KPEPC

2014 Commodity Flow Study

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EVALUATING HAZARDOUS MATERIALS TRANSPORTED THROUGH THE KANAWHA VALLEY

An Update of the 2008 Study

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2014

KANAWHA PUTNAM EMERGENCY PLANNING COMMITTEE
COMMODITY FLOW STUDY
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1.0 INTRODUCTION

1.1 Background

Hazardous materials flow through and into the Kanawha Valley over highways, railways, waterways, airways, and via pipelines. Emergency planning and response agencies in the Valley need to be aware of the materials that pose a risk to the public while in transportation. Protecting the public from this risk involves strong emergency planning, public education, and well-trained, well-equipped responders.

Originally, the National Institute for Chemical Studies (NICS) published the first hazardous materials transportation study for the Kanawha Valley in 1994. The study, using data collected in 1993, showed significant amounts of diverse materials flowing through the Valley. With a Hazardous Materials Emergency Planning (HMEP) grant from the West Virginia State Emergency Response Commission (SERC), the Kanawha Putnam Emergency Planning Committee (KPEPC) and NICS updated the study in 2001 and arrived at similar results. The KPEPC utilized an HMEP grant to update the study again in 2008 and utilized a private contractor to collect the data; the results were similar to those from 1993 and 2001.

This update, again funded by a HMEP grant from the SERC, is intended to characterize any changes that have occurred in the transportation of hazardous materials since 2008. This study also added a pipeline analysis to the discussion, in light of the many pipeline emergencies that have occurred throughout the county as well as the 2012 Sissonville pipeline explosion. The updated data will allow emergency management and response agencies throughout the Valley update their plans based on current risk data as well as realistically evaluate training and equipment needs. The updated data may also identify changes to existing public education campaigns with the intent of better preparing the public to handle potential emergency incidents.

The previous editions of this study identified a wide variety of materials in transit throughout the Valley. In fact, those studies revealed that most of the materials traveling on the interstates were not related to local industry. While chemical storage (Tier 2) reports provide the KPEPC and other emergency response agencies with sound data regarding hazardous materials used, stored, and potentially transported over the Valley's transportation systems, there are no standard reports that characterize the materials traveling across transportation

networks. This report, like the previous editions, seeks to fill that gap in essential data.

1.2 Methodology

As mentioned, the KPEPC was awarded a HMEP grant from the West Virginia SERC for the purpose of completing this project. With those funds, the KPEPC procured the services of a contractor – JH Consulting, LLC (JHC) of Buckhannon, West Virginia – to complete all data collection and analysis. Highways, rail lines, and waterways were included as in 1993, 2001, and 2008; covered facilities and airways were also included as in 2008; as noted above, this edition adds a pipeline analysis. JHC completed all data collection during the summer and fall of 2014.

Six types of analyses were completed as part of the project in an effort to depict hazardous material flow and usage throughout the Valley as comprehensively as possible: highway, rail, water, air, pipeline, and facility. The highway analysis was the most complex and included a series of monitoring sites along roadways through Kanawha and Putnam Counties. JHC placed monitors at various time intervals to observe the amount of truck traffic as well as the number and types of placards denoting hazardous material shipments passing through these sites. Where possible, monitoring was completed during daytime *and* nighttime hours in an effort to best characterize commodity flow. Monitors recorded data on standard forms; data is presented later in this report.

The rail, water, air, and facility analyses required extensive coordination with representatives from the companies conducting those operations. CSX Transportation and Norfolk Southern were contacted regarding commodity flow on rail lines, the United States Army Corps of Engineers was contacted about waterways, and representatives from Yeager Airport provided data regarding air shipments. The pipeline analysis was completed utilizing data from the National Pipeline Mapping System (NPMS). JHC distributed a questionnaire to the major covered facilities in the county requesting the types of materials used/stored at their facilities, the frequency of shipments of those materials, and the transportation systems used to transport those materials. Facility participation was voluntary; consequently, responses were not received from all facilities.

1.3 The Transportation Network of the Kanawha Valley

The Kanawha Valley is served by the state's busiest airport, a complex system of highways and railways, and the Kanawha River, all of which run through Charleston and the surrounding communities. The highway system, which includes three interstates – I-64, I-77, and I-79 – along with US highways 35, 60, and 119, provide easy access to the Charleston metropolitan area, other parts of the state, and the rest of the nation.

Two railways also serve the Valley and the other parts of the east coast. CSX Transportation has the most extensive rail network in the Kanawha Valley. Its main line follows the south bank of the Kanawha River throughout Kanawha and Putnam Counties and serves industries and businesses from Chelyan (at the east end of the Valley) to South Charleston and St. Albans (in the western end). Three major coal carrying lines of CSX extend southeast along the Coal River and into southern Kanawha County along Paint and Cabin Creeks.

The Norfolk Southern Rail Line follows the north bank of the Kanawha River for its entire length through Kanawha and Putnam Counties. Norfolk Southern serves businesses in the Belle, Charleston, Dunbar, and Nitro areas. A major branch extends to the northeast along the Elk River to serve primarily the coal mining areas to the north.

The full length of the Kanawha River and a short reach of the Elk River are navigable waterways sufficient to support commercial barge traffic. There are in excess of 80 private river terminals served by river barges and by connected truck, rail, pipeline, and conveyor belt systems at facilities on the shore. About 25 of these terminals are chemical or petroleum product loading facilities. Other terminals handle coal, aggregates, and other miscellaneous products. Twelve barge lines are reported to provide services in the Kanawha Valley.

Yeager Airport just north of Charleston provides commercial air services to the Valley. The airport's primary function is passenger travel and it offers non-stop flights to Charlotte, Detroit, Houston, Dallas/Fort Worth, Myrtle Beach, Orlando, Atlanta, Chicago, and Washington D.C. Currently, four air cargo/freight carriers operate from the airport. There is also a large Air National Guard operation at Yeager Airport.

2.0 HIGHWAY ANALYSIS

2.1 Data Collection

Information about hazardous materials traveling by truck through the Kanawha Valley is only available from field surveys. For this update, data collected via a series of highway monitoring points was used to characterize truck transport. Monitors at designated roadside locations used in the earlier study (with one addition) recorded information about placarded trucks passing by. The information recorded included placard and class numbers, type of truck, and direction of travel. Additionally, monitors also tallied total traffic through a site. A copy of the data collection form is included in Appendix 1.

Survey sites were chosen in conjunction with local emergency managers during the first study (in 1993). In order to compare 1993, 2001, 2008, and 2014 data, the same survey locations were used. (The "new" sites are noted as such in the following discourse.) The sites were selected on the basis of suitability for data collection and safety of the monitors. Vehicles need to be moving relatively slowly through a site to allow placards to be accurately observed and data recorded. Sites were located in lighted areas when possible to facilitate the collection of night-time data. This was not always possible, however, for important routes and sites.

The placard survey sites were located at the following locations:

<u>Kanawha County</u>

Site 5: Intersection of State Route (SR) 25 with I-64 at Institute

Survey of east and westbound traffic on SR 25 and entering/exiting onto or from I-64

Site 6: I-77: Approximately two (2) miles north of the I-77/I-79 split

Survey of north and southbound traffic on I-77

Site 8: I-79: Approximately two (2) miles north of the I-77/I-79 split

Survey of north and southbound traffic on I-79

Site 10: I-77 (WV Turnpike), Chelyan – Exit 85

Survey of north and southbound traffic on I-77

Site 12: US Route 119 at Terry Road

Near Southridge and Trace Fork shopping centers

Site 13: Intersection of Montrose Drive with MacCorkle Avenue, SW in South Charleston

Survey of east and westbound traffic on MacCorkle Avenue (US 60) and entering/leaving the Dow Chemical facility

Site 14: Intersection of MacCorkle Avenue, SW and the east-bound entrance/exit of I-64 in South Charleston

Survey of eastbound traffic existing I-64 east and west onto MacCorkle Avenue as well as general east-west traffic on MacCorkle Avenue

Site 16: Intersection of SR 25 and SR 62 (West Washington Street)

Survey of north and southbound traffic on SR 62 and east-west traffic on SR 25

Site 17: West Virginia Turnpike, Marmet (Exit 89)

Survey of north and southbound traffic on SR 94

Putnam County

Site 21: Intersection of US 35 and SR 34 west of Winfield

Survey of north and southbound traffic on US 35 and SR 34

Site 22: Intersection of exit/entrance ramp of I-64 (St. Albans – Exit 44)

Survey of north and southbound traffic on US 35 and traffic entering/exiting I-64

Site 23: Intersection of SR 25 and I-64 west at Nitro (Exit 45)

Survey of east and westbound traffic on SR 25 and traffic entering/exiting I-64 west

Site 24: I-64 Crooked Creek exit (between St. Albans and Winfield)

Survey of east and westbound traffic on I-64

Surveys were conducted on both weekdays and weekends. Where lighting allowed, surveys were conducted randomly throughout a 24-hour period over the weekdays. The weekday surveys were randomly scheduled for four-hour periods beginning at 7, 7:30, or 8 a.m. Sites were chosen for four-hour periods on a Sunday in an effort to characterize weekend transport.

2.2 Characteristics of Hazardous Materials Transport at Specific Locations

The data gathered during the placard surveys at 20 locations in Kanawha and Putnam Counties allows assessment of the characteristics of hazardous materials transport at these sites, intersections, and connecting roadways. Each site has been characterized to support emergency preparedness efforts. The frequency of shipments is provided under the assumption that the more often a material is transported through a location, the higher the probability than an accident will involve that product. A shipment is defined as a single placard on a truck. When more than one placard is present, more than one shipment is recorded. Most trucks carry only one type of hazardous material (i.e. one placard type). However, trucks have been recorded that carry two, three, and even five different placards.

For each site, all materials recorded are listed. In addition, the transportation pattern by time of day is also provided. Where possible, the data are also compared with the data gathered in 1993, 2001, and 2008 to evaluate trends in hazardous commodity flow through the Kanawha Valley.

Appendix 2 contains a detailed breakdown for each site. Appendix 2 also includes a comparison by percentage of the hazardous materials traffic recorded and the total traffic reported by the West Virginia Department of Transportation. As such, emergency planners can estimate the percentages of traffic through a site at any given 24-hr. period that is carrying hazardous materials.

Site 5: Intersection of SR 25 with I-64 at Institute

Monitoring at Site 5 was limited to daytime hours. Class 3 flammable liquids comprised 82.1% of the hazardous materials recorded at this site and Class 8 corrosives comprised 14.3%. Specific materials most frequently recorded were gasoline (39.3%), methanol (21.4%), combustible liquid (14.3%), and the general corrosive placard (7.1%).

Figure 2.2.a.

	2014	2008	2001	1993
# hazmat trucks/hr.	5.6	7.1	6.4	3.8
# hazmat shipments/hr.	5.6	7.5	7.0	4.5
% of trucks carrying hazmats	19.0%	10.9%	8.2%	8.0%
Total trucks/hr.	18.4	68.9	78.1	47.4

A significantly lesser number of trucks passed through Site 5 during this monitoring period than in previous studies. Though the number of shipments decreased significantly, the percentage of the shipments carrying hazardous materials increased significantly. The following materials were recorded at Site 5:

Chloropicrin	3.6%	Gasoline	39.3%
Combustible liquid	14.3%	Methanol	21.4%
Corrosive liquid, acidic, organic, n.o.s.	3.6%	Methyl methacrylate monomer	3.6%
Corrosive placard	7.1%	**Nitric acid**	3.6%
Flammable liquid, toxic, n.o.s.	3.6%		

Site 6: Approximately 2 miles north of the I-77/I-79 split

Monitoring at Site 6 was during both evening and night hours. The most frequent hazardous materials by hazard class traveling through Site 6 were flammable liquids (62.5%), followed by flammable/non-flammable gases (25.0%). The specific material most frequently recorded was gasoline (37.5%), followed by methyl chloride (25.0%).

Figure 2.2.b.

	2014	2008	2001	1993
# hazmat trucks/hr.	1.0	5.5	8.7	3.9
# hazmat shipments/hr.	1.0	5.5	9.8	4.0
% of trucks carrying hazmats	1.2%	4.5%	5.0%	7.0%
Total trucks/hr.	82.6	121.8	198.9	47.1

Total traffic and hazardous material traffic decreased at this site when compared to previous data. During the sampling period, hazardous material carriers were more frequent during the nighttime hours, during which 1.3 placarded vehicles passed through the site per hour. During evening monitoring, approximately 0.4 placarded vehicles passed through the site per hour. The following materials were recorded at Site 6:

Ammonium nitrate fertilizers	12.5%	Gasoline	37.5%
Flammable liquid placard	25.0%	Methyl chloride	25.0%

Site 8: Approximately two (2) miles north of the I-77/I-79 split

Monitoring at Site 8 was during day and evening hours. The most frequent hazardous materials by hazard class traveling through Site 8 were flammable liquids (75.6%), followed by flammable/non-flammable gases (11.1%). The specific material most frequently recorded was petroleum crude oil (42.2%) followed by gasoline (26.7%).

Figure 2.2.c.

	2014	2008	2001	1993
# hazmat trucks/hr.	5.3	6.9	7.4	3.9
# hazmat shipments/hr.	5.6	7.0	7.5	4.0
% of trucks carrying hazmats	6.7%	7.4%	7.4%	10.0%
Total trucks/hr.	78.8	95.0	112.8	38.8

As with Site 6, truck and hazardous material traffic decreased slightly in 2014. Hazardous shipments were most frequent during the evening hours (between 7:00 a.m. and 11:00 a.m.) with approximately 6.3 shipments per hour. During the evening hours, hazardous materials shipments passed the site at a rate of approximately 5.0 per hour. The following materials were recorded at Site 8:

Argon, refrigerated liquid	2.2%	Non-flammable gas placard	2.2%
Corrosive placard	2.2%	Paint	2.2%
Dangerous when wet placard	2.2%	Petroleum crude oil	42.2%
Flammable gas placard	2.2%	**Phosphorus trichloride**	2.2%
Gasoline	26.7%	Poison placard	2.2%
Hydrobromic acid	2.2%	Pyrophoric alloy, n.o.s.	2.2%
Liquefied petroleum gas	4.4%	Vinyltoluenes, stabilized	2.2%
Methyl methacrylate monomer	2.2%		

Site 10: I-77 (WV Turnpike), Chelyan – Exit 85

Monitoring at Site 10 was limited to daytime hours. The most frequent hazard classes at Site 10 were flammable liquids (50.0%) followed by flammable/non-flammable gases (21.4%). The specific material most frequently recorded was gasoline (32.7%).

