



United States
Environmental Protection
Agency

Office of Emergency and
Remedial Response
Hazardous Response Support Division

Environmental
Response
Team

Incident Mitigation and Treatment Methods Problems



FEB 04 1991

EPA 0743

1200 Sixth Avenue/Seattle, WA 98101

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INCIDENT MITIGATION & TREATMENT METHODS

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INCIDENT MITIGATION AND TREATMENT METHODS
CLASS PROBLEM: INCIDENT RESPONSE

INCIDENT A

At 7:00 P.M. on May 23, 1985 a commercial van struck the rear of a chemical tank truck traveling northbound on Interstate 65 in rural Warren County, Kentucky. Both vehicles came to a stop on the shoulder and the drivers were relatively unharmed. As they began to inspect the damage they found that a rear support had been driven into the tank, causing a slow but steady stream of product to spill onto the shoulder. The Kentucky State Police responded to the driver's call within ten minutes, and upon arrival obtained shipping papers from the trucker, who told them he was hauling 4500 gallons of Cresol. One officer approached the truck close enough to see the products draining off the shoulder toward a sinkhole on an adjacent farm. A small group of motorists had stopped to offer assistance and with the police and truckers, were standing on the highway shoulder about 50 yards south of the accident.

As sunset approached, the temperature was 70°F with clear skies and a 5 mph wind out of the west. Sunshine and a high of 80°F was forecast for the following day.

- 1) What actions would you suggest to contain and cleanup the spill?
- 2) What are the responder's greatest concerns?
- 3) What factors are beyond the control of the responders?

INCIDENT B

At 6:00 a.m. on October 10, 1985 a gasoline tank truck overturned in a single vehicle accident on Route 8 in California, Kentucky, a small community near Cincinnati, Ohio. The underside valve was ripped off and several holes abraded in the side of the tank allowing approximately 7500 gallons to flow out. Eventually a 15' to 20' puddle formed across the roadway collecting in the roadside and railway drainage ditches east of the road. About 500 gallons of gasoline remained in the damaged tanker.

A rail line running parallel to Route 8 and between the road and the Ohio River carried passenger and freight traffic. The next scheduled train was Amtrak to Washington, D.C., originating in Cincinnati at 6:05 a.m.

Approximately 25 persons resided within a one mile radius of the accident site.

- 1) What actions should be taken to protect public safety and the environment?
- 2) What personnel protective gear would be necessary?

2569, Cresol(s). Cresylic acid; cresylol; incresol C_7H_8O ; mol wt 108.13. C 77.75%, H 7.46%, O 14.80%. $HOC_6H_4CH_3$. Mixture of the three isomeric cresols, in which the *m*-isomer predominates. Obtained from coal tar: Paulsen, U.S. pat. 2,998,457 (1962 to Ashland Oil & Ref.). Usually contains a few per cent phenol. Prepn by sulfonation of toluene: Englund *et al.*, *Ind. Eng. Chem.* 45, 189 (1953); by oxidation of toluene: Braunwarth, Winsted, U.S. pat. 2,994,722 (1961 to Pure Oil).

Colorless, yellowish, brownish-yellow or pinkish liq; phenolic odor; becomes darker with age and on exposure to light. *Poisonous!* d_4^{20} 1.030-1.038. Not less than 90% by vol distills between 195-205°. Soluble in about 50 parts water; miscible with alcohol, benzene, ether, glycerol, petr ether; also sol in solns of fixed alkali hydroxides. A soln in water is neutral to bromocresol purple. *Protect from light.*

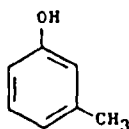
Human Toxicity: Orally 8 g or more produces rapid circulatory collapse, death. Chronic poisoning from oral or percutaneous absorption may produce digestive disturbances, nervous disorders with faintness, vertigo, mental changes, skin eruptions, jaundice, oliguria, uremia. *Caution:* General protoplasmic poison. *See also* Phenol.

USE: For making synthetic resins.

THERAP CAT: Disinfectant.

THERAP CAT (VET): Local antiseptic, parasiticide, disinfectant; has been used as an intestinal antiseptic.

2570. *m*-Cresol. 3-Methylphenol. C_7H_8O ; mol wt 108.13. C 77.75%, H 7.46%, O 14.80%. Obtained from coal tar: Maesawa, Kurakano, Japan, pat. 8929('55) (to Osaka Gas), *C.A.* 52, 1231d (1958); Macak, Rehak, *Brennstoff Chem.* 43, 80 (1962). Prepn from toluene: Toland, U.S. pat. 2,760,991 (1956 to California Res. Corp.); by oxidation of *o*- or *p*-toluic acid: Kaeding *et al.*, *Ind. Eng. Chem.* 53, 805 (1961).



Colorless or yellowish liquid; phenolic odor. d_4^{20} 1.034. bp 202°. mp 11-12°. Flash pt 86°. n_D^{20} 1.5398. Sol in about 40 parts water, in solns of fixed alkali hydroxides; miscible with alc, chloroform, ether. LD₅₀ orally in rats: 2.02 g/kg, Deichmann, Witherup, *J. Pharmacol. Exp. Ther.* 80, 233 (1944).

USE: In disinfectants and fumigants; in photographic developers, explosives. *Caution:* *See* Phenol.

The Merck Index Ninth Edition, 1976

cresol (methyl phenol; hydroxymethylbenzene; cresylic acid.) $CH_3C_6H_4OH$. A mixture of isomers obtained from coal tar or petroleum.

Properties: Colorless, yellowish, or pinkish liquid; phenolic odor; sp. gr. 1.030-1.047; wt/gal 8.66-8.68 lb; flash point approx. 180°F (82°C); m.p. 11-35°C; b.p. 191-203°C. Soluble in alcohol, glycol, dilute alkalis and water.

Derivation: Coal tar (from coke and gas works); also from toluene by sulfonation or oxidation.

Grades: Various, depending on phenol content, or other properties. N.F. grade contains not more than 5% phenol.

Containers: Drums; tank cars; tank trucks.

Hazard: Toxic and irritant; corrosive to skin and mucous membranes; absorbed through skin. Tolerance, 5 ppm in air.

Uses: Disinfectant; phenolic resins; tricresyl phosphate; ore flotation; textile scouring agent; organic intermediate, mfg. of salicylaldehyde, coumarin, and herbicides; surfactant; synthetic food flavors (para isomer only).

See also cresylic acids.

meta-cresol (meta-cresylic acid; 3-methylphenol) $CH_3C_6H_4OH$.

