REPORT OF THE VIRGINIA DEPARTMENT
OF EMERGENCY SERVICES ON

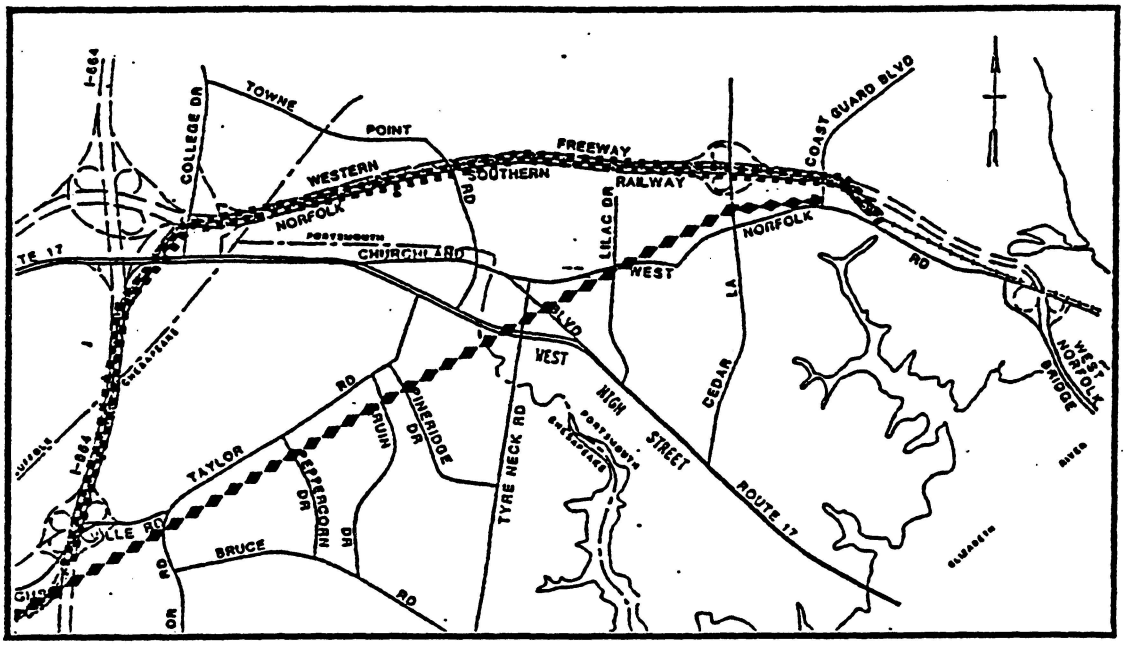
Safety of Vehicular Crossings on the Norfolk and Southern Railroad Under Study for Relocation in the Cities of Chesapeake, Portsmouth, and Suffolk

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

HOUSE DOCUMENT NO. 35

COMMONWEALTH OF VIRGINIA
RICHMOND
1989

Cities of Chesapeake, Portsmouth, and Suffolk



HAZARDS ANALYSIS

for

Feasibility Study of Relocating the Norfolk & Southern Railway in the Median of the Western Freeway and Interstate 664

Virginia Department of Transportation

VDOT

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VIRGINIA DEPARTMENT OF EMERGENCY SERVICES

EXECUTIVE SUMMARY

As requested by House Joint Resolution No. 162, passed by the 1988 Session of the General Assembly, the Department of Emergency Services has conducted a safety and hazard analysis of the Norfolk and Southern Railway grade crossings between Gum Road in the City of Chesapeake and Cedar Lane in the City of Portsmouth. An expected accident rate was calculated for each rail crossing using a standard U. S. Department of Transportation mathematical model. Expected accident rates were calculated for each crossing as it now exists and for an upgraded condition of flashing lights and gate guards for both the 1987 observed traffic volumes and the projected 2010 traffic volumes (Tables 4 and 5). These expected accident rates were low and were improved by as much as sixty percent on some crossings by the addition of flashing lights and gate guards.

Using the U.S. Environmental Protection Agency's Technical Guidance for Hazards Analysis risk areas were defined for the hazardous materials currently transported over the existing railroad. This area encompasses a corridor twenty miles wide along the railroad from its juncture with I-664 to the Virginia Chemical facility with a ten mile arc east of Virginia Chemical. Dependent upon the location of an incident releasing one of these hazardous materials, the quantity released, the wind direction, and other atmospheric conditions, a variable number of the estimated 475,000 people located in the defined risk area would be exposed to the risk. A similar risk area was defined for the proposed relocation route. However, due to the geography and demographics of the area, the population at risk from a train related accident would increase rather than decrease.

Similar risk areas were defined using the U. S. Department of Transportation's Guidebook for Initial Response to Hazardous Materials Incidents. This is an area of risk, extending one and one half miles on either side of the transportation routes (See Figure 2), for which immediate decisions must be made for protective actions for the population at risk. There are approximately 34,000 citizens potentially at risk in this area who, dependent upon the conditions described above, would be considered for immediate evacuation. A similar area defined for the proposed relocation route would initially reduce the population at risk from a train related accident by approximately 1,300; however, projected growth in the northern section of the City of Suffolk would soon nullify this advantage. The area at risk from the current transportation of these hazardous materials by truck over U.S. Route 17 closely approximates the risk area defined for the relocation route for the railroad. Upon completion of the Western Freeway, the risk area for hazardous materials transported by truck will be

identical to the risk area for the same materials transported by rail if the railroad is relocated.

Relocating the railroad would remove the risk of a railroad crossing accident involving a loaded chemical car and a motor vehicle. This risk, however, would be replaced with the risk of a train derailment on the new route, particularly during the first two to four years after construction, reduced accessibility to the site of a rail accident, and the compounding of the hazardous materials risk by sharing the transportation corridor with other vehicular traffic transporting hazardous materials.

There are three curves within the first one and one half miles of the proposed track which are seven and eight degree curves. Sixty percent of rail buckling, which can cause train derailments, occurs on five to ten degree curves, although this only represents seven percent of the railroad track. In the event that, due to the protected nature of the railroad track in the highway median, train speeds are increased above the five to ten miles per hour at which they now operate it would be reasonable to expect that the likelihood of a tank car being ruptured in a derailment would increase. Highway barriers separating the freeway traffic from the railroad in the median strip would also inhibit access by emergency response personnel and the absence of fire hydrants would limit their ability to combat fires and fumes from hazardous material releases.

In conclusion, relocating the railroad does not necessarily remove the hazard nor does it significantly reduce the population at risk. Potentially it could exchange the probability of a slow speed grade crossing accident for the probability of a higher speed train derailment on one of the curves on the new track, compound the hazardous materials risk along the Western Freeway, and inhibit access by emergency response personnel to the site of a rail accident. For these reasons the hazard reduction realized by the slightly reduced risk of a hazardous materials incident and the elimination of the risk of a grade crossing accident by relocating the railroad are not of sufficient magnitude to justify its relocation at this time. However, it is also clear that any increased growth in the use of the railroad required by industrial development and growth is the I-664 and Western Freeway corridor could alter the risk assessment. Accordingly, the following recommendations are made:

1. Reevaluate the relocation of the railroad to the median of the Western Freeway and I-664 when increased rail transportation required by industrial development and/or other factors clearly changes the current balance of risk in favor of relocation.

2. Provide an alternate access route for residents of the Lilac Road area north of the railroad by a connecting street between the north end of Lilac Road and Moore Road or by extending Lilac Road eastward to Cedar Lane.

3. Further reduce the expected accident rate of the existing crossings by installing lights and gates crossing guards at each crossing.

4. Allocate sufficient space in the median of the Western Freeway and I-664 for construction of the railroad at a future date should it become a necessity.

GENERAL ASSEMBLY OF VIRGINIA -- 1988 SESSION

HOUSE JOINT RESOLUTION NO. 162

Requesting a continuation of the study on relocation of the Norfolk Southern Railroad into I-664 and the Western Freeway.

Agreed to by the House of Delegates, February 11, 1988
Agreed to by the Senate, March 9, 1988

WHEREAS, the 1987 Session of the General Assembly directed the Virginia Department of Transportation to study the relocation of the Norfolk Southern Railway located in the Churchland area of the City of Portsmouth into I-664 and the Western Freeway; and

WHEREAS, certain issues pertaining to the safety of existing vehicular crossings on such railroad were submitted to the Virginia Department of Transportation in connection with said study; and

WHEREAS, the issues pertaining to the safety of vehicular crossings on such railroad were not addressed in the report of the study; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Department of Emergency Services, in cooperation with the Virginia Department of Transportation, is hereby requested to continue this study pertaining to the relocation of the Norfolk Southern Railroad into I-664 and the Western Freeway and to address the issues of the safety of existing vehicular crossings on such railroad which were not included in the report of the study.

The Department of Emergency Services and the Virginia Department of Transportation shall submit their findings and recommendations prior to December 1, 1988.

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HAZARDS ANALYSIS

for
Feasibility Study of Relocating the Norfolk & Southern Railway in the Median of the Western Freeway and Interstate 664

PURPOSE

As requested by House Joint Resolution No. 162 passed by the 1988 General Assembly the Department of Emergency Services has conducted a safety and hazard analysis of the Norfolk and Southern Railway grade crossings between Gum Road in the City of Chesapeake and Cedar Lane in the City of Portsmouth. Based on the observed traffic volume in 1987 and the projected traffic volume for the year 2010 the study compares the statistical probability of an accident involving a railroad car and a motor vehicle occurring at the grade crossings, as they now exist, to the probability of an accident if they were all upgraded to guarded crossings using flashing lights and gates. In addition, a hazard analysis was made of other transportation routes over which chemicals are transported to and from the Virginia Chemical facility served by the railroad.

TRAFFIC

The traffic flow data found at Tables 1, 2, & 3[1] are taken from the original feasibility study and were used as the basis for this study. The level of production and shipment of hazardous materials at the Virginia Chemical Amines plant varies according to customer demands for the product. However, the only impact this will have on the transportation of hazardous materials through the study area would be in the type and quantity of a specific material shipped in any given period of time. The overall number of rail-cars and trucks containing hazardous materials would remain approximately the same.

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[1] Feasibility Study of Relocating the Norfolk & Southern Railway in the Median of the Western Freeway and Interstate 664, (Virginia Department of Transportation, 1987), pp. 3-4.

Table 1

VDOT Surveyed Train Movements - a.m. and p.m.
Monday, June 15, 1987
Friday, July 31, 1987
Wednesday, August 12, 1987

Train Size

June 15	a.m.	1 engine 9 cars
	p.m.	1 engine 8 cars
July 31	a.m.	1 engine 7 cars
	p.m.	1 engine 7 cars
August 12	a.m.	1 engine 10 cars
	p.m.	1 engine 9 cars
Average Train Size		1 engine 8 cars
Average Frequency		6 trains per week

Table 2

Average Delay at Grade Crossings

Location	Protection	Delay Time	Vehicles Delayed
Taylor Road	Lights and Gates	1 min. 10 sec.	10
Peppercorn Drive	Crossbucks	29 sec.	1
Bruin Drive	Crossbucks	34 sec.	1
Pineridge Drive	Crossbucks	33 sec.	1
West High Street	Flashing Lights	54 sec.	51
Tyre Neck Road	Crossbucks	1 min. 0 sec.	14
Churchland Blvd.	Crossbucks*	58 sec.	14
West Norfolk Road	Crossbucks	41 sec.	14
Lilac Road	Crossbucks	40 sec.	1
Cedar Lane	Crossbucks**	39 sec.	8

* Churchland Boulevard is hand flagged to stop traffic.

** Flashing lights and gates will be installed on Cedar Lane in conjunction with the Western Freeway construction.

Table 3

Current and Projected Daily Traffic Volumes

Location	Type of Facility	Existing 1987	Projected 2010
Taylor Road	Four lane thoroughfare	19,702	22,000
Peppercorn Drive	Two lane residential	1,041	1,500
Bruin Drive	Two lane residential	4,141	5,000
Pineridge Drive	Two lane residential	1,768	2,000
West High Street	Four lane divided thr'fare	32,550	40,000
Tyre Neck Road	Two lane thoroughfare	9,873	12,400
Churchland Blvd.	Two lane thoroughfare	11,366	15,000
West Norfolk Road	Two lane thoroughfare	15,050	17,800
Lilac Road	Two lane residential	867	1,000
Cedar Lane	Two lane thoroughfare*	11,926	21,200

* Cedar Lane will be upgraded to a four lane facility in conjunction with the Western Freeway construction.

GRADE CROSSING ACCIDENT PROBABILITIES

Accident probabilities were calculated for each of the grade crossings using the 1987 traffic counts and the 2010 predictions found in Table 3 above. The mathematical formula or model used to calculate these probabilities was the Department of Transportation (DOT) Hazardous Index Formula. This is an absolute model which is designed to evaluate specific crossings rather than a relative model used to compare the relative hazards of different types of crossings. Although the absolute model cannot predict the exact number of accidents at a crossing it can predict a mean number of expected accidents over an extended period of time. Using future traffic volume predictions, the DOT Hazardous Index Formula provides a better estimate of the probability of an accident occurring at a given crossing than by looking at the accident history of that crossing.

