HUMAN PERFORMANCE FACTORS GROUP CHAIRMAN'S FACTUAL REPORT

Bridge Collapse
Mount Vernon, Washington: 05/23/2013

HWY-13-MH-012
(26 pages)

NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF HIGHWAY SAFETY
WASHINGTON, D.C.

A. ACCIDENT

LOCATION:	Interstate 5 at Milepost 228.25 over the Skagit River, in Mount Vernon, Skagit County, Washington.
VEHICLE 1:	2010 Kenworth Truck Tractor and 1997 Aspen Flatbed Semitrailer, Hauling an Oversize Load
OPERATOR:	Mullen Trucking LP, Aldersyde, Alberta, Canada
VEHICLE 2:	1997 Dodge Ram Pickup Truck, Piloting the Oversize Load
OPERATOR:	G&T Crawlers, Olympia, Washington
VEHICLE 3:	2000 Kenworth Truck Tractor and 1996 Utility Refrigerated Semitrailer
OPERATOR:	Motorways Transport LTD, Surrey, British Columbia, Canada
VEHICLE 4:	2010 Dodge Ram Pickup Truck and 2009 Jayco Travel Trailer
OPERATOR:	Private owner
VEHICLE 5:	2013 Subaru VX Crosstrek
OPERATOR:	Private owner
VEHICLE 6:	1995 BMW 525i
OPERATOR:	Private owner
DATE:	May 23, 2013
TIME:	Approximately 7:05 p.m. PDT
FATAL:	0
INJURIED:	3 minor, 5 uninjured
NTSB #:	**HWY13MH012**

B. HUMAN PERFORMANCE FACTORS GROUP

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C. ACCIDENT SUMMARY

For a summary of the accident, refer to the *Accident Summary* report in the docket for this investigation.

D. DETAILS OF THE HUMAN PERFORMANCE FACTORS INVESTIGATION

The accident discussed in this report involves the collision of a 2010 Kenworth truck-tractor in combination with a 1997 Aspen flatbed semitrailer with the Interstate 5 (I-5) bridge over the Skagit River in Mount Vernon, Washington. The 2010 Kenworth was transporting an oversized, permitted load and was being escorted by a pilot car.

The Human Performance factual investigation focused on the behavioral, medical, operational, and environmental factors associated with the driver of the 2010 Kenworth and the driver of the pilot car, a 1997 Dodge Ram pickup truck. Each driver is discussed in a separate section below.

Human performance factors associated with the drivers of vehicles 3 through 6 would not have caused or contributed to this accident and will not be addressed in this report.

1. Factors Associated With the 2010 Kenworth Driver

Information in this section and subsections was obtained from an interview with the driver,[1] his logbook,[2] records from his cell phone service provider,[3] and the truck company's dispatching and scheduling system. [4]

[1] Human Performance Factual Report Attachment 1: Narratives/Transcripts of Investigative Interviews.
[2] Available in the docket as Attachment #16 to the Motor Carrier Group Chairman's Factual Report.
[3] Human Performance Factual Report Attachment 2: 2010 Kenworth Driver's Cellular Telephone Records.
[4] Available in the docket as Attachment #4 to the Motor Carrier Group Chairman's Factual Report.

1.1. Behavioral Factors

1.1.1. Activities Prior to the Accident

Using the above-mentioned sources of information, investigators generated the following table of the driver's activities preceding the accident. All times in the table are in Pacific Daylight Time (PDT).

Table 1. 2010 Kenworth driver activities prior to the accident

Monday, May 20, 2013		
Time	Event	Source
8:30 a.m.	Driver awakes in Edison, Alberta	Interview
Unknown	Driver departs campground for home	Interview
1:30 p.m.	Driver arrives at his home in Spruce Grove, Alberta	Interview
Unknown	Driver does yard work, eats dinner	Interview
8:00 p.m.	Driver goes to bed	Interview
Tuesday, May 21, 2013		
Time	Event	Source
~2-3 a.m.	Driver awakes to go to the restroom	Interview
6:30 a.m.	Driver awakes, Spruce Grove	Interview
Unknown	Driver takes his son to school, returns home	Interview
7:48 a.m.	Driver receives incoming text (first cellular activity)	Cell Records
8:00 a.m.	Driver departs home for Aldersyde, Alberta, in truck	Interview
8:15 a.m.	Duty status changes from off-duty to on-duty, not driving (Spruce Grove)	Logbook
8:30 a.m.	Duty status changes from on-duty, not driving to driving	Logbook
~11:30 p.m.	Driver arrives at office in Aldersyde	Interview
12:15 p.m.	Duty status changes from driving to on-duty, not driving (Aldersyde)	Logbook
1:00 p.m.	Duty status changes from on-duty, not driving to off-duty	Logbook
2:15 p.m.	Duty status changes from not off-duty to driving	Logbook
Unknown	Driver departs Aldersyde for Nisku, Alberta	Interview
6:30 p.m.	Driver arrives in Nisku	Interview
6:30 p.m.	Duty status changes from driving to off-duty (Nisku)	Logbook
7:00 p.m.	Duty status changes from off-duty to sleeper berth	Logbook
8:00 p.m.	Driver goes to bed in sleeper berth	Interview
9:18 p.m.	Driver is 2.39 miles N of Finning (ignition off)	GPS data
10:05 p.m.	Driver sends text message (last cellular activity)	Cell Records
Wednesday, May 22, 2013		
Time	Event	Source
2:00 a.m.	Driver awakes to use the restroom	Interview
5:12 a.m.	Driver is 2.41 miles is N of Finning (ignition on)	GPS data
7:00 a.m.	Driver awakes in Nisku	Interview
7:00 a.m.	Duty status changes from sleeper berth to off-duty	Logbook
9:58 a.m.	Driver is 3.66 miles NNE of Finning (ignition off)	GPS data