Figure 2.2.d.

	2014	2008	2001	1993
# hazmat trucks/hr.	12.5	6.4	N/A	N/A
# hazmat shipments/hr.	12.3	6.4	N/A	N/A
% of trucks carrying hazmats	4.7%	3.0%	N/A	N/A
Total trucks/hr.	263.5	212.8	N/A	N/A

Hazmat shipments increased compared to 2008; in fact, the shipments per hour nearly doubled. The following materials were recorded at Site 10:

Acetic anhydride	1.0%	Grenades, practice	1.0%
Acrolein dimer, stabilized	1.0%	Heptanes	1.0%
Ammonium nitrate emulsion	4.1%	Hexaldehyde	1.0%
Argon	1.0%	Ink, printer's, flammable	1.0%
Carbon dioxide, refrigerated liquid	2.0%	Isopentane	1.0%
Combustible liquids	2.0%	Isopropyl alcohol	1.0%
Corrosive liquid, toxic, n.o.s.	1.0%	Isopropyl butyrate	1.0%
Corrosive placard	3.1%	Liquefied petroleum gas	14.3%
Cupriethylenediamine, solution	1.0%	Maleic anhydride	1.0%
Cyclohexylamine	1.0%	Metal alkyls, water-reactive, n.o.s.	1.0%
Dinitrogen tetroxide	1.0%	Methyl formate	1.0%
Elevated temperature liquid, flammable, n.o.s.	1.0%	Non-flammable gas placard	1.0%
Elevated temperature liquid, n.o.s.	6.1%	Organophosphorus pesticide, liquid, toxic	1.0%
Environmentally hazardous substances, liquid, n.o.s.	3.1%	Self-heating solid, organic, n.o.s.	1.0%
Ethyl formate	1.0%	Sodium perborate monohydrate	1.0%
Flammable gas placard	1.0%	Stannic chloride, anhydrous	1.0%
Flammable liquid placard	3.1%	Toxic solid, inorganic, n.o.s.	1.0%
Formaldehyde, solution	1.0%	Trimethylamine, anhydrous	1.0%
Gasoline	32.7%	Xylenes	1.0%

Site 12: US Route 119 at Terry Road

Monitoring at Site 12 was limited to daytime hours. The only hazardous materials by hazard class traveling through Site 12 were non-flammable gases (100.0%). Methyl chloride (58.3%) was the most frequently-transported material through the site.

Figure 2.2.e.

	2014	2008	2001	1993
# hazmat trucks/hr.	3.0	4.0	3.5	3.5
# hazmat shipments/hr.	3.0	4.0	4.0	3.4
% of trucks carrying hazmats	5.8%	4.9%	4.3%	5.0%
Total trucks/hr.	51.8	81.3	80.5	58.5

While traffic decreased, hazardous material shipments steadied at Site 12. The number of actual shipments counted in 2014 decreased by 1.0, yet the percentage of hazmat shipments increased by nearly a full percentage point. The following materials were recorded at Site 12:

Methyl chloride (R-40)	58.3%	Refrigerant gas	41.7%

Site 13: Intersection of Montrose Drive with MacCorkle Avenue, SW in South Charleston

Monitoring at Site 13 was limited to daytime hours. The most frequent hazardous materials by hazard class traveling through Site 13 were flammable liquids (77.8%). Methanol (66.7%) was the most frequently-transported material through the site.

Figure 2.2.f.

	2014	2008	2001	1993
# hazmat trucks/hr.	2.3	3.9	3.5	3.0
# hazmat shipments/hr.	2.3	5.5	4.1	3.7
% of trucks carrying hazmats	23.7%	16.4%	5.2%	8.0%
Total trucks/hr.	9.5	33.6	59.4	33.9

While hazardous material traffic only decreased slightly, the total truck traffic through the site decreased dramatically. The decrease in truck traffic led to an increase in the percentage of those trucks that were carrying hazardous materials. Generally, in the four flow studies that have been completed, trends at Site 13 are difficult to determine. The following materials were recorded at Site 13:

Chloropicrin	11.1%	Methyl methacrylate monomer	11.1%
Methanol	66.7%	**Nitric acid**	11.1%

Site 14: Intersection of MacCorkle Avenue, SW and the east-bound entrance/exit of I-64 in South Charleston

Monitoring at Site 14 was limited to daytime hours. The most frequent hazardous materials by hazard class traveling through the site were flammable liquids (60.0%), followed by flammable/non-flammable gases (40.0%).

Figure 2.2.g.

	2014	2008	2001	1993
# hazmat trucks/hr.	1.3	2.3	2.5	1.7
# hazmat shipments/hr.	1.3	2.8	2.5	1.9
% of trucks carrying hazmats	7.7%	6.3%	2.6%	5.0%
Total trucks/hr.	16.3	43.8	95.6	30.8

As with Site 13, total traffic estimates declined significantly while the percentage of trucks carrying hazardous commodities increased. The following materials were recorded at Site 14:

Gasoline	60.0%	Methyl chloride (R-40)	40.0%

Site 16: Intersection of SR 25 and SR 62 (West Washington Street)

Monitoring at Site 16 was limited to daytime hours. The most frequent hazardous materials by hazard class traveling through Site 16 were flammable and non-flammable gases (100.0%).

Figure 2.2.h.

	2014	2008	2001	1993
# hazmat trucks/hr.	0.5	1.3	3.1	1.9
# hazmat shipments/hr.	1.0	2.0	3.2	2.4
% of trucks carrying hazmats	14.8%	5.6%	6.0%	4.0%
Total trucks/hr.	6.8	36.0	51.9	41.6

Site 16 is another of the sites where the total truck traffic declined significantly. In the case of Site 16, however, even with a parallel decline in the total number of hazmat trucks and hazmat shipments per hour, the percentage of trucks carrying hazardous materials still increased. The following materials were recorded at Site 16:

Flammable gas	50.0%	Non-flammable gas	50.0%

Site 17: West Virginia Turnpike, Marmet (Exit 89)

Site 17 was added as part of this update. Monitoring at the site was limited to daytime hours. The most frequent hazardous materials by hazard class traveling through Site 24 were flammable liquids (56.1%), followed by flammable/non-flammable gases (17.1%). The specific material most frequently recorded was gasoline (36.6%).

Figure 2.2.i.

	2014	2008	2001	1993
# hazmat trucks/hr.	5.4	N/A	N/A	N/A
# hazmat shipments/hr.	12.8	N/A	N/A	N/A
% of trucks carrying hazmats	9.4%	N/A	N/A	N/A
Total trucks/hr.	114.8	N/A	N/A	N/A

The following materials were recorded at Site 17:

Ammonia, anhydrous	3.9%	Gasoline	13.7%
Ammonium nitrate	9.8%	Hypochlorite solution	2.0%
Ammoniun nitrate, liquid, not	3.9%	Miscellaneous placard	2.0%
Combustible liquids	35.3%	Non-flammable gas placard	5.9%
Environmentally hazardous substances, liquid, n.o.s.	2.0%	Oxidizing liquid, n.o.s.	9.8%
Flammable gas placard	5.9%	Oxygen, refrigerated liquid	2.0%
Flammable liquid, toxic, n.o.s.	2.0%	Sodium hydroxide	2.0%

Site 21: Intersection of US 35 and SR 34 west of Winfield

Monitoring at Site 21 was limited to daytime hours. The most frequent hazardous materials by hazard class traveling through Site 21 were flammable liquids (40.0%), tied by flammable/non-flammable gases (40.0%).

Figure 2.2.j.

	2014	2008	2001	1993
# hazmat trucks/hr.	1.3	8.4	6.3	3.6
# hazmat shipments/hr.	1.3	8.9	7.0	3.9
% of trucks carrying hazmats	0.7%	6.3%	4.4%	1.0%
Total trucks/hr.	175.8	140.9	142.8	95.1

Site 21 proved to be a rarity in the 2014 study as the total number of hazardous materials shipments decline along with the percentage of trucks carrying hazardous materials *while the total truck traffic increased significantly*. The following materials were recorded at Site 21:

Alcohols, n.o.s.	20.0%	Methyl chloride (R-40)	20.0%
Cobalt naphthenates, powder	20.0%	Vinyl methyl ether, stabilized	20.0%
Gasoline	20.0%		

Site 22: Intersection of exit/entrance ramp of I-64 (St. Albans – Exit 44)

Monitoring at Site 22 was limited to daytime hours. The most frequent hazardous materials by hazard class traveling through Site 22 were flammable liquids (47.1%), followed by corrosives (17.6%). The specific material most frequently recorded was hypochlorite solution (17.6%).

Figure 2.2.k.

	2014	2008	2001	1993
# hazmat trucks/hr.	3.8	4.5	4.9	4.0
# hazmat shipments/hr.	4.3	4.8	5.8	4.4
% of trucks carrying hazmats	11.2%	5.2%	4.0%	8.0%
Total trucks/hr.	38.0	91.5	122.8	44.7

Hazardous material shipments at Site 22 declined slightly from 2008 data. The percentage of shipments that were considered hazmat, though, increased significantly. The increase in percentage can be attributed to the steady hazmat shipment totals and the declining truck traffic observed at the site. The following materials were recorded at Site 22:

Alcohols, n.o.s.	11.8%	Gasoline	11.8%
Combustible liquids	11.8%	Hypochlorite solution	17.6%
Elevated temperature liquid, n.o.s.	11.8%	Non-flammable gas placard	5.9%
Flammable gas placard	5.9%	n-Propyl acetate	5.9%
Flammable liquid, toxic, n.o.s.	5.9%	**Sulfur dioxide**	11.8%

Site 23: Intersection of SR 25 and I-64 west at Nitro (Exit 45)

The most frequent hazardous materials by hazard class traveling through Site 23 were flammable/non-flammable gases (33.3%), followed by flammable liquids and corrosives (27.8% each). The specific material most frequently recorded were combustible liquids and sodium hydroxide (22.2% each).

Figure 2.2.I.

	2014	2008	2001	1993
# hazmat trucks/hr.	1.9	8.9	5.3	3.9
# hazmat shipments/hr.	2.0	9.4	6.1	4.3
% of trucks carrying hazmats	3.9%	10.1%	5.5%	7.0%
Total trucks/hr.	58.4	92.6	95.4	51.5

Hazardous material traffic as well as total truck traffic declined at this site as compared with all previous studies. It is difficult to determine trends at Site 23 as traffic has alternated between increases and decreases with each flow study update. The following materials were recorded at Site 23:

Combustible liquids	22.2%	Non-flammable gas placard	16.7%
Environmentally hazardous substances, solid, n.o.s.	5.6%	Propionyl chloride	5.6%
Flammable gas placard	16.7%	Sodium hydroxide	22.2%
Gasoline	5.6%	Sulfur chlorides	5.6%

Site 24: I-64 Crooked Creek exit (between St. Albans and Winfield)

Monitoring at Site 24 was limited to daytime hours. The most frequent hazardous materials by hazard class traveling through Site 24 were flammable/non-flammable gases (48.5%), followed by flammable liquids (35.4%). The specific material most frequently recorded was liquefied petroleum gas (18.5%).

Figure 2.2.m.

	2014	2008	2001	1993
# hazmat trucks/hr.	11.0	10.3	N/A	N/A
# hazmat shipments/hr.	15.0	10.3	N/A	N/A
% of trucks carrying hazmats	5.1%	3.7%	N/A	N/A
Total trucks/hr.	319.8	273.5	N/A	N/A

Both hazardous material shipments and total truck traffic increased as compared to 2008. The following materials were recorded at Site 24:

Acetone	5.4%	Gasoline	15.4%
Alkali metal amalgam	0.8%	**Hydrogen peroxide, aqueous**	0.8%
Ammonium nitrate emulsion	0.8%	Isobutyl acrylate, stabilized	0.8%
Ammonium nitrate fertilizers	4.6%	Liquefied petroleum gas	18.5%
Ammunition	0.8%	Maleic anhydride	0.8%
Argon, refrigerated liquid	0.8%	Methyl chloride (R-40)	11.5%
Chromic acid, solution	1.5%	Methyl methacrylate monomer	1.5%
Coal tar distillates, flammable	0.8%	n-Butyl methacrylate, stabilized	0.8%
Coumarin derivative pesticide, solid, toxic	0.8%	Nitrogen	0.8%
Corrosive liquid, toxic, n.o.s.	1.5%	Non-flammable gas placard	7.7%
Diesel fuel/fuel oil	1.5%	Petroleum crude oil	6.9%
Elevated temperature liquid, n.o.s.	1.5%	Resin solution	1.5%
Explosives 1.5	1.5%	Sodium hydroxide	0.8%
Flammable gas placard	7.7%	Vinyl chloride	1.5%
Flammable liquid placard	0.8%		

2.3 Comparing Hazardous Materials Transportation among Placard Sites

The 2001 and 2008 studies provided extrapolated figures of hazardous materials shipments and trucks on an annual basis. This update provides the same sort of information. As in previous studies, it is important to understand that these data are calculated from the placards observed and total trucks recorded at the monitoring sites. The sample size is small relative to the overall amount of traffic through the Kanawha Valley on an annual basis. Any variability in the sampling period data will be magnified when multiplied to extrapolate annual totals.

This study confirms that weekend traffic is more variable than weekday traffic. As a result, the annual extrapolations reflect only weekday totals. The estimated hourly rate was multiplied by 6,240 to extrapolate annual traffic. The absolute numbers should be evaluated in this light; however, the relationship among sites is likely to be accurate.

Figure 2.3.a.

Extrapolated Average Hourly and Annual Frequencies of Hazardous Materials Transport in the Kanawha Valley

(based on weekdays only)

Site	Avg. Hazmat Shipments/ hr.	Avg. Hazmat Shipments/ yr.	Change from 2008	Avg. Hazmat Trucks/hr.	Avg. Hazmat Trucks/yr.	Change from 2008
5	5.6	34,944	-11,856	5.6	34,944	-9,360
6	1.0	6,240	-28,080	1.0	6,240	-28,080
8	5.6	34,944	-8,736	5.3	33,072	-9,984
10	12.3	76,752	37,440	12.5	78,000	38,688
12	3.0	18,720	-6,240	3.0	18,720	-6,240
13	2.3	14,352	-46,800	2.3	14,352	6,240
14	1.3	8,112	-9,360	1.3	8,112	-6,240
16	1.0	6,240	-6,240	0.5	3,120	-4,992
17	12.8	79,872	N/A	5.4	33,696	N/A
21	1.3	8,112	-47,424	1.3	8,112	-44,304
22	4.3	26,832	-3,120	3.8	23,712	-4,368
23	2.0	12,480	-46,176	1.9	11,856	-43,680
24	15.0	93,600	28,328	11.0	68,640	4,368
All Sites	**5.2**	**32,400**	**-17,165**	**4.2**	**26,352**	**-8,304**

Figure 2.3.a. shows that Site 24 would be expected to have the highest number of hazardous materials trucks traveling east and west between Charleston and Huntington with more than an estimated 93,600 hazardous carriers passing annually. (Site 24 was also the site noted as potentially the busiest in 2008.) Both

sites 6 and 16 would be anticipated to have the lowest number of hazardous materials carriers on an annual basis, each with an estimated 6,240 hazardous carriers passing through. (2014 data represents a significant change for Site 6, which was a busy site in 2008.)