Historically since 1975 there have been a total of five accidents/incidents at the crossings under study in which a train and a motor vehicle were involved. Three of these incidents involved trains carrying hazardous materials. The first incident occurred on December 12, 1975, at the Dorton Street crossing. In this incident the driver of the automobile failed to stop for the crossing and was struck by the train causing five hundred dollars damage to the automobile and injury to the driver. The second occurred on November 21, 1978, at the Taylor Road crossing. The highway user passed another vehicle that had stopped for the

crossing and hit the train. The automobile received three hundred and fifty dollars of damage and the driver was injured in the incident. The third incident occurred on October 10, 1981 at the Taylor Road crossing. Again the driver of the automobile did not stop for the crossing and was struck by the train resulting in one thousand dollars of damage to the automobile. The driver was not injured. It should be noted here that the Taylor Road Crossing has been upgraded with lights and gates since the occurrence of these incidents. The fourth incident occurred on September 9, 1983, at the Lilac Road crossing when the train struck an automobile which was stalled on the crossing resulting in five hundred dollars damage to the automobile but no injuries. (See Exhibit 7) The latest incident occurred on November 26, 1988, at the West Norfolk Road crossing resulting in a very minor scratch on the bumper of the highway vehicle and no injuries. This incident was minor that an accident report was not filed by the Portsmouth police department.

Table 4 is a comparison of the probability of an accident occurring at each crossing between the 1987 traffic flow and the predicted traffic in year 2010 with no changes in the crossing guard systems. Table 5 makes the same comparison with the crossing guard systems upgraded with flashing lights and gates.

TABLE 4

ESTIMATED ACCIDENT RATE
EXISTING CONDITIONS
WITH
UNGUARDED CROSSINGS

STREET NAME	CROSSING ID NUMBER	TRAFFIC VOLUME 1987	EAR EXISTING CONDITION 1987 TRAFFIC	TRAFFIC VOLUME 2010	EAR EXISTING CONDITION 2010 TRAFFIC
Taylor Road	464-123 T	19,702	.0409	22,000	.0440
Bruin Drive	857-684 U	4,141	.0604	5,000	.0604
Peppercorn Drive		1,041	.0359	1,500	.0390
Pineridge Drive	464-118 W	1,768	.0426	2,000	.0426
West High Street	464-116 H	32,550	.1168	40,000	.1272
Tyre Neck Road	464-114 U	9,873	.0772	12,400	.0848
Churchland Blvd.	464-113 M	11,366	.0848	15,000	.0913
West Norfolk Road	464-102 A	15,050	.0999	17,800	.0999
Lilac Lane	464-110 S	867	.0333	1,000	.0333
Cedar Lane	464-108 R	11,926	.0848	21,200	.0913

TABLE 5

ESTIMATED ACCIDENT RATE
UPGRADED CROSSINGS
WITH
FLASHING LIGHTS AND GATES

STREET NAME	CROSSING ID NUMBER	TRAFFIC VOLUME 1987	EAR WITH LIGHTS & GATES 1987 TRAFFIC	TRAFFIC VOLUME 2010	EAR WITH LIGHTS & GATES 2010 TRAFFIC
Taylor Road	464-123 T	19,702	.0409	22,000	.0440
Bruin Drive	857-684 U	4,141	.0238	5,000	.0238
Peppercorn Drive		1,041	.0159	1,500	.0165
Pineridge Drive	464-118 W	1,768	.0181	2,000	.0181
West High Street	464-116 H	32,550	.0427	40,000	.0454
Tyre Neck Road	464-114 U	9,873	.0280	12,400	.0331
Churchland Blvd.	464-113 M	11,366	.0313	15,000	.0331
West Norfolk Road	464-102 A	15,050	.0356	17,800	.0356
Lilac Lane	464-110 S	867	.0149	1,000	.0149
Cedar Lane	464-108 R	11,926	.0313	21,200	.0383

Some concern has been expressed that the traffic counts taken in the summer of 1987 do not take into account increased traffic during the school year. School traffic would only be affect by the afternoon train between two and four pm. However, to evaluate this concern the expected accident rates have been recalculated using a twenty percent increase in the traffic count for the crossings as they exist today, Table 6, and for the crossings if they were all guarded by flashing lights and gates, Table 7. Even with this increase in calculated traffic the resultant increase in the expected accident rate for each of the crossings is negligible.

TABLE 6

ESTIMATED ACCIDENT RATE
EXISTING CONDITIONS
WITH UNGUARDED CROSSINGS WITH
TRAFFIC COUNT INCREASED TWENTY PERCENT

STREET NAME	CROSSING ID NUMBER	1987 TRAFFIC INCREASED	EAR EXISTING CONDITION 1987 TRAFFIC	2010 TRAFFIC INCREASED	EAR EXISTING CONDITION 2010 TRAFFIC
Taylor Road	464-123 T	23,642	.0440	26,400	.0467
Bruin Drive	857-684 U	4,969	.0604	6,000	.0682
Peppercorn Drive		1,249	.0359	1,800	.0390
Pineridge Drive	464-118 W	2,121	.0485	2,400	.0485
West High Street	464-116 H	39,060	.1272	48,000	.1472
Tyre Neck Road	464-114 U	11,847	.0848	14,880	.0913
Churchland Blvd.	464-113 M	13,639	.0913	18,000	.0998
West Norfolk Road	464-102 A	18,060	.0999	21,360	.1096
Lilac Lane	464-110 S	1,040	.0390	1,200	.0390
Cedar Lane	464-108 R	14,311	.0913	25,440	.1180

TABLE 7

ESTIMATED ACCIDENT RATE
WITH CROSSINGS UPGRADED WITH GATES AND LIGHTS
WITH TRAFFIC COUNT INCREASED TWENTY PERCENT

STREET NAME	CROSSING ID NUMBER	1987 TRAFFIC INCREASED	EAR WITH LIGHTS & GATES 1987 TRAFFIC	2010 TRAFFIC INCREASED	EAR WITH LIGHTS & GATES 2010 TRAFFIC
Taylor Road	464-123 T	23,642	.0440	26,400	.0467
Bruin Drive	857-684 U	4,969	.0238	6,000	.0263
Peppercorn Drive		1,249	.0159	1,800	.0165
Pineridge Drive	464-118 W	2,121	.0200	2,400	.0200
West High Street	464-116 H	39,060	.0454	48,000	.0626
Tyre Neck Road	464-114 U	11,847	.0313	14,880	.0397
Churchland Blvd.	464-113 M	13,639	.0331	18,000	.0356
West Norfolk Road	464-102 A	18,060	.0356	21,360	.0430
Lilac Lane	464-110 S	1,040	.0159	1,200	.0159
Cedar Lane	464-108 R	14,311	.0331	25,440	.0406

In 1987 there were 5,627[2] accidents nationwide at public rail crossings involving highway vehicles, none of which resulted in a train derailment. Of the total number of rail crossing accidents nationwide only a 109[3] occurred in the State of Virginia. With 185,621 crossings nationwide and 2,516 in Virginia the average accident rate per crossing is .03 accidents per year nationally and .04 accidents per year for the State of Virginia[4]. These figures include all accidents/incidents regardless of the amount of damage involved. The ten crossings under study have had a total of five accident/incidents since 1975 resulting in two injuries and a total of $2,350 damage to the motor vehicles (Exhibit 7). In 1987 there were fourteen accidents nationwide between trains carrying hazardous materials and highway users at railroad crossings. Only three of these fourteen accidents resulted in the release of hazardous materials and all together required the evacuation of a total of 500 people[5]. In the State of Virginia there were nine accidents involving trains carrying hazardous materials in 1987 none of which resulted in a release of hazardous materials or required evacuation[6].

The accident probabilities in Tables 4, 5, 6 & 7 are calculated on the assumption that the same number of trains pass through the crossings each day. At the time of this study only two trains a day, three days a week, are scheduled to run on the section of railroad under study. The DOT Formula does not facilitate calculations for this three day-per-week operation. Also, due to the cyclical demand for products with resultant variations in production schedules at the Virginia Chemical plant, all trains do not necessarily carry extremely hazardous materials. Table 8 lists the shipments of extremely hazardous materials via rail tank car over a two week period in May 1988. There were twelve trains, six in and six out, of which five did not contain a shipment of extremely hazardous materials. As

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[2] Rail-Highway Crossing Accident/Incident and Inventory Bulletin, No. 10, Calendar Year 1987. U. S. Department of Transportation, Federal Railroad Administration, Office of Safety. August 1988. pp. 2.

[3] Ibid., 6.

[4] Ibid., 53.

[5] Accident/Incident Bulletin, No. 156, Calendar Year 1987. U. S. Department of Transportation, Federal Railroad Administration, Office of Safety. July 1988. pp. 41.

[6] Ibid., 42.

a result of the three day per week train schedule and the fact that all trains do not carry extremely hazardous materials the probability of an accident occurring at any of the rail crossings involving hazardous materials will be less than the estimated accident rates shown at Tables 4, 5 6, & 7.

Table 8

Virginia Chemical
Rail-car Shipments and Receipts
Extremely Hazardous Materials Only

May 1-14, 1988

Days of the Week	S	M	T	W	T	F	S	S	M	T	W	T	F	S
Day of the Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Scheduled Train Days		X		X		X			X		X		X	
<u>Outgoing</u>														
Sulfur Dioxide		E		FE					E		2FE		E	
Cyclohexylamine													F	
<u>Incoming</u>														
Sulfur Dioxide		3F							3F					
Cyclohexylamine		2F		F		F			F					

F=Full E=Empty 3FE= Three full and one Empty, etc.

Note: Train days remain the same. The hazardous substances and quantities vary in response to customer demand.

Table 9 lists the shipments of the same extremely hazardous materials by truck during the same two week period. When carrying hazardous materials the primary truck route into and out of the city is US-17. The Western Freeway will become the primary route upon its completion. This would reduce the risk of an accident involving hazardous materials at over 25 street intersections within the city; however, there would then be the risk of hazardous materials being involved in a high speed accident on the freeway. High speed accidents increase the likelihood of a hazardous materials release.

Table 9

Virginia Chemical
Truck Shipments
Extremely Hazardous Materials Only

May 1-14, 1988

Day or the Week	S	M	T	W	T	F	S	S	M	T	W	T	F	S
Day of the Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Outgoing														
Sulfur Dioxide	1T	2T		5T	2T			3T	2T		2T	5T		
Cyclohexylamine				4D	1D				1D		1D			
				1T										
Allylamine	1D													

Note: (n)T = # of Tanker Trucks, (n)D = # of Trucks with Shipments in 55 gal. Drums

HAZARD IDENTIFICATION

Hazard identification is limited, primarily, to identifying those extremely hazardous substances, as defined by Section 302 of the Superfund Amendments and Reauthorization Act of 1986 (SARA), which could reasonably be expected to be shipped by tractor trailer truck or by rail car to or from the Virginia Chemical facility. Of the seven chemicals identified Allylamine, Sulfur Dioxide, and Ammonia are the most hazardous (Table 10). While Ammonia is shipped exclusively by truck the other chemicals may be shipped by truck or rail car. The frequency of shipments, by chemical, the quantities of the chemical in the shipment and the mode of transportation varies with customer demand for the various products.

In addition to the extremely hazardous chemicals identified above, one other hazard was identified along the railroad. Colonial Pipe Line has a 12 inch petroleum pipeline that shares the railroad right-of-way from Gum Road to Cedar Lane. This pipeline transports marine diesel and jet fuel to the U. S. Naval Supply Center at Craney Island. Although it presents a very low risk and is not as hazardous as the materials being transported over the railroad it is a hazard that would remain even if the railroad were to be relocated.

