	THOMPSON HILL T.I.C. (S.B.)	I - 35	10	3.2
19	WORTHINGTON T.I.C.	TH 60	8	4.0
24	ADRIAN (E.B.)	I - 90	6	6.6
25	ADRIAN (W.B.)	I - 90	6	7.1
26	DES MOINES RIVER (W.B.)	I - 90	9	4.6
27	CLEAR LAKE (E.B)	I - 90	7	7.2
28	BLUE EARTH (E.B.)	I - 90	9	8.8
29	BLUE EARTH (W.B.)	I - 90	9	9.3
30	HAYWARD (E.B.)	I - 90	10	9.4
31	OAKLAND WOODS (W.B.)	I - 90	10	10.7
33	MARION (W.B)	I - 90	10	28.2
34	ENTERPRISE (E.B.)	I - 90	13	10.5
35	DRESBACH T.I.C. (W.B.)	I - 90	6	5.8
37	LAKE IVERSON (E.B.)	I - 94	11	12.3
38	HANSEL LAKE (W.B.)	I - 94	10	8.7
39	LAKE LATOKA (E.B)	I - 94	18	18.4
40	BURGEN LAKE (W.B.)	I - 94	12	12.0
45	ELM CREEK R.A. (E.B.)	I - 94	10	12.6
46	ST CROIX T.I.C. (W.B.)	I - 94	35	30.0
50	GARRISON	TH 169	19	5.7

(1) Calculated from midnight data collected from February 1995 through February 1997, and 2 a.m. factors developed from midnight and 2 a.m. data collected from May 1998 to September 1998.

TABLE 4 -
2 a.m. UTILIZATION AT REST AREAS WITH POTENTIAL CAPACITY PROBLEM

Map Key No.	Safety Rest Area Name	Roadway	Estimated Number of Days per Year Capacity was Met or Exceeded *(1) (2)*	Estimated % of Days per Year Capacity was Met or Exceeded *(3)*	Estimated Number of Weekdays per Year Capacity was Met or Exceeded *(2)*	Estimated % of Weekdays per Year Capacity was Met or Exceeded *(3)*
3	CASS LAKE	TH 2	13	4	10	4
7	ALBERT LEA T.I.C. (N.B.)	I - 35	290	79	230	88
8	STRAIGHT RIVER (S.B.)	I - 35	109	30	102	39
9	STRAIGHT RIVER (N.B.)	I - 35	232	64	203	78
10	HEATH CREEK (N.B.)	I - 35	32	9	29	11
11	NEW MARKET (S.B.)	I - 35	49	13	45	17
17	THOMPSON HILL T.I.C. (S.B.)	I - 35	25	7	11	4
19	WORTHINGTON T.I.C.	TH 60	13	4	12	5
24	ADRIAN (E.B.)	I - 90	120	33	104	40
25	ADRIAN (W.B.)	I - 90	157	43	124	48
26	DES MOINES RIVER (W.B.)	I - 90	13	4	10	4
27	CLEAR LAKE (E.B)	I - 90	111	30	97	37
28	BLUE EARTH (E.B.)	I - 90	109	30	95	36
29	BLUE EARTH (W.B.)	I - 90	132	36	114	44
30	HAYWARD (E.B.)	I - 90	99	27	88	34
31	OAKLAND WOODS (W.B.)	I - 90	149	41	128	49
33	MARION (W.B)	I - 90	343	94	257	99
34	ENTERPRISE (E.B.)	I - 90	84	23	79	30
35	DRESBACH T.I.C. (W.B.)	I - 90	141	39	122	47
37	LAKE IVERSON (E.B.)	I - 94	229	63	182	70
38	HANSEL LAKE (W.B.)	I - 94	113	31	94	36
39	LAKE LATOKA (E.B)	I - 94	138	38	122	47
40	BURGEN LAKE (W.B.)	I - 94	154	42	133	51
45	ELM CREEK R.A. (E.B.)	I - 94	202	55	182	70
46	ST CROIX T.I.C. (W.B.)	I - 94	84	23	84	32
50	GARRISON	TH 169	37	10	4	2

(1) Calculated from midnight data collected from February 1995 through February 1997, and 2 a.m. factors developed from midnight and 2 a.m. data collected from May 1998 to September 1998

(2) Number of days where the number of trucks met or exceeded capacity annually

(3) Percentage of days where the number of trucks met or exceeded capacity annually

Conclusions and Recommendations

This study found that there may be a commercial vehicle parking problem at 26 safety rest areas in Minnesota out of the 55 full service rest areas operated by Mn/DOT. These sites were estimated to meet or exceed nighttime parking capacity more than 3 percent of the weekdays or total days per year. These sites are listed in Table 4. This finding allows Mn/DOT to concentrate its resources on documenting the extent of the problem and where appropriate recommending mitigation within these highway corridors.

As a result of this finding, the following actions are recommended:

1. Increase the number of rest area sites inventoried for 2:00 am parking to include all rest areas with potential truck parking capacity problems.

2. Conduct on-site nighttime interviews with commercial vehicle drivers and motor carrier managers to identify problems at high use rest area. Determine why some rest areas are more heavily used for nighttime parking. Interview both independent drivers and corporate drivers.