Based on these figures, adding Site 17 during this update was beneficial; it turned out to be the second-busiest site in the study. Site 10 may also see a significant amount of annual hazardous material traffic, topping an estimated 76,000 trucks and shipments.

As can be seen, the change from 2008 to 2014 is significant and somewhat unpredictable. As this study is updated, comparisons of this nature should continue to be made. Only then will planners be able to accurately anticipate trends regarding hazardous material flow through the Kanawha Valley.

As was stated in the 2008 study, with this amount of hazardous traffic, it is reasonable to assume that there will be transportation accidents involving hazardous materials. The KPEPC should pass these data to its hazard assessment and training committees to incorporate findings into emergency plans and exercises as well as public outreach activities.

3.0 RAILWAY ANALYSIS

3.1 Data Collection

JHC and the KPEPC requested data on hazardous materials carried by CSX Transportation and the Norfolk Southern Railway Company, the two major rail carriers in the planning area. Data were provided by both companies.

3.2 Rail Transportation of Hazardous Materials through the Kanawha Valley

Two railways serve the businesses and industries of the Kanawha Valley. CSX Transportation has a major line on the south side of the Kanawha River, while Norfolk Southern runs on the north side. *NOTE: USEPA "Extremely Hazardous Substances" are noted in red.

In Kanawha County, CSX handled 10,323 hazardous material shipments. Those shipments were comprised of 90 individual materials, which are listed in Figure 3.2.a. below.

Figure 3.2.a.

Commodities Shipped via CSX Line (Kanawha County)

Commodity	Hazard Class	Carloads (2013)	% of Total
Sulfur, molten*	9	2,214	21.44
Liquefied petroleum gases*	2.1	2,042	19.77
Ammonia, anhydrous*	2.2	999	9.67
Sodium hydroxide solution*	8	854	8.27
Carbon dioxide, refrigerated liquid *	2.2	796	7.71
Ammonium nitrate*	5.1	766	7.42
Petroleum crude oil	3	402	3.89
Styrene monomer, stabilized*	3	367	3.55
Propane	2.1	285	2.76
Chlorine*	2.3	247	2.39
Acrylonitrile, stabilized*	3	214	2.07
Sulfuric acid*	8	172	1.67
Environmentally hazardous substances, liquid, n.o.s.*	9	140	1.36
Butane	2.1	124	1.2
Sodium chlorate*	5.1	121	1.17
Alcohols, n.o.s.	3	92	<1.0
FAK-Hazardous Materials	0	82	<1.0

Commodity	Hazard Class	Carloads (2013)	% of Total
(Formaldehyde) Urea Formaldehyde Concentrate	CL	75	<1.0
Elevated temperature liquid, n.o.s.*	9	32	<1.0
Toluene	3	30	<1.0
Ethanol	3	26	<1.0
Chemicals, NEC toxic inhalation hazard	6.1	26	<1.0
Butanols*	3	19	<1.0
Phosphoric acid, liquid	8	16	<1.0
Air bag modules	9	12	<1.0
Hazard Class 9 Miscellaneous Hazardous Materials	9	11	<1.0
Engines, internal combustion	9	10	<1.0
Propylene	2.1	10	<1.0
Vehicle, flammable liquid powered	9	8	<1.0
Gasoline, NEC (Benzene)(Methanol, 1,4-Dioxane)	3	7	<1.0
Flammable liquids, n.o.s.	3	6	<1.0
Specialty denatured (ethyl acetate) alcohol	3	5	<1.0
Methanol	3	5	<1.0
Propane gas, liquefied	2.1	5	<1.0
Gas oil	3	5	<1.0
FAK-Explosives 1.1	1.1	4	<1.0
Diesel fuel	3	4	<1.0
Aerosols	2.1	4	<1.0
Compounds, resin, not (butyl acetate) commercially suitable for extruding or molding purposes, in flake, liquid, lump, P	3	4	<1.0
Resin solution	3	4	<1.0
Batteries, wet, filled with acid	8	4	<1.0
Cartridges for weapons, inert projectile	1.4C	4	
Radioactive material, low specific activity (LSA-II)	7	3	<1.0
Cartridges for weapons, inert projectile	1.4S	3	<1.0
Aerosols	2.2	3	<1.0
Environmentally hazardous substances, solid, n.o.s.	9	3	<1.0
Toxic solids, organic, n.o.s.	6.1	2	<1.0

Commodity	Hazard Class	Carloads (2013)	% of Total
Corrosive solid, basic, inorganic, n.o.s.*	8	2	<1.0
Liquefied petroleum gas, NEC, compressed	2.1	2	<1.0
Sodium nitrate	5.1	2	<1.0
Flares, aerial	1.3G	2	<1.0
Hydrochloric acid	8	2	<1.0
Sodium perborate	5.1	2	<1.0
Heptafluoropropane	2.2	2	<1.0
Isopropanol	3	2	<1.0
FAK-Explosives 1.3	1.3	2	<1.0
Ethylene oxide	2.3	2	<1.0
Corrosive liquid, basic, organic, n.o.s.	8	2	<1.0
Benzene	3	2	<1.0
Other regulated substances, liquid, n.o.s.	9	2	<1.0
Tetraethyl silicate	3	1	<1.0
Alcoholic beverages	3	1	<1.0
Hydrogen chloride, refrigerated liquid	2.3	1	<1.0
Radioactive material, type B(U) package	7	1	<1.0
Articles, pressurized pneumatic	2.2	1	<1.0
Chlorodifluorobromo-methane	2.2	1	<1.0
Elevated temperature liquid, n.o.s.*	9	1	<1.0
Ethyl alcohol, anhydrous	3	1	<1.0
Paint related material	3	1	<1.0
Sodium fluorosilicate	6.1	1	<1.0
Corrosive liquid, basic, inorganic, n.o.s.*	8	1	<1.0
Nitrocellulose with alcohol	4.1	1	<1.0
Flammable solids, organic, n.o.s.	4.1	1	<1.0
Allyl alcohol	6.1	1	<1.0
Perfumery products	3	1	<1.0
Sodium nitrite	5.1	1	<1.0
Strontium nitrate	5.1	1	<1.0
Amines, liquid, corrosive, n.o.s.	8	1	<1.0
Compounds, cleaning liquid	3	1	<1.0
Metal catalyst, wetted	4.2	1	<1.0
Toxic liquids, flammable, organic, n.o.s.	6.1	1	<1.0

Commodity	Hazard Class	Carloads (2013)	% of Total
Ferrous chloride solution*	8	1	<1.0
FAK-Explosives 1.2	1.2	1	<1.0
Polyester resin kits	3	1	<1.0
Cartridges for weapons	1.1E	1	<1.0
Combustible liquids, n.o.s.	CL	1	<1.0
Organic peroxide, type D, liquid	5.2	1	<1.0
Fluorosilicic acid	8	1	<1.0
Propylene oxide	3	1	<1.0
Solids containing flammable liquid, n.o.s.	4.1	1	<1.0

** denotes materials listed in 2008 study*

In Putnam County, 12,320 shipments were handled in 2013. The CSX reported showed 90 products that comprised 100% of the total hazardous materials shipments in Putnam County.

Figure 3.2.b.

Commodities Shipped via CSX Line (Putnam County)

Commodity	Hazard Class	Carloads (2013)	% of Total
Sulfur, molten*	9	2,214	21.45
Liquefied petroleum gases*	2.1	2,040	19.76
Ammonia, anhydrous*	2.2	999	9.68
Sodium hydroxide solution*	8	854	8.27
Carbon dioxide, refrigerated liquid *	2.2	796	7.71
Ammonium nitrate*	5.1	766	7.42
Petroleum crude oil	3	402	3.89
Styrene monomer, stabilized*	3	367	3.55
Propane	2.1	285	2.76
Chlorine*	2.3	247	2.39
Acrylonitrile, stabilized*	3	214	2.07
Sulfuric acid*	8	172	1.67
Environmentally hazardous substances, liquid, n.o.s.*	9	140	1.36
Butane	2.1	124	1.2
Sodium chlorate*	5.1	121	1.17
Alcohols, n.o.s.	3	92	<1.0
FAK-Hazardous Materials	0	82	<1.0
(Formaldehyde) Urea Formaldehyde Concentrate	CL	75	<1.0
Elevated temperature liquid, n.o.s.*	9	32	<1.0

Commodity	Hazard Class	Carloads (2013)	% of Total
Toluene	3	30	<1.0
Ethanol	3	26	<1.0
Chemicals, NEC toxic inhalation hazard	6.1	26	<1.0
Butanols*	3	19	<1.0
Phosphoric acid, liquid	8	16	<1.0
Air bag modules	9	12	<1.0
Hazard Class 9 Miscellaneous Hazardous Materials	9	11	<1.0
Engines, internal combustion	9	10	<1.0
Propylene	2.1	10	<1.0
Vehicle, flammable liquid powered	9	8	<1.0
Gasoline, NEC (Benzene)(Methanol, 1,4-Dioxane)	3	7	<1.0
Flammable liquids, n.o.s.	3	6	<1.0
Specialty denatured (ethyl acetate) alcohol	3	5	<1.0
Methanol	3	5	<1.0
Propane gas, liquefied	2.1	5	<1.0
Gas oil	3	5	<1.0
FAK-Explosives 1.1	1.1	4	<1.0
Aerosols	2.1	4	<1.0
Compounds, resin, not (butyl acetate) commercially suitable for extruding or molding purposes, in flake, liquid, lump, P	3	4	<1.0
Resin solution	3	4	<1.0
Batteries, wet, filled with acid	8	4	<1.0
Cartridges for weapons, inert projectile	1.4C	4	
Diesel fuel	3	3	<1.0
Radioactive material, low specific activity (LSA-II)	7	3	<1.0
Aerosols	2.2	3	<1.0
Cartridges for weapons, inert projectile	1.4S	3	<1.0
Environmentally hazardous substances, solid, n.o.s.	9	3	<1.0
Toxic solids, organic, n.o.s.	6.1	2	<1.0
Corrosive solid, basic, inorganic, n.o.s.*	8	2	<1.0
Liquefied petroleum gas, NEC, compressed	2.1	2	<1.0

Commodity	Hazard Class	Carloads (2013)	% of Total
Sodium nitrate	5.1	2	<1.0
Flares, aerial	1.3G	2	<1.0
Hydrochloric acid	8	2	<1.0
Sodium perborate	5.1	2	<1.0
Heptafluoropropane	2.2	2	<1.0
Isopropanol	3	2	<1.0
FAK-Explosives 1.3	1.3	2	<1.0
Ethylene oxide	2.3	2	<1.0
Corrosive liquid, basic, organic, n.o.s.	8	2	<1.0
Benzene	3	2	<1.0
Other regulated substances, liquid, n.o.s.	9	2	<1.0
Tetraethyl silicate	3	1	<1.0
Alcoholic beverages	3	1	<1.0
Hydrogen chloride, refrigerated liquid	2.3	1	<1.0
Radioactive material, type B(U) package	7	1	<1.0
Articles, pressurized pneumatic	2.2	1	<1.0
Chlorodifluorobromo-methane	2.2	1	<1.0
Elevated temperature liquid, n.o.s.*	9	1	<1.0
Ethyl alcohol, anhydrous	3	1	<1.0
Paint related material	3	1	<1.0
Sodium fluorosilicate	6.1	1	<1.0
Corrosive liquid, basic, inorganic, n.o.s.*	8	1	<1.0
Nitrocellulose with alcohol	4.1	1	<1.0
Flammable solids, organic, n.o.s.	4.1	1	<1.0
Allyl alcohol	6.1	1	<1.0
Perfumery products	3	1	<1.0
Sodium nitrite	5.1	1	<1.0
Strontium nitrate	5.1	1	<1.0
Amines, liquid, corrosive, n.o.s.	8	1	<1.0
Compounds, cleaning liquid	3	1	<1.0
Metal catalyst, wetted	4.2	1	<1.0
Toxic liquids, flammable, organic, n.o.s.	6.1	1	<1.0
Ferrous chloride solution*	8	1	<1.0
FAK-Explosives 1.2	1.2	1	<1.0
Polyester resin kits	3	1	<1.0
Cartridges for weapons	1.1E	1	<1.0

Commodity	Hazard Class	Carloads (2013)	% of Total
Combustible liquids, n.o.s.	CL	1	<1.0
Organic peroxide, type D, liquid	5.2	1	<1.0
Fluorosilicic acid	8	1	<1.0
Propylene oxide	3	1	<1.0
Solids containing flammable liquid, n.o.s.	4.1	1	<1.0

** denotes materials listed in 2008 study*

The level of detail in the 2013 data is much greater than in 2007. As such, it was expected that the 2013 data would reveal a greater number of hazardous materials in transit through the Kanawha Valley. Eight materials, however, reported in 2007 did not appear in 2013: 2-dimethylaminoethanol; acetaldehyde; chlorobenzene; flammable liquids, toxic, n.o.s.; hydrogen peroxide; methylamine, anhydrous; sulfuric acid, fuming; and vinyl methyl ether, stabilized. Sulfuric acid, fuming is an USEPA-designated "Extremely Hazardous Substances".

Figure 3.2.c. presents carloads by quarter of 2013 for the top ten-transported materials by CSX. Figure 3.2.d. follows and presents the same information for Putnam County.

Figure 3.2.c.

Carloads by Quarter – Kanawha County (CSX)

Commodity	Haz. Cl.	Carloads (2013)			
		Q1	Q2	Q3	Q4
Sulfur, molten	9	497	743	585	389
Liquefied petroleum gases	2.1	878	230	391	543
Ammonia, anhydrous	2.2	327	0	320	352
Sodium hydroxide solution	8	229	233	235	157
Carbon dioxide, refrigerated liquid	2.2	201	212	203	180
Ammonium nitrate	5.1	223	183	162	198
Petroleum crude oil	3	402	0	0	0
Styrene monomer, stabilized	3	107	91	85	84
Propane	2.1	111	69	54	51
Chlorine	2.3	58	74	75	40

Figure 3.2.d.