TABLE 10

VIRGINIA CHEMICAL
CHEMICALS SHIPPED
VIA
NORFOLK SOUTHERN RAILWAY

CHEMICAL NAME	CAS #	QUANITY LBS	STATE	LOC (G/M3)	LIQUID FACTOR AMBIENT (LFA)	RATE OF RELEASE LBS/MIN	EVAC DIST MI D STABILITY URBAN
ALLYLAMINE	107-11-9	186,000	LIQUID	.0032	.02	5,208	10
SULFURIC ACID	7664-93-9	186,000	LIQUID	.0080	.00000000005	.00001	
PROPIONITRILE	107-12-0	186,000	LIQUID	.0037	.0010	260	1.0
CYCLOHEXYLAMINE	108-91-8	186,000	LIQUID	.1600	.0005	130	0.1
SULFER DIOXIDE	7446-09-5	186,000	GAS	.0260	N/A	18,600	10
AMMONIA	7664-41-7	186,000	GAS	.0350	N/A	18,600	10
HYDROGEN PEROXIDE	7722-84-1	186,000	LIQUID	.0100	.0001	26	0.1

CHEMICAL NAME	CAS #	QUANITY LBS	STATE	LOC (G/M3)	LIQUID FACTOR AMBIENT (LFA)	RATE OF RELEASE LBS/MIN	EVAC DIST MI F STABILITY URBAN
ALLYLAMINE	107-11-9	186,000	LIQUID	.0032	.02	5,208	10
SULFURIC ACID	7664-93-9	186,000	LIQUID	.0080	.00000000005	.00001	
PROPIONITRILE	107-12-0	186,000	LIQUID	.0037	.0010	260	3.5
CYCLOHEXYLAMINE	108-91-8	186,000	LIQUID	.1600	.0005	130	0.3
SULFER DIOXIDE	7446-09-5	186,000	GAS	.0260	N/A	18,600	10
AMMONIA	7664-41-7	186,000	GAS	.0350	N/A	18,600	10
HYDROGEN PEROXIDE	7722-84-1	186,000	LIQUID	.0100	.0001	26	0.5

CAS # (Chemical Abstracts Service Number): A number assigned to a chemical compound and all its synonyms for identification purposes.

LOC (Level Of Concern): The concentration of a chemical in grams per cubic meter above which there may be serious irreversible health effects or death as a result of a single exposure for a relatively short period of time.

LFA (Liquid Factor Ambient): A factor used to estimate the rate of evaporation of a liquid at ambient tempertures to determine release quanities.

TABLE 11

VIRGINIA CHEMICAL
CHEMICALS SHIPPED
VIA
TRACTOR-TRAILER TRUCK

CHEMICAL NAME	CAS #	QUANITY LBS	STATE	LOC (G/M3)	LIQUID FACTOR AMBIENT (LFA)	RATE OF RELEASE LBS/MIN	EVAC DIST MI D STABILITY URBAN
ALLYLAMINE	107-11-9	40,000	LIQUID	.0032	.02	1120	2.8
SULFURIC ACID	7664-93-9	40,000	LIQUID	.0080	.00000000005	.00000	
PROPIONITRILE	107-12-0	40,000	LIQUID	.0037	.0010	56	0.4
CYCLOHEXYLAMINE	108-91-8	40,000	LIQUID	.1600	.0005	28	
SULFER DIOXIDE	7446-09-5	40,000	GAS	.0260	N/A	4,000	1.9
AMMONIA	7664-41-7	40,000	GAS	.0350	N/A	4,000	1.3
HYDROGEN PEROXIDE	7722-84-1	40,000	LIQUID	.0100	.0001	6	0.1

CHEMICAL NAME	CAS #	QUANITY LBS	STATE	LOC (G/M3)	LIQUID FACTOR AMBIENT (LFA)	RATE OF RELEASE LBS/MIN	EVAC DIST MI F STABILITY URBAN
ALLYLAMINE	107-11-9	40,000	LIQUID	.0032	.02	1120	10
SULFURIC ACID	7664-93-9	40,000	LIQUID	.0080	.00000000005	.00000	
PROPIONITRILE	107-12-0	40,000	LIQUID	.0037	.0010	56	1.4
CYCLOHEXYLAMINE	108-91-8	40,000	LIQUID	.1600	.0005	28	0.2
SULFER DIOXIDE	7446-09-5	40,000	GAS	.0260	N/A	4,000	7.6
AMMONIA	7664-41-7	40,000	GAS	.0350	N/A	4,000	4.9
HYDROGEN PEROXIDE	7722-84-1	40,000	LIQUID	.0100	.0001	6	0.3

CAS # (Chemical Abstracts Service Number): A number assigned to a chemical compound and all its synonyms for identification purposes.

LOC (Level Of Concern): The concentration of a chemical in grams per cubic meter at which health problems could develop.

LFA (Liquid Factor Ambient): A factor used to estimate the rate of evaporation of a liquid at ambient tempertures to determine release quanities.

POPULATION AT RISK

Due to the extremely hazardous nature of the materials involved in this study the area potentially at risk consists of a twenty mile wide corridor along the transportation routes with a ten mile arc to the east of the termination point of the railroad at the Virginia Chemical facility[7]. This area encompasses the entire population of the City of Portsmouth, most of the City of Norfolk, the most urban and heavily populated (northern third) area of the City of Chesapeake, Fort Monroe, The City of Hampton out to the Memorial Stadium, the City of Newport News out to Briarfield Road and northwest through the City of Suffolk into the County of Isle of Wight to the Carrollton Township. Based on the 1986 projected population figures[8], the population potentially at risk in the defined risk area is estimated to be in excess of 475,000 people. However, dependent upon the location of the incident, the amount of chemical released, the duration of the release, the wind direction, and other variables, only a portion of this population would be at risk in any specific incident.

This study has focused on that risk area along both transportation routes which would be considered for initial evacuation (See Fig. 2) in the event an incident occurred involving one or more of the extremely hazardous materials identified in Table 10. Three windshield surveys and a helicopter fly over were made of the area to determine the geographical relationship of densely populated areas and special facilities to the existing and proposed railroad tracks.

It was readily apparent from the fly over that the number of individuals affected would vary greatly according to the location of the incident and the wind direction. The amount of material released and the stability factor, which is based on a number of atmospheric factors, will determine the degree of exposure for the residents. The winds, based on

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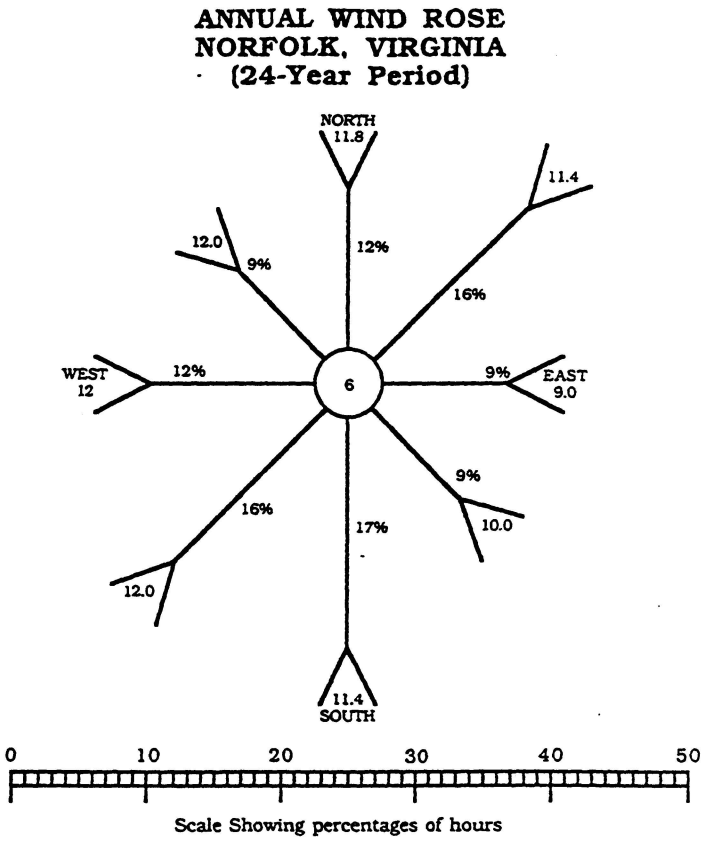
[7] Technical Guidance for Hazards Analysis, (U.S. Environmental Protection Agency, FEMA, U.S. Department of Transportation, December 1987), pp. C-13, C-16; 3-13, 14, 17, 18.

[8] Julia H. Martin, Estimates of the Population of Virginia Counties and Cities 1985 and 1986, (Center for Public Service University of Virginia, January 1988).

Hampton Roads Economic Forecast, (Southeast Virginia Planning District, June 1987), pp. 92-101.

the nearest wind rose station of record at Norfolk, are from the south, southwest and west 45% of the time, from the north, northeast, and east 37% of the time and from the northwest or southeast 9% each. The wind velocities are in the "D" Stability range, 11-12 miles per hour, except from the east and southeast where they average 9-10 miles per hour (Figure 1). Although these wind velocities help in dispersing chemical releases they will be of little benefit in reducing the risk area due to the low Level of Concern (LOC) of the chemicals involved. LOC's are the concentrations of a chemical in grams per cubic meter above which there may be serious irreversible health effects or death as a result of a single exposure for a relatively short period of time. The more toxic the chemical, the lower the Level of Concern.

Figure 1



The wind rose shows the wind that prevailed at the U.S. Weather Bureau, City Office, Norfolk, Virginia, over a 24-year period. The arrows fly with the wind, and their length, measured on the above scale, from the outside of the circle, gives the average percentage of hours that the wind prevailed from the various directions. The figures at the tails of the arrows show the average velocity in miles per hour. The figure in the center of the circle gives the percentage of calms in hundreths of a percent.

As defined by DOT P 5800.4[9], a guidebook for initial actions to be taken by first responding emergency personnel, the initial evacuation zone for the existing railroad includes the Western Branch Schools, the Churchland Primary, Elementary, Junior High and High Schools and an estimated population of 34,000 citizens potentially at risk. By moving the railroad to the proposed location an estimated 2,500 citizens would be removed from the risk area in the Western Branch area of the City of Chesapeake; however, an estimated 1,200 citizens in the northern area of the City of Suffolk would now be exposed to the risk (See Fig. 2). It should be noted here that the Director of Planning and Zoning for the City of Suffolk projects a 7500 increase in housing units in the Harbor View North area over the next twenty-five to thirty years. The Director of Planning and Zoning also estimates that the population will have increased by 8,000 to 10,000 in the area by the year 2000.

Of additional concern is the Maryview Hospital Nursing Home, a 120 bed facility, being constructed on property adjoining the proposed railroad right-of-way between the curves where the railroad would leave the I-664 median and where it would join the Western Freeway median. Maryview Hospital is also considering the filing of an application for a Certificate of Public Need to the Virginia Department of Health for a hospital near the intersection of Townpoint Road and College Drive. This is approximately one mile north of where the railroad would join the Western Freeway.

The rail curve that would enter the I-664 median at Boone is an 8 degree curve, where it would leave the I-664 median it is a 7 degree curve and there is an 8 degree curve where it would enter the Western Freeway median. The degree of track curvature is significant in that a study by A. M. Zarembski and G. M. Magee of railroad track buckling incidents on railroads using Continuous Welded Rail (CWR), found that 80% of the buckles occurred on curves even though 66% of the railroad was on tangent track. Of the 479 cases of rail buckling investigated in the study, 55% were within 1000 feet or less of an adjacent structure such as a railroad crossing or bridge head. Approximately 12% of the buckles resulted in actual derailments. The study noted that the sharper curves, those between 5 and 10 degrees, accounted for 60% of the buckles, although they represented

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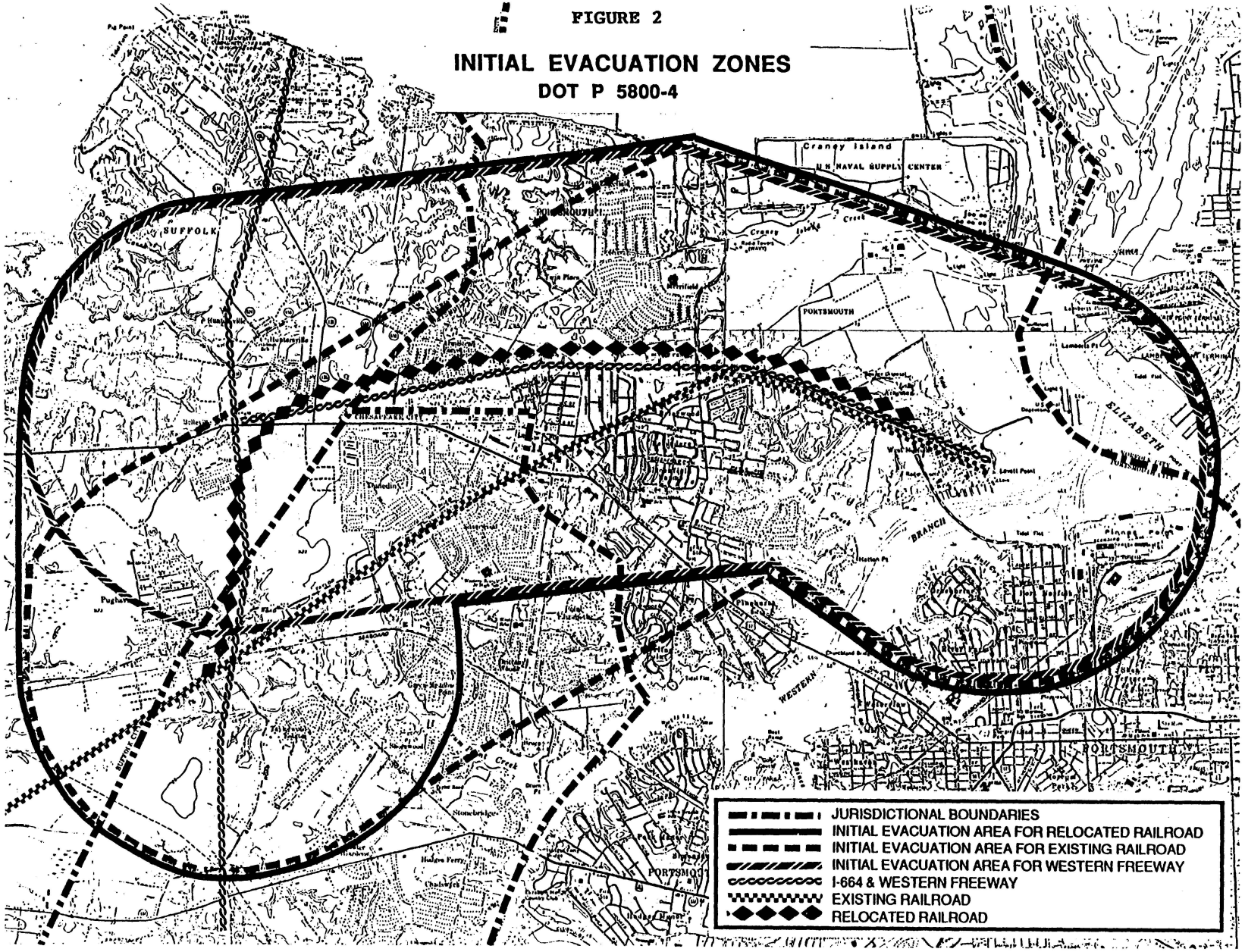
[9] Emergency Response Guidebook DOT P 5800.4, (U. S. Department of Transportation, September 1, 1987).