Properties: Colorless to yellowish liquid; phenol-like odor. Soluble in alcohol, ether, and chloroform; soluble in water. Sp. gr. 1.034; m.p. 12°C; b.p. 203°C; wt/gal 8.66 lb flash point 187°F (86°C). Autoignition temp. 1038°F (558°C).

Derivation: By fractional distillation of crude cresol (from coal tar); also synthetically.

Method of purification: Rectification.

Grade: Technical (95-98%).

Toxicity, uses, see cresol.

The Condensed Chemical Dictionary
Tenth Edition, 1981

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading. Shipment No. 818100

FROM-MERICHEM COMPANY

at HOUSTON

03/22/85

By ERUL DYKE

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined, as indicated below, which (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of destination if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier or all or any of said property over all or any portion of destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Straight Bill of Lading set forth (1) in Official, Southern, Western and Illinois Freight Classifications in effect on the date hereof. If this is a rail or rail-water shipment, or (2) in the applicable carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading set forth in the classification or tariff which govern transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

Consigned to DIAZ CHEMICAL
Destination Address 40 JACKSON STREET

Route GROUNDEYKE
Car or Vehicle I.D. 2527-1698

HOLLY

14476

DESCRIPTION OF ARTICLES
SPECIAL MARKS AND EXCEPTIONS

1 CONTAINS APPROXIMATELY 30700.0000 LBS

LIQUID, CORROSIVE MATERIAL, UN2076, POISON

FOR FURTHER CALL WEIGHTS PROMPTLY TO 455-1311, EXT. 304.

Subject to Section 7 of the applicable Bill of Lading, shipment is to be delivered consignee without recourse to the consignor, the consignor makes the following statement:

The carrier shall not make of this shipment without payment of freight and all other lawful

(Signature of Consignor)

If charges are to be written or stamped here, "To be F"

MAIL COPIES OF
SCALE TICKETS
MERICHEM COMPANY
S & D DEPARTMENT
1914 HADEN ROAD
HOUSTON, TX. 77

GROSS
TARE
NET

"If the shipment moves between two ports by a carrier by water, the law requires the bill of lading shall state whether it is 'carrier's or shipper's weight'. NOTE- Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property. This is to certify that the above-named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation, according to the regulations of the Department of Transportation. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding _____"

MERICHEM COMPANY, Shipper

Per _____
Permanent post-office address of shipper

1914 HADEN ROAD

3-2

AGENT MUST DETACH AND RETAIN THIS SHIPMENT ORDER AND MUST SIGN THE ORIGINAL BILL OF LADING



MERICHEM COMPANY

MATERIAL SAFETY DATA SHEET

SECTION 1 – MATERIAL DESCRIPTION AND MANUFACTURER

1. Chemical Name and Synonyms Cresols, Xylenols, Phenols (Mixture)	2. Trade or Common Names and Synonyms Creosylic Acid
3. Chemical Family Phenols	4. Chemical Formula Mixture of: C_6H_5OH , $CH_3C_6H_4OH$, $(CH_3)_2C_6H_3OH$
5. Manufacturer's Name Merichem Company	6. a. Manufacturer's Emergency Telephone — 24 Hours 713/455-1311
7. Street Address 1914 Haden Road	6. b. Transportation Emergency Telephone — 24 Hours 800/424-9300
8. City, State, Zip Code Houston, Texas 77015	

SECTION 2 – PHYSICAL PROPERTIES DATA

1. Normal Physical State Liquid	8. Specific Gravity at 60°F/60°F (ASTM D 1298) 1.030 to 1.040
2. Normal Color Amber	9. Reid Vapor Pressure (ASTM D323) a. At 62 °F 1mm Hg b. At 100 °F p.s.i.a. c. At 248 °F 0.48 p.s.i.a.
3. Normal Odor Antiseptic, Sweet	
4. Boiling Point (ASTM D 850-70) 374 to 455 °F (190 to 235 °C)	10. Vapor Density, Air = 1 3.86 (calculated)
5. Freeze Point (ASTM D 1493-67) < 0 °F (< -17.8°C)	11. Coefficient of Thermal Expansion 0.00043 per °F (0.00077 per °C)
6. a. Viscosity (ASTM D88-56) (49CFR173.115) 32 S.U.S. at 177°F (80°C)	12. Latent Heat of Vaporization 210 BTU/lb. @ 100°F
6. b. Viscosity (ASTM D445-72) (49CFR 171.8) 2 Centistokes at 177°F (80°C)	13. pH (ASTM E70) 5.5
7. Solubility in Water (ASTM D1788) 5 % by Wt. at 212 °F (100 °C)	

SECTION 3 – HAZARD DATA

A. EXPLOSIVITY, FLAMMABILITY, COMBUSTIBILITY (49 CFR 173.50; 173.115)										
1. Flash Point, according to tests specified in 49 CFR 173.115 (d): > 175 °F (> 79.4 °C)	3. Explosive Range in air, % by Volume LEL%— 1.5 UEL% _____									
2. Flash Point test method used for A, 1: Tag closed cup	4. Flammability Range in air, % by Volume LFL%— _____ UFL% _____									
5. Suitable Extinguishing Media: ("X" indicates suitable) <input checked="" type="checkbox"/> Water Fog <input checked="" type="checkbox"/> Foam <input checked="" type="checkbox"/> Alcohol Foam <input checked="" type="checkbox"/> CO ₂ <input checked="" type="checkbox"/> Dry Chemical <input type="checkbox"/> Other										
B. TOXICITY (49 CFR 173.343 and 29 CFR 1910.1000)										
1. According to tests specified in 49 CFR 173.343, Material is— (a) by Oral Ingestion <input checked="" type="checkbox"/> Toxic <input type="checkbox"/> Non-Toxic (b) by Inhalation <input checked="" type="checkbox"/> Toxic <input type="checkbox"/> Non-Toxic (c) by Skin Absorption <input checked="" type="checkbox"/> Toxic <input type="checkbox"/> Non-Toxic	2. According to 29 CFR 1910.1000, personal exposures maximums to Material are: (a) Ceiling Value (b) 8-hr. Wgt'd. Avg. <table border="1"><thead><tr><th>TABLE Z1</th><th>TABLE Z2</th><th>TABLE Z3</th></tr><tr><th>p.p.m., mg/m³</th><th>p.p.m., mg/m³</th><th>p.p.m., mg/m³</th></tr></thead><tbody><tr><td>5</td><td>22</td><td></td></tr></tbody></table>	TABLE Z1	TABLE Z2	TABLE Z3	p.p.m., mg/m ³	p.p.m., mg/m ³	p.p.m., mg/m ³	5	22	
TABLE Z1	TABLE Z2	TABLE Z3								
p.p.m., mg/m ³	p.p.m., mg/m ³	p.p.m., mg/m ³								
5	22									
C. CORROSIVITY (49 CFR 173.240)										
1. According to tests specified in 49 CFR 173.240, Material is — (a) on human skin tissue <input checked="" type="checkbox"/> Corrosive <input type="checkbox"/> Non-corrosive (b) on steel (SAE 1020, by NACE TM-01-89) <input type="checkbox"/> Corrosive <input checked="" type="checkbox"/> Non-corrosive (c) on brass, bronze, copper <input checked="" type="checkbox"/> Corrosive <input type="checkbox"/> Non-corrosive (d) on aluminum (NACE TM-01-89) <input checked="" type="checkbox"/> Corrosive <input type="checkbox"/> Non-corrosive (e) other: <u>On stainless steel</u> <input type="checkbox"/> Corrosive <input checked="" type="checkbox"/> Non-corrosive										
D. REACTIVITY										
1. Stability <input checked="" type="checkbox"/> Stable <input type="checkbox"/> Unstable	Conditions to Avoid Contact with strong oxidizers or strong alkali									
2. Hazardous Polymerization <input type="checkbox"/> May Occur <input checked="" type="checkbox"/> Will Not Occur	Conditions to Avoid									
3. Other chemicals or materials of construction to avoid:										