Carloads by Quarter – Putnam County (CSX)

Commodity	Haz. Cl.	Carloads (2013)			
		Q1	Q2	Q3	Q4
Sulfur, molten	9	497	743	585	389
Liquefied petroleum gases	2.1	878	230	391	541
Ammonia, anhydrous	2.2	2.2	327	0	320
Sodium hydroxide solution	8	8	229	233	235
Carbon dioxide, refrigerated liquid	2.2	2.2	201	212	203
Ammonium nitrate	5.1	5.1	223	183	162
Petroleum crude oil	3	3	402	0	0
Styrene monomer, stabilized	3	3	107	91	85
Propane	2.1	2.1	111	69	54
Chlorine	2.3	2.3	58	74	75

Norfolk Southern provided the top 25 materials transported on their lines in the study area for the latest 12 months (period ending March 31, 2014). The following chart (Figure 3.2.e.) depicts data for the Institute location (NSRR Location Denotation WV175).

Figure 3.2.e

Top 25 Commodities Shipped via Norfolk Southern Line (Institute WV175 Location)

Commodity	Hazard Class	UN Number
Ethylene oxide*	2.3	1040
Dimethylamine, anhydrous*	2.1	1032
Flammable liquids, n.o.s. (HMRC 4909328)*	3	1993
Hydrochloric acid*	8	1789
Methylamine, anhydrous*	2.1	1061
Dimethyl ether*	2.1	1033
Dimethyl sulfate*	6.1	1595
Methyl isobutyl*	3	2053
Flammable liquids, n.o.s. (HMRC 4910185)*	3	1993
Methyl isobutyl ketone*	3	1245
Environmentally hazardous substances, n.o.s.	9	3082
Trimethylamine, anhydrous*	2.1	1083
Dimethylamine, solution*	3	1160
Methylamine, aqueous*	3	1235
N,N-Dimethylformamide*	3	2265
Diisobutyl ketone*	3	1157
Butanols*	3	1120

Commodity	Hazard Class	UN Number
Corrosive liquid, acidic, n.o.s.*	8	3265
Sodium hydroxide solution*	8	1824
Other regulated materials*	9	3082
Acetic acid, glacial*	8	2789
Methyl methacrylate*	3	1247
N-Butyl methacrylate	3	2227
Combustible liquid, n.o.s.*	CL	1993
Other regulated materials*	9	3082

** denotes materials listed in 2008 study*

Norfolk Southern's response in the 2008 study included several additional chemicals that were not reported in this version of the study. Those chemicals included:

- 4-Thiapentanal,
- Acetone cyanohydrin (was also reported in 2001),
- Ammonium nitrate,
- Chlorine (was also reported in 2001),
- Combustible liquid, n.o.s. (HMRC 4915390),
- Ethyl chloroformate,
- Flammable liquids (HMRC 4904328) (was also reported in 2001),
- Fuel, aviation, turbine,
- Methacrylic acid (was also reported in 2001),
- Methyl methacrylate, and
- Sulfuric acid.

Of the above list, acetone cyanohydrin, chlorine, and sulfuric acid are considered "extremely hazardous substances". It is also significant to note that Norfolk Southern's data in 2008 indicated shipments on a "Nitro Line" and a "Belle Line"; the data submission in 2014 appears to have been consolidated.

Shipments of petroleum crude oil are garnering national headlines as the number of such shipments is increasing nationwide (and the presence of the material in high-profile derailment accidents in 2012 and 2013). It is significant to note that petroleum crude oil did not appear in the 2008 or previous studies. In 2013, crude oil shipments comprised 3.89% of CSX's shipments in Kanawha and Putnam Counties. Norfolk Southern did not report any petroleum crude oil transports.

The following materials were reported by both CSX Transportation and Norfolk Southern as transported materials.

- Butanols
- **Ethylene oxide**
- Flammable liquids, n.o.s.
- **Hydrochloric acid**
- Sodium hydroxide solution

4.0 WATERWAY ANALYSIS

4.1 Data Collection

JHC requested data from the Waterborne Commerce Statistics Center of the United States Army Corps of Engineers on barge transportation of hazardous materials on the Kanawha River. A list of materials as well as tonnages by commodity class shipped on the Kanawha River from the Ohio River to the head of the navigable portion of the river was obtained.

4.2 Barge Transportation of Hazardous Commodities

The Kanawha River is a major transportation corridor for large amounts of commodities, both hazardous and non-hazardous, and is the primary navigable waterway in the study area. Industrial and commercial facilities located in the Kanawha Valley are the customers for these commodities. On average, about 8.4% of barge shipments on an annual basis are hazardous commodities. The vast majority of the rest of the shipments are coal. Hazardous materials that are shipped along the Kanawha River are grouped by category. From most frequently shipped to least, these categories are as follows:

Figure 4.2.a.

Commodity Categories Transported by Barge, 2012

Category	Tonnages	% of Total
Coal	13,666,053	77.0
Aggregates	2,385,780	13.4
Petroleum	960,052	5.4
Chemicals	525,928	3.0
Others	140,754	0.8
Iron/Steel	65,709	0.4
TOTAL	**17,744,276**	

Figure 4.2.b. depicts the specific commodities transported by barge on the Kanawha River. It should be noted that the Army Corps of Engineers provides data on domestic and foreign shipments per waterway; all shipments on the Kanawha River were classified as “domestic”. The unit of measure for Figure 4.2.b. is “short tons”.

Figure 4.2.b.

Commodities Transported on the Kanawha River, 2012

Commodity	All Traffic Types (Domestic & Foreign)				
	All Directions	Receipts	Shipments	Intra-waterway	Through
1100 Coal & Lignite	13,666,053	2,613,962	9,392,450	1,659,641	0
2211 Gasoline	439,274	439,274	0	0	0
2330 Distillate Fuel Oil	425,080	425,080	0	0	0
2340 Residual Fuel Oil	95,698	95,698	0	0	0
3219 Other Hydrocarbons	2,998	2,998	0	0	0
3220 Alcohols	209,747	158,634	51,113	0	0
3230 Carboxylic Acids	43,130	43,130	0	0	0
3260 Organic Comp. NEC	173,168	170,937	2,231	0	0
3273 Ammonia	25,500	25,500	0	0	0
3274 Sodium Hydroxide	70,473	70,473	0	0	0
3276 Metallic Salts	912	0	0	0	912
4170 Wood in the Rough	2,500	0	0	2,500	0
4322 Limestone	1,423,703	1,375,959	1,733	0	46,011
4331 Sand & Gravel	945,624	853,726	3,378	0	88,520
4335 Waterway Improvement Material	16,453	16,453	0	0	0
4410 Iron Ore	65,709	62,472	0	0	3,237
4860 Slag	3,000	0	3,000	0	0
4900 Non-Metal Min. NEC	79,272	79,272	0	0	0
5220 Cement & Concrete	54,827	54,827	0	0	0
5370 I&S Pipe & Tube	1,155	1,155	0	0	0
TOTALS (All Commodities)	**17,744,276**	**6,489,550**	**9,453,905**	**1,662,141**	**138,680**

5.0 AIRWAY ANALYSIS

5.1 Data Collection

JHC requested data from officials at Yeager Airport regarding the transport of hazardous materials by air. Additionally, JHC contacted the four freight operators at Yeager Airport: Air Cargo Carriers; Mountain Air Cargo, Inc.; Quantum Aviation; and Ram Air Freight. Air Cargo Carriers and Ram Air Freight provided data for this study as did officials from Yeager Airport. Based on the responses of freight operators, JHC also contacted UPS regarding commodity shipments via air.

5.2 Air Transportation of Hazardous Commodities

Yeager Airport officials indicated that there are no known hazardous commodities that are shipped from the airport. Officials did acknowledge that some materials could be shipped under the heading of “general aviation”; however, no extremely hazardous substances are known to be flown.

Air Cargo Carriers indicated that approximately two to three boxes containing materials that could be considered hazardous are flown from Yeager Airport per night. Examples of materials under such a heading include dry ice and urine samples. The hazardous materials carried by Air Cargo are flown on behalf of UPS. Ram Air Freight indicated that it did not have the equipment available to do bulk shipments of hazardous materials from Yeager; the company is more involved in the movement of people. Ram Air does, however, do medical flights where cargo may be an organ for transplant.

UPS officials indicated that few numbers of shipments containing materials considered moderately hazardous may be flown out of Yeager Airport. General hazardous material data provided by UPS indicates that certain specific terms may be clues that dangerous goods and/or hazardous materials are present; those materials are as follows.

- Auto parts (may include carburetors, gas lines, or gas tanks which may contain gasoline)
- Barometers (may indicate the presence of mercury)
- Batteries (including spillable lead acid batteries, lithium batteries, etc.)
- Breathing apparatus (may include oxygen cylinders under pressure)
- Bull semen (may signal the presence of dry ice or liquefied gas)

- Camping gear/equipment (may include ammunition, batteries, flammable gas, fire starting pastes, flammable liquids, cooking/heating fuel, etc.)
- Chemical oxygen
- Pharmaceuticals (may include flammable liquids, radioactive medicines, or other hazardous chemicals)
- Refrigeration equipment (may contain gases under pressure)
- Thermometers (may indicate the presence of mercury)
- Vaccines (may be packed in dry ice)

The majority of hazardous materials shipped by UPS, though, would be shipped via truck by highway out of the Charleston facility. (*NOTE: Highway placarded shipments would have been noted during the highway analysis.)

Generally, UPS does not accept recycled UN 3268 (airbag inflators/airbag modules) materials, Class 5 oxidizers and organic peroxides, or hazardous packages in excess of 70 lbs. gross weight (with the exception of shipments containing dry ice). Note also that Class 6 toxic or poison materials will be labeled with PG III per UPS regulation.

6.0 PIPELINE ANALYSIS

6.1 Data Collection

A pipeline analysis was added to the commodity flow study for the 2014 update. The National Pipeline Mapping System (NPMS) was utilized to gather data on pipeline commodity flow in Kanawha and Putnam Counties. The NPMS shows gas transmission as well as hazardous liquid pipelines via a web interface. Data on pipeline operators (including contact information), commodity categories (e.g., natural gas), and commodity descriptions are provided for each pipeline in the database.

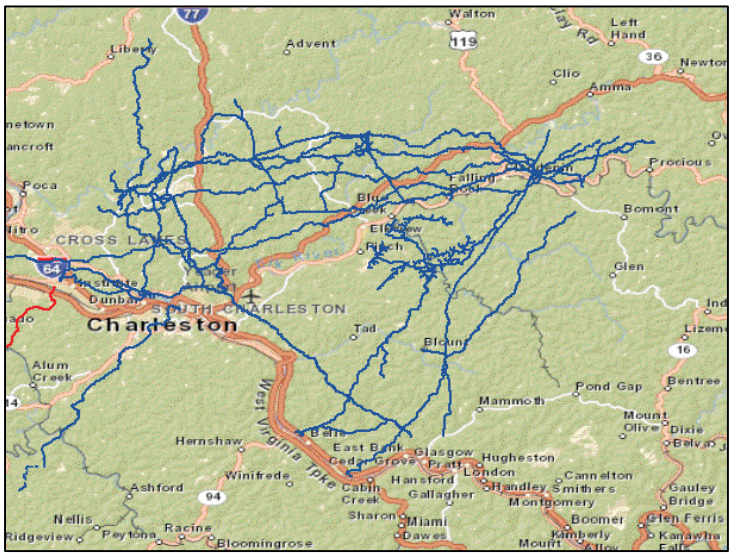
6.2 Hazardous Commodity Transport via Pipeline

Natural gas is the commodity that is primary transported via pipeline through the Kanawha Valley.

Kanawha County Data

Figure 6.2.a.

Pipelines in Kanawha County



In Figure 6.2.a. above, the blue lines represent gas transmission pipelines. In the case of Kanawha County, all of these pipelines carry natural gas. Capacities vary significantly, as do such specifications as line size, pressure, etc. In most cases, gas

flow is heavier during the winter months and is related to home and business heating. The following pipeline operators are active in Kanawha County and manage pipelines carrying natural gas.

- Columbia Gas Transmission, LLC (Charleston, WV)
- Cranberry Pipeline Corp, WV (Pittsburgh, PA)
- Dominion Transmission, Inc. (Clarksburg, WV)
- Tennessee Gas Pipeline Company (Houston, TX)

As can be seen in Figure 6.2.a., there is a small hazardous liquid pipeline running south from the Institute area (colored red within the figure). This pipeline is operated by Markwest Ranger Pipeline Company, LLC and is known as the ALPS/RANGER system. It contains natural gas liquids, such as ethane (UN 1035), propane (UN 1978), butane (UN 1011), isobutene (UN 1969), and pentane (UN 1265). (NOTE: UN numbers represent identifiers should these materials be transported via roadways; the UN numbers are for informational purposes only.)

Putnam County Data

Figure 6.2.b.

Pipelines in Putnam County

In Figure 6.2.b. above, the blue lines represent gas transmission pipelines. In the case of Putnam County, all of these pipelines carry natural gas. Capacities vary significantly, as do such specifications as line size, pressure, etc. In most cases, gas flow is heavier during the winter months and is related to home and business heating. The following pipeline operators are active in Putnam County and manage pipelines carrying natural gas.

- Columbia Gas Transmission, LLC (Charleston, WV)
- Cranberry Pipeline Corp, WV (Pittsburgh, PA)
- Teavee Oil & Gas, Inc. (Winfield, WV)
- Tennessee Gas Pipeline Company (Houston, TX)

7.0 COVERED FACILITIES ANALYSIS

7.1 Data Collection

JHC requested data from representatives of the major covered facilities in the Kanawha Valley. A questionnaire was distributed to the facilities in February of 2014 requesting information on the materials used/stored at their facility, the average quantities contained in shipments to/from their facility, the type of container used in the shipment, and the average number of shipments on an annual basis. Questionnaires were sent to the following facilities:

- Bayer Corporation,
- Bayer CropScience,
- Bayer MaterialScience,
- Clearon Corporation,
- Dow Chemical,
- E.I. Dupont,
- Elementis Specialties, and
- Toyota

7.2 Hazardous Materials Reported by Covered Facilities in the Kanawha Valley

It is significant to note that participation in this survey was voluntary for covered facilities in the Kanawha Valley. All of these facilities report per SARA Title III requirements to the Kanawha-Putnam Emergency Planning Committee (KPEPC). The data collected by this survey was meant to supplement Tier II reporting; the data targeted by the questionnaires was tailored to the flow of hazardous commodity shipments to and from the facilities.