FIGURE 2

INITIAL EVACUATION ZONES

DOT P 5800-4



only 7% of the railroad trackage and appeared to be twenty times more likely to buckle than a tangent track[10].

The Zarembski-Magee study also analyzed a selected group of 65 derailments throughout North America which were caused by track buckling.[11] Of these derailments 57% occurred on curved track which is significantly less than one-half of the total track in North America. Although CWR was a significant factor, 31% of these derailments due to buckling occurred on jointed track. This was unexpected and was partially explained by the age and condition of the track and the fact that there is more jointed track in use than CWR track. It is significant to note that in over 90% of these derailments the first car to derail was ten or more cars back from the front of the train with many of the derailments occurring in the last half of the train[12]. This would suggest that so long as the length of the train serving the Virginia Chemical facility remained at ten cars or under the problem of derailments due to track buckling would be greatly reduced.

As a result of this study on the buckling problem on curves associated with CWR it has also been suggested that the use of jointed track, particularity on the sharper curves, would be more practical and would provide a safer track condition; however, CWR provides a stronger rail system. The joints in the jointed track are weak points where flexing of the rail can result in broken bolts and side plates resulting in rail misalignment, gage widening, and other changes in rail geometry. When questioned on the merits of CWR versus jointed rail for use on curves, Mr. Ed English, Chief Maintenance Programs Division, Federal Railroad Administration in Washington, DC, strongly supported the use of CWR. The division engineer for Norfolk and Southern Railroad, Mr. E. G. Cody, also stated that CWR would be used if the railroad is relocated.

The existing track is constructed using CWR track. The rail buckling study found that 55% of the buckles occurred within 1000 feet of a rail structure such as a railroad crossing, a bridge head, or rail switch.[13] From this data, one would

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[10] A. M. Zarembski and G. M. Magee, An Investigation of Railroad Maintenance Practices to Prevent Track Buckling, (AREA Bulletin 684 September & October 1981), pp. 12-13.

[11] Ibid., 17.

[12] Ibid., 17.

[13] Ibid., 13.

expect a buckling problem on the existing track with the ten rail crossings being studied. However, the study on track buckling also noted that 56% of the buckles occurred within two years of the track being laid[14] and the study of derailments caused by buckling found that "... 38% of the incidents occurred within four years of installation, with the remainder spread out over a period of 75 years"[15]. The absence of buckling or derailments on the track under study for relocation may be accounted for in part by the proximity of the crossings to each other which would restrict the accumulation of longitudinal forces and rail creep associated with longer stretches of unrestricted track and the age of the track.

The results of the Zarembiski-Magee study would indicate that the risk of a train derailment would be increased within the first mile and a half of the proposed relocation route within a two to four year period after construction.

Another concern is the problem of highway vehicles breaching barriers which separate highway traffic from rapid transit, rail freight, and rail passenger traffic right-of-way (ROW) along common transportation corridors. This is a growing problem which should be of concern not only to mass transit systems in common corridors but to common corridors used for transporting hazardous materials. While most of the studies appear to deal with highway barriers separating highway traffic the same problems are encountered with separating highway traffic from rail traffic in the medians or alongside the highway. As a result of barrier penetrations, mass transit authorities across the country are studying the problem and in some cases are replacing their barrier system.

"The Chicago Transit Authority (CTA) has reported breaches (3 to 5 per year) into their ROW by highway vehicles."[16] Only one penetration of the Bay Area Rapid Transit District (BART) system prompted the authorities to initiate a program to replace their metal/wooden guardrails with 32-inch concrete median barriers. A study of guardrail types in Michigan (Lampala and Yang, 1974) found a direct relationship between barrier penetrations and increased speeds up to 60 mph. The data suggest there is a real risk

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[14] Ibid., 13.

[15] Ibid., 17.

[16] De Leuw, Cather. "Orange Line Highway/Rapid Rail Common Corridor Safety Analysis." Report to Washington Metropolitan Area Transit Authority. De Leuw, Cather & Company. May, 1984, p. 9.

of barrier penetration at moderate speeds of 40-60 mph[17] which would certainly be expected on the Western Freeway. Researchers at the Texas Transportation Institute (TTI) recommend a barrier height of 54 inches to contain tractor trailers. Although this does not meet the lowest center of gravity of a tractor trailer it does match the height of most trailer beds providing a solid point of contact to redirect the truck and prevent roll over. TTI, however, recommends a 90 inch barrier for tank trailers because their contact point is 90 inches above the roadway.[18] These barriers would greatly hinder access to any train incident in the median and reduce the effective time response personnel would have to secure the situation; but, barriers are essential for traffic separation.

RESPONSE CAPABILITIES OF LOCAL GOVERNMENTS

The emergency response organizations for the Cities of Portsmouth and Chesapeake are better manned and better trained than the City of Suffolk in terms of the number of response personnel who have received higher levels of hazardous materials response training (See Exhibits 3, 4,& 5). The City of Portsmouth has received a $150,000 grant to develop a Regional Level Three hazardous materials response capability in the Tidewater Area south of the James River. The Cities of Chesapeake and Virginia Beach have entered into agreements to support this Regional Response Team with trained personnel. A similar grant will be forth coming in FY '90. The three municipalities affected by the railroad under study are in the process of developing mutual aid agreements with each other and, in addition, have access to assistance from the Hazardous Materials Response Teams from the City of Newport News, the Norfolk Naval Shipyard, and the Virginia Chemical Company. Technical guidance and assistance and some specialized equipment are also available through the Virginia Department of Emergency Services' Regional Hazardous Materials Office in the Tidewater area. Their response capability is limited by the availability of personnel.

Response times to the rail crossings on the existing railroad and to specified sections of I-664 and the Western Freeway are excellent for the fire and rescue services of the Cities of Portsmouth and Chesapeake within their jurisdictions. Their response time for providing mutual aid in each others area of responsibility is very good. However, access to a train derailment or other accident on

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17 Ibid., 5.

18 Ibid., 14-15.

the proposed median track may be hindered by the presence of the fence and the 6-8 foot concrete walls on either side of the railroad. As the chemicals concerned with in this study are heavier than air these concrete barriers and retention walls would act as a dam delaying the dispersal of the chemical fumes over a longer period of time and over a wider front. Emergency response personnel would require full encapsulated suits to approach the incident site. Their effective time on site would be greatly reduced by the time required to climb over the walls and down into the rail-bed and back out again before their self contained air supply was depleted. In addition, the absence of fire hydrants along the freeway may restrict the ability of the response personnel to apply water or foam to knock down chemical vapors or fumes or to combat a fire which may result from a derailment. However, if the incident involved the catastrophic failure of a tank car of a hazardous gas the availability of water would be of little consequence along either route.

Response time to, access to, and the availability of water at the site of an incident on either route could be critical in cases involving fire or leaks of hazardous materials which could be brought under control. In a catastrophic failure response time to identify the hazardous material threat could be critical for the issuance of warnings, evacuation instructions, and closing off public access to the area.

OTHER CONSIDERATIONS

A train derailment at the Cedar Lane crossing which prohibited through traffic would adversely affect response time for other emergencies which might occur in the Merrifields and Edgefields sections north of the railroad. A similar accident at the Lilac Road crossing would prevent any access or egress for the residents of Lilac Road, Gentle Road, and Larkspur Road north of the railroad crossing. Should the incident require evacuation the only means available to these residents would be on foot. A similar situation exists for two homes on the south end of Popular Hill Road which becomes a private gravel road just prior to crossing the railroad. Other study areas have alternate evacuation routes available.

CONCLUSIONS

The area of vulnerability for the extremely hazardous materials transported over the Norfolk and Southern Railroad through the Cities of Portsmouth and Chesapeake has a population of over 475,000 people. Should an accident

occur releasing one of these chemicals, the number of individuals who would be affected would vary greatly dependent upon the location of the incident, the amount of material released, the wind direction and speed, and other atmospheric conditions. Relocating the railroad to the median of I-664 and the Western Freeway would have a minimal, short range effect in reducing the number of persons at risk in initial evacuation zones for a chemical release as a result of a rail accident. This reduction will quickly disappear as development progresses in the City of Suffolk north of US 17 and west of College Drive. In addition, this area of development will be at risk from the same chemicals, which are frequently shipped by tractor trailer tankers. The only difference being that relocating the railroad compounds the risk for the Western Freeway corridor.

The ten grade crossings do have an existing probability for an accident that would cause the release of hazardous materials. However, due to the inability of the DOT Hazardous Index Formula to accommodate a three day train week and to consider a train with no hazardous materials aboard, the calculated probabilities (provided by the DOT formula) for an accident occurring at any one crossing is somewhat higher than the probability for an accident involving hazardous materials. Taking this into consideration and the operating procedures of the train, 8-10 mile per hour speeds and hand flagging at the Churchland Boulevard crossing, there is a low probability of a crossing accident which would result in the release of hazardous materials.

Relocating the railroad would remove the possibility of an accident at the grade crossings; however, the location of three rather sharp curves within one and one half miles of each other on the proposed relocation route increases the probability of a train derailment, particularly during the first two to four years after construction. If train operating speeds are increased above the current five to ten miles per hour there would be an increase in the risk of a loaded tank car being ruptured should a derailment occur. High-speed expressway traffic also presents the risk of highway vehicles encroaching upon the railway right-of-way damaging the track or colliding with the train at a high rate of speed.

It is recognized that the chemicals of concern in this study are extremely hazardous and present a level of risk to a large segment of the population in the Tidewater area and that the railroad crossings present a potential for accidents. Relocating the railroad to the median of I-664 and the Western Freeway would remove the risk of a rail

accident at the railroad crossings: however, it would not remove the risk of a hazardous materials accident, nor would it greatly reduce the number of citizens at risk should one occur. It could increase the probability of a train derailment at a higher rate of speed particularly during the first two to four years after construction. As the level of risk in one area is reduced by the relocation of the railroad the level of risk is increased in another area with the result being that the degree of risk is about balanced between the two locations. For these reasons, in the opinion of this investigator, the hazard reduction realized by the slightly reduced risk of a hazardous materials incident and the elimination of the risk of a grade crossing accident by relocating the railroad are not of sufficient magnitude to justify its relocation until such time as conditions change the risk profile.

RECOMMENDATIONS

Reevaluate the relocation of the railroad to the median of the Western Freeway and I-664 when increased rail transportation required by industrial development and/or other factors clearly changes the current balance of risk in favor of relocation.

Provide an alternate access route for residents of the Lilac Road area north of the railroad by a connecting street between the north end of Lilac Road and Moore Road or by extending Lilac east to connect with Cedar Lane.

Further reduce the expected accident rate of the existing crossings by installing lights and gates crossing guards at each crossing.

Allocate sufficient space in the median of the Western Freeway and I-664 for construction of the railroad at a future date should it become a necessity.

COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1401 EAST BROAD STREET
RICHMOND, 23219

RAY D. PETHTEL
COMMISSIONER

ROBERT G. CORDER
RAIL & PUBLIC TRANSPORTATION ADMINISTRATOI

June 13, 1988

Study Work Plan
House Joint Resolution 162
Railroad Relocation Feasibility Study
Cities of Portsmouth and Chesapeake

Mr. Linwood O. Grant
Special Projects Planner
Department of Emergency Services
310 Turner Road
Richmond, Virginia 23225-6491

Dear Mr. Grant:

Reference is made to your memorandum of June 1, 1988 regarding the above noted subject, more specifically to the data items required by this office which are under Section 3 of the proposed study.