Wednesday, May 22, 2013 (continued)		
Time	Event	Source
10:20 a.m.	Driver sends text message (first cellular activity)	Cell Records
~11:00 a.m.	Loading of truck begins	Interview
Unknown	Driver measures, weighs, adjusts load and gets permits	Interview
1:26 p.m.	Driver is 1.65 miles S of Finning (ignition off)	GPS data
1:56 p.m.	Driver is 1.65 miles S of Finning (ignition off)	GPS data
3:00 p.m.	Duty status changes from off-duty to on-duty, not driving	Logbook
4:00 p.m.	Driver departs Nisku	Interview
4:00 p.m.	Duty status changes from on-duty, not driving to driving	Logbook
~4:30 p.m.	Driver arrives in Acheson, Alberta	Interview
4:45 p.m.	Duty status changes from driving to on-duty, not driving (Acheson)	Logbook
Unknown	Driver weighs truck and re-measures height; sends these numbers to Washington State for permits.	Interview
5:00 p.m.	Duty status changes from on-duty, not driving to off-duty	Logbook
Unknown	Driver proceeds to Edson, Alberta	Interview
5:15 p.m.	Duty status changes from on-duty, not driving to driving	Logbook
6:45 p.m.	Duty status changes from driving to off-duty (Edson)	Logbook
6:53 p.m.	Driver is 2.92 miles ENE of Bickerdike, AB (ignition off)	GPS data
7:15 p.m.	Duty status changes from off-duty to driving	Logbook
8:12 p.m.	Driver gets text message (last cellular activity)	Cell Records
~8:30 p.m.	Driver arrives in Edson, Alberta	Interview
Unknown	Driver meets pilot cars at British Columbia border	Interview
Unknown	Driver proceeds to Valemount, BC	Interview
10:00 p.m.	Driver arrives in Valemount	Interview
10:00 p.m.	Duty status changes from driving to sleeper berth (Valemount)	Logbook
10:30 p.m.	Driver goes to sleep	Interview
10:45 p.m.	Driver is 3.06 miles NNW of Valemount, BC (ignition off)	GPS data
Thursday, May 23, 2013		
Time	Event	Source
7:00 a.m.	Duty status changes from sleeper berth to off-duty	Logbook
7:05 a.m.	Driver is 3.12 miles NNW of Valemount, BC (ignition on)	GPS data
8:00 a.m.	Duty status changes from off-duty to on-duty, not driving	Logbook
8:15 a.m.	Duty changes from on-duty, not driving to driving	Logbook
8:23 a.m.	Driver is 3.03 miles NNW of Valemount, BC (ignition off)	GPS data
8:25 a.m.	Driver is 2.59 miles NNW of Valemount, BC	GPS data
~8:30 a.m.	Driver awakes in Valemount, BC	Interview
~9:00 a.m.	Driver departs Valemount for Kamloops, BC	Interview
9:16 a.m.	Driver sends text message (first cellular activity)	Cell Records

Thursday, May 23, 2013 (continued)		
Time	Event	Source
~12:00 p.m.	Driver arrives in Kamloops, gets fuel and permits	Interview
12:00 p.m.	Duty status changes from driving to on-duty, not driving (Kamloops)	Logbook
12:15 p.m.	Duty status changes from on-duty, not driving to off-duty	Logbook
12:30 p.m.	Duty status changes from off-duty to driving	Logbook
Unknown	Driver departs for Merritt, BC	Interview
Unknown	Driver stops for safety check in Merritt, BC	Interview
1:30 p.m.	Break in duty status, logged as Merritt	Logbook
Unknown	Driver reaches summit of the Coquihalla Mountain; undergoes another safety check	Interview
2:45 p.m.	Duty status changes from driving to on-duty, not driving (Hwy 550)	Logbook
3:00 p.m.	Duty status changes from on-duty, not driving to driving	Logbook
Unknown	Driver arrives in Hope, BC and weighs his vehicle	Interview
Unknown	Driver passes through U.S. Customs at Sumas, WA	Interview
4:30 p.m.	Duty status changes from driving to on-duty, not driving (Sumas)	Logbook
4:30 p.m.	Driver meets pilot car drivers	Interview
4:51 p.m.	First GPS location reading of Sumas, WA	GPS data
5:00 p.m.	Driver departs Sumas	Interview
5:00 p.m.	Duty status changes from on-duty, not driving to off-duty	Logbook
~5:30 p.m.	Driver reaches I-5; following car returns to Sumas	Interview
5:30 p.m.	Duty status changes from off duty (entry not completed)	Logbook
5:36 p.m.	Last GPS location reading of Sumas, WA	GPS data
6:07 p.m.	Driver is 6.02 miles S of Everson, WA	GPS data
6:22 p.m.	Driver is 3.07 miles NW of Geneva, WA	GPS data
6:43 p.m.	Driver is 4.41 miles ESE of Bellingham, WA	GPS data
6:53 p.m.	Driver passes through Bow Hill scale	Interview
6:57 p.m.	Driver places outbound call of 29 seconds	Cell Records
6:58 p.m.	Driver is 2.79 miles NNW of Burlington, WA	GPS data
~7:00 p.m.	**Accident Occurs**	

1.2. Medical Factors

1.2.1. Medical Examination for Motor Vehicle Operators

As the holder of a class 1 driver's license from the province of Alberta in Canada, the driver of the 2010 Kenworth was required to undergo a medical examination.[5] The

[5] In Alberta, a medical report is required with applying for or renewing a class 1, 2, or 4 license; if the license has driver code "C" (periodic satisfactory medical report) or "D" (periodic vision report); if the driver has a medical condition that may affect their driving ability; or if they are 75 years old or older. See: http://www.servicealberta.ca/672.cfm, (accessed on July 16, 2013). In the absence of extra requirements, the medical report is to be completed every 5 years until age 45; every two years from age 45 to 65; and

most recent medical examination of the driver was performed on February 7, 2013 and expires in 2018. The examination was performed by the driver's primary care physician.

In that examination, the driver's physician indicated the driver was "healthy, no concerns". The examiner checked "no" to all specific items on the exam form.[6] The driver's blood pressure was recorded as 135/88. No history of myocardial infarction, diabetes, or significant hypoglycemic episodes was noted.