Data reported by facilities and included in this report is not meant to supersede Tier II reports maintained by the KPEPC. This data supplements the data collected for the highway, railway, waterway, airway, and pipeline analyses. It is used as a “quality control measure” and to explain why certain materials were sighted in some areas and not others. This data, coupled with regular Tier II reporting, can indicate to planners which materials are bound for (or originating from) destinations in the Kanawha Valley and which are simply passing through to other locations.

Three of the eight facilities above (37.5%) participated in this survey. Those facilities were as follows: Bayer Material Science, Clearon Corporation, and E.I. DuPont.

Figure 7.2.a. presents the survey data as well as its implications for the remainder of this study. NOTE: Each facility is listed with a column indicating "Incident at Facility"; data for this column was taken from the United States Environmental Protection Agency's Enviro Facts Database.

Figure 7.2.a.

Covered Facilities with Materials

Facility	*Material(s)*	*Frequency of Shipments*					*Incident at Facility*
		Daily	*Weekly*	*Bi-Weekly*	*Monthly*	*Other*	*Yes/No*
Bayer Materials Science	**Acrylonitrile** Vendor: Cornerstone/Ineos Container Size: 185,000 rc Quantity Shipped: 36,058,000lbs Route Utilized: Rail Russell, KY	X					**No**
	AIBN-64 Vendor: Dupont Container Size: 6,200 dr on box trlr Quantity Shipped: 682,000 lbs Route Utilized: I64			X			
	Glycerine Vendor: Vitusa Container Size: 45,000 tt Quantity Shipped: 4,659,000 lbs Route Utilized: Truck I79			X			
	Irg 1076 Molten Vendor: BASF Container Size: 45,000 tt Quantity Shipped: 549,000 Route Utilized: I64 from KY				X		
	Irg 5057 Molten Vendor: BASF Container Size: 45,000 tt Quantity Shipped: 182,000 Route Utilized: I64 from KY					1/quarter	
	Isopropanol Vendor: Exxon Mobile/Dow Container Size: 45,000 tt Quantity Shipped: 2,674,000 Route Utilized: I64 from KY		X				

Facility	*Material(s)*	*Frequency of Shipments*					*Incident at Facility*
		Daily	*Weekly*	*Bi-Weekly*	*Monthly*	*Other*	*Yes/No*
Bayer Materials Science (cont.)	**LG275K** Vendor: ER Carpenter, TX Container Size: 185,000 rc Quantity Shipped:3,869,000 Route Utilized: Rail Russell, KY					2/month	**No**
	LG350K Vendor: ER Carpenter, TX Container Size: 185,000 rc Quantity Shipped: 10,662,000 Route Utilized: Rail Russell. KY					5/month	
	LS200K Vendor: ER Carpenter, TX Container Size: 185,000 rc Quantity Shipped: 3,593,300 Route Utilized: Rail Russell. KY					2/month	
	NaOH Vendor: Brenntagg Container Size: 45,000 tt Quantity Shipped: 21,118,000 Route Utilized: Rt.60/I64 St. Albans WV		**X**			1-2/week	
	Propylene Vendor: VItusa Container Size: 45,000 tt Quantity Shipped: 2,597,000 lbs Route Utilized: Truck I79		**X**			1	
	Chemical Vendor: Styrolutions/Knight Cherr Container Size: 185,000 rc Quantity Shipped: 60,329,000 lbs Route Utilized: Rail Russell, KY	**X**					
	Sulfuric Acid Vendor: Dupont Container Size: 45,000 tt Quantity Shipped:1,893,000 Route Utilized: I64 from KY		**X**			1	
Clearon Corporation	**Caustic Soda 50%** Vendor: Axilla Container Size: Tank car Quantity Shipped: 200,000 lbs Route Utilized: Rail Nitrium WV to SCWV					Inbound (no other info)	**No**
	Hydrogen Peroxide 50% Vendor: FMC Container Size: Tank truck Quantity Shipped: 40,000 lbs Route Utilized: I77 & I64 Columbus OH to SCWV					Inbound (no other info)	

Facility	Material(s)	Frequency of Shipments					Incident at Facility
		Daily	Weekly	Bi-Weekly	Monthly	Other	Yes/No
Clearon Corporation (cont.)	**Liquid Chlorine** Vendor: Axiall Container Size: Tank car Quantity Shipped: 180,000 lbs Route Utilized: Rail Nitrium WV to SCWV					Inbound (no other info)	**No**
	Muratic Acid 32% Vendor: Axiall Container Size: Tank truck Quantity Shipped: 40,000 lbs Route Utilized: I77 & I64 Natrium WV to SCWV					Inbound (no other info)	
	Sodium Bisulfite 40% Vendor: Brenntagg Container Size: Tank Truck Quantity Shipped: 40,000 Route Utilized: I64 Nitro, WV to SCWV					Inbound (no other info)	
	Sulfuric Acid Vendor: Dupont Container Size: Tank truck Quantity Shipped: 40,000 lbs Route Utilized: I64 Wirtland, KY to SCWV					Inbound (no other info)	
	TCCA Vendor: Clearon Container Size: Van truck Quantity Shipped: 40,000 lbs Route Utilized: SCWV to all points					Outbound (no other info)	
E.I. DuPont DeNemours & Co. Inc.	**Flammable Liquid** Vendor: N/A Container Size: Tank truck Quantity Shipped:40,000 Route Utilized: US 60, I64, I77			**X**			**Yes**
	2-EHMA Vendor: N/A Container Size: Tank truck Quantity Shipped: 40,000 Route Utilized: US 60, I64, I77					3/week	
	Acetic Acid Vendor: N/A Container Size: Tank truck Quantity Shipped: 150,000 Route Utilized: NS Rail line					4/month	
	Acetone Vendor: N/A Container Size: Tank car Quantity Shipped: 150,000 Route Utilized: NS Rail line					4/week	

Facility	Material(s)	Frequency of Shipments					Incident at Facility
		Daily	Weekly	Bi-Weekly	Monthly	Other	Yes/No
E.I. DuPont DeNemours & Co. Inc. (cont.)	**Ammonia** Vendor: N/A Container Size: Barge Quantity Shipped: 400,000 Route Utilized: Kanawha River					8/year	**Yes**
	Cyanamid Vendor: N/A Container Size: Tank truck Quantity Shipped; 40,000 Route Utilized: US 60, I77, I64		**X**				
	Dimethyl Ether Vendor: N/A Container Size: Tank truck Quantity Shipped: 40,000 Route Utilized: US60, I64, I77	**X**					
	Dimethyl Sulfate Vendor: N/A Container Size: Tank truck Quantity Shipped: 40,000 Route Utilized: US60, I64, I77	**X**					
	Dimethyl Sulfate Vendor: N/A Container Size: Tank car Quantity Shipped: 150,000 Route Utilized: NS Rail line					3/week	
	Dimethyl Amines Vendor: N/A Container Size: Tank truck Quantity Shipped: 40,000 Route Utilized: US60, I64, I77					10/week	
	Dimethyl Amines Vendor: N/A Container Size: Tank car Quantity Shipped: 150,000 Route Utilized: NS Rail line	**X**					
	Diformamide Vendor: N/A Container Size: Tank truck Quantity Shipped: 40,000 Route Utilized: US60, I64, I77	**X**					
	Diformamide Vendor: N/A Container Size: Tank car Quantity Shipped: 190,000 Route Utilized: NS Rail line			**X**			

Facility	Material(s)	Frequency of Shipments					Incident at Facility
		Daily	Weekly	Bi-Weekly	Monthly	Other	Yes/No
E.I. DuPont DeNemours & Co. Inc. (cont.)	**Ethanol** Vendor: N/A Container Size: Tank car Quantity Shipped: 150,000 Route Utilized: NS Rail line					3/week	**Yes**
	Formaldehyde Vendor: N/A Container Size: Tank truck Quantity Shipped: 40,000 Route Utilized: US60, I64, I77					14/week	
	Glycolic Acid Vendor: N/A Container Size: Tank truck Quantity Shipped: 40,000 Route Utilized: US60, I64, I77					14/week	
	Glycolic Acid Vendor: N/A Container Size: Tank car Quantity Shipped: 170,000 Route Utilized: NS Rail line					5/quarter	
	Hydrochloric Acid Vendor: N/A Container Size: Tank truck Quantity Shipped: 40,000 Route Utilized: US60, I64, I77			**X**			
	Hydrogen Peroxide Vendor: N/A Container Size: Tank truck Quantity Shipped: 43,000 Route Utilized: US60, I64, I77					2/month	
	Methanol Vendor: N/A Container Size: Barge Quantity Shipped: 300,000 Route Utilized: Kanawha River					4/month	
	Monomethyl Amine Vendor: N/A Container Size: Tank truck Quantity Shipped: 40,000 Route Utilized: US60, I64, I77					4/week	
	Monomethyl Amine Vendor: N/A Container Size: Tank car Quantity Shipped: 150,000 Route Utilized: NS Rail line					7/week	

Facility	*Material(s)*	*Frequency of Shipments*					*Incident at Facility*
		Daily	*Weekly*	*Bi-Weekly*	*Monthly*	*Other*	*Yes/No*
E.I. DuPont DeNemours & Co. Inc. (cont.)	**Methyl Methacrylate** Vendor: N/A Container Size: Tank truck Quantity Shipped: 40,000 Route Utilized: US60, I64, I77					7/week	**Yes**
	Methyl Methacrylate Vendor: N/A Container Size: Tank car Quantity Shipped: 150,000 Route Utilized: NS Rail Line					7/week	
	N-Butanol Vendor: N/A Container Size: Tank truck Quantity Shipped: 40,000 Route Utilized: US60, I64, I77					3/week	
	Sodium Bisulfite Vendor: N/A Container Size: Tank truck Quantity Shipped: 30,000 Route Utilized: US60, I64, I77				**X**		
	Sodium Hydroxide Vendor: N/A Container Size: Tank car Quantity Shipped: 150,000 Route Utilized: US60, I64, I77				**X**		
	Sodium Hypochlorite Vendor: N/A Container Size: Tank truck Quantity Shipped: 46,000 Route Utilized: US60, I64, I77					14/week	
	Sulfuric Acid Vendor: N/A Container Size: Tank car Quantity Shipped: 150,000 Route Utilized: NS Rail line					1/quarter	
	Sulfur Trioxide Vendor: N/A Container Size: Tank car Quantity Shipped: 40,000 Route Utilized: NS Rail line					14/week	
	Trimethyl Amine Vendor: N/A Container Size: Tank truck Quantity Shipped: 40,000 Route Utilized: US60, I64, I77					7/week	

Facility	*Material(s)*	*Frequency of Shipments*					*Incident at Facility*
		Daily	*Weekly*	*Bi-Weekly*	*Monthly*	*Other*	*Yes/No*
E.I. DuPont DeNemours & Co. Inc.	**Trimethyl Amine** Vendor: N/A Container Size: Tank car Quantity Shipped: 150,000 Route Utilized: NS Rail line					4/week	**Yes**

* Note: ***Chemical Name*** Denotes "Extremely Hazardous Substances"

Figure 7.2.b. below presents the predictions that can be made using Figure 7.2.a. regarding the highway analysis. 7.2.b. also indicates whether such predictions were valid based on actual field data from the above analyses.

Figure 7.2.b.

Predictions for Hazardous Material Flow per Covered Facilities Analysis

Route	Materials Likely to be Reported	Confirmed via Analyses Above?
Railway – NSRR	• Acetic acid • Acetone • Dimethyl sulfate • Diformamide • Ethanol • Glycolic acid • Methyl methacrylate • Monomethyl amine • Sulfuric acid • Sulfur trioxide • Trimethyl amine	Y N Y N N N Y N N N Y
Waterway	• Ammonia • Methanol	Y N
US 60 (Site 14)	• Hydrogen peroxide 50% • Muriatic acid 32% • Sodium bisulfite • Sulfuric acid	N N N N

Route	Materials Likely to be Reported	Confirmed via Analyses Above?
I-77 (Site 10)	• Cyanamid • Dimethyl ether • Dimethyl sulfate • Formaldehyde • Glycolic acid • Hydrochloric acid • Hydrogen peroxide 50% • Muriatic acid 32% • N-Butanol • Sodium bisulfite • Sodium hydroxide • Sodium hypochlorite • Trimethyl amine	N N N N N N N N N N N N N

It is significant to note that the monitoring schedule could affect the confirmations listed above. In such cases, the data provided by respondent facilities should be used to supplement field monitoring data.

8.0 EMERGENCY PREPAREDNESS IMPLICATIONS OF THE DATA

The data gathered and analyzed for this update of the 2008 study provides valuable information for understanding the degree of risk from hazardous material transportation throughout the Kanawha Valley as well as for improving emergency preparedness. Generally, the patterns of hazardous material flow through Kanawha and Putnam Counties has remained steady. The frequency of hazardous shipments (and, consequently, the number of hazard-carrying trucks), however, has varied considerably from the 1994, 2001, 2008, and 2014 versions.

Figure 8.0.a. below compares the classifications exhibited by commodities recorded in the highway analysis.

Figure 8.0.a.

Percentages of Hazardous Materials Recorded by Hazard Class

Class	% Recorded in 2014	% Recorded in 2008	% Recorded in 2001	% Recorded in 1993
1: Explosives	0.5%	1.0%	1.4%	1.0%
2: Gases	23.7%	24.0%	9.4%	18.0%
3: Flammable liquids	54.4%	40.2%	52.3%	50.0%
4: Flammable solids	1.3%	0.6%	N/A	N/A
5: Oxidizers	7.0%	4.2%	7.5%	5.0%
6: Poisons/toxics	1.9%	1.0%	6.3%	3.0%
7: Radioactives	0.0%	0.0%	0.4%	1.0%
8: Corrosives	7.0%	19.8%	13.3%	16.0%
9: Miscellaneous	4.0%	8.9%	1.6%	5.0%

**NOTE: Percentages may not add to 100% because of trucks where the placards could not be recorded.*

Flammable materials continue to be the most frequently-observed hazardous materials throughout the Kanawha Valley. Based on this observation, a transportation incident involving hazardous materials has a greater chance of involving flammables. The mutual aid system with the Kanawha Valley continues to be well-equipped for responding to incidents of this nature.

Another implication of the likelihood of accidents involving flammables is the public protection response needed. If an incident involving flammables occurs in a populated area, the public protective response should involve evacuating the public

at risk. As a result, the KPEPC (and other emergency agencies in Kanawha and Putnam Counties) should continue to evaluate and update evacuation plans and the resources available to implement them.