SECTION 4 – SPECIAL PROTECTION & PRECAUTIONS

A. HANDLING AND STORING

1. Avoid

Unventilated areas.

2. Personal Protective Equipment ("X" indicates recommended)

☐ Hard Hat ☐ Safety Glasses ☐ Safety Goggles ☒ Face Shield ☒ Chemical Gloves
☐ Full Chemical/Acid Suit ☒ Chemical Boots ☒ Respirator ☒ Other: Slicker suit.

3. Recommended Materials of Construction for:

(a) Tanks	carbon steel	(d) Valves	S/S ball with teflon ring
(b) Pipes	carbon steel	(e) Hoses	Buna-N with S/S reinforced web
(c) Pumps	carbon steel with S/S trim.	(f) Gaskets	Johns-Manfield #80 or equal.

B. PERSONAL EXPOSURES

TYPE	POSSIBLE HARMFUL EFFECTS	FIRST AID ACTION TO BE TAKEN
1. Inhaled	Systemic poisoning. May be fatal.	Keep warm. See physician. May require artificial respiration.
2. Swallowed	Systemic poisoning. May be fatal.	Drink large amounts of milk or water. Do not induce vomiting. See physician.
3. On Skin	Chemical burns. Absorbed thru skin. May be fatal.	Flush with large amounts of water. See physician.
4. In Eyes	Chemical burns. Severe eye damage.	Flush with large amounts of water. See physician.
Other:		
5.		

C. SPILLS AND LEAKS

1. Containment and Recovery. Spills must be disposed of immediately by properly trained and protected personnel. No others should remain in the area. The size of the spill will determine what procedure to follow in cleaning up. All contaminated material, including earth, must be removed. Proper government agencies should be notified.

2. Disposal.

For assistance in disposing of material, contact Merichem Company.

** SEE SECTION 6

SECTION 5 – TRANSPORTATION REQUIREMENTS

	49CFR	Mode of DOMESTIC Transportation		
		Highway	Rail	Barge
1. DOT Haz. Classn.	172.101	Corrosive material	Corrosive material	48 CFR sub-chapter 0
2. Auth. Shipping Cont. (a) Bulk	172.101	MC304, MC307, MC310, MC311, MC312	103W, 111A80W1, 111A100W1, 111A100W3	48 CFR 15 1.05
(b) Drum	172.101	DOT 17E	DOT 17E	
3. Drum Label	172.101	Corrosive and Poison	Corrosive and Poison	
4. Drum Marking See Section 6	172.300	Cresol UN2078	Cresol UN2078	
5. Placard	172.500	Corrosive 2078	Corrosive 2078	MCA Cargo Information card
6. Proper Shpg. Name See Section 6	172.101	Cresol	Cresol	Cresols
7. ID Number.	172.101	2078	2078	

SECTION 6 – ADDITIONAL INFORMATION

For containers of 1,000 pounds or more the letters RQ must precede the proper shipping name.
All shipping papers must have the word "Poison" following the ID number.

The information on this form is furnished solely for the purposes of enabling those who transport, handle or use our products to ensure the safety and health of their employees and to comply with various laws and regulations (federal, state and local). This information is offered in good faith and is believed to be accurate. Merichem, however, makes no guarantee or warranty, express or implied, regarding

Combined Short Form Bill of Lading and Freight Bill
GROENDYKE TRANSPORT, INC.

ACCT. # _____

B/L NO. _____

ORDER NO. _____

P.O. BOX 632 PHONE 405-234-4663

ENID, OKLAHOMA 73702

TRUCK NO. 2527

TRAILER NO. 1698

SHIPPER MERICHEM CO	SHIPPER ORIGIN GREENS BAYOU, TEX	Pump: G.T.I. <input type="checkbox"/>
CONSIGNEE DIAZ	DESTINATION HOLLY, NY	HOSE: Rubber <input type="checkbox"/> Oil <input type="checkbox"/>
PARTIAL LOADING OR UNLOADING POINT (S)		No. Feet
		Seal Nos.