1.2.2. General Health

The driver of the 2010 Kenworth truck-tractor was a 41-year-old male. When interviewed by NTSB investigators, he stated his health was good and he had no allergies of any kind. He stated his height was 6 feet and 2 inches and his weight was 212 pounds. This corresponds to a Body Mass Index (BMI) of 27.2. [7] He reported his most recent acute illness was a sinus infection a few weeks prior to the accident.

1.2.3. Vision

When interviewed by NTSB investigators, the 2010 Kenworth driver described his vision as "excellent" and specifically stated he was not having any vision problems at the time of the accident. The driver does not wear glasses or contact lenses. In his 2013 Medical Examination, his uncorrected visual acuity was listed as 6/6[8] for both the right and left eyes individually and as 6/5 for both eyes together. Although not specifically recorded on the form, guidance provided to the examiner on the back of the form also indicates that to hold a Class 1 license, the person examined must also be able to identify traffic lights and be able to see 150 continuous degrees along the horizontal meridian and 20 continuous degrees above and below fixation with both eyes open and examined together.

1.2.4. Hearing

When interviewed by NTSB investigators, the 2010 Kenworth driver described his hearing as good, both in general and at the time of the accident. He stated he has never had any problems with his hearing. In his 2013 Medical Examination, the driver was noted as not having hearing loss greater than 40 decibels averaged at 500, 1000, and 2000 Hz. Although not recorded on the form, the guidance to the examiner also indicates the person examined must be able to perceive a forced-whispered voice at no less than five feet.

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every year after age 65. See A Commercial Driver's Guide to Operation, Safety and Licensing: Trucks, Buses, Emergency Responders, and Taxis, available from http://www.transportation.alberta.ca/531.htm (accessed July 16, 2013).

[6] A sample form can found as Human Performance Factual Attachment 3 2010 Kenworth Medical Examination for Motor Vehicle Operators Form with Sample Blank Form.

[7] http://www.nhlbi.nih.gov/guidelines/obesity/BMI/bmicalc.htm

[8] Snellen fractions are a measure of visual acuity (sharpness of sight). In the Snellen fraction, the first number represents the test distance (6 meters) and the second represents the distance at which the average eye could see the letters on a certain line of the chart. A fraction of 6/6 is considered normal vision.

1.2.5. Medications (Prescription, Over-the-Counter, Other)

When interviewed by NTSB investigators, the driver of the 2010 Kenworth stated the only prescription medication he takes is testosterone; he is supposed to take that pill daily and did so on the day of the accident and each of the three days prior. He takes the pill in the morning.

With respect to over-the-counter medications, the driver told investigators that he took what he described as "back pills" in the evening three days prior to the accident. When asked, the driver described the "back pills" as being muscle relaxant and ibuprofen together.

With respect to herbal supplements, the driver told NTSB investigators that he takes what he described as "health vitamins".

1.2.6. Alcohol and Drug Consumption

The 2010 Kenworth driver told NTSB investigators his last alcohol consumption was one beer and one mixed drink approximately four days prior to the accident. He described those two drinks as the only ones he had consumed since March. The driver stated he does not drink at all while working and does not take any illegal or illicit drugs.

He told NTSB investigators he very seldom drinks alcohol and when he does, he typically consumes no more than three or four beers. The driver stated he did not consume any alcohol on the day of the accident. He also stated he does not take any illicit drugs.

1.2.7. Post-accident Toxicology

1.2.7.1. Law Enforcement

Following the accident, the 2010 Kenworth driver voluntarily provided a blood sample to the Washington State Patrol. Results of that testing have not been received by the NTSB.

1.2.7.2. Department of Transportation Required Post-accident Drug and Alcohol Testing

According to the 2010 Kenworth driver and his employer, the driver provided a urine sample the morning following the accident, per post-accident toxicological testing rules under 49 CFR §382.303.[9] The results of that testing were negative for amphetamines, marijuana, opiates, cocaine, and phencyclidine.

[9] Human Performance Factual Attachment 4 2010 Result of DOT Controlled Substance Test.

1.2.7.3. Civil Aerospace Medical Institute (CAMI)

At the request of the NTSB, the sample provided to the Washington State Patrol was split and the split portion was delivered to the Civil Aerospace Medical Institute (CAMI) in Oklahoma City, Oklahoma. The sample was tested for alcohol and drugs, [10] with negative results. [11]

1.2.8. Psychological Factors

When interviewed by NTSB investigators, the 2010 Kenworth driver stated he had not experienced any significant life changes or stressors in the days and weeks prior to the accident.

1.2.9. Sleep Habits

When interviewed by NTSB investigators, the 2010 Kenworth driver stated on days he does not have to work he typically goes to bed by 9:00 p.m. and gets up by 7:30 a.m. to take his son to school. He also stated on the days he works he tends to arise early - with the sun - in order to move the truck during daylight. He typically wakes on his own, without the use of an alarm clock, both when he works and when he does not. He stated he does not nap normally and described his sleep quality as good. He estimated that it typically takes him approximately 10 minutes to fall asleep at night. He told investigators he typically awakes most nights around 2 or 3 a.m. to go to the restroom. He reported no trouble falling back asleep afterwards. In the days prior to the accident, the driver thinks he awoke at that time on Monday, was certain he awoke at 2:00 a.m. on Tuesday, and did not think he awoke Wednesday night.

Based on his interview, logbook, and vehicle GPS data, the driver had the opportunities for sleep listed in table 2.

Table 2. 2010 Kenworth Driver Opportunities for Rest

From		To		
Date	**Time**	**Date**	**Time**	**Sleep Opportunity**
May 20, 2013	8:00 p.m.	May 21, 2013	6:30 a.m.	10.5 hours
May 21, 2013	10:05 p.m.	May 22, 2013	5:12 a.m.	~ 7 hours
May 22, 2013	10:45 p.m.	May 23, 2013	7:00 a.m.	8.25 hours

[10] CAMI commonly tests for a number of drugs, including (but not limited to) amphetamines, opiates, cannabinoids, cocaine and cocaine metabolites, phencyclidine, benzodiazepines, barbiturates, antidepressants, and antihistamines. For comprehensive information concerning all drugs detected by the laboratory, please see the CAMI drug information web site.