The above paragraphs are written with the understanding that other hazardous materials may be involved in an emergency incident. A wide variety of hazardous materials were observed at the monitoring sites throughout the study area. In Appendix 2, a list of commodities observed at each highway monitoring site is included. (Commodities transported via other modes of transportation are presented above.) Those agencies that were provided a copy of the previous versions of this report should be provided with this update. Those organizations should review the data from their jurisdiction and evaluate their preparedness (e.g., available equipment and level of training needed to respond) accordingly.

Both the KPEPC and local response agencies can use this data to update hazard analyses to improve emergency plans. To appropriately conduct these analyses, the analyst should consider the mode of transportation, the location of the analysis, and the material potentially involved. Such resources as CAMEO, ALOHA, or other plume dispersion programs can be used to graphically model risk areas.

- What mode of transportation will be modeled?

  For most of the response agencies in the Kanawha Valley, the primary transportation risk is from trucks along highways. The secondary risk is via rail. While hazard analyses do not need to focus exclusively on these modes, they should concentrate on highways and railways.

- What location should be used for modeling?

  Vehicle accident data can be useful in assessing the risk of hazardous material transport and can help prioritize locations for conducting hazard analyses. Areas such as busy intersections, high-volume roadways, etc. may result in a high number of accidents. Average and/or probably weather conditions should be used to fully anticipate where the vulnerable population may be.

- What hazardous materials should be modeled?

  Data from this update corresponding to the high-probability accident areas discussed above can be used to determine the materials used in an analysis. It would be difficult to create scenarios involving all materials; however, this study identified frequently-transported materials as well as USEPA-designated “Extremely Hazard Substances”.

Plume diagrams are useful in identifying populations that may be affected by an incident (including special needs and other vulnerable groups), training, and equipment needs. The identification of populations should also include such factors as the number of people in residences, automobiles, institutions, etc. This study as well as any hazard analyses born from it can be used to develop realistic exercise scenarios.

As listed in the 2001 study, a general approach for using transportation data can be summarized as follows:

1. Review transportation data
2. Conduct hazard analysis
3. Identify susceptible areas and vulnerable populations
4. Prioritize efforts

Emergency Response	Emergency Planning	Environmental Protection
a. Assess response capabilities, personnel, & equipment – enhance as needed	a. Assess public alert systems and instructions	a. Identify sensitive and valuable resources
b. Use data for training and exercises	b. Assess public protection plans	b. Assess spill contingency and cleanup plans
	c. Assess medical treatment and health care needs	
	d. Assess evacuation needs	

Several other organizations participated in the successful completion of this update, including the US Army Corps of Engineers, US Department of Transportation, CSX Transportation, Norfolk Southern Railway Company, Bayer MaterialScience, Clearon Corporation, and E.I. DuPont. These organizations should continue to be involved in the development of plans and exercise scenarios to ensure not only accuracy and realism, but also that a solid collaborative relationship be formed to address potential emergencies. Active participation in the planning process fosters effective cooperation during emergencies; such participation can and should be encouraged by the KPEPC.

9.0 LIST OF APPENDICES

Appendix 1: List of Hazardous Materials by Analysis

Appendix 2: Monitoring Site Data

10.0 REFERENCED MATERIALS

Kanawha-Putnam Emergency Planning Committee and National Institute for Chemical Studies. *Evaluating Hazardous Materials Transported through the Kanawha Valley*. 2008.

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KANAWHA PUTNAM EMERGENCY PLANNING COMMITTEE
COMMODITY FLOW STUDY
APPENDIX 1: LIST OF HAZARDOUS MATERIALS BY ANALYSIS

This appendix contains comprehensive lists of the materials recorded by this study and is organized by the analyses that were completed: highway, railway, waterway, airway, and covered facilities.

Highway Analysis

UN Number	Hazard Class	Material	Shipments	% of Highway Total
15	1	Ammunition	1	0.3%
110	1	Grenades, Practice	1	0.3%
1005	2	Ammonia, Anhydrous	2	0.5%
1006	2	Argon	1	0.3%
1063	2	Methyl Chloride (R-40)	27	7.3%
1066	2	Nitrogen	1	0.3%
1067	2	Dinitrogen Tetroxide	1	0.3%
1073	2	Oxygen, Refrigerated Liquid	1	0.3%
1075	2	Liquefied Petroleum Gas	40	10.8%
1078	2	Refrigerant Gas	5	1.3%
1079	2	Sulfur Dioxide	2	0.5%
1083	2	Trimethylamine, Anhydrous	1	0.3%
1086	2	Vinyl Chloride	2	0.5%
1087	2	Vinyl Methyl Ether, Stabilized	1	0.3%
1090	3	Acetone	7	1.9%
1136	3	Coal Tar Distillates, Flammable	1	0.3%
1190	3	Ethyl Formate	1	0.3%
1198	3	Formaldehyde, Solution	1	0.3%
1202	3	Diesel Fuel/Fuel Oil	2	0.5%
1203	3	Gasoline	92	24.8%
1206	3	Heptanes	1	0.3%
1207	3	Hexaldehyde	1	0.3%
1210	3	Ink, Printer's, Flammable	1	0.3%
1219	3	Isopropyl Alcohol	1	0.3%
1230	3	Methanol	12	3.2%
1243	3	Methyl Formate	1	0.3%
1247	3	Methyl Methacrylate Monomer	5	1.3%
1263	3	Paint	1	0.3%
1265	3	Isopentane	1	0.3%
1267	3	Petroleum Crude Oil	28	7.5%
1276	3	n-Propyl Acetate	1	0.3%
1307	3	Xylenes	1	0.3%
1383	4	Pyrophoric Alloy, n.o.s.	1	0.3%
1389	4	Alkali Metal Amalgam	1	0.3%
1580	6	Chloropicrin	2	0.5%
1715	8	Acetic Anhydride	1	0.3%
1755	8	Chromic Acid, Solution	2	0.5%
1761	8	Cupriethylenediamine, Solution	1	0.3%
1788	8	Hydrobromic Acid	1	0.3%
1791	8	Hypochlorite Solution	4	1.1%
1809	6	Phosphorus Trichloride	1	0.3%
1815	8	Propionyl Chloride	1	0.3%
1824	8	Sodium Hydroxide	6	1.6%
1827	8	Stannic Chloride, Anhydrous	1	0.3%
1828	6	Sulfur Chlorides	1	0.3%
1866	3	Resin Solution	2	0.5%

UN Number	Hazard Class	Material	Shipments	% of Highway Total
1942	5	Ammonium Nitrate	5	1.3%
1951	2	Argon, Refrigerated Liquid	2	0.5%
1987	3	Alcohols, n.o.s.	1	0.3%
1987	3	Alcohols, n.o.s.	2	0.5%
1992	3	Flammable Liquid, Toxic, n.o.s.	3	0.8%
1993	3	Combustible Liquids	30	8.1%
2001	4	Cobalt Naphthenates, Powder	1	0.3%
2003	4	Metal Alkyls, Water-Reactive, n.o.s.	1	0.3%
2014	5	Hydrogen Peroxide, Aqueous	1	0.3%
2031	8	Nitric Acid	2	0.5%
2067	5	Ammonium Nitrate Fertilizers	6	1.6%
2068	5	Ammonium Nitrate Fertilizers	1	0.3%
2187	2	Carbon Dioxide, Refrigerated Liquid	2	0.5%
2215	8	Maleic Anhydride	2	0.5%
2227	3	n-Butyl Methacrylate, Stabilized	1	0.3%
2357	8	Cyclohexylamine	1	0.3%
2405	3	Isopropyl Butyrate	1	0.3%
2426	5	Ammonium Nitrate, Liquid (Hot)	2	0.5%
2527	3	Isobutyl Acrylate, Stabilized	1	0.3%
2607	3	Acrolein Dimer, Stabilized	1	0.3%
2618	3	Vinyltoluenes, Stabilized	1	0.3%
2922	8	Corrosive Liquid, Toxic, n.o.s.	3	0.8%
3018	6	Organophosphorus Pesticide, Liquid, Toxic	1	0.3%
3027	6	Coumarin Derivative Pesticide, Solid, Toxic	1	0.3%
3077	9	Env. Haz. Substances, Solid, n.o.s.	1	0.3%
3082	9	Env. Haz. Substances, Liquid, n.o.s.	4	1.1%
3088	4	Self-Heating Solid, Organic, n.o.s.	1	0.3%
3139	5	Oxidizing Liquid, n.o.s.	5	1.3%
3256	3	Elevated Temp. Liquid, Flammable, n.o.s.	1	0.3%
3257	9	Elevated Temp. Liquid, n.o.s.	10	2.7%
3265	8	Corrosive Liquid, Acidic, Organic, n.o.s.	1	0.3%
3288	6	Toxic Solid, Inorganic, n.o.s.	1	0.3%
3375	5	Ammonium Nitrate Emulsion	5	1.3%
3377	5	Sodium Perborate Monohydrate	1	0.3%

Railway Analysis

UN Number	Material	Hazard Class
0093	Flares, Aerial	1.3G
1005	Ammonia, Anhydrous	2.2
1011	Butane	2.1
1017	Chlorine	2.3
1032	Dimethylamine, Anhydrous	2.1
1033	Dimethyl Ether	2.1
1040	Ethylene Oxide	2.3
1061	Methylamine, Anhydrous	2.1
1075	Liquefied Petroleum Gas, NEC, Compressed	2.1
1075	Liquefied Petroleum Gases	2.1

UN Number	Material	Hazard Class
1075	Propane	2.1
1077	Propylene	2.1
1083	Trimethylamine, Anhydrous	2.1
1093	Acrylonitrile, Stabilized	3
1098	Allyl Alcohol	6.1
1114	Benzene	3
1120	Butanols	3
1157	Diisobutyl Ketone	3
1160	Dimethylamine, Solution	3
1170	Ethanol	3
1170	Ethyl Alcohol, Anhydrous	3
1202	Gas Oil	3
1203	Gasoline, NEC (Benzene)(Methanol, 1,4-Dioxane)	3
1219	Isopropanol	3
1230	Methanol	3
1235	Methylamine, Aqueous	3
1245	Methyl Isobutyl Ketone	3
1247	Methyl Methacrylate*	3
1266	Perfumery Products	3
1267	Petroleum Crude Oil	3
1280	Propylene Oxide	3
1292	Tetraethyl Silicate	3
1294	Toluene	3
1495	Sodium Chlorate	5.1
1498	Sodium Nitrate	5.1
1507	Strontium Nitrate	5.1
1595	Dimethyl Sulfate	6.1
1759	Ferrous Chloride Solution	8
1778	Fluorosilicic Acid	8
1789	Hydrochloric Acid	8
1805	Phosphoric Acid, Liquid	8
1824	Sodium Hydroxide Solution	8
1830	Sulfuric Acid	8
1866	Resin Solution	3
1942	Ammonium Nitrate	5.1
1950	Aerosols	2.1
1950	Aerosols	2.2
1987	Alcohols, n.o.s.	3
1993	Combustible Liquid, n.o.s.	CL
1993	Diesel Fuel	3
1993	Flammable Liquids, n.o.s.	3
1993	Flammable Liquids, n.o.s. (HMRC 4909328)	3
1993	Flammable Liquids, n.o.s. (HMRC 4910185)	3
2053	Methyl Isobutyl	3
2055	Styrene Monomer, Stabilized	3
2186	Hydrogen Chloride, Refrigerated Liquid	2.3
2187	Carbon Dioxide, Refrigerated Liquid	2.2
2227	N-Butyl Methacrylate	3
2265	N,N-Dimethylformamide	3
2448	Sulfur, Molten	9

UN Number	Material	Hazard Class
2556	Nitrocellulose with Alcohol	4.1
2674	Sodium Fluorosilicate	6.1
2789	Acetic Acid, Glacial	8
2794	Batteries, Wet, Filled with Acid	8
2811	Toxic Solids, Organic, n.o.s.	6.1
2920	Amines, Liquid, Corrosive, n.o.s.	8
2925	Flammable Solids, Organic, n.o.s.	4.1
2929	Toxic liquids, Flammable, Organic, n.o.s.	6.1
3065	Alcoholic Beverages	3
3066	Paint Related Material	3
3077	Environmentally Hazardous Substances, Solid, n.o.s.	9
3082	Environmentally Hazardous Substances, Liquid, n.o.s.	9
3082	Other Regulated Materials	9
3082	Other Regulated Substances, Liquid, n.o.s.	9
3105	Organic Peroxide, Type D, Liquid	5.2
3164	Articles, Pressurized Pneumatic	2.2
3175	Solids Containing Flammable Liquid, n.o.s.	4.1
3247	Sodium Perborate	5.1
3257	Elevated Temperature Liquid, n.o.s.	9
3265	Corrosive Liquid, Acidic, n.o.s.	8
3266	Corrosive Liquid, Basic, Inorganic, n.o.s.	8
3268	Air Bag Modules	9
3296	Heptafluoropropane	2.2
N/A	Cartridges for Weapons	1.1E
N/A	Cartridges for Weapons, Inert Projectile	1.4C
N/A	Cartridges for Weapons, Inert Projectile	1.4S
N/A	Chemicals, NEC Toxic Inhalation Hazard	6.1
N/A	Chlorodifluorobromo-Methane	2.2
N/A	Compounds, Cleaning Liquid	3
N/A	Compounds, Resin, Not (Butyl Acetate) Commercially Suitable for Extruding or Molding Purposes, in Flake, Liquid, Lump, P	3
N/A	Engines, Internal Combustion	9
N/A	FAK-Explosives 1.1	1.1
N/A	FAK-Explosives 1.2	1.2
N/A	FAK-Explosives 1.3	1.3
N/A	FAK-Hazardous Materials	0
N/A	(Formaldehyde) Urea Formaldehyde Concentrate	CL
N/A	Hazard Class 9 Miscellaneous Hazardous Materials	9
N/A	Metal Catalyst, Wetted	4.2
N/A	Polyester Resin Kits	3
N/A	Radioactive Material, Low Specific Activity (LSA-II)	7
N/A	Radioactive Material, Type B(U) Package	7
N/A	Specialty Denatured (Ethyl Acetate) Alcohol	3
N/A	Vehicle, Flammable Liquid Powered	9