[illegible]

TARIFF-	MILES-		
ORIGINATING TERMINAL NO.	45	FOR THE CONSIGNEE	
Subject to Section 7 of Conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement. The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.		BEFORE UNLOADING: I HAVE CHECKED THE DOCUMENTS PERTAINING TO THIS SHIPMENT, VERIFIED THE PRODUCT TO BE RECEIVED AND FURNISHED UNLOADING INSTRUCTIONS TO THE DRIVER.	The property described hereon is in parent good order, except (contents and condition of packages unknown) marked, and destined as indicated, and the carrier agrees that every service performed hereunder shall be in accordance with all the terms and conditions of the Interstate Commerce Commission. Carrier certifies that the cargo tank supplied for this shipment is a proper container for the transportation of each commodity, as indicated by the shipper. Received subject to tariffs and/or contracts in effect at date of issuance hereof.
PREPAID <input type="checkbox"/> COLLECT <input type="checkbox"/> CONSIGNOR AGENT		_____ SIGNATURE	
FREIGHT PAID BY:		AFTER UNLOADING: ABOVE DESCRIBED COMMODITIES RECEIVED IN GOOD CONDITION AND WAS ACCEPTED AND UNLOADED AS DIRECTED. (EXCEPT AS NOTED).	
		FIRM _____ DATE _____ BY _____ SIGNATURE _____ DRIVER _____	

PRESS HARD—YOU ARE MAKING 6 COPIES

TRIP STARTED AT	MILEAGE		PAY NO.	STATE MILEAGES				
	LOADED	EMPTY		STATE	MILES	STATE		
LOADED AT G. BAYOU, TEX			REG.	77526	03468			
UNLOADED AT HOLLY, NY								
PROCEEDED TO			OTHER					
			TOTAL PAY					
TOTAL MILES								
REMARKS:								

DATE: 05/27/85
TIME: 10:40:55

M E R I C H E M C O M P A N Y
=====

PAGE:

LABORATORY REPORT

MATERIAL: (MC985) 98.5% META CRESOL

TANK:

ASSAY NO: 9-17-14 BATCH NO: 05271030 CUSTOMER: 8030003

DIAZ CHEMICAL

VEHICLE: 2527-1698 SHIPMENT: A081810001 40 JACKSON STREET

LOAD DATE: 05/27/85 SHIP DATE: 05/27/85

HOLLY

NY 1142

PRODUCT PROPERTIES
=====

SPECIFIC GRAVITY @ 15.5/15.5°C 1.038

MOISTURE (KARL FISCHER) WT.% 0.05

NEUTRAL OIL (VOL./WT.%)% 0.000

MERCAPTAN SULPHUR WT.% 0.000

TOTAL SULPHUR: PT WT.% 0.000

COLOR: BARRETT 3/481

APPEARANCE AMBER

NITROGEN BASES WT.% 0.001

PURITY BY FREEZING POINT:

FREEZING POINT, WET °C

FREEZING POINT, DRY °C

SPECIAL TESTS OR COMMENTS:

NEUTRAL OIL: [<0.001]

BENZENE= ND

PENTANOL= ND

ANALYSIS BY: GK-HB-WES

CHECKED BY:

APPROVED

DATE: 05/27/85 TIME: 10:36

DATE: 00/00/00

DATE: 00

DATE: 05/27/85
TIME: 10:40:58

M E R I C H E M C O M P A N Y
=====

PAGE:

LABORATORY REPORT

MATERIAL: (MC985) 98.5% META CRESOL

TANK:

ASSAY NO: 9-17-14

BATCH NO: 05271030

CUSTOMER P030003

DIAZ CHEMICAL

VEHICLE: 2527-1698

SHIPMENT: A081810001

40 JACKSON STREET

LOAD DATE: 05/27/85

SHIP DATE: 05/27/85

HOLLY

NY 1447

PRODUCT PROPERTIES

=====

ORGANIC COMPOSITION BY GAS CHROMATOGRAPH: (S)

WT.%

O-CRESOL 0.1

P-CRESOL 0.4

M-CRESOL 99.0

O-ETHYLPHENOL 0.2

2,4- AND 2,5-XYLENOLS 0.3

TOTAL 100.0

TOTAL ALKS

=====

ANALYSIS BY: GK-HB-WES

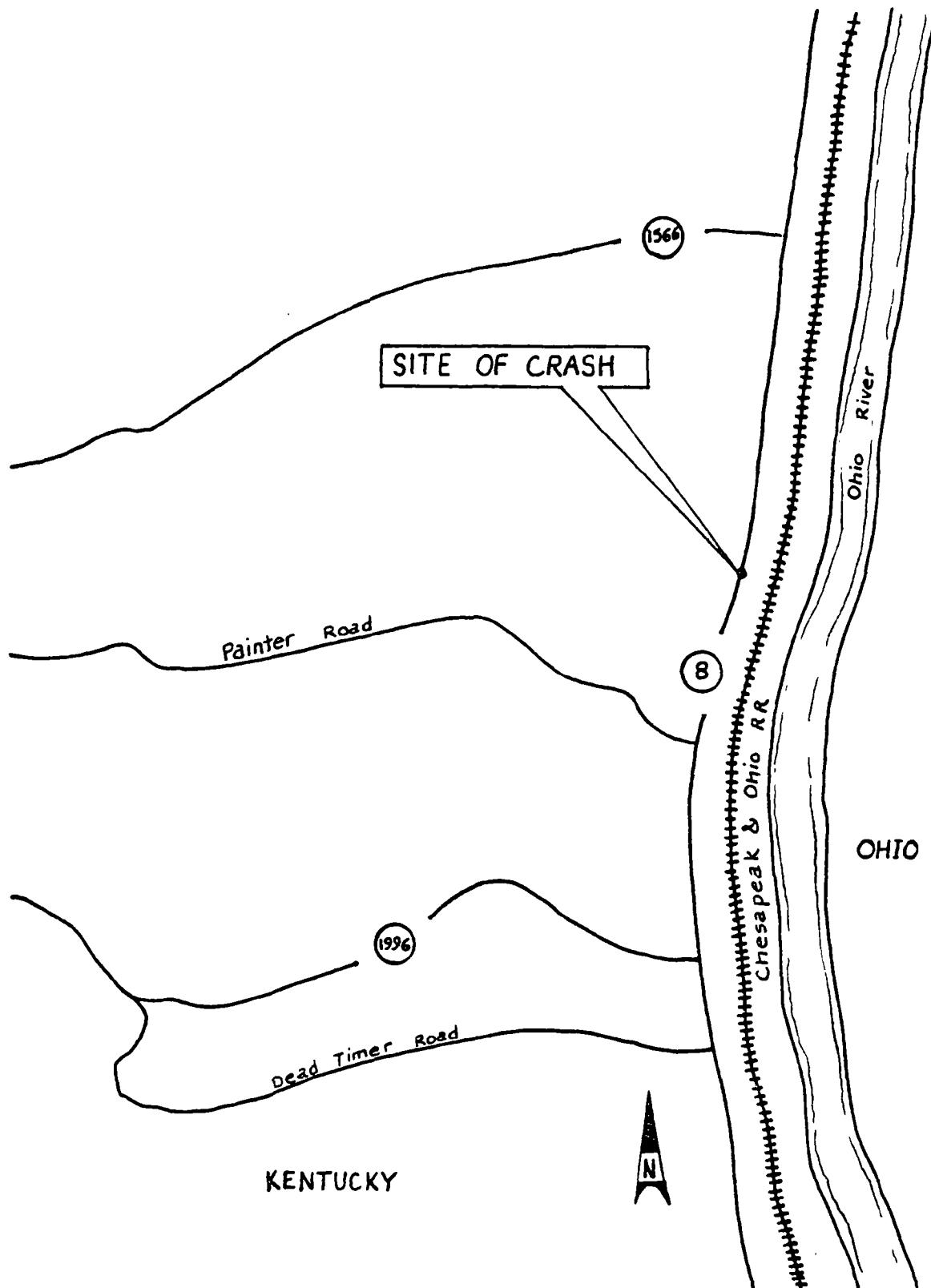
CHECKED BY:

APPROVED B

DATE: 05/27/85 TIME: 10:36

DATE: 00/00/00

DATE: 00.



GASOLINES: AUTOMOTIVE (<4.23g lead/gal)

GAT

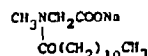
Common Synonyms Motor spirit Petrol		Watery liquid Floats on water. Flammable, irritating vapor is produced		Colorless to pale brown or pink Gasoline odor																																					
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.																																									
Fire		FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.																																							
Exposure		CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped give artificial respiration if breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.																																							
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.																																							
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability. Evacuate area. Disperse and flush.		2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3																																							
3. CHEMICAL DESIGNATIONS 3.1 CQ Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: (Mixture of hydrocarbons) 3.3 IMO/UN Designation: 31/1203 3.4 DOT ID No.: 1203 3.5 CAS Registry No.: Data not available		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to brown 4.3 Odor: Gasoline																																							
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective goggles, gloves. 5.2 Symptoms Following Exposure: Irritation of mucous membranes and stimulation followed by depression of central nervous system. Breathing of vapor may also cause dizziness, headache, and incoordination or, in more severe cases, anesthesia, coma, and respiratory arrest. If liquid enters lungs, it will cause severe irritation, coughing, gagging, pulmonary edema, and, later, signs of bronchopneumonia and pneumonia. Swallowing may cause irregular heartbeat. 5.3 Treatment of Exposure: INHALATION, maintain respiration and administer oxygen, enforce bed rest if liquid is in lungs. INGESTION, do NOT induce vomiting, stomach should be lavaged (by doctor) if appreciable quantity is swallowed. EYES, wash with copious quantity of water. SKIN, wipe off and wash with soap and water. 5.4 Threshold Limit Value: 300 ppm 5.5 Short Term Inhalation Limit: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD ₅₀ = 0.5 to 5 g/kg. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.25 ppm. 5.11 IDLH Value: Data not available.																																									
6. FIRE HAZARDS 6.1 Flash Point: -36°F C C 6.2 Flammable Limits in Air: 1.4%-7.4% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: None. 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 853°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 4 mm/min 6.10 Adiabatic Flame Temperature: Data not available. 6.11 Stoichiometric Air to Fuel Ratio: Data not available. 6.12 Flame Temperature: Data not available.																																									
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent. 7.7 Molar Ratio (Reactant to Product): Data not available. 7.8 Reactivity Group: 33.																																									
8. WATER POLLUTION 8.1 Aquatic Toxicity: 90 ppm/24 hr/Juvenile American shad/TL ₅₀ /fresh water 91 mg/1/24 hr/Juvenile American shad/TL ₅₀ /salt water 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 8%, 5 days. 8.4 Food Chain Concentration Potential: None.																																									
9. SHIPPING INFORMATION 9.1 Grades of Purity: Various octane ratings, military specifications. 9.2 Storage Temperature: Ambient. 9.3 Inert Atmosphere: No requirement. 9.4 Venting: Open (flame arrester) or pressure-vacuum.																																									
10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W																																									
11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid. 11.2 NAB Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>3</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>2</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>2</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>0</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table> 11.3 NFPA Hazard Classification: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>3</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>						Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0
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Reactivity (Yellow)	0																																								
12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 18°C and 1 atm: Liquid. 12.2 Molecular Weight: Not pertinent. 12.3 Boiling Point at 1 atm: 140-390°F = 60-199°C = 333-472°K. 12.4 Freezing Point: Not pertinent. 12.5 Critical Temperature: Not pertinent. 12.6 Critical Pressure: Not pertinent. 12.7 Specific Gravity: 0.7321 at 20°C (liquid). 12.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019-0.023 N/m at 20°C. 12.9 Liquid Water Interfacial Tension: 49-51 dynes/cm = 0.049-0.051 N/m at 20°C. 12.10 Vapor (Gas) Specific Gravity: 3.4. 12.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.054. 12.12 Latent Heat of Vaporization: 130-150 Btu/lb = 71-81 cal/g = 3.0 - 3.4 X 10 ⁴ J/kg. 12.13 Heat of Combustion: -18,720 Btu/lb = -10,400 cal/g = 435.1 X 10 ⁴ J/kg. 12.14 Heat of Decomposition: Not pertinent. 12.15 Heat of Solution: Not pertinent. 12.16 Heat of Polymerization: Not pertinent. 12.25 Heat of Fusion: Data not available. 12.26 Limiting Value: Data not available. 12.27 Reid Vapor Pressure: 7.4 psia.																																									
NOTES																																									

GAT	GASOLINES: AUTOMOTIVE (<4.23g lead/gal)
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F (estimate)	Temperature (degrees F)	Centipoise
45	48.270	10	.459	40	.909	48	.521
50	48.130	15	.482	50	.900	48	.514
55	48.000	20	.484	60	.891	50	.507
60	45.850	25	.487	70	.883	52	.500
65	45.710	30	.470	80	.874	54	.494
70	45.560	35	.472	90	.865	56	.487
75	45.400	40	.475	100	.856	58	.481
80	45.240	45	.478	110	.847	60	.475
85	45.080	50	.480	120	.838	62	.469
90	44.910	55	.483	130	.829	64	.463
95	44.750	60	.486	140	.821	66	.457
100	44.570	65	.488	150	.812	68	.451
105	44.390	70	.491	160	.803	70	.448
110	44.210	75	.494	170	.794	72	.440
115	44.030	80	.496	180	.785	74	.435
		85	.499	190	.776	76	.430
		90	.502			78	.424
		95	.504			80	.419
		100	.507			82	.414
		105	.510			84	.410
						86	.405
						88	.400
						90	.396
						92	.391
						94	.387
						96	.382

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		D A T A N O T A V A I L A B L E		N O T P E R T I N E N T		D A T A N O T A V A I L A B L E

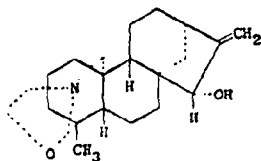
4205. Gardol®. *N-Methyl-N-(1-oxododecyl)glycine sodium salt; N-lauroyl sarcosine sodium salt; sodium N-lauroyl sarcosinate; Medialan LL-99.* $C_{13}H_{25}NNaO_3$; mol wt 293.39. C 61.41%, H 9.62%, N 4.77%, Na 7.84%, O 16.36%. Prepn: Jungermann et al. *J. Am. Chem. Soc.* **78**, 172 (1956).