[11] Human Performance Attachment 5: Final Forensic Toxicology Non-Fatal Accident Report.

1.3. Operational Factors

1.3.1. Licensing

The 2010 Kenworth driver held an Alberta, Canada class "1" commercial operator's license,[12] issued in February 2013 and expiring in February 2017.

The 2010 Kenworth driver told investigators he was first issued a driver's license of any kind when he was 16 years old and lived in British Columbia, Canada. He described this as a class 5 license, which limited him to passenger cars. When the driver was 19 years old, he obtained a class 1 license; he holds that same license today.

1.3.2. Training / Experience

1.3.2.1. General Experience

The 2010 Kenworth driver has worked for Mullen Trucking (Mullen) for approximately 8 years. He typically works 20 days a month, which equates to 2 loads a month (loads take 10 days to deliver). The majority of his loads are specialized freight – oversize and/or overweight loads. He stated he has moved structures similar to the accident load and larger items in the past. He told NTSB investigators he has moved 4 or 5 of these loads – which he called drill rigs – since coming to work for Mullen.

1.3.2.2. Training

When asked about his training, the 2010 Kenworth driver stated he went through a school offered through the Teamsters Union. The school involved 1.5 weeks of classroom training and 40 or 50 hours of behind-the-wheel with an instructor before taking the test. The driver passed the test the first time he took it. When asked about annual or recurrent training, the driver said he takes the "Smith Driving System" through Mullen every two years; the last time was approximately two years ago.

When asked about training on working with pilot cars, the driver stated he had not had any specific formal training on the subject. When he was a new driver he was shown what to do by more experienced drivers. When asked about operating procedures, the driver stated that if the pilot car pole strikes an object, the driver is to radio immediately and stay where they are, if they can safely do so.

1.3.2.3. Specific Experience

1.3.2.3.1. Route Experience

When asked about his experience with the I-5 Bridge over the Skagit River, the 2010 Kenworth driver stated he has had to cross this bridge 4 or 5 times over his career

[12] A Class 1 operator's license allows the operation of any motor vehicle or combination of vehicles other than a motor cycle.

with Mullen. All loads he has taken over this bridge have been oversize loads. The last time he took a load southbound over the bridge was 2 years ago. The last time he took a load over the bridge in the northbound direction was earlier in May 2013. Most of the driver's loads were going south to north.

1.3.2.3.2. Vehicle Experience

When asked about his experience with the 2010 Kenworth, the driver stated he owned the truck-tractor and had owned it for three and a half years, having bought it new. He told investigators his total experience with Kenworth truck-tractors was approximately 6 1/2 years.

1.3.3. Accident / License History

A check of the driver's history with Alberta authorities by the Motor Carrier Group Chairman showed no current violations or accidents.[13] According to the driver, this was his first accident while employed by Mullen.

1.3.4. Company Policies

Company policy requires the driver to complete pre-trip inspections, which he did on the morning of May 23rd. According to the driver, there were no problems with his truck. The company also has a policy requiring him to wear his seatbelt, which he was doing at the time of the accident. The company has a cell phone policy which requires drivers to use a hands-free unit while driving. According to the driver, Mullen's policy on accidents is to call the company's safety manager, which the driver did following this accident. The company has a drug and alcohol policy and requires pre-employment testing, which the driver completed with negative results.

1.4. Task Factors

1.4.1. Accident Trip

At the time of the accident, the 2010 Kenworth was one of two vehicles moving oversized loads from the United States (U.S.) / Canada border crossing in Sumas, Washington to the port in Vancouver, Washington. The movement of the oversized loads required the use of pilot cars; after completing the border crossing, the accident driver met up with the pilot car drivers. The movement of the oversize loads required two pilot cars per load from Sumas to Interstate 5 (I-5) and one pilot car per load thereafter. This meant there were supposed to be four pilot cars at Sumas, but only three were present. When asked, the driver stated that the fourth car simply did not show up.

The accident driver proceeded to I-5 with two of the pilot cars, one in front and one in the rear. According to the driver, this trip took between 30 and 40 minutes. When they reached I-5, the trailing pilot car was no longer required and returned to the border

[13] Please see the Motor Carrier Group Chairman's Factual Report for more information.

crossing to escort the second truck with the third pilot car. The 2010 Kenworth driver and his leading pilot car proceeded along I-5 to the Bow Hill scale, where the truck was weighed but not measured before continuing. The driver was heading to exit 207, where there was a rest area where he could remain overnight.[14] He stated he was in communication with the pilot car via radio and had, in fact done so a few times because he had thought a few of the clearances were tight. He told the pilot car driver to not initiate communication unless there was a problem; the driver told investigators this was because he was concerned that frequent communication would reduce the effectiveness of the communication to serve as a warning.

The driver stated that as he approached and began to traverse the bridge over the Skagit River, he was in the right lane of the two-lane roadway at a speed between 56 and 58 miles per hour. He estimated the pilot car was halfway or more across the bridge, also in the right lane. He went on to describe their separation as half a mile as he approached the bridge, then stated he was not a good judge of distance but he was sure the pilot car was far enough ahead that he could have stopped if he needed to. He told investigators that he looked at the bridge, and recalled thinking that his load would "go", as the pilot car was more to the shoulder and the pilot car driver "never said nothing about the pole hitting".

According to the 2010 Kenworth driver, a white tractor-trailer combination vehicle, possibly another Kenworth, came up on his left; the driver described the other truck as moving “fast” and stated it “squeezed” him. His first indication that something was wrong was a loud (horrendous) “boom” and a shaking of his truck. He stated the other truck was right at the window in his door. He applied his brakes, coasted across the bridge, and stopped on the right shoulder. After stopping, he was approached by the driver of another car who told him they had just made it across the bridge before it collapsed. When the driver asked what he meant, he was told the bridge had fallen and there were people in the water. Not believing that, the driver walked back towards the north end of the bridge and saw that the bridge had, in fact, collapsed. The driver went back to his truck and called Randy, the safety manager at Mullen. This was his first call post-accident. He remained with his truck and noted the arrival of the State Police.

At the time of the accident, the driver had approximately 220 miles to go to get to the load’s final destination in Vancouver, Washington.