Waterway Analysis

UN Number	Material	Hazard Class
1203	Gasoline	3
1824	Sodium Hydroxide	8
1987	Alcohols	3
1993	Distillate Fuel Oil	3
1993	Residual Fuel Oil	3
1993	Other Hydrocarbons	3
2073	Ammonia	2
2218	Carboxylic Acids	8
N/A	Coal & Lignite	N/A
N/A	Organic Comp. NEC	N/A
N/A	Metallic Salts	N/A
N/A	Wood in the Rough	N/A
N/A	Limestone	N/A
N/A	Sand & Gravel	N/A
N/A	Water Improvement Material	N/A
N/A	Iron Ore	N/A
N/A	Slag	N/A
N/A	Non-Metal Minerals NEC	N/A
N/A	Cement & Concrete	N/A
N/A	I&S Pipe & Tube	N/A

Airway Analysis

UN Number	Material	Hazard Class
1203	Auto Parts (may contain gasoline)	3
2809	Barometers (may contain mercury)	6
1830	Batteries (may contain sulfuric acid)	8
1072	Breathing Apparatus	2
2187	Bull Semen (may indicate dry ice)	2
N/A	Camping Gear (may include flammables)	2, 3
1072	Chemical Oxygen	2
2187	Dry Ice	2
N/A	Pharmaceuticals (may include flammable liquids, radioactive medicines, etc.)	
N/A	Refrigeration Equipment (may contain gases under pressure)	2
2809	Thermometers (may contain mercury)	6
N/A	Urine Samples	N/A
2187	Vaccines (may be packed in dry ice)	2

Pipeline Analysis

UN Number	Material	Hazard Class
1011	Butane	2
1035	Ethane	2
1265	Pentane	2
1969	Isobutane	2
1971	Natural Gas (Methane)	2
1978	Propane	2

Covered Facilities Analysis

UN Number	Material	Hazard Class
1033	Dimethyl Ether	2
1061	Monomethyl Amine	2
1077	Propylene	2
1083	Trimethyl Amine	2
1090	Acetone	3
1093	Acrylonitrile	3, 6
1120	N-Butanol	3
1170	Ethanol	3
1198	Formaldehyde	3, 8
1219	Isopropanol	3
1230	Methanol	3
1247	Methyl Methacrylate	3
1403	Cyanamid	4
1595	Dimethyl Sulfate	6, 8
1760	Glycerine	8
1789	Hydrochloric Acid	8
1789	Muriatic Acid 32%	8
1791	Sodium Hypochlorite	8
1824	Caustic Soda	8
1824	Sodium Hydroxide	8
1829	Sulfur Trioxide	8
1830	Sulfuric Acid	8
1993	Flammable Liquid	3
2014	Hydrogen Peroxide 50%	5
2468	Trichloro-S-Triazinetrione, Dry (TCCA)	5
2693	Sodium Bisulfite	8
2735	Dimethyl Amines	8
2762	Liquid Chlorine	3, 6
2790	Acetic Acid	8, 3
3242	Diformamide	4

UN Number	Material	Hazard Class
3347	Glycolic Acid	6, 3
N/A	2-EHMA	N/A
N/A	AIBN-64	N/A
N/A	IRG 1076 Molten	N/A
N/A	LG275K	N/A
N/A	LG350K	N/A
N/A	LS200K	N/A

KANAWHA PUTNAM EMERGENCY PLANNING COMMITTEE
COMMODITY FLOW STUDY
APPENDIX 2: MONITORING SITE DATA

This appendix contains detailed data sheets for each one of the monitoring sites observed as part of this update.

Site 8: I-79 Approximately 2 Miles North of the 77/79 Split

Date: June 9, 2014

Time: 7:00 a.m. ***Interval:*** 4 hours *Monitor:* N/S on I-79

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*	*UN No.*	*Class*	*Name*	*Total*	*% of All Placards*	*General Placards*	*Totals*	*% of All Placards*
#1	0	0.0%	1075	2	Liquefied Petroleum Gas	1	4.0%	N/A		
#2	5	1.2%	1203	3	Gasoline	5	20.0%			
#3	1	0.2%	1267	3	Petroleum Crude Oil	17	68.0%			
#4	0	0.0%	1809	6	Phosphorus Trichloride	1	4.0%			
#5	0	0.0%	1951	2	Argon, Refrigerated Liquid	1	4.0%			
#6	18	4.5%								
#7	0	0.0%								
#8	1	0.2%								
Other	0	0.0%								

Total Haz-Mat	**25**
Total Placards	**5**
Total Truck Traffic	**403**
% w/ Placard:	**6.2%**
WVDOT Count:	23500
24 hr-Trucks Calc:	2418
24-hr Haz Calc:	150
Est Haz per hr:	6
% Haz per 24-hr:	0.6%

Site 10: I-77 (WV Turnpike), Chelyan Exit 85

Date: June 9, 2014

Time: 11:00 a.m. ***Interval:*** 5 hours *Monitor:* E/W on I-64, on/off I-64 to extent possible

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	0	0.0%
#2	2	0.4%
#3	2	0.4%
#4	0	0.0%
#5	0	0.0%
#6	15	2.9%
#7	4	0.8%
#8	6	1.2%
Other	1	0.2%

Total Haz-Mat	**28**
Total Placards	**17**
Total Truck Traffic	**513**
% w/ Placard:	**5.5%**
WVDOT Count:	32000
24 hr-Trucks Calc:	2462.4
24-hr Haz Calc:	134.4
Est Haz per hr:	6
% Haz per 24-hr:	0.4%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
1067	2	Dinitrogen Tetroxide	1	3.6%
1075	2	Liquefied Petroleum Gas	1	3.6%
1083	2	Trimethylamine, Anhydrous	1	3.6%
1190	3	Ethyl Formate	1	3.6%
1198	3	Formaldehyde, Solution	1	3.6%
1203	3	Gasoline	4	14.3%
1993	3	Combustible Liquids	2	7.1%
2003	4	Metal Alkyls, Water-Reactive, n.o.s.	1	3.6%
2215	8	Maleic Anhydride	1	3.6%
2357	8	Cyclohexylamine	1	3.6%
2405	3	Isopropyl Butyrate	1	3.6%
2922	8	Corrosive Liquid, Toxic, n.o.s.	1	3.6%
3082	9	Env. Haz. Substances, Liquid, n.o.s.	1	3.6%
3257	9	Elevated Temp. Liquid, n.o.s.	5	17.9%
3375	5	Ammonium Nitrate Emulsion	2	7.1%

General Placards	*Totals*	*% of All Placards*
Corrosive	3	10.7%
Flammable Liquid	1	3.6%

Site 5: Intersection of SR 25 with I-64 at Institute

Date: June 10, 2014

Time: 7:00 a.m. ***Interval:*** 4 hours

Monitor: E/W on SR 25 and on/off I-64 to extent possible

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	0	0.0%
#2	0	0.0%
#3	0	0.0%
#4	0	0.0%
#5	0	0.0%
#6	2	2.8%
#7	6	8.5%
#8	1	1.4%
Other	0	0.0%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
1230	3	Methanol	6	66.7%
1247	3	Methyl Methacrylate Monomer	1	11.1%
1580	6	Chloropicrin	1	11.1%
2031	8	Nitric Acid	1	11.1%

General Placards	*Totals*	*% of All Placards*
N/A		

Total Haz-Mat	**9**
Total Placards	**4**
Total Truck Traffic	**71**
% w/ Placard:	**12.7%**
WVDOT Count:	3662
24 hr-Trucks Calc:	426
24-hr Haz Calc:	54
Est Haz per hr:	2
% Haz per 24-hr:	1.5%

Date: June 10, 2014

Site 13: Intersection of Montrose Drive w/ MacCorkle Avenue, SW in S. Charleston

Time: 11:30 a.m. ***Interval:*** 4 hours *Monitor:* E/W on US 60, on/off Montrose Drive

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*	*UN No.*	*Class*	*Name*	*Total*	*% of All Placards*	*General Placards*	*Totals*	*% of All Placards*
#1	0	0.0%	1230	3	Methanol	6	66.7%	N/A		
#2	0	0.0%	1247	3	Methyl Methacrylate Monomer	1	11.1%			
#3	0	0.0%	1580	6	Chloropicrin	1	11.1%			
#4	0	0.0%	2031	8	Nitric Acid	1	11.1%			
#5	0	0.0%								
#6	2	5.3%								
#7	6	15.8%								
#8	1	2.6%								
Other	0	0.0%								

Total Haz-Mat	**9**
Total Placards	**4**
Total Truck Traffic	**38**
% w/ Placard:	**23.7%**
WVDOT Count:	1741
24 hr-Trucks Calc:	228
24-hr Haz Calc:	54
Est Haz per hr:	2
% Haz per 24-hr:	3.1%

Date: June 10, 2014

Site 6: I-77 Approximately 2 Miles North of the 77/79 Split

Time: 4:00 p.m. ***Interval:*** 4 hours *Monitor:* N/S on I-77

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	0	0.0%
#2	0	0.0%
#3	0	0.0%
#4	0	0.0%
#5	0	0.0%
#6	2	0.7%
#7	0	0.0%
#8	1	0.4%
Other	0	0.0%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
1063	2	Methyl Chloride (R-40)	2	66.7%
2068	5	Ammonium Nitrate Fertilizers	1	33.3%

General Placards	*Totals*	*% of All Placards*
N/A		

Total Haz-Mat	**3**
Total Placards	**2**
Total Truck Traffic	**285**
% w/ Placard:	**1.1%**
WVDOT Count:	24500
24 hr-Trucks Calc:	1710
24-hr Haz Calc:	18
Est Haz per hr:	1
% Haz per 24-hr:	0.1%

Date: June 12, 2014

Site 24: I-64 Crooked Creek Exit (Between St. Albans and Winfield)

Time: 7:00 a.m. ***Interval:*** 4 hours *Monitor:* E/W on I-64

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	0	0.0%
#2	4	0.4%
#3	0	0.0%
#4	0	0.0%
#5	0	0.0%
#6	23	2.5%
#7	1	0.1%
#8	4	0.4%
Other	0	0.0%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
1063	2	Methyl Chloride (R-40)	15	46.9%
1075	2	Liquefied Petroleum Gas	4	12.5%
1203	3	Gasoline	8	25.0%
2067	5	Ammoniun Nitrate Fertilizers	4	12.5%
3257	9	Elevated Temp. Liquid, n.o.s.	1	3.1%

General Placards	*Totals*	*% of All Placards*
N/A		

Total Haz-Mat	**32**
Total Placards	**5**
Total Truck Traffic	**918**
% w/ Placard:	**3.5%**
WVDOT Count:	38500
24 hr-Trucks Calc:	5508
24-hr Haz Calc:	192
Est Haz per hr:	8
% Haz per 24-hr:	0.5%

Date: June 12, 2014

Site 21: Intersection of US 35 and SR 34 West of Winfield

Time: 12:00 p.m. ***Interval:*** 4 hours *Monitor:* N/S on US 35

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	0	0.0%
#2	0	0.0%
#3	1	0.1%
#4	0	0.0%
#5	0	0.0%
#6	2	0.3%
#7	0	0.0%
#8	2	0.3%
Other	0	0.0%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
1063	2	Methyl Chloride (R-40)	1	20.0%
1087	2	Vinyl Methyl Ether, Stabilized	1	20.0%
1203	3	Gasoline	1	20.0%
1987	3	Alcohols, n.o.s.	1	20.0%
2001	4	Cobalt Naphthenates, Powder	1	20.0%

General Placards	*Totals*	*% of All Placards*
N/A		

Total Haz-Mat **5**
Total Placards **5**
Total Truck Traffic **703**
% w/ Placard: **0.7%**

WVDOT Count: 13207
24 hr-Trucks Calc: 4218
24-hr Haz Calc: 30
Est Haz per hr: 1
% Haz per 24-hr: 0.2%

Date: June 12, 2014

Site 23: Intersection of SR 25 and I-64 West at Nitro Exit 45

Time: 4:30 p.m. ***Interval:*** 4 hours *Monitor:* N/S on SR 25, on/off I-64 WB, and train

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*	*UN No.*	*Class*	*Name*	*Total*	*% of All Placards*	*General Placards*	*Totals*	*% of All Placards*
#1	3	0.9%	1203	3	Gasoline	1	9.1%	Flammable Gas	3	27.3%
#2	0	0.0%	1815	8	Propionyl Chloride	1	9.1%	Non-Flammable Gas	3	27.3%
#3	2	0.6%	1993	3	Combustible Liquids	3	27.3%			
#4	1	0.3%								
#5	2	0.6%								
#6	0	0.0%								
#7	0	0.0%								
#8	0	0.0%								
Other	0	0.0%								

Total Haz-Mat	**11**
Total Placards	**5**
Total Truck Traffic	**343**
% w/ Placard:	**3.2%**
WVDOT Count:	14317
24 hr-Trucks Calc:	2058
24-hr Haz Calc:	66
Est Haz per hr:	3
% Haz per 24-hr:	0.5%

Site 12: US 119 at Terry Road

Date: June 13, 2014

Time: 7:30 a.m. ***Interval:*** 4 hours *Monitor:* N/S on US 119

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	0	0.0%
#2	0	0.0%
#3	0	0.0%
#4	0	0.0%
#5	0	0.0%
#6	12	5.8%
#7	0	0.0%
#8	0	0.0%
Other	0	0.0%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
1063	2	Methyl Chloride (R-40)	7	58.3%
1078	2	Refrigerant Gas	5	41.7%

General Placards	*Totals*	*% of All Placards*
N/A		

Total Haz-Mat	**12**
Total Placards	**2**
Total Truck Traffic	**207**
% w/ Placard:	**5.8%**
WVDOT Count:	8534
24 hr-Trucks Calc:	1242
24-hr Haz Calc:	72
Est Haz per hr:	3
% Haz per 24-hr:	0.8%

Date: June 13, 2014

Site 14: Intersection of MacCorkle Ave, SW and EB Entrance/Exit of I-64 in S. Charleston

Time: 12:30 p.m. ***Interval:*** 4 hours *Monitor:* E/W on US 60, on/off I-64 EB

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	0	0.0%
#2	0	0.0%
#3	0	0.0%
#4	0	0.0%
#5	0	0.0%
#6	2	3.1%
#7	0	0.0%
#8	3	4.6%
Other	0	0.0%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
1063	2	Methyl Chloride (R-40)	2	40.0%
1203	3	Gasoline	3	60.0%

General Placards	*Totals*	*% of All Placards*
N/A		

Total Haz-Mat	**5**
Total Placards	**2**
Total Truck Traffic	**65**
% w/ Placard:	**7.7%**
WVDOT Count:	9120
24 hr-Trucks Calc:	390
24-hr Haz Calc:	30
Est Haz per hr:	1
% Haz per 24-hr:	0.3%