Attached is a copy of the grade crossing list which provides the probability of an incident at each of the grade crossings for the 1987 traffic volumes and the 2010 projected traffic volumes for the eleven crossings in the study area.

Providing the probability of a train derailment along these existing tracks and along the proposed relocation site is subjective; however, it is our feeling that the train speeds on the existing track will remain somewhat stable at approximately 10 MPH. Further, that the track structure (ties, ballast, rail) will continue to be properly maintained. Consequnetly, this situation should minimize any derailments. Also, because of the low speed, any derailment would not necessarily result in an overturned car.

Relocating the railroad and eliminating the grade crossing may result in an increase in the speed of the trains. This, coupled with the increased curvature of the track and the introduction of switch points for the passing siding, could increase the potential for a derailment. Additionally, because of the speed, a derailment on the relocated track could have more disastrous results.

I am sorry we cannot be more definitive regarding derailments; however, I am sure you understand how subjective this issue can be.

It is our hope that the above addresses our input into the study. If you have any additional questions, please advise.

Sincerely,

Robert G. Corder, Administrator
Rail and Public Transportation Division

JTM:swp
Cc: Mr. R. C. Lockwood
Mr. E. C. Cochran, Jr.

EXHIBIT 1

EXHIBIT 1 (cont)

	Route	DOT/AAR#	1987 Traffic	EAR 1987 Traffic Exist Cond	EAR 1987 Traffic (L&G)	1987 Traffic Increased 20%	1987 Traffic Increased Exist Cond	1987 Traffic Increased EAR L&G
(L&G)	Taylor Road	464-123T	19,702	0.0409	0.0409	23,642	0.0440	0.0440
	Peppercorn Dr.		1,241	0.0359	0.0159	1249	0.0359	0.0159
	Brain Dr.	867-684U	4,141	0.0604	0.0238	4969	0.0604	0.0238
	Pineridge Dr.	464-118W	1,768	0.0436	0.0200	2121	0.0485	0.0200
	West High St.	464-116H	32,550	0.1168	0.0481	34060	0.1212	0.0454
(L)	Tyne Neck Rd	464-114U	9,873	0.0772	0.0200	11,847	0.0848	0.0313
	Churchland Blvd.	464-113M	11,366	0.0848	0.0313	13,639	0.0913	0.0331
	West Norfolk Rd.	464-112A	15,050	0.0999	0.0356	18,060	0.0999	0.0356
	Elloc Dr.	464-111S	867	0.0333	0.0149	1040	0.0390	0.0159
	Cedar Lane	464-110E	11,726	0.0848	0.0313	14,311	0.0913	0.0331

EXHIBIT 1 (cont.)

2016 Traffic	EAK 2016 Traffic Existing	EAK 2016 Traffic EAK	2016 Traffic increased 20%	2016 Traffic increased EAK Existing	2016 Traffic increased EAK EAK
22,000	0.0410	0.0440	26,400	0.0467	0.0467
1,500	0.0310	0.0165	1,800	0.0390	0.0165
5,500	0.0084	0.0238	6,600	0.0682	0.263
2,000	0.0426	0.0181	2,400	0.0455	0.0200
40,000	0.1212	0.0454	45,000	0.1412	0.0626
12,400	0.0848	0.0331	14,880	0.0913	0.0317
15,000	0.0913	0.0331	18,000	0.0915	0.0356
17,500	0.0900	0.0356	21,360	0.1076	0.0430
1,000	0.0333	0.0149	1,200	0.0390	0.0159
21,200	0.1076	0.0383	25,440	0.1180	0.0406

Truck Shipments May 1-14, 1988

Date		Product	Tanker or drums	In or Out
May	1	2EHA	T	Out
	1	MALA	DRUMS	Out
	1	MBS	T	Out
	1	MBS SLN	T	Out
	1	SO2	T	Out
	2	70% MIPA	DRUMS	Out
	2	DCHA	DRUMS	Out
	2	DEA	DRUMS	Out
	2	DEET	DRUMS	Out
	2	DEET	DRUMS	Out
	2	MBS	T	Out
	2	MBS SLN	T	Out
	2	SO2	T	Out
	2	SO2	T	Out
	3	MBA	DRUMS	Out
	3	MBS	T	Out
	3	MBS SLN	T	Out
	3	MOA	DRUMS	Out
	3	TALA	DRUMS	Out
	4	MBS SLN	T	Out
	4	MCHA	T	Out
	4	MCHA	DRUMS	Out
	4	MCHA	DRUMS	Out
	4	MCHA	DRUMS	Out
	4	MCHA	DRUMS	Out
	4	SO2	T	Out
	4	SO2	T	Out
	4	SO2	T	Out
	4	SO2	T	Out
	4	SO2	T	Out
	5	70% MIPA	DRUMS	Out
	5	932	T	Out
	5	MCHA	DRUMS	Out
	5	MIPA	DRUMS	Out
	5	SO2	T	Out
	5	SO2	T	Out
	6	70% MIPA	DRUMS	Out
	6	MBS SLN	T	Out
	6	TEA	DRUMS	Out
	8	SO2	T	Out
	8	SO2	T	Out
	8	SO2	T	Out
	9	70% MIPA	DRUMS	Out
	9	932	T	Out

EXHIBIT 2 (cont)

Truck Shipments May 1-14, 1988

Date	Product	Tanker or drums	In or Out
9	DCHA	DRUMS	Out
9	DIAMINE	T	Out
9	MBA	DRUMS	Out
9	MCHA	DRUMS	Out
9	SO2	T	Out
9	SO2	T	Out
9	TEA	DRUMS	Out
10	MBA	DRUMS	Out
10	MBS	T	Out
10	MBS SLN	T	Out
10	MBS/SS	T	Out
10	MIPA	DRUMS	Out
10	MIPA	DRUMS	Out
11	70% MEA	DRUMS	Out
11	DIPA	DRUMS	Out
11	DIPA	T	Out
11	MBA	T	Out
11	MBA	DRUMS	Out
11	MBS	T	Out
11	MCHA	DRUMS	Out
11	MEA	T	Out
11	SO2	T	Out
11	SO2	T	Out
12	932	T	Out
12	DCHA	DRUMS	Out
12	DEET	DRUMS	Out
12	DIPA	DRUMS	Out
12	MBS	T	Out
12	SO2	T	Out
12	SO2	T	Out
12	SO2	T	Out
12	SO2	T	Out
12	SO2	T	Out
12	TALA	DRUMS	Out
13	70% MEA	T	Out
13	MBS SLN	T	Out
13	MEA	T	Out

Product Codes

2EHA	2-Ethylhexylamine
MALA	Allylamine
MBS	Sodium Metabisulfite
MBS SLN	Sodium Metabifulfite Solution
SO2	Sulfur Dioxide

EXHIBIT 2 (cont)

Legend

Railcar shipments and receipts:

Train days are the days the train runs down our track. On the train day, the train brings in a string of cars and picks up a string of cars. In May, the first train day was May 2, 1988.

The train, May 2, brought in:

Three full Sulfur Dioxide Railcars
Two full Cyclohexylamine Railcars

When it left, it took out:

An empty Acrylic Acid Railcar
An empty Soda Ash Railcar
An empty Sodium Hydroxide Solution Railcar
An empty Sulfur Dioxide Railcar

I have no record of any cars the train brought to the plant that it left on the track and then took back to Suffolk.

Truck Shipments:

Trucks can take materials out of the plant in a number of different forms. Generally, the small quantities of materials go our in 55 gallon drums. Bulk shipments go out in tanker trailers.

On May 1, 1988 we shipped:

A truck of 2-ethylhexylamine
Several drums of allylamine (under a truckload)
A truck of Sodium Metabisulfite Crystal
A truck of Sodium Metabisulfite Solution
A truck of Sulfur Dioxide Liquid

At the end of the truck shipment list is a glossary describing the product acronyms used in the list.

Railcar Shipments and Receipts

Outgoing Railcars F=Full E=Empty F2E= One full & 2 empties

Train Days			T			T			T			T		T	Total	Total
Date: (May, 1988)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Full	Empty
Acrylic Acid		E							E						0	2
Soda Ash		E		E					E				E		0	4
Sodium Hydroxide 50%		E				E			E				2E		0	5
Sulfur Dioxide		E		FE					E		F2E		E		2	6
Monoisopropylamine				E											0	1
Misc. Amines									E						0	1
Diamylamine									F						1	0
Cyclohexylamine													F		1	0
TOTAL EMPTY		4		3		1			5		2		4			19
TOTAL FULL		0		1		0			1		1		1		4	
TOTAL PER TRAIN		4		4		1			6		3		5			

Incoming Railcars F=Full E=Empty F2E= One full & 2 empties

Train Days			T			T			T			T		T	Total	Total
Date: (May, 1988)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Full	Empty
Acrylic Acid													F		1	0
Soda Ash						2F			F		F		F		5	0
Sodium Hydroxide 50%											F				1	0
Sulfur Dioxide		3F							3F						6	0
Monoisopropylamine									F						1	0
t-Butylamine											F				1	0
Diamylamine													E		0	1
Cyclohexylamine		2F		F		F			F						5	0
TOTAL EMPTY		0		0		0			0		0		1			1
TOTAL FULL		5		1		3			6		3		2		20	
TOTAL PER TRAIN		5		1		3			6		3		3			

EXHIBIT 2 (cont)

June 1, 1988

Virginia Chemicals Company
[illegible]

Keith F. Spafford
Hazardous Materials Officer
Department of Emergency Services
7700 Midlothian Turnpike
Richmond, Va 23235

Dear Keith:

Please find attached the analysis you requested. From May 1 through May 14 we tracked the rail traffic into and out of our gate and our truck shipments out. The attached is a summary of that data.

A few comments about the data. The Amines plant runs on a campaign basis. The campaigns may last a few weeks or extend into several months. The campaign the plant is running will impact the transportation profile. The impact will be primarily in the types of materials shipped. The overall number of railcars and trucks will remain approximately the same.

Some of our businesses are seasonal. This causes us to shift our production rates as the seasons pass. This shift in production will cause a shift in the transportation profile. This will impact the number of railcars and trucks but the shift is expected to be less than 15%.

Our SAM facility will need more acrylic acid in the future. There will probably be an extra railcar or two of acrylic acid per week in the future.

A few words about our Transportation Emergency Response Team. Our team is a part of the Chemtrec network. We respond to incidents involving any of our products and several of our raw materials (primarily the allyl compounds). The team can respond either as a technical resource or with the necessary equipment to cap or seal a leak. Our team works out of our Portsmouth Site and we have a sister team that works out of our facility in Mobile, Alabama. Our equipment includes capping kits for sulfur dioxide cars, capping kits for allyl chloride cars, Vetter bags, drum patching kits, totally encapsulated suits and SCBAs. Our team includes specialists in manufacturing, shipping, maintenance and engineering.

EXHIBIT 2

I believe this is the information you requested. If you have any questions, please feel free to give me a call.

Very truly yours,

R. J. Sabacinski

cc: T. E. Foxworth
J. A. Saveika
F. Sepulveda

EXHIBIT 2 (cont)

Truck Shipments May 1-14, 1988

Product	
70% MIPA	70% Monoisopropylamine / Water Solution
DEA	Diethylamine
DEET	N,N-Diethyl-m-toluamide
MOA	Octylamine
TALA	Triallylamine
MCHA	Cyclohexylamine
932	Water Treatment Chemical / Water solution
TEA	Triethylamine
MBS/SS	Sodium Metabisulfite and Sodium Sulfite
Diamine	N,N'-Di-Tert-Butylethylenediamine
DIPA	Diisopropylamine
MEA	Ethylamine

EXHIBIT 2 (cont)

City of Portsmouth
Virginia 23705

Established 1752

Office of the
City Manager

P. O. Box 820
804 393-8641

June 27, 1988

Mr. A. E. Slayton, Jr.
State Coordinator
Department of Emergency Services
310 Turner Road
Richmond, VA 23225-6491

Dear Mr. Slayton:

Attached is the completed questionnaire and backup material prepared by Donald Brown, Emergency Services Coordinator, on our capability to respond to a hazardous material accident at the existing vehicular crossings of the Norfolk and Southern Railway, and its proposed relocation to the median of the Western Freeway. I hope this will be helpful to you in your assessment study.

Should you have any questions, pleased feel free to contact Mr. Brown directly at (804) 393-8551.