When asked about his approach to the bridge, the driver stated he recalls approaching the bridge clearly. He stated the pilot car pole was 16 feet 2 inches[15] and passed through the bridge cleanly. He described the position of the pilot car relative to his truck as far enough ahead of him that he could have stopped. He described his position as in the right lane but more to the center than to the shoulder with the pilot car being more to the shoulder in the same lane. When specifically asked by NTSB investigators, the driver stated the pilot car did not radio that her pole had struck the

[14] The Smokey Point Rest Area at milepost 207, which is 19.5 miles south of Mount Vernon.
[15] He observed the pilot car driver set and measure the pole when they met up at the Sumas border crossing and observed the Washington State Department of Transportation measure the pole post-accident.

bridge. The only other traffic the driver could recall ahead of him was the pilot car; he did not know what was behind him.

1.4.2. Workload / Distraction

1.4.2.1. External Workload / Distraction

Following the accident, NTSB investigators examined the environment outside the vehicle at the accident location.[16] The collapse of the bridge prevented investigators from documenting the exact environment; however, investigators were able to note that there were no unusual or complex billboards, displays, or lighting.

When asked, the driver stated there was nothing unusual or attention-grabbing in the environment. The driver did note that it was windy that day, which makes it harder to pull the load and causes him to burn more fuel, but also noted the wind did not change how the truck handled.

1.4.2.2. Internal Workload / Distraction

1.4.2.2.1. Portable Electronic Devices

The 2010 Kenworth driver had his cell phone with him at the time of the accident but stated he did not have any other portable electronic devices in the cab of his truck.

1.4.2.2.2. Other Distractions Internal to the Vehicle

The truck was equipped with a built-in GPS unit in the dashboard, two radios, and a Qualcomm system. The built-in GPS unit was not on at the time of the accident. The driver was not entering data or reading the Qualcomm system at the time of the accident;[17] he is only to use the system when stopped.

[16] For a detailed description of the roadway, please see the Highway Group Chairman's Factual Report.
[17] The Qualcomm unit was transmitting fleet tracking and management data, but this did not require input or monitoring by the driver.

2. Factors Associated With the Pilot Car Driver

Information in this section and subsections was drawn from an interview of the Pilot Car driver conducted by NTSB investigators[18] and her cell phone records.[19]

2.1. Behavioral Factors

2.1.1. Activities Prior to the Accident

Based on the above-mentioned sources of information, the following table of the Pilot Car driver's activities preceding the accident was generated.

Table 3. Pilot car driver activities

Monday, May 20, 2013		
Time	Event	Source
5:30 a.m.*	Driver awakes at her residence Olympia, WA	Interview[20]
8:47 a.m.	Driver makes first outgoing cellular call of day	Cell Records
8:55 p.m.	Driver receives last incoming cellular call of day	Cell Records
~9:30 p.m.*	Driver goes to bed at her residence	Interview
Tuesday, May 21, 2013		
Time	Event	Source
5:30 a.m.*	Driver awakes at her residence Olympia, WA	Interview
7:27 a.m.	Driver sends first text message of day	Cell Records
6:35 p.m.	Driver receives last incoming cellular call of day	Cell Records
~9:30 p.m.*	Driver goes to bed at her residence	Interview
Wednesday, May 22, 2013		
Time	Event	Source
5:30 a.m.*	Driver awakes at her residence Olympia, WA	Interview
7:52 a.m.	Driver receives first incoming cellular call of day	Cell Records
~9:30 p.m.*	Driver goes to bed at her residence	Interview
10:17 p.m.	Driver receives last incoming cellular call of day	Cell Records
Wednesday, May 23, 2013		
Time	Event	Source
5:30 a.m.*	Driver awakes at her residence Olympia, WA	Interview
7:34 a.m.	Driver makes first outgoing cellular call of day	Cell Records
Unknown	Driver goes to repair shop to get items from another car	Interview
Unknown	Driver departs for Sumas, WA	Interview
4:00 p.m.	Driver arrives in Sumas, WA	Interview
Unknown	Driver fuels, stops at store, sets up pole	Interview

[18] See Human Performance Factual Report Attachment 2.
[19] Human Performance Factual Report Attachment 6: Cellular Telephone Records for Pilot Car Driver.
[20] When interviewed by NTSB investigators, the pilot car driver could not remember her specific activities but was able to describe her general habits. Items marked with "*" indicate times based on these general habits.

Wednesday, May 23, 2013 (continued)		
Time	Event	Source
Unknown	Driver calls for other pilot cars	Interview
~5:00 p.m. – 5:30 p.m.	Loads clear the border crossing in Sumas, WA	Interview
Unknown	Begins movement of load from Sumas south	Interview
Unknown	Load reaches I-5; trailing car sent back to Sumas	Interview
Unknown	Pilot car and load pass through scales south of Bellingham	Interview
7:00 p.m.	Driver receives last incoming call before accident	Cell Records
7:05 p. m.	Call ends	Cell Records
~7:05 p.m.	**Accident Occurs**	

2.2. Medical Factors

Information in this section is based on the interview with the pilot car driver. Investigators also conducted a canvas of pharmacies and medical providers near her home; no medical records were located.

2.2.1. General Health

The pilot car driver was a 55 year-old female. When interviewed, she described her health as "good". She stated she does not regularly go to the doctor and does not have a primary care physician. She told NTSB investigators she does not have any medical conditions or allergies. She was not experiencing any health issues on the day of the accident. She gave her height as 5 feet 4 inches and her weight as 180 pounds, which corresponds to a Body Mass Index of 30.9. [21]

2.2.2. Vision

When interviewed, she described her vision as "fairly good" and was not experiencing any vision problems at the time of the accident. She has never had any problems with her vision and does not wear glasses or contact lenses.

2.2.3. Hearing

When interviewed, she described her hearing as "fairly good" and has never had any problems with her hearing. She was not experiencing any hearing issues on the day of the accident.

2.2.4. Medications (Prescription, Over-the-Counter, Other)

When interviewed, she stated she does not regularly take any prescription medications, over-the-counter medications, or vitamins. She does occasionally take the

[21] For BMI information, see: http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html.

herbal supplement melatonin to help her sleep, but did not do so in the days prior to the accident.