3. Conduct focus groups with commercial vehicle drivers to investigate scope of problem and preferences of the commercial drivers to meet their short term stopping and long term parking needs.

4. Collect 24 hour video or license plate reader information to record data about vehicles using the rest area and the mainline traffic to determine the percent of commercial drivers using rest areas at night and to determine length of stay for each vehicle. Calculate the percent of drivers that use rest areas for short rest stops vs layovers of eight hours or more.

5. Study highway corridors with high commercial truck parking demand to document the availability of commercial, and other free, non-commercial parking opportunities within a corridor to determine if all parking facilities are being used to capacity. If some facilities are not being used to capacity determine what issues prevent commercial drivers from using them, such as: security concerns, poor visibility or accessibility, no services (lack of toilets), lack of directional signing, etc.

Bibliography

U.S. Department of Transportation, FHWA, Office of Motor Carriers, and the Trucking Research Institute, Apogee Research, Inc., and Wilbur Smith Assoc. Commercial Driver Rest Area Requirements; No room at the Inn. 1996.

Appendices

MINNESOTA DEPARTMENT OF TRANSPORTATION SAFETY REST AREAS
TRUCK PARKING DATA COLLECTION FORM 1995

REST AREA NAME ALBERT LEA INFO LOCATION 35N.

MONTH Sept-96 DISTRICT Owatonna

Date/Day	Midnight	6 - (7) or 8am	Notes
1 Sun.	3	5	
2 Mon.	1	4	
3 Tue	13	22	
4 Wed	9	24	
5 Thur	15	26	
6 Fri.	11	25	
7 Sat	7	20	
8 Sun.	2	3	
9 Mon	19	18	
10 Tue	21	22	
11 Wed	16	20	
12 Thur	15	19	
13 Fri.	20	23	
14 Sat	5	6	
15 Sun	5	9	
16 Mon	12	18	
17 Tue	14	15	
18 Wed	9	19	
19 Thur.	16	25	
20 Fri	15	17	
21 Sat	10	8	
22 Sun	3	7	
23 Mon	13	20	
24 Tue	12	15	
25 Wed	28	32	
26 Thur	16	21	
27 Fri.	21	19	
28 Sat	6	7	
29 Sun.	7	9	
30 Mon.	26	30	
31			

Return this form to:
DENNIS FORSELL - send with your foreman report

Minnesota Department of Transportation Safety Rest Areas
Nighttime Commercial Truck Parking Data Collection Form

Rest Area Name ALBERT LEA INFO Location (TH) 235-N Dist. 6 Month/Year SEPTEMBER 1998

Record information on the number of commercial trucks and "other" oversized vehicles (such as recreational vehicles) that are in the TRUCK AND CAR parking lots during each of the designated recording periods.

Date/Day	10:00 PM		Midnight		1 AM or 2 AM (for 18 hour sites, record at end of shift) OR 3 AM (for 21 and 24 hour service sites)		6 (7) or 8 AM (Circle designated data collection time for site)		
	Truck	Other	Truck	Other	Truck	Other	Truck	Other	Comments
1 TUE.	12	0	19	0	23	0	24	0	
2 WED.	11	0	16	0	21	0	17	0	
3 THUR.	10	0	18	0	16	0	9	0	
4 FRI.	5	0	7	1	9	1	6	1	CAMPER
5 SAT.	1	0	4	0	6	0	6	4	
6 SUN.	0	0	3	0	3	0	5	0	
7 MON.	7	0	10	0	13	0	23	1	MOTORHOME
8 TUE.	10	0	15	0	21	4	21	0	
9 WED.	8	0	13	0	14	6	24	0	
10 THUR.	11	0	18	0	18	0	26	0	
11 FRI.	12	1	6	0	11	0	10	0	CAMPER
12 SAT.	1	0	8	0	10	0	10	0	
13 SUN.	8	0	8	0	12	0	14	0	
14 MON.	6	0	11	0	19	0	17	0	CAMPER
15 TUE.	15	1	13	1	21	1	22	2	
16 WED.	7	0	14	0	20	0	28	0	
17 THUR.	10	0	17	0	22	0	22	0	
18 FRI.	3	0	6	0	6	0	14	0	
19 SAT.	5	0	5	0	6	0	7	0	
20 SUN.	13	0	16	0	23	0	20	0	
21 MON.	6	1	11	1	14	1	20	1	CAMPER
22 TUE.	8	1	16	1	23	1	18	0	CAMPER
23 WED.	12	0	19	0	25	0	11	0	
24 THUR.	9	0	15	0	13	0	12	0	
25 FRI.	5	0	6	0	0	0	9	0	
26 SAT.	2	1	2	0	3	0	7	1	CAMPER
27 SUN.	8	0	14	0	15	0	23	0	
28 MON.	5	0	11	0	16	1	21	0	
29 TUE.	7	1	14	0	18	2	28	0	2 CAMPERS
30 WED.	10	0	17	1	22	1	17	0	1 CAMPER
31									

Return this form to Dennis Forsell with your Crew Leader report.