Sincerely,

George L. Hanbury, II
City Manager

GLH/ces

attachment

cc: Lin Grant, State Project Coordinator
Donald Brown, Emergency Services Coordinator
Patrick J. Coffield, Assistant City Manager
V. Wayne Orton, Assistant City Manager
Chief Joseph Koziol, Police
Chief Odell Benton, Fire
Jim Martin, Legislative Liaison

OPERATIONS
JUL 7 1988
DIVISION

JUL 1988
VA EMERGENCY SERVICES

EXHIBIT 3 (cont)

CAPABILITY ASSESSMENT
for
HAZARDOUS MATERIALS RESPONSE
by the
CITY OF PORTSMOUTH

	TOTAL NUMBER	HAZMAT TRAINING LEVEL I	LEVEL II	LEVEL IIE	LEVEL III	LEVEL IV	SCBA TRNED	ENCAPS SUIT TRNED	OTHER
FIRE PERSONNEL									
CAREER	221	219	29	5	0	0	219	0	0
VOLUNTEER	N/A	-	-	-	-	-	-	-	-
INITIAL RESPONSE CAPABILITY									
CAREER	70*	70	10	0	0	0	70	0	0
VOLUNTEER	N/A	-	-	-	-	-	-	-	-
EMS PERSONNEL									
CAREER	218	219	29	5	0	0	219	0	0
VOLUNTEER	N/A	-	-	-	-	-	-	-	-
INITIAL RESPONSE CAPABILITY									
CAREER	70	70	10	0	0	0	70	0	0
VOLUNTEER	N/A	-	-	-	-	-	-	-	-
POLICE									
CAREER	210	210	3	0	0	0	5	0	0
AUXILIARY	41	41	0	0	0	0	3	0	0
INITIAL RESPONSE CAPABILITY									
CAREER	18	18	0	0	0	0	**	0	0
AUXILIARY	41**	-	-	-	-	-	-	-	-

HAZARDOUS MATERIALS EQUIPMENT INVENTORY	NUMBER
SCBA's	94
ENCAPSULATING SUITS	4
CHLORINE C KIT(S)	0
PRESURIZED VESSEL PLUG KIT(S)	0
OTHER	

*All firefighters are trained Emergency Medical Technicians (EMTs) and respond on all ambulance calls.

**This number would depend on who is on duty at the time.

EXHIBIT 3 (cont)

HAZARDOUS MATERIALS RESPONSE TIMES TO

	Response Time in Minutes		
	FIRE	EMS	POLICE
TAYLOR ROAD	7.5	6-8	3-5
PEPERCORN DRIVE	7.3	6-8	3-5
BRUIN DRIVE	9.5	6-8	3-5
PINERIDGE DRIVE	9.3	6-8	3-5
WEST HIGH STREET	2.3	6-8	3-5
TYRE NECK ROAD	2.5	6-8	3-5
CHURCHLAND BLVD.	2.8	6-8	3-5
WEST NORFOLK ROAD	7.2	6-8	3-5
LILAC DRIVE	3.0	6-8	3-5
CEDAR LANE	4.4	6-8	3-5

THE RESPONSE TIMES LISTE ON THE LEFT ARE AVERAGE EMERGENCY RESPONSE TIMES SHOULD AN ACCIDENT OCCUR IN THE NORTH CHURCHLAND AREA, WHICH IS THE MOST HEAVILY POPULATED, THE EMERGENCY RESPONSE TIMES COULD BE SIGNIFICANTLY INCREASED IF THE TRAIN CARS BLOCKED ONE OF THE TWO ROADS (CEDAR LANE OR HIGH STREET WEST) AS NOTED ON THE ATTACHED MAP.

ALONG I-664/WESTERN FREEWAY BETWEEN INTERSECTIONS OF

	Response Time in Minutes		
PUGHSVILLE RD & WESTERN FREEWAY	8.5	6-8	3-5
WESTERN FREEWAY & COLLEGE DR.	9.0	6-8	3-5
COLLEGE DR. & TOWNE POINT ROAD	8.5	6-8	3-5
TOWNE POINT ROAD & CEDAR LANE	2.8	6-8	3-5

PLEASE PROVIDE A WRITTEN ASSESSEMENT OF YOUR EMERGENCY SERVICES ORGANIZATION'S CAPABILITY TO RESPOND TO A HAZARDOUS MATERIALS INCIDENT ALONG:

A. THE EXISTING RAILWAY BETWEEN GUM ROAD AND COAST GUARD BLVD, AND

B. ALONG THE PROPOSED RELOCATION ROUTE IN THE MEDIAN OF I-664 AND THE WESTERN FREEWAY.

ALSO DISCUSS FUTURE PLANS FOR UPGRADING YOUR HAZARDOUS MATERIALS RESPONSE CAPABILITY THROUGH INCREASED TRAINING, PURCHASES OF SPECIALIZED EQUIPMENT, INCREASED NUMBER OF TRAINED EMPLOYEES, OR OTHER MEANS.

Maximum Response Capability	Police	18
Excluding Mutual Aid	Emergency Medical Services (EMS)	6 (ambulance crews)
	Fire	70
	Total	94

EXHIBIT 3 (cont)

NARRATIVE
HAZARDOUS MATERIALS RESPONSE QUESTIONNAIRE

I. CAPABILITY TO RESPOND TO HAZARDOUS MATERIALS INCIDENT ALONG:

A. The existing railway between Gum Road and Coast Guard Boulevard.

- The Fire Department has a station on Cedar Lane that houses three pieces of equipment with approximately twelve men at all times. Their response time to any section of the existing railroad should be no more than three to eight minutes.

- The Police Department has two units in their Police Sector Three. Each unit has one or two officers capable of a first responder arrival time of two to five minutes.

- One of the three Emergency Medical Services (EMS) ambulances is stationed at Maryview Hospital and has the capability of an eight minute response time.

- After the first responders, Police, Fire, and EMS arrive, there are approximately ninety-four career personnel capable of a maximum response. This number will vary depending on calls for service, court time, etc.

NOTE: **The City of Chesapeake Fire Station Number 12 is located in the 4400 block of Taylor Road with two units and six firemen per shift. There response time to the existing railroad would be three to five minutes.**

B. The Proposed Relocation Route In The Median of I-664 and the Western Freeway.

- The Fire Department's first units should respond from the Cedar Lane Station. Their arrival time would vary from approximately nine minutes to College Drive down to approximately three minutes at the Cedar Lane crossing. The College Drive crossing is geographically located in Suffolk, however, Portsmouth units will respond on a Mutual Aid Agreement.

- The Police Department has two units that can respond to an incident; and their time should be slightly less than that of the Fire Department (from three to five minutes).

EXHIBIT 3 (cont)

- The EMS response time to an incident along this route would be approximately ten minutes to College Drive to about six minutes at the Cedar Lane crossing.

II. **FUTURE EMERGENCY RESPONSE PLANS/TENTATIVE BASED ON BUDGETARY CONSTRAINTS**

A. The City does not currently have an operational Hazardous Material Response (Haz Mat) Team and as such, its capability to respond to an emergency is limited. If an incident should occur, the City would respond to identify and prevent further contamination through isolation and evacuation. Should evacuation be necessary from the existing railroad or proposed relocation site, the immediate population areas affected would generally be the same (CT 130, 131.01, 131-02) depending upon the wind direction at the time of the incident. That population is adjusted to 23,937 by 1980 Census Tract data from the City Planning Department. There are only three evacuation routes South of the existing railroad corridor. These area State Route 659 (Taylor Road), Routes 13/17 South (High Street) and West Norfolk Road. Since the prevailing wind direction is generally North/Southeast, West Norfolk Road would not be accessible for evacuation purposes.

Temporary shelters would be opened at Manor and Cradock High Schools and Waters Jr. High School. Additionally, the Haz Mat Response Teams from the Norfolk Naval Shipyard and/or Newport News Fire Department would be requested to assist in conjunction with a private contractor for clean up.

B. Tentative plans call for an operational Haz Mat Response Team for the City of Portsmouth. This unit would have all the necessary specialized equipment and Level III and IV training to respond to any type of hazardous material incident and provide mutual aid for the surrounding Southside Hampton Roads areas.

C. The Fire Department has all of it personnel trained to Level I with plans to train the 221 firefighters to at least Level II with some being trained to Level III for response to any major hazardous materials incident.

D. All Police Officers have receive some type of hazardous materials training. Plans are being developed to insure that all first responders are trained to Level I.

EXHIBIT 3 (cont)

City of Chesapeake

Virginia

Office of the City Manager

July 27, 1988

Mr. A. E. Slayton, Jr.
State Coordinator
Commonwealth of Virginia
Department of Emergency Services
310 Turner Road
Richmond, Virginia 23225-6491

Dear Mr. Slayton:

This letter and attachment is in response to your inquiry of June 10, 1988 regarding the hazardous material impacts to be associated with the relocation of the Norfolk and Southern Railway to the median of I-664 and the Western Expressway. This information has been prepared by the City Safety Engineer with assistance from other city staff.

If we may provide additional information, please advise.

Sincerely,

James W. Rein
City Manager

JWR/wbf

Attachment
cc: Mr. Lin Grant, Department of Emergency Services
Chief Michael L. Bolac, Fire
Mr. M. Reid MacCallum, Emergency Preparedness/ Communications/Risk Management
Mr. John A. O'Connor, Public Works

EXHIBIT 4 (cont)

CAPABILITY ASSESSMENT
for
HAZARDOUS MATERIALS RESPONSE
by the
CITY OF CHESAPEAKE

	TOTAL NUMBER	HAZMAT TRAINING LEVEL I	LEVEL II	LEVEL IIE	LEVEL III	LEVEL IV	SCBA TRNED	ENCAPS SUIT TRNED	OTHER
FIRE PERSONNEL									
CAREER	258	246	58				258	4	
VOLUNTEER	50	2	2						
INITIAL RESPONSE CAPABILITY									
CAREER	40	40	10				40	2	
VOLUNTEER	15								
EMS PERSONNEL									
CAREER	27	22	3				26		
VOLUNTEER	80								
INITIAL RESPONSE CAPABILITY									
CAREER	9	9	1				9		
VOLUNTEER									
POLICE									
CAREER	238	22							
AUXILIARY	43								
INITIAL RESPONSE CAPABILITY									
CAREER	25	5							
AUXILIARY									

HAZARDOUS MATERIALS EQUIPMENT INVENTORY	NUMBER
SCBA's	158
ENCAPSULATING SUITS	2
CHLORINE C KIT(S)	
PRESURIZED VESSEL PLUG KIT(S)	
OTHER	

EXHIBIT 4 (cont)

HAZARDOUS MATERIALS
RESPONSE TIMES TO

	FIRE	EMS	POLICE
TAYLOR ROAD	3 min.	3 min.	6.04 min.
PEPERCORN DRIVE	1 min.	4 min.	6.04 min.
BRUIN DRIVE	1 min.	4 min.	6.04 min.
PINERIDGE DRIVE	1 min.	4 min.	6.04 min.
WEST HIGH STREET	N/A	N/A	N/A
TYRE NECK ROAD	1.3 min.	4.3 min.	6.04 min.
CHURCHLAND BLVD.	1 min.	4 min.	6.04 min.
WEST NORFOLK ROAD	N/A	N/A	N/A
LILAC DRIVE	2 min.	2 min.	6.04 min.
CEDAR LANE	2 min.	2 min.	6.04 min.

ALONG I-664/WESTERN FREEWAY
BETWEEN INTERSECTIONS OF

PUGHSVILLE RD & WESTERN FREEWAY	1.3 min.	3.3min	6.04 min.
WESTERN FREEWAY & COLLEGE DR.	2 min.	4 min.	6.04 min.
COLLEGE DR. & TOWNE POINT ROAD	2 min.	4 min.	6.04 min.
TOWNE POINT ROAD & CEDAR LANE	2.3 min.	2.3 min	6.04 min.

PLEASE PROVIDE A WRITTEN ASSESSEMENT OF YOUR EMERGENCY SERVICES ORGANIZATION'S CAPABILITY TO RESPOND TO A HAZARDOUS MATERIALS INCIDENT ALONG:

A. THE EXISTING RAILWAY BETWEEN GUM ROAD AND COAST GUARD BLVD, AND (See paragraph 1 on Attachment 1.)

B. ALONG THE PROPOSED RELOCATION ROUTE IN THE MEDIAN OF I-664 AND THE WESTERN FREEWAY.

(See paragraph 1 on Attachment 1.)

ALSO DISCUSS FUTURE PLANS FOR UPGRADING YOUR HAZARDOUS MATERIALS RESPONSE CAPABILITY THROUGH INCREASED TRAINING, PURCHASES OF SPECIALIZED EQUIPMENT, INCREASED NUMBER OF TRAINED EMPLOYEES, OR OTHER MEANS.

(See paragraph 2 on Attachment 1.)

EXHIBIT 4 (cont)

Currently, fire apparatus responding to a hazardous materials incident along these routes, would be limited to performing those duties normally associated with typical fire suppression activities. We have at this time, a limited amount of personal protection equipment for hazardous materials handling and would only be capable of providing those services associated with a level II response. In the event a level III response became necessary, we would rely on our mutual aid agreements with surrounding localities for additional assistance and would call the hazardous materials response team from Newport News Fire Department and/or the Norfolk Naval Shipyard.