2.2.5. Alcohol and Drug Consumption

The driver of the pilot car told investigators she consumes less than one alcoholic drink a week and did not consume any alcohol in the three days prior to the accident. She also stated she could not recall the last time she had consumed alcohol. She stated she does not take illegal drugs.

2.2.6. Post-accident Toxicology

She was not required to complete post-accident toxicological testing; therefore, no testing was performed on her.

2.2.7. Psychological Factors

When asked about sources of stress or recent major changes in her life, she stated there had been no recent changes and no major life events.

2.2.8. Sleep Habits

When interviewed, the pilot car driver stated she typically sleeps six to seven hours a night and does not regularly wake during the night. She described the quality of her sleep as "fine". She has been told she snores, but has not been diagnosed with any sleeping disorders or problems. She does not typically use an alarm clock but wakes on her own. Based on the interview and cell phone records, she had the opportunities for sleep listed in table 4.

Table 4. 1997 Dodge Ram Driver Opportunities for Rest

From		To		
Date	**Time**	**Date**	**Time**	**Sleep Opportunity**
May 20, 2013	9:30 p.m.	May 21, 2013	5:30 a.m.	8 hours
May 21, 2013	9:30 p.m.	May 22, 2013	5:30 a.m.	8 hours
May 22, 2013	10:15 p.m.	May 23, 2013	5:30 a.m.	7hours 15 minutes

2.3. Operational Factors

2.3.1. Licensing

She held a non-commercial (basic) Washington State driver's license with no endorsements and no restrictions, issued in August of 2011 and expiring in May of 2014. She also held a Washington State Pilot Escort Vehicle Certificate, expiring in January of 2015. She first received a driver's license in 1974 at age 16. She first received a Washington State driver's license in 1976. She has never held a commercial driver's license.

2.3.2. Training / Experience

2.3.2.1. General Experience

When interviewed, she told investigators she has worked as a pilot car operator for over 20 years. She first received her pilot car certificate when the state of Washington began the program; she could not recall the year that occurred. She typically works as a pilot car operator two or three days a week and estimated the number of loads she has escorted as "many". She did not think she had ever escorted a casing shed before the accident trip.

2.3.2.2. Training

When asked about her training to be a pilot car operator, she told investigators her training was through a company called Evergreen. She stated she completes the training program every three years, with the last time being in January 2012

2.3.2.3. Training Materials

The pilot car driver's most recent training used materials provided by the Evergreen Safety Council (ESC).[22] The training materials included an overview of Washington Administrative Code (WAC) 468-38, a handbook on Washington highway height and width restrictions, and the *Certified Pilot/Escort Vehicle Operator Handbook*.[23]

The handbook on Washington highway height and width restrictions[24] provides guidance on the Washington State Department of Transportation *Bridge List*.[25] In its forward, the handbook states:

> "This handbook is meant for use by agencies moving materials that exceed standard dimensions and can not be reduced in size. [...] The organization moving an Oversize Load is responsible for the safety of the motoring public and is responsible for any damage to highway structures."

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[22] The Evergreen Safety Council is a private, non-profit, non-governmental association with the mission of preventing "accidental deaths and injuries by being a resource for safety training, consulting, and information for businesses and citizens of Washington State and the Greater Northwest." http://www.esc.org, accessed on August 21, 2013.

[23] Evergreen Safety Council. *Certified Pilot/Escort Vehicle Operator Handbook*. January 2009; see Human Performance Factual Report Attachment 7.

[24] Human Performance Factual Report Attachment 8: Evergreen Safety Council Highway Height & Width Restrictions.

[25] Washington State Department of Transportation, Engineering and Regional Operations, Bridge and Structures Office. *Bridge List*, October 2011. Available from: http://www.wsdot.wa.gov/publications/manuals/m23-09.htm, accessed on August 21, 2013.

The forward to the *Bridge List* states:

> "The *Bridge List* is useable as a guide for clearances, but because of physical changes to highways and other possible inconsistencies due to new construction, overlays, etc., it cannot be guaranteed."[26]

The *Bridge List* also goes on to quote the Washington Annotated Code, Title 468, Chapter 38, Section 070:

> "It is the responsibility of the permit applicant to check, or prerun, the proposed route and provide for safe maneuvers around the obstruction or detours as necessary."[27]

When describing how to use the clearance list, the *Bridge List* states:[28]

> "B. Check the "MIN" column relative to the route and direction of the intended trip.
>
> 1. If the height of the load is less than the "MIN" for a bridge, the load should clear in all lanes.
>
> 2. If the load's height is greater than the "MIN" for any bridge:
>
> a. If the height of the load is less than the "MAX" column, the load should clear the bridge, but the operator must determine the proper lane to travel."

When describing the vertical clearances listed in the document, the *Bridge List* states:[29]

> "The clearances listed are usable vertical clearances approximately three inches less than actual measurement based on the best available information, but are not guaranteed for complete accuracy due to continuing construction activities. As stated on all permits, the operator is responsible to clear all obstructions."

and:

> "Note that the lane in which the maximum clearance occurs is not listed. This must be determined by the operator."[30]

Staff notes the *Bridge List* entry for the I-5 Bridge over the Skagit River states the southbound maximum clearance is seventeen (17) feet three (3) inches and the minimum southbound clearance is fourteen (14) feet five (5) inches.[31]

The *Certified Pilot/Escort Vehicle Operator Handbook* contains the following instructions for students:

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[26] *Bridge List*, page iii.
[27] *Bridge List*, page iii.
[28] *Bridge List*, page 2.
[29] *Bridge List*, page 5.
[30] *Bridge List*, page 6.
[31] *Bridge List*, page 101.

- The lead P/EVO[32] should not exceed a 1/2 mile ahead of the permitted vehicle or be closer than four (4) seconds. Allow one (1) second lead for each 10 feet of the permitted load and an additional one (1) second over 40 MPH and above;
- In a multi-lane, one car escort, the vehicle will be in the lead and should not exceed a 1/2 mile in front of the Oversize Load and should drive on the right side of the highway except where necessary to clear obstacles and to avoid breaking the height pole;
- The height pole should not be less than three inches above the permitted load height or greater than six inches above the maximum height of the permitted load;
- The height pole must be nonconductive, adjustable, and nondestructive; and
- Measure bridge lanes from their midpoint.