Date: June 15, 2014

Site 8: I-79 Approximately 2 Miles North of the 77/79 Split

Time: 4:00 p.m. ***Interval:*** 4 hours *Monitor:* N/S on I-79

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	2	0.9%
#2	0	0.0%
#3	2	0.9%
#4	0	0.0%
#5	1	0.4%
#6	9	4.0%
#7	3	1.3%
#8	0	0.0%
Other	0	0.0%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
1075	2	Liquefied Petroleum Gas	1	5.0%
1203	3	Gasoline	7	35.0%
1247	3	Methyl Methacrylate Monomer	1	5.0%
1263	3	Paint	1	5.0%
1267	3	Petroleum Crude Oil	2	10.0%
1383	4	Pyrophoric Alloy, n.o.s.	1	5.0%
1788	8	Hydrobromic Acid	1	5.0%
2618	3	Vinyltoluenes, Stabilized	1	5.0%

General Placards	*Totals*	*% of All Placards*
Corrosive	1	5.0%
Dangerous When Wet	1	5.0%
Flammable Gas	1	5.0%
Non-Flammable Gas	1	5.0%
Poison	1	5.0%

Total Haz-Mat	**20**
Total Placards	**13**
Total Truck Traffic	**227**
% w/ Placard:	**8.8%**
WVDOT Count:	23500
24 hr-Trucks Calc:	1362
24-hr Haz Calc:	120
Est Haz per hr:	5
% Haz per 24-hr:	0.5%

Site 17: WV Turnpike, Marmet Exit 89

Date: June 16, 2014

Time: 7:30 a.m. ***Interval:*** 4 hours *Monitor:* N/S on SR 94

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	2	0.9%
#2	0	0.0%
#3	6	2.6%
#4	0	0.0%
#5	0	0.0%
#6	13	5.7%
#7	1	0.4%
#8	1	0.4%
Other	0	0.0%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
1005	2	Ammonia, Anhydrous	2	7.1%
1073	2	Oxygen, Refrigerated Liquid	1	3.6%
1203	3	Gasoline	4	14.3%
1791	8	Hypochlorite Solution	1	3.6%
1942	5	Ammonium Nitrate	5	17.9%
1993	3	Combustible Liquids	14	50.0%

General Placards	*Totals*	*% of All Placards*
Miscellaneous	1	3.6%

Total Haz-Mat **28**
Total Placards **7**
Total Truck Traffic **230**
% w/ Placard: **12.2%**

WVDOT Count: 8491
24 hr-Trucks Calc: 1380
24-hr Haz Calc: 168
Est Haz per hr: 7
% Haz per 24-hr: 2.0%

Date: June 16, 2014

Site 16: Intersection of SR 25 and SR 62 (W. Washington St.)

Time: 1:00 p.m. ***Interval:*** 4 hours *Monitor:* N/S on SR 25; on/off SR 62

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*	*UN No.*	*Class*	*Name*	*Total*	*% of All Placards*	*General Placards*	*Totals*	*% of All Placards*
#1	2	7.4%			N/A			Flammable Gas	2	50.0%
#2	0	0.0%						Non-Flammable Gas	2	50.0%
#3	0	0.0%								
#4	0	0.0%								
#5	0	0.0%								
#6	0	0.0%								
#7	0	0.0%								
#8	0	0.0%								
Other	0	0.0%								

Total Haz-Mat	**4**
Total Placards	**2**
Total Truck Traffic	**27**
% w/ Placard:	**14.8%**
WVDOT Count:	15932
24 hr-Trucks Calc:	162
24-hr Haz Calc:	24
Est Haz per hr:	1
% Haz per 24-hr:	0.2%

Date: June 16, 2014

Site 6: I-77 Approximately 2 Miles North of the 77/79 Split

Time: 9:00 p.m. ***Interval:*** 4 hours *Monitor:* N/S on I-77

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*	*UN No.*	*Class*	*Name*	*Total*	*% of All Placards*	*General Placards*	*Totals*	*% of All Placards*
#1	0	0.0%	1203	3	Gasoline	3	60.0%	Flammable Liquid	2	40.0%
#2	0	0.0%								
#3	0	0.0%								
#4	0	0.0%								
#5	0	0.0%								
#6	5	1.3%								
#7	0	0.0%								
#8	0	0.0%								
Other	0	0.0%								

Total Haz-Mat	**5**
Total Placards	**2**
Total Truck Traffic	**376**
% w/ Placard:	**1.3%**
WVDOT Count:	24500
24 hr-Trucks Calc:	2256
24-hr Haz Calc:	30
Est Haz per hr:	1
% Haz per 24-hr:	0.1%

Date: June 17, 2014

Site 23: Intersection of SR 25 and I-64 West at Nitro Exit 45

Time: 1:30 a.m. ***Interval:*** 4 hours *Monitor:* N/S on SR 25 and Train

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*	*UN No.*	*Class*	*Name*	*Total*	*% of All Placards*	*General Placards*	*Totals*	*% of All Placards*
#1	0	0.0%	1824	8	Sodium Hydroxide	4	57.1%	N/A		
#2	0	0.0%	1828	6	Sulfur Chlorides	1	14.3%			
#3	0	0.0%	1993	3	Combustible Liquids	1	14.3%			
#4	1	0.8%	3077	9	Env. Haz. Substances, Solid, n.o.s.	1	14.3%			
#5	0	0.0%								
#6	6	4.8%								
#7	0	0.0%								
#8	0	0.0%								
Other	0	0.0%								

Total Haz-Mat	**7**
Total Placards	**4**
Total Truck Traffic	**124**
% w/ Placard:	**5.6%**
WVDOT Count:	14317
24 hr-Trucks Calc:	744
24-hr Haz Calc:	42
Est Haz per hr:	2
% Haz per 24-hr:	0.3%

Date: June 17, 2014

Site 22: Intersection of Entrance/Exit Ramp of I-64 (St. Albans, Exit 44)

Time: 8:00 a.m. ***Interval:*** 4 hours *Monitor:* On/off I-64

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*	*UN No.*	*Class*	*Name*	*Total*	*% of All Placards*	*General Placards*	*Totals*	*% of All Placards*
#1	5	3.3%	1079	2	Sulfur Dioxide	2	11.8%	Flammable Gas	1	5.9%
#2	0	0.0%	1203	3	Gasoline	2	11.8%	Non-Flammable Gas	1	5.9%
#3	7	4.6%	1276	3	n-Propyl Acetate	1	5.9%			
#4	0	0.0%	1791	8	Hypochlorite Solution	3	17.6%			
#5	0	0.0%	1987	3	Alcohols, n.o.s.	2	11.8%			
#6	3	2.0%	1992	3	Flammable Liquid, Toxic, n.o.s.	1	5.9%			
#7	0	0.0%	1993	3	Combustible Liquids	2	11.8%			
#8	0	0.0%	3257	9	Elevated Temp. Liquid, n.o.s.	2	11.8%			
Other	0	0.0%								

Total Haz-Mat	**17**
Total Placards	**10**
Total Truck Traffic	**152**
% w/ Placard:	**11.2%**
WVDOT Count:	4866
24 hr-Trucks Calc:	912
24-hr Haz Calc:	102
Est Haz per hr:	4
% Haz per 24-hr:	2.1%

Date: June 17, 2014

Site 24: I-64 Crooked Creek Exit (Between St. Albans and Winfield)

Time: 1:00 p.m. ***Interval:*** 4 hours *Monitor:* E/W on I-64

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	17	1.0%
#2	10	0.6%
#3	45	2.7%
#4	0	0.0%
#5	0	0.0%
#6	9	0.5%
#7	2	0.1%
#8	5	0.3%
Other	0	0.0%

Total Haz-Mat	**98**
Total Placards	**28**
Total Truck Traffic	**1640**
% w/ Placard:	**6.0%**
WVDOT Count:	38500
24 hr-Trucks Calc:	9840
24-hr Haz Calc:	588
Est Haz per hr:	25
% Haz per 24-hr:	1.5%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
15	1	Ammunition	1	1.0%
1066	2	Nitrogen	1	1.0%
1075	2	Liquefied Petroleum Gas	20	20.4%
1086	2	Vinyl Chloride	2	2.0%
1090	3	Acetone	7	7.1%
1136	3	Coal Tar Distillates, Flammable	1	1.0%
1202	3	Diesel Fuel/Fuel Oil	2	2.0%
1203	3	Gasoline	12	12.2%
1247	3	Methyl Methacrylate Monomer	2	2.0%
1267	3	Petroleum Crude Oil	9	9.2%
1389	4	Alkali Metal Amalgam	1	1.0%
1755	8	Chromic Acid, Solution	2	2.0%
1824	8	Sodium Hydroxide	1	1.0%
1866	3	Resin Solution	2	2.0%
1951	2	Argon, Refrigerated Liquid	1	1.0%
2014	5	Hydrogen Peroxide, Aqueous	1	1.0%
2067	5	Ammonium Nitrate Fertilizers	2	2.0%
2215	8	Maleic Anhydride	1	1.0%
2227	3	n-Butyl Methacrylate, Stabilized	1	1.0%
2527	3	Isobutyl Acrylate, Stabilized	1	1.0%
2922	8	Corrosive Liquid, Toxic, n.o.s.	2	2.0%
3027	6	Coumarin Derivative Pesticide, Solid, Toxic	1	1.0%
3257	9	Elevated Temp. Liquid, n.o.s.	1	1.0%
3375	5	Ammonium Nitrate Emulsion	1	1.0%

General Placards	*Totals*	*% of All Placards*
Explosives 1.5	2	2.0%
Flammable Gas	10	10.2%
Flammable Liquid	1	1.0%
Non-Flammable Gas	10	10.2%

Site 10: I-77 (WV Turnpike), Chelyan Exit 85

Date: June 19, 2014

Time: 7:00 a.m. ***Interval:*** 4 hours *Monitor:* E/W on I64, on/off I-64 to extent possible

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	13	0.8%
#2	2	0.1%
#3	23	1.4%
#4	0	0.0%
#5	0	0.0%
#6	23	1.4%
#7	5	0.3%
#8	4	0.3%
Other	0	0.0%

Total Haz-Mat	**70**
Total Placards	**27**
Total Truck Traffic	**1595**
% w/ Placard:	**4.4%**
WVDOT Count:	32000
24 hr-Trucks Calc:	9570
24-hr Haz Calc:	420
Est Haz per hr:	18
% Haz per 24-hr:	1.3%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
110	1	Grenades, Practice	1	1.4%
1006	2	Argon	1	1.4%
1075	2	Liquefied Petroleum Gas	13	18.6%
1203	3	Gasoline	28	40.0%
1206	3	Heptanes	1	1.4%
1207	3	Hexaldehyde	1	1.4%
1210	3	Ink, Printer's, Flammable	1	1.4%
1219	3	Isopropyl Alcohol	1	1.4%
1243	3	Methyl Formate	1	1.4%
1265	3	Isopentane	1	1.4%
1307	3	Xylenes	1	1.4%
1715	8	Acetic Anhydride	1	1.4%
1761	8	Cupriethylenediamine, Solution	1	1.4%
1827	8	Stannic Chloride, Anhydrous	1	1.4%
2187	2	Carbon Dioxide, Refrigerated Liquid	2	2.9%
2607	3	Acrolein Dimer, Stabilized	1	1.4%
3018	6	Organophosphorus Pesticide, Liquid, Toxic	1	1.4%
3082	9	Env. Haz. Substances, Liquid, n.o.s.	2	2.9%
3088	4	Self-Heating Solid, Organic, n.o.s.	1	1.4%
3256	3	Elevated Temp. Liquid, Flammable, n.o.s.	1	1.4%
3257	9	Elevated Temp. Liquid, n.o.s.	1	1.4%
3288	6	Toxic Solid, Inorganic, n.o.s.	1	1.4%
3375	5	Ammonium Nitrate Emulsion	2	2.9%
3377	5	Sodium Perborate Monohydrate	1	1.4%

General Placards	*Totals*	*% of All Placards*
Flammable Gas	1	1.4%
Flammable Liquid	2	2.9%
Non-Flammable Gas	1	1.4%

Date: June 19, 2014

Site 17: WV Turnpike, Marmet Exit 89

Time: 11:30 a.m. ***Interval:*** 4 hours *Monitor:* N/S on SR 94

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	4	1.7%
#2	0	0.0%
#3	12	5.2%
#4	0	0.0%
#5	0	0.0%
#6	2	0.9%
#7	0	0.0%
#8	2	0.9%
Other	0	0.0%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
1203	3	Gasoline	3	13.0%
1824	8	Sodium Hydroxide	1	4.3%
1992	3	Flammable Liquid, Toxic, n.o.s.	1	4.3%
1993	3	Combustible Liquids	4	17.4%
2426	5	Ammonium Nitrate, Liquid (Hot)	2	8.7%
3082	9	Env. Haz. Substances, Liquid, n.o.s.	1	4.3%
3139	5	Oxidizing Liquid, n.o.s.	5	21.7%

General Placards	*Totals*	*% of All Placards*
Flammable Gas	3	13.0%
Non-Flammable Gas	3	13.0%

Total Haz-Mat	**23**
Total Placards	**9**
Total Truck Traffic	**229**
% w/ Placard:	**10.0%**
WVDOT Count:	8491
24 hr-Trucks Calc:	1374
24-hr Haz Calc:	138
Est Haz per hr:	6
% Haz per 24-hr:	1.6%

Site 5: Intersection of SR 25 with I-64 at Institute

Date: June 20, 2014

Time: 12:00 p.m. ***Interval:*** 4 hours

Monitor: E/W on SR 25 and on/off I-64 to the extent possible

Trucks Carrying Haz-Mat

Trucks may have multiple placards

Trailer Type	*Totals*	*% of Total*
#1	2	2.6%
#2	0	0.0%
#3	3	3.9%
#4	0	0.0%
#5	0	0.0%
#6	14	18.4%
#7	0	0.0%
#8	0	0.0%
Other	0	0.0%

UN No.	*Class*	*Name*	*Total*	*% of All Placards*
1203	3	Gasoline	11	57.9%
1992	3	Flammable Liquid, Toxic, n.o.s.	1	5.3%
1993	3	Combustible Liquid	4	21.1%
3265	8	Corrosive Liquid, Acidic, Organic, n.o.s.	1	5.3%

General Placards	*Totals*	*% of All Placards*
Corrosive	2	10.5%

Total Haz-Mat	**19**
Total Placards	**5**
Total Truck Traffic	**76**
% w/ Placard:	**25.0%**
WVDOT Count:	3662
24 hr-Trucks Calc:	456
24-hr Haz Calc:	114
Est Haz per hr:	5
% Haz per 24-hr:	3.1%