We are in the process of training all of our personnel to a level II response capability. In addition, we are equipping a hazardous materials response van with a limited amount of level III equipment and will have it staffed with personnel who have been trained to this level as well. We are also in the process of developing bid specifications for entering into a contractual agreement with a private hazardous materials contractor to provide level III response, containment and clean up services.

CITY OF SUFFOLK

P. O. BOX 1858. SUFFOLK. VIRGINIA 23434. PHONE 934-3111
EXT. 231

ASSISTANT CITY MANAGER

July 5, 1988

Mr. A. E. Slayton, State Coordinator
Department of Emergency Services
310 Turner Road
Richmond, Virginia 23225-6491

Dear Mr. Slayton:

In follow-up to your letter of June 10, 1988, please find the completed Hazardous Materials Response Capability Questionnaire.

Sincerely,

T. G. Underwood
Assistant City Manager

/ch
Attachment

CAPABILITY ASSESSMENT
for
HAZARDOUS MATERIALS RESPONSE
by the
CITY OF SUFFOLK

	TOTAL NUMBER	HAZMAT TRAINING LEVEL I	LEVEL II	LEVEL IIE	LEVEL III	LEVEL IV	SCBA TRNED	ENCAPS SUIT TRNED	OTHER
FIRE PERSONNEL									
CAREER	58	55	3				58	4	
VOLUNTEER	100	20	4				100		
INITIAL RESPONSE CAPABILITY									
CAREER	20	20	2				20	2	
VOLUNTEER	8	4					8		
EMS PERSONNEL									
CAREER	7	6	2				7		
VOLUNTEER	50	18					10		
INITIAL RESPONSE CAPABILITY									
CAREER	7	6	2				7		
VOLUNTEER	10	5					10		
POLICE									
CAREER	87	40					40		
AUXILIARY	10						2		
INITIAL RESPONSE CAPABILITY									
CAREER	3	1					3		
AUXILIARY	1								

HAZARDOUS MATERIALS EQUIPMENT INVENTORY	NUMBER
SCBA's	33
ENCAPSULATING SUITS	2
CHLORINE C KIT(S)	Have access to kit at Suffolk Chemical
PRESURIZED VESSEL PLUG KIT(S)	1
OTHER	
Type B Tool Kit	1
Plug & Dike	1
Overpack Drum	2
Tyvec Suits	4 doz.
Splash Suits	12

EXHIBIT 5 (cont)

HAZARDOUS MATERIALS
RESPONSE TIMES TO

	FIRE	EMS	POLICE
TAYLOR ROAD			
PEPERCORN DRIVE			
BRUIN DRIVE			
PINERIDGE DRIVE			
WEST HIGH STREET			
TYRE NECK ROAD			
CHURCHLAND BLVD.			
WEST NORFOLK ROAD			
LILAC DRIVE			
CEDAR LANE			

ALONG I-664/WESTERN FREEWAY
BETWEEN INTERSECTIONS OF

PUGHSVILLE RD & WESTERN FREEWAY	5 min	3 min	10 min
WESTERN FREEWAY & COLLEGE DR.	6 min	4 min	10 min
COLLEGE DR. & TOWNE POINT ROAD	8 min	7 min	10 min
TOWNE POINT ROAD & CEDAR LANE			

PLEASE PROVIDE A WRITTEN ASSESSEMENT OF YOUR EMERGENCY SERVICES ORGANIZATION'S CAPABILITY TO RESPOND TO A HAZARDOUS MATERIALS INCIDENT ALONG:

A. THE EXISTING RAILWAY BETWEEN GUM ROAD AND COAST GUARD BLVD, AND

B. ALONG THE PROPOSED RELOCATION ROUTE (N/A Mutual aid) IN THE MEDIAN OF I-664 AND THE WESTERN FREEWAY.

ALSO DISCUSS FUTURE PLANS FOR UPGRADING YOUR HAZARDOUS MATERIALS RESPONSE CAPABILITY THROUGH INCREASED TRAINING, PURCHASES OF SPECIALIZED EQUIPMENT, INCREASED NUMBER OF TRAINED EMPLOYEES, OR OTHER MEANS.

At the present time the Suffolk Fire Department plans to certify all personnel to level II Hazardous Materials response and participate in a regional hazardous materials response team to be formed in Portsmouth or Chesapeake.

EXHIBIT 5 (cont)

Hoechst Celanese

Virginia Chemicals Company
Hoechst Celanese Corporation
3340 West Norfolk Road
Portsmouth, VA 23703
804 483 7000

August 8, 1988

Linwood Grant
Department of Emergency Services
310 Turner Rd.
Richmond, Va 23225

Dear Mr. Grant:

It was good speaking with you Monday, August 8. Per our conversation, I have obtained the following information.

Sulfur Dioxide shipments by truck normally net 40,000 lbs. By rail, the shipment is about 180,000 lbs.

Monocyclohexylamine shipments by truck normally net 40,000 lbs.
By rail, the shipments range from about 180,000 to 186,000 lbs.

Allylamine shipments are generally in the form of drums in a trailer. The shipment maximum would be about 40,000 lbs. The majority of our shipments are only a few drums per truck, perhaps 2,000 lbs.

I will be most interested in the results of your transportation risk analysis with respect to the railroad relocation proposal.
If you have any further questions, please don't hesitate to call.

Sincerely,

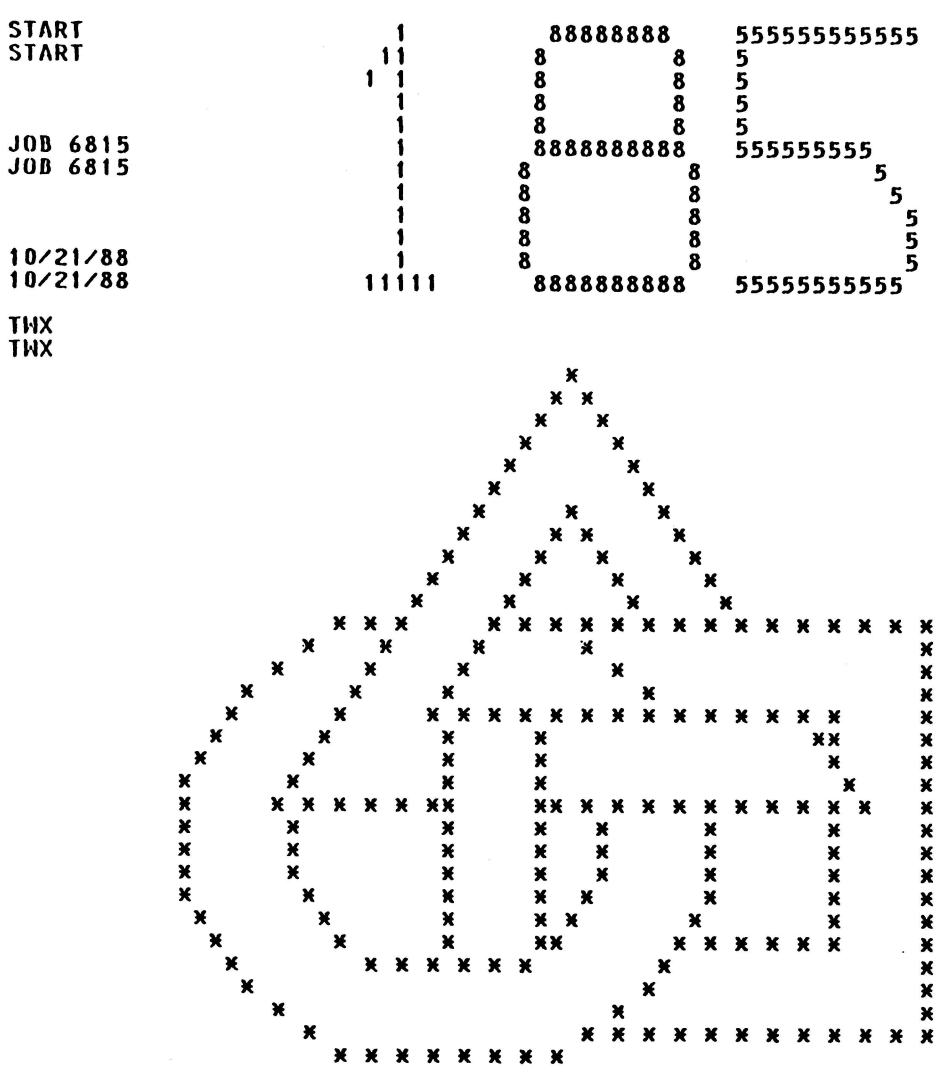
R. J. Sabacinski

Hoechst

EXHIBIT 6

EXHIBIT 7

COMPUTER CENTER
Division of Computer Research and Technology
National Institutes of Health



START JOB 6815 TWX9732W 10/21/88 TWX WYLX01 BOX 185
START JOB 6815 TWX9732W 10/21/88 TWX WYLX01 BOX 185
START JOB 6815 TWX9732W 17:03:13 THOMAS P. WOLL PRINTR5 BOX 185
START JOB 6815 TWX9732W 17:03:13 THOMAS P. WOLL PRINTR5 BOX 185

COMPUTER CENTER
NATIONAL INSTITUTES OF HEALTH
BUILDING 12, ROOM 1100, BETHESDA, MARYLAND 20892

EXHIBIT 7 (cont)

RAIL-HIGHWAY GRADE CROSSING
ACCIDENT/INCIDENT REPORT

GRADE CROSSING ID: 464110S DATE OF INCIDENT:09/21/83 TIME: 0510 PM

RAILROADS INVOLVED	INCIDENT NUMBER	ALPHABETIC CODE	
REPORTING RAILROAD:	X420983003	NFD	NORFOLK, FRANKLIN AND DANVILLE RAILROAD COM
OTHER RAILROAD INVOLVED:	---	---	
RAILROAD RESPONSIBLE FOR TRACK MAINTENANCE:	X420983003	NFD	

PART 1: LOCATION

NEAREST RAILROAD STATION: WEST NORFOLK COUNTY:CHESAPEAKE STATE:VIRGINIA
CITY: CHESAPEAKE HIGHWAY: LILAC DRIVE

PART 2: INCIDENT SITUATION

HIGHWAY USER INVOLVED: AUTO EQUIPMENT INVOLVED: TRAIN(UNITS PULLING)
SPEED: 010 MPH VEHICLE DIRECTION: WEST
POSITION OF CAR UNIT IN TRAIN: 001
POSITION: MOVING OVER CROSSING CIRCUMSTANCE: TRAIN STRUCK HIGHWAY USER
WAS HIGHWAY USER AND/OR RAIL EQUIPMENT INVOLVED IN
THE IMPACT TRANSPORTING HAZARDOUS MATERIALS? RAIL EQUIPMENT

PART 3: ENVIRONMENT

TEMPERATURE: 078 F VISIBILITY: DAY WEATHER: RAIN

PART 4: TRAIN AND TRACK

TYPE OF TRAIN: FREIGHT TYPE OF TRACK: MAIN
TRACK NUMBER OR NAME: SINGLE MAIN FRA TRACK CLASSIFICATION: 2
NUMBER OF CARS: 005 NUMBER OF LOCOMOTIVE UNITS: 01
TRAIN SPEED: 010 MPH (ESTIMATED) TIME TABLE DIRECTION: WEST

PART 5: CROSSING WARNING

TYPE: GATES	NO	HWY. TRAFFIC SIGNALS	NO	WATCHMAN		NO
CANTILEVER FLS	NO	AUDIBLE	NO	FLAGGED BY CREW		NO
STANDARD FLS	NO	CROSSBUCKS	YES	OTHER		NO
WIG WAGS	NO	STOP SIGNS	NO	NONE		NO

WAS THE SIGNALED CROSSING WARNING WORKING? LOCATION OF WARNING: BOTH SIDES
WAS CROSSING WARNING INTERCONNECTED WAS CROSSING ILLUMINATED BY STREET
WITH HIGHWAY SIGNALS? LIGHTS OR SPECIAL LIGHTS:

PART 6: MOTORIST ACTION

MOTORIST PASSED STANDING HIGHWAY VEHICLE: NO MOTORIST DROVE BEHIND OR IN FRONT OF TRAIN
MOTORIST UNKNOWN AND STRUCK OR WAS STRUCK BY SECOND TRAIN: NO
VIEW OF TRACK OBSCURED BY NOTHING

PART 7: HIGHWAY VEHICLE PROPERTY DAMAGE/CASUALTIES

HIGHWAY VEHICLE PROPERTY DAMAGE: $500 00 DRIVER WAS UNINJURED
TOTAL NUMBER OF OCCUPANTS KILLED: 0000 WAS DRIVER IN THE VEHICLE ? YES
TOTAL NUMBER OF OCCUPANTS INJURED: 0000 TOTAL NUMBER OF OCCUPANTS INCLUDING DRIVER: 0001

ITEMNO 00004828

EXHIBIT 7 (cont)