Aq soln. *Medialan LL-33*.
LSE: Detergent, foaming agent, antienzyme for dentifrices: King. U.S. pat. 2,689,170 (1954 to Colgate-Palmolive)

4206. Garlic. *Allium*. Fresh bulb of *Allium sativum* L., *Liliaceae*. *Habit*. Central Asia, Southern Europe, U.S. *Constit*. Alliin, allacin, volatile and fatty oils, mucilage, albumin. LSE. As a spice and seasoning in foods.

4207. Garryine. $C_{11}H_{13}NO$; mol wt 183.49. C 76.92%, H 9.68%, N 4.08%, O 9.32%. From bark of *Garrya veatchii* Kellogg, *Garryaceae*, where it occurs together with veatchine and other alkaloids: Oneto, *J. Am. Pharm. Assoc.* **35**, 204 (1946); Wiesner et al. *Can. J. Chem.* **30**, 608 (1952). Structure: Wiesner et al. *J. Am. Chem. Soc.* **76**, 6068 (1954); Djerassi et al. *ibid.* **77**, 4801 (1955). Stereochemistry: Solo, Pelletier, *Chem. & Ind. (London)* 1960, 1108. Racemic syntheses and resolution: Masamune, *J. Am. Chem. Soc.* **86**, 290 (1964); Nagata et al. *ibid.* **89**, 1499 (1967); Guthrie et al. *Coll. Czech. Chem. Commun.* **31**, 602 (1966).



Monohydrate, crystals from dil acetone. Bitter taste, mp 74-82°. pK 8.70. $[\alpha]_D^{25} -84.23^\circ$ ($c = 1.44$ in ethanol). Sol in water, alcohol.

Hydrochloride, $C_{11}H_{13}NO \cdot HCl$, crystals from abs ethanol + ether, dec 263-268°. Soluble in water.

4208. Gasoline. Petrol (British); Benzin (German). A mixture of C_4 to C_{12} hydrocarbons. Natural gasoline, obtained by fractional distillation of petroleum contains mostly saturated hydrocarbons; but the ordinary commercial grades of motor gasoline contain paraffins, olefins, naphthenes, and aromatics, all in substantial concns. Motor gasolines are made chiefly by cracking processes, in which heavier petr fractions are converted into more volatile fractions by thermal or catalytic decompn. (Where petr is scarce, as in Germany, gasoline also has been made commercially by catalytic high-pressure hydrogenation of soft coal and by catalytic synthesis of hydrocarbons from carbon monoxide and hydrogen.) Most gasolines sold in the U.S.A. contain a minor proportion of tetraethyllead, which is added in concns not exceeding 3 ml per gallon of motor gasoline to prevent "knock" in engines in which the gasoline is used as fuel. Knock is the audible manifestation of an excessive rate of pressure rise when the gasoline vapor is ignited under compression in an engine. (The relative knocking tendencies of gasolines are measured in terms of "Octane Number," which is defined as the percentage of iso-octane, having "100 Octane No.," to be blended with *n*-heptane, having "0 Octane No.," by definition, in order to obtain the same degree of knock as is obtained with the gasoline being rated, under standard conditions in a standardized test engine.)

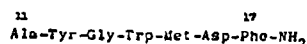
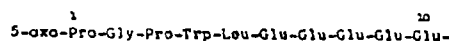
Commercial grades of tetraethyllead or Ethyl fluid typically contain about 63% tetraethyllead and about 35% ethylene dichloride or dibromide, which aids in evacuating the products of combustion of the lead compd from engines. In addition, the fluid contains a red or a blue dye. All leaded gasolines are dyed for recognition and should be used only as motor fuel. Other materials occasionally blended in gasoline to decrease knock, particularly in Europe, are benzene and ethanol. Comprehensive review: Lane, "Gasoline and

Other Motor Fuels" in Kirk-Othmer *Encyclopedia of Chemical Technology* vol. 10 (Interscience, New York, 2nd ed., 1966) pp 463-498.

Gasoline is a highly flammable, mobile liq with characteristic odor. It evaporates quickly. Flash pt about -50°F or -45°C . Explosive limits, vol % in air: lower 1.3, upper 6.0; sp gr 60/60°F: 0.72 to 0.76. Initial bp 39°C ; after 10% distilled bp 60° ; after 50% bp 110° ; after 90% bp 170° , final bp 204° . Insol in water; freely sol in abs alcohol, ether, chloroform, benzene. Dissolves fats, oils, natural resins.

USE: As fuel in internal combustion engines of the spark-ignited, reciprocating type. *Caution*: Ingestion causes irritation, vomiting, vertigo, fever, drowsiness, confusion, cyanosis, aspiration causes bronchitis or pneumonia. Inhalation causes intense burning in throat and lungs; possibly bronchopneumonia.

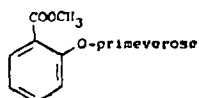
4209. Gastrins. Heptadecapeptide hormones isolated from the mucosal lining of the gastric antrum of various mammalian species. Highly potent gastric secretion stimulants first discovered in 1905 by J. S. Edkins: *Proc. Roy. Soc. London* **76B**, 376 (1905). Present in two forms, gastrin I and gastrin II, which are identical in amino acid sequence with the latter having sulfated tyrosine residues. There is relatively little sequence variation among various mammalian gastrins; all possess the same amino acid sequence in the biologically important C-terminal region.



human gastrin I

Structure of porcine gastrins: Gregory et al. *Nature* **204**, 391 (1964); human gastrins: Bentley et al. *ibid.* **209**, 583 (1966). Synthesis of porcine gastrin: Anderson et al. *ibid.* **204**, 933 (1964); human: Beacham et al. *ibid.* **209**, 583 (1966); human and canine: Agarwal, Kenner, *J. Chem. Soc. (C)* 1969, 2213; ovine: Agarwal et al. *ibid.* 954; feline: *idem*, *Experientia* **25**, 346 (1969). Review of chemical studies: Kenner, Sheppard, *Proc. Roy. Soc. London* **170B**, 89 (1968). Review of physiological advances: Gregory, *ibid.* **81**. General reviews: Sanders, Schimmel, *Am. J. Med.* **49**, 380 (1970); McGuigan, *Vitam. Horm. (New York)* **32**, 47-88 (1974).

4210. Gaultherin. 2-[(6-O- β -D-Xylopyranosyl- β -D-glucopyranosyl)oxy]benzoic acid; methyl salicylate-2-glucosyl- β -D-glucopyranoside; methyl salicylate-2-primeveroside; monotropitin; monotropitoside. $C_{19}H_{26}O_{11}$; mol wt 446.40. C 51.12%, H 5.87%, O 43.01%. In the wintergreen plant, *Gaultheria procumbens* L., in *Monotropa hypopitys* L., *Ericaceae* in *Betula lenta* L., *Betulaceae*, in *Spiraea ulmaria* L. and *S. filipendula* L., *Rosaceae*: Brdel, *Compt. Rend.* **177**, 642 (1923); 179, 991 (1924); 180, 1421, 1864 (1925); Brdel, Grillon, *ibid.* **187**, 609 (1928). Synthesis: Robertson, Waters, *J. Chem. Soc.* 1931, 1881. On hydrolysis with 3% H_2SO_4 gaultherin forms 1 mol methyl salicylate, 1 mol D-glucose and 1 mol D-xylose. Enzymatic hydrolysis gives methyl salicylate and primeverose (glucosyl-xylose).



Needles in star formation from 99% acetone. mp 180° . $[\alpha]_D^{20} -58^\circ$ ($c = 2$). Sol in water and alcohol, slightly sol in ethyl acetate, acetone; insol in ether.

Note: The older literature regards gaultherin as methyl-salicylate-D-glucoside.

Gaultherioside, $C_{19}H_{26}O_{10}$, ethyl primeveroside. mp 185° . $[\alpha]_D^{20} -58^\circ$. Gaultherioside forms glucose, xylose, and EtOH on hydrolysis with 3% H_2SO_4 .

FIRE OR EXPLOSION

Will burn. May be ignited by heat, sparks and flames.
Flammable vapor may spread away from spill.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.

HEALTH HAZARDS

Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away.
Stay upwind; keep out of low areas.
Isolate hazard area and deny entry.
Wear self-contained breathing apparatus and full protective clothing.
Isolate for 1/2 mile in all directions if tank or tankcar is involved in fire.
FOR EMERGENCY ASSISTANCE CALL CHEMTREC (800) 424-9300.
Also, in case of water pollution, call local authorities.

FIRE

Small Fires: Dry chemical, CO₂, water spray or foam.
Large Fires: Water spray, fog or foam.
Move container from fire area if you can do it without risk.
Stay away from ends of tanks.
Cool containers that are exposed to flames with water from the side until well after fire is out.
For massive fire in cargo area, use unmanned hose holder or monitor nozzles.
If this is impossible, withdraw from area and let fire burn.
Withdraw immediately in case of rising sound from venting safety device or discoloration of tank.

SPILL OR LEAK

No flames, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Use water spray to reduce vapors.
Small Spills: Take up with sand, or other noncombustible absorbent material, then flush area with water.
Large Spills: Dike far ahead of spill for later disposal.

FIRST AID

Move victim to fresh air; call emergency medical care.
If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.
In case of contact with material, immediately flush skin or eyes with running water or at least 15 minutes.
Remove and isolate contaminated clothing and shoes.

Disaster Hazard: When heated to decomp it emits acrid smoke and fumes.

GALLIUM(III) NITRATE (1:3)

CAS RN: 13494901 NIOSH #: LW 9625000
mf: $\text{N}_2\text{O}_5 \cdot \text{Ga}$; mw: 255.75

White, deliquescent crystals. mp: decomp @ 110° , bp: $-\text{Ga}_2\text{O}_3$ @ 200° .

TOXICITY DATA: 3

skn-mam 500 mg SEV
dnd-mam:lym 40 $\mu\text{mol/L}$
ori-mus LD50:4360 mg/kg
scu-mus LD50:600 mg/kg
ivn-hmn TDLo:7 mg/kg TFX:CNS
ivn-hmn TDLo:7 mg/kg TFX:GIT
ivn-hmn TDLo:144 mg/kg TFX:BLD
ipr-rat LD50:68 mg/kg
scu-rat LDLo:72 mg/kg
ipr-mus LD50:80 mg/kg

CODEN:

GISAAA 45(10),13,80
JCHODP 7,411,76
GISAAA 45(10),13,80
GISAAA 45(10),13,80
CTRRDO 62,1449,78
CTRRDO 62,1449,78
CTRRDO 62,1449,78
EQSSDX 1,1,75
INMEAF 12,7,43
EQSSDX 1,1,75

Reported in EPA TSCA Inventory, 1980.

THR: In humans it causes CNS problems; GIT effects and damage to blood. HIGH ipr, scu. See also gallium compounds.

Disaster Hazard: When heated to decomp it emits tox fumes of NO_2 .

GALOXOLIDE

S RN: 1222055 NIOSH #: GY 0790000
 $\text{C}_{18}\text{H}_{26}\text{O}$; mw: 258.44

SYN: 1,3,4,6,7,8-HEXAHYDRO-4,6,6,7,8,8-HEXAMETHYL-CYCLO-PENTA-GAMMA-2-BENZOPYRAN

TOXICITY DATA: 2

skn-rbt 500 mg/24H MOD

CODEN:

FCTXAV 14,659,76

Reported in EPA TSCA Inventory, 1980.

THR: MOD skn irr.

Disaster Hazard: When heated to decomp it emits acrid smoke and fumes.

GAS OIL

Yellow liquid. flash p: 150°F ; d: 1; lel = 6.0%; uel = 13.5%; autoign temp: 640°F ; bRange: 230° - 250° .

THR: Unk. See also kerosene.

Fire Hazard: Mod, when exposed to heat or flame.

Explosion Hazard: Mod, when exposed to heat or flame.

To Fight Fire: Foam, CO_2 , dry chemical.

Incomp: Oxidizing material.

GASOLINE (from 50-100 octane)

CAS RN: 8006619 NIOSH #: LX 3300000

Clear, aromatic, volatile liquid, a mixture of aliphatic hydrocarbons. flash p: -50°F ; d: <1.0 , vap. d: 3.0-4.0, ulc: 95-100, lel = 1.3%, uel = 6.0%, autoign. temp.: 66° - 853°F . bp: Initially 39° ; after 10% distilled = 60° ; at 50% = 110° ; after 90% = 170° ; final bp: 204° . sol in H_2O , freely sol in abs alc, ether, chloroform, benzene.

SYN: PETROL

TOXICITY DATA:

eye-man 500 ppm/1H MOD

eye-hmn 140 ppm/8H MLD

ihl-man TCLo:900 ppm/1H

TFX:CNS

ihl-mam LCLo:30000 ppm/5M

3-2

CODEN:

AEHLAU 1,548,60

JIHTAB 25,225,43

JIHTAB 25,225,43

AEPPAE 138,65,28

TLV: Air: 300 ppm DTLVS* 4,203,80. **Toxicology Review:** 27ZTAP 3,72,69. Reported in EPA TSCA Inventory, 1980.

THR: HIGH to MOD via inhal route. Repeated or prolonged dermal exposure causes dermatitis. Can cause blistering of skin. Inhal and via oral routes causes CNS depression. Pulmonary aspiration can cause severe pneumonitis. Some addiction has been reported to inhal of fumes. Even brief inhal of high conc can cause a fatal pulmonary edema. It can cause hyperemia of the conjunctiva and other disturbances of the eyes. The vapors are considered to be mod poisonous. If its conc in air is sufficiently high to reduce the oxygen content below that needed to maintain life, it acts as a simple asphyxiant. Gasoline is a common air contaminant. See mineral oils.

Fire Hazard: Dangerous, when exposed to heat or flame; can react vigorously with oxidizing materials.

Explosion Hazard: Mod, when exposed to heat or flame.

Disaster Hazard: Dangerous, in the presence of heat or flame.

To Fight Fire: Foam, CO_2 , dry chemical.

GASOLINE (100-130 octane)

Flash p: -50°F , autoign. temp.: 824°F , lel = 1.3%, uel = 7.1%.

Fire Hazard: Dangerous, via heat, flame or oxidizers.

To Fight Fire: Water spray or mist, CO_2 , dry chemical.

GASOLINE (115-145 octane)

Flash p: -50°F , autoign. temp.: 880°F , lel = 1.2%, uel = 7.1%.

Fire Hazard: See Gasoline (100-130 octane).

To Fight Fire: See Gasoline (100-130 octane).

For further information see Vol. 1, No. 8 of DPIM Report.

GASOLINE ENGINE EXHAUST "TAR"

NIOSH #: LX 3350000

TOXICITY DATA:

skn-mus TDLo:110 gm/kg/
69W-1:CARC

3

CODEN:

CANCAR 15,103,62

Toxicology Review: ACRSAJ 7,475,63.

THR: An exper CARC.

GEDUNIN

CAS RN: 2629110

mf: $\text{C}_{28}\text{H}_{36}\text{O}_7$; mw: 484.64

NIOSH #: WH 1318000

TOXICITY DATA:

scu-rat TDLo:1040 mg/kg/
65W-1:ETA

3

CODEN:

BJCAAI 20,134,66

INCIDENT MITIGATION AND TREATMENT METHODS

CLASS PROBLEM

I. INTRODUCTION

The compatibilities of hazardous materials are determined through controlled bench-scale experimentation. However, to minimize the number of trial and error mixture experiments, a safe approach is to first predict the possible reactions which may take place between specific compounds or classes of compounds.

II. OBJECTIVE

This exercise is designed to be used in conjunction with the EPA publication entitled "A Method for Determining the Compatibility of Hazardous Wastes." Participants should become familiar with the use of the compatibility scheme presented here. Participants should also gain an appreciation of the limitations associated with such schemes.

III. PROCEDURE

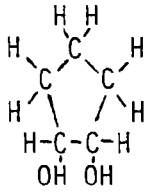
The reactions between materials of known origin, composition, or reactivity can generally be predicted by the method used here. The tables, charts, and appendices found in the manual, as well as other sources of information may be used to complete this exercise. Remember that when using this scheme, compatibility can only be predicted on a one-to-one basis with each constituent of each mixture. Synergistic or antagonistic effects cannot generally be anticipated.

IV. EXERCISES

- A. For the following materials, determine the Reactivity Group Number(s) (RGN) and Reactivity Group Name(s):

<u>Material</u>	<u>RGN</u>	<u>Group Name</u>
1. Nitric Acid	2	acid, mineral
2. Picric Acid (2,4,6 Trinitrophenol)	7	amine, aliphatic
(3) 3. Ethyl Benzoate ($C_2H_5COOC_6H_5$) $C_2H_5COOC_6H_5$	13	ester
4. Methyl Methacrylate	13, 103	

EXERCISE A - Continued

<u>Material</u>	<u>RGN</u>	<u>Group Name</u>
5. Styrene (Vinyl Benzene)	16, 28 103	Polymers/Plastic
6. cis-3,4 Cyclopentane diol	4	alcohol & Glycol
		
7. Peroxybenzoic Acid	30, 3	acid, organic

EXERCISE B For the following industries, determine the waste stream component, the RGN, and the group name:

<u>Industry</u>	<u>Waste Stream</u>	<u>RGN</u>	<u>Group Name</u>
1. Phenol Production			
<i>Benzene sulfonate → from cumene oxidation from chlorination benzene</i>		1, 96, 17, 101 31	

EXERCISE C What would be the result of mixing the following?

1. Potassium & Water	21 107 / 106	flammable gas / heat
2. Isopropyl Alcohol & Cresote	OK	
3. Strong Oxidizers & Refuse (organic)	heat - fire - gas	
4. Paint Sludge & Toluidine (all isomers)	everything and anything	

EXERCISE C - Continued

5. Calcium Hypochlorite & Kerosene

101

EXERCISE D The contents of two small storage tanks are to be transferred to a tank truck for off-site disposal. Given the contents of each tank, determine if any incompatible mixtures may result. Use the worksheet provided.

Waste Tank A

Benzaldehyde 5

Benzene 16

Styrene Monomer

Trichloroethylene 17

Waste Tank B

Propanol 29