2.3.2.4. Specific Experience

2.3.2.4.1. Route Experience

She told NTSB investigators that she has previously escorted loads over the Skagit River I-5 Bridge. The majority of her loads were northbound rather than southbound. The last time prior to the accident she had escorted a load across the bridge was approximately one week prior to the accident. She described herself as being familiar with the bridge.

2.3.2.4.2. Vehicle Experience

The vehicle she normally drives when escorting a load is a 2004 Dodge Ram pickup truck. On the day of the accident, that vehicle was in for repairs and she drove another of her vehicles, the 1997 Dodge Ram pickup truck. She told investigators she bought the 1997 Dodge new, in 1997. When asked, she stated the differences between the 2004 and 1997 vehicles are minor; the pole mounts are secured to the vehicles differently, but are located in approximately the same position.

2.3.3. Accident / License History

A check of the pilot car driver's history with Washington State indicated a single instance of speeding in October of 2010.[33] A check with the National Driver Register (NDR) found no adverse information for the driver.[34]

2.4. Task Factors

2.4.1. Accident Trip

According to the pilot car driver, the escort job was brokered by another pilot car operator. She was supposed to meet the truck at Sumas at 4:30 p.m., but arrived early at approximately 4:00 p.m. She was the first pilot car to arrive. She prepared her equipment and called the pilot car operator that had brokered the job for her to report she

[32] Pilot/Escort Vehicle Operator.
[33] Human Performance Factual Report Attachment 9: Washington State Driving Record.
[34] Human Performance Factual Report Attachment 10: Response from National Driver Register.

was there and that she was the only pilot car there so far. The 1997 Dodge driver was given the numbers of several other drivers to contact to try and get the required number of cars to escort the two trucks.

The truck she was to escort came out of the X-ray shed at Sumas between 5:00 p.m. and 5:30 p.m. The driver of her truck showed her his permit;[35] she had asked him to provide her a copy of the permit but he did not have one. The driver told her the load was 15 feet 9 inches high and she thinks the permit was for 15 feet 10 inches. She set her pole to approximately 16 feet 2 inches.

She began to escort the accident truck away from the Sumas border crossing. A second pilot car driver, known to her only as "Doc", served as the trailing car for the move of the accident truck from Sumas to Interstate 5 (I-5). She described the trip from Sumas to I-5 as uneventful. According to the pilot car driver, by the time they left Sumas, she knew they would not make their planned stopping place for the night, the rest area at exit 207 (Smokey Point). When they reached I-5, "Doc" was no longer required – it was no longer a two-lane road – and he returned to Sumas to escort the second truck to I-5 with the third pilot car.

According to the pilot car driver, as the accident truck approached the bridge, there was another truck in the lane next to it; she thinks the other truck was white in color. She was watching the accident truck cross the bridge in her rear-view and side mirrors and saw dust and the bridge collapse. The cloud of dust was the first indication she had that something was wrong. After the collapse, both the pilot car and the accident truck pulled over to the side of the road. The accident truck driver went back to the bridge, came back, and told her there were cars and people in the water.

When asked, she explicitly stated the pole on her vehicle did not strike the I-5 Bridge. She stated she was in the right lane, but was not sure of where she was within the lane. She believes she was in the center of the lane. She does not know if she was still in the "caged part" of the bridge when the load struck the bridge. She described the distance she tried to stay ahead of the accident truck as in front, but not too far in front. She further described the separation she tried to keep as varying according to the situation, but that as they approached the I-5 Bridge over the Skagit River, she was trying to stay 4 to 5 seconds ahead of the truck.

2.4.2. Workload / Distraction

2.4.2.1. External Workload / Distraction

When interviewed, she told investigators there was nothing distracting or unusual in the external environment at the time of the accident.

[35] Human Performance Factual Report Attachment 11: Accident Load Permit.

2.4.2.2. Internal Workload / Distraction

2.4.2.2.1. Portable Electronic Devices

The pilot car driver told NTSB investigators she was using her cell phone at the time of the accident. She was engaged in a conversation with her husband regarding the routing of the load she was escorting, as she was upset and concerned over a segment the load would cross the following day. She stated she had been on the phone for a few minutes prior to beginning to cross the I-5 Bridge and was using a hands-free device. She had used her phone a few times during the trip from Sumas.

She also had a Garmin GPS unit in the vehicle. She believes the unit was on, although she was not using it to provide a route at the time of the accident. There were no other portable electronic devices in the vehicle.

2.4.2.2.2. Other Distractions Internal to the Vehicle

The pilot car was equipped with two Citizen's Band (CB) radios, which the driver used to communicate with the accident truck (one primary and a backup unit), providing information on the next turn and other route-related information. She believes they were using Channel 19. She told investigators there was some other chatter on the channel, but not to the extent that it bothered her. She stated she did not use the radio for "chatter" not related to the job.

3. Other Factors

3.1. Environmental Factors

In order to acquire accurate weather and illumination information, NTSB investigators used a Garmin® model 760 Global Positioning System (GPS) unit to obtain the coordinates and heading of the accident scene. The following values were recorded:

Latitude: N 48° 26' 46.9"
Longitude: W 122° 20' 28.5"
Heading: 147° measured relative to true north

3.1.1. Illumination

Using the GPS coordinates obtained by NTSB investigators, astronomical data for the accident location and date was downloaded from the United States Naval Observatory[36] (USNO). Downloaded astronomical data is summarized in the table below.

Table 5. Sun and Moon Data for Mount Vernon, WA for May 23, 2013

Event	Time
Begin civil twilight[37]	4:40 a.m.
Sunrise	5:19 a.m.
Sun Transit	1:06 p.m.
Accident	**7:00 p.m.**
Sunset	8:54 p.m.
End civil twilight	9:33 p.m.

According to the USNO, at 7:00 p.m. PDT on May 23, 2013 in Mount Vernon, Washington, the sun was at an altitude of 36.1° above the horizon at 260.7° east of true north.

Using the above GPS data, investigators used a NOAA website[38] to generate the following graphic approximation of the sun's position at the time of the accident (Figure 1). The accident location is shown with a red marker in the center of the image and the sun position is represented by the yellow line.

[36] http://www.usno.navy.mil/USNO/astronomical-applications
[37] Morning civil twilight begins when the geometric center of the sun is 6° below the horizon and ends at sunrise.
[38] http://www.esrl.noaa.gov/gmd/grad/solcalc/

Figure 1. Graphic Approximation of Sun Position

3.1.2. Weather

Weather data for May 23, 2013 from the weather station MTAVON in Mount Vernon, WA was located; information from the observations immediately prior and immediately after the accident is shown in the table below.

Table 6. Weather Data from MTAVON

Time	6:10 p.m.	7:01 p.m.
Temperature	54.0° F	54.0° F
Dew Point	46.0° F	46.0° F
Humidity	74%	74%
Pressure	29.99 in	29.99 in
Wind	SE	SE
Wind Speed	13.0 MPH	13.0 MPH
Wind Gust	17.0 MPH	17.0 MPH
Precipitation	N/A	N/A
Conditions	N/A	N/A
Visibility	N/A	N/A

3.2. 2010 Kenworth Qualcomm Data

The 2010 Kenworth was equipped with a Qualcomm system. GPS location information from that system was obtained by NTSB investigators.[39]

3.3. Witness Statement(s)

3.3.1. Southbound 2001 Ford Ranger Driver

Investigators from the NTSB conducted a telephone interview of the driver of a 2001 Ford Ranger who was southbound on I-5 near the time of the accident and passed the pilot car and combination vehicle as they began to cross the Skagit River Bridge.[40]

According to the driver of the 2001 Ford Ranger, he noticed the accident combination vehicle as he moved to the left lane to pass another vehicle. He told investigators that the load looked over-height and wide. The Ford Ranger driver slowly passed the combination vehicle, as he was trying to determine what the load it was carrying was. As he pulled away from the combination vehicle, he could see the pilot car ahead of it. He stated he was looking at the pilot car and saw the pole strike 4 or 5 of the bridge elements. The Ford Ranger driver looked in his mirror and saw the load strike the bridge. He did not recall seeing a white commercial vehicle next to the accident vehicle and estimated the distance between the pilot car and the load at 100 to 150 yards.

The driver was interviewed a second time, again by telephone. He again stated the pole on the pilot car struck several bridge elements. When specifically asked, he could not recall the position of the pilot car within its lane.

3.3.2. Southbound 2000 Kenworth Driver

On July 26, 2013, the driver of a southbound tractor-trailer was interviewed by the Washington State Police. This driver and his vehicle were identified as the vehicle visible on video of the collapse, passing the 2010 Kenworth as it began to cross the bridge.[41]

In that interview, the driver of the 2000 Kenworth stated he was hauling a load of bottled water from Hope to the Tacoma area. The driver crossed into the United States at the Sumas border crossing and made his way to Interstate 5. According to the driver, as he went through the Bow Hill scale, he noted the oversized load involved in the accident. He said he noticed the oversized load because it was "empty inside" and memorable. After leaving the scale, the driver of the 2000 Kenworth proceeded across the I-5 Bridge over the Skagit River. He stated he passed the pilot car in the middle of the bridge; he was in the left lane and the pilot car and the oversized load were in the right lane. He

[39] See Attachment #4 to the Motor Carrier Group Chairman's Factual Report.
[40] See Human Performance Factual Report Attachment 1.
[41] See Human Performance Factual Report Attachment 12: Transcript of Police Interview of 2000 Kenworth Driver.

estimated the distance between the pilot car and the load as 400 feet. He recalled hearing a noise, but thought that the load was "jumping" on the trailer; he did not know the bridge had been struck and had come down. The 2000 Kenworth driver stated that, in his opinion, 400 feet of separation between the pilot car and the oversized load was not enough space to allow the load to move to the left lane if needed.

NTSB conducted a follow-up interview with the driver of the 2000 Kenworth.[42] In that interview, the driver told investigators that when he saw the oversized load after leaving the Bow Hill scale, both his truck and the oversized load were in the right lane. The driver of the 2000 Kenworth stated he moved into the left lane because he knew he was approaching an on-ramp and knew there would be traffic merging from the right. He stated he was not concerned about passing the oversize load and did not consider the bridge ahead. The driver of the 2000 Kenworth told investigators he never saw any indication from the oversize load that it wanted to come into the left lane, and that he believes that if it wanted to, it would have begun that movement well before he (the driver of the 2000 Kenworth) was passing. When asked, the 2000 Kenworth driver stated he did see the pilot car and had passed both the oversized load and the pilot car on the bridge. He described the pilot car as not very far ahead of the oversized load. He described the position of the pilot car as in the middle of the right lane.

[42] See Human Performance Factual Report Attachment 1.

E. ACCIDENT DOCKET MATERIAL

The following attachments and photographs are included in the docket for this investigation:

LIST OF ATTACHMENTS

Attachment 1:	Narratives/Transcripts of Investigative Interviews
Attachment 2:	2010 Kenworth Driver's Cellular Telephone Records
Attachment 3:	2010 Kenworth Medical Examination for Motor Vehicle Operators Form with Sample Blank Form.
Attachment 4:	Result of DOT Controlled Substance Test
Attachment 5:	Final Forensic Toxicology Non-Fatal Accident Report
Attachment 6:	Cellular Telephone Records for Pilot Car Driver
Attachment 7:	Certified Pilot/Escort Vehicle Operator Handbook
Attachment 8:	Evergreen Safety Council Highway Height & Width Restrictions
Attachment 9:	Washington State Driving Record
Attachment 10:	Response from National Driver Register
Attachment 11:	Accident Load Permit
Attachment 12:	Transcript of Police Interview of 2000 Kenworth Driver

LIST OF PHOTOGRAPHS

NONE

END OF REPORT

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