RAIL-HIGHWAY GRADE CROSSING
ACCIDENT/INCIDENT REPORT

GRADE CROSSING ID: 464119D DATE OF INCIDENT:12/17/75 TIME: 0240 PM

RAILROADS INVOLVED	INCIDENT NUMBER	ALPHABETIC CODE
REPORTING RAILROAD:	A131273	NFD NORFOLK, FRANKLIN AND DANVILLE RAILROAD COM
OTHER RAILROAD INVOLVED:	---	---
RAILROAD RESPONSIBLE FOR TRACK MAINTENANCE:	---	---

PART 1: LOCATION

NEAREST RAILROAD STATION: WEST NORFOLK COUNTY: STATE:VIRGINIA
CITY: WEST NORFOLK HIGHWAY: DORTON STREET

PART 2: INCIDENT SITUATION

HIGHWAY USER INVOLVED: AUTO EQUIPMENT INVOLVED: TRAIN(UNITS PULLING)
SPEED: 015 MPH VEHICLE DIRECTION: SOUTH
POSITION OF CAR UNIT IN TRAIN: 001
POSITION: MOVING OVER CROSSING CIRCUMSTANCE: TRAIN STRUCK HIGHWAY USER
WAS HIGHWAY USER AND/OR RAIL EQUIPMENT INVOLVED IN
THE IMPACT TRANSPORTING HAZARDOUS MATERIALS? NEITHER

PART 3: ENVIRONMENT

TEMPERATURE: 040 F VISIBILITY: DAY WEATHER: RAIN

PART 4: TRAIN AND TRACK

TYPE OF TRAIN: FREIGHT TYPE OF TRACK: MAIN
TRACK NUMBER OR NAME: MAIN FRA TRACK CLASSIFICATION: 2
NUMBER OF CARS: 007 NUMBER OF LOCOMOTIVE UNITS: 01
TRAIN SPEED: 015 MPH TIME TABLE DIRECTION: WEST

PART 5: CROSSING WARNING

TYPE: GATES	NO	HWY. TRAFFIC SIGNALS	NO	WATCHMAN	NO
CANTILEVER FLS	NO	AUDIBLE	NO	FLAGGED BY CREW	NO
STANDARD FLS	NO	CROSSBUCKS	NO	OTHER	NO
WIG WAGS	NO	STOP SIGNS	NO	NONE	YES

WAS THE SIGNALED CROSSING WARNING WORKING? LOCATION OF WARNING:
WAS CROSSING WARNING INTERCONNECTED WAS CROSSING ILLUMINATED BY STREET
WITH HIGHWAY SIGNALS? LIGHTS OR SPECIAL LIGHTS:

PART 6: MOTORIST ACTION

MOTORIST PASSED STANDING HIGHWAY VEHICLE: NO MOTORIST DROVE BEHIND OR IN FRONT OF TRAIN
MOTORIST DID NOT STOP AND STRUCK OR WAS STRUCK BY SECOND TRAIN: NO
VIEW OF TRACK OBSCURED BY NOTHING

PART 7: HIGHWAY VEHICLE PROPERTY DAMAGE/CASUALTIES

HIGHWAY VEHICLE PROPERTY DAMAGE: $500 00 DRIVER WAS INJURED
TOTAL NUMBER OF OCCUPANTS KILLED: 0000 WAS DRIVER IN THE VEHICLE ? YES
TOTAL NUMBER OF OCCUPANTS INJURED: 0001 TOTAL NUMBER OF OCCUPANTS INCLUDING DRIVER: 0001

ITEMNO 00011518

EXHIBIT 7 (cont.)

RAIL-HIGHWAY GRADE CROSSING
ACCIDENT/INCIDENT REPORT

GRADE CROSSING ID: 464120X DATE OF INCIDENT:11/21/78 TIME: 1155 AM

RAILROADS INVOLVED	INCIDENT NUMBER	ALPHABETIC CODE	
REPORTING RAILROAD:	A131304	NFD	NORFOLK, FRANKLIN AND DANVILLE RAILROAD COM
OTHER RAILROAD INVOLVED:	---	---	
RAILROAD RESPONSIBLE FOR TRACK MAINTENANCE:	A131304	NFD	

PART 1: LOCATION

NEAREST RAILROAD STATION: WEST NORFOLK VIRGINI COUNTY: STATE:VIRGINIA
CITY: CHESAPEAKE VIRGINIA HIGHWAY: TAYLOR ROAD

PART 2: INCIDENT SITUATION

HIGHWAY USER INVOLVED: AUTO EQUIPMENT INVOLVED: TRAIN(UNITS PULLING)
SPEED: 005 MPH VEHICLE DIRECTION: SOUTH
POSITION OF CAR UNIT IN TRAIN:
POSITION: MOVING OVER CROSSING CIRCUMSTANCE: TRAIN STRUCK BY HIGHWAY USER
WAS HIGHWAY USER AND/OR RAIL EQUIPMENT INVOLVED IN
THE IMPACT TRANSPORTING HAZARDOUS MATERIALS? RAIL EQUIPMENT

PART 3: ENVIRONMENT

TEMPERATURE: 060 F VISIBILITY: DAY WEATHER: CLEAR

PART 4: TRAIN AND TRACK

TYPE OF TRAIN: FREIGHT TYPE OF TRACK: MAIN
TRACK NUMBER OR NAME: MAIN FRA TRACK CLASSIFICATION: 2
NUMBER OF CARS: 006 NUMBER OF LOCOMOTIVE UNITS: 01
TRAIN SPEED: 020 MPH (ESTIMATED) TIME TABLE DIRECTION: EAST

PART 5: CROSSING WARNING

TYPE: GATES	NO	HWY. TRAFFIC SIGNALS	YES	WATCHMAN	NO
CANTILEVER FLS	NO	AUDIBLE	NO	FLAGGED BY CREW	NO
STANDARD FLS	NO	CROSSBUCKS	YES	OTHER	NO
WIG WAGS	NO	STOP SIGNS	NO	NONE	NO

WAS THE SIGNALED CROSSING WARNING WORKING? YES LOCATION OF WARNING: BOTH SIDES
WAS CROSSING WARNING INTERCONNECTED WAS CROSSING ILLUMINATED BY STREET
WITH HIGHWAY SIGNALS? UNKNOWN LIGHTS OR SPECIAL LIGHTS: NO

PART 6: MOTORIST ACTION

MOTORIST PASSED STANDING HIGHWAY VEHICLE: YES MOTORIST DROVE BEHIND OR IN FRONT OF TRAIN
MOTORIST DID NOT STOP AND STRUCK OR WAS STRUCK BY SECOND TRAIN: NO
VIEW OF TRACK OBSCURED BY NOTHING

PART 7: HIGHWAY VEHICLE PROPERTY DAMAGE/CASUALTIES

HIGHWAY VEHICLE PROPERTY DAMAGE: $350.00 DRIVER WAS INJURED
TOTAL NUMBER OF OCCUPANTS KILLED: 0000 WAS DRIVER IN THE VEHICLE ? YES
TOTAL NUMBER OF OCCUPANTS INJURED: 0001 TOTAL NUMBER OF OCCUPANTS INCLUDING DRIVER: 0001

ITEMNO. 00050308

EXHIBIT 7 (cont.)

RAIL-HIGHWAY GRADE CROSSING ACCIDENT/INCIDENT REPORT

GRADE CROSSING ID: 464123T DATE OF INCIDENT:10/02/81 TIME: 0915 AM

RAILROADS INVOLVED	INCIDENT NUMBER	ALPHABETIC CODE	
REPORTING RAILROAD:	M242324	NFD	NORFOLK, FRANKLIN AND DANVILLE RAILROAD COM
OTHER RAILROAD INVOLVED:	---	---	
RAILROAD RESPONSIBLE FOR TRACK MAINTENANCE:	M242324	NFD	

PART 1: LOCATION

NEAREST RAILROAD STATION: SUFFOLK COUNTY:SUFFOLK STATE:VIRGINIA
CITY: SUFFOLK HIGHWAY: TAYLOR RD

PART 2: INCIDENT SITUATION

HIGHWAY USER INVOLVED: AUTO EQUIPMENT INVOLVED: TRAIN(UNITS PULLING)
SPEED: 035 MPH VEHICLE DIRECTION: NORTH
POSITION OF CAR UNIT IN TRAIN: 001
POSITION: MOVING OVER CROSSING CIRCUMSTANCE: TRAIN STRUCK HIGHWAY USER
WAS HIGHWAY USER AND/OR RAIL EQUIPMENT INVOLVED IN
THE IMPACT TRANSPORTING HAZARDOUS MATERIALS? NEITHER

PART 3: ENVIRONMENT

TEMPERATURE: 065 F VISIBILITY: DAY WEATHER: CLOUDY

PART 4: TRAIN AND TRACK

TYPE OF TRAIN: FREIGHT TYPE OF TRACK: MAIN
TRACK NUMBER OR NAME: MAIN TRACK FRA TRACK CLASSIFICATION: 2
NUMBER OF CARS: 003 NUMBER OF LOCOMOTIVE UNITS: 01
TRAIN SPEED: 010 MPH (ESTIMATED) TIME TABLE DIRECTION: EAST

PART 5: CROSSING WARNING

TYPE:						
GATES	NO	HWY. TRAFFIC SIGNALS	NO	WATCHMAN	NO
CANTILEVER FLS	NO	AUDIBLE	NO	FLAGGED BY CREW	NO
STANDARD FLS	NO	CROSSBUCKS	YES	OTHER	NO
WIG WAGS	NO	STOP SIGNS	NO	NONE	NO

WAS THE SIGNALED CROSSING WARNING WORKING? LOCATION OF WARNING: BOTH SIDES
WAS CROSSING WARNING INTERCONNECTED WAS CROSSING ILLUMINATED BY STREET
WITH HIGHWAY SIGNALS? NO LIGHTS OR SPECIAL LIGHTS:

PART 6: MOTORIST ACTION

MOTORIST PASSED STANDING HIGHWAY VEHICLE: NO MOTORIST DROVE BEHIND OR IN FRONT OF TRAIN
MOTORIST DID NOT STOP AND STRUCK OR WAS STRUCK BY SECOND TRAIN: NO
VIEW OF TRACK OBSCURED BY NOTHING

PART 7: HIGHWAY VEHICLE PROPERTY DAMAGE/CASUALTIES

HIGHWAY VEHICLE PROPERTY DAMAGE: $1000.00 DRIVER WAS UNINJURED
TOTAL NUMBER OF OCCUPANTS KILLED: 0000 WAS DRIVER IN THE VEHICLE ? YES
TOTAL NUMBER OF OCCUPANTS INJURED: 0000 TOTAL NUMBER OF OCCUPANTS INCLUDING DRIVER: 0002

ITEMNO. 00007537

TELEPHONE CONTACTS AND INTERVIEWS

Mr. Donald E. Brown	Coordinator of Emergency Services City of Portsmouth
Mr. M. Reid MacCallum	Coordinator of Emergency Services City of Chesapeake
Mr. Thomas G. Underwood	Coordinator of Emergency Services City of Suffolk
Mr. James G. Vacalis	Director of Planning City of Suffolk
Mr. J. T. Mills	VA Department of Transportation
Mr. Lewis Campbell	Traffic Engineer VA Department of Transportation
Mr. Bob Hogan	Yard Master (Suffolk) Norfolk & Southern Railroad
Mr. Don Dodson	Maintenance of Way Supervisor Norfolk & Southern Railroad
Mr. Richard C. Eubank	Manager Governmental Reports Norfolk & Southern Railroad
Mr. E. G. Cody	Division Engineer Norfolk & Southern Railroad
Mr. Paul Oakly	Executive Director State Rail Programs American Association of Railroads
Ms. Debra M. Darr	Southeastern Virginia Planning District Commission
Ms. Sheila Smith	Director of Planning Maryview Hospital
Ms. Kathy Blanchard	Assistant Director of Programs SEVAMP
Mr. Ernest Johnson	Chief Operator (Chesapeake) Colonial Pipeline
Mr. Tom Reece	Virginia Department of Health
Mr. Richard J. Sabacinski	Senior Process Engineer Hoechst Celanese Virginia Chemicals

EXHIBIT 8

Mr. Bruce Story	Chemical Engineer Hoechst Celanese Virginia Chemicals
Mr. Erich Hines	Transportation Dispatcher Hoechst Celanese Virginia Chemicals
Mr. Russell G. Quimby	Safety Engineer, Rail National Transportation Safety Board
Mr. Edward R. English	Chief Maintenance Programs Federal Railroad Administration
Mr. Robert Finkelstein	Accident Information Analyst Federal Railroad Administration
Mr. Bruce George	Office of Safety National Transportation Safety Board
Mr. Cameron C. Pitts	Chairman Railroad Relocation Task Force
Hon. William S. Moore, Jr.	Delegate, Seventy-ninth District
Mr. Allen M. Zarembski	Co-author CWR Buckling Study President Zeta-Tech Association

EXHIBIT 8 (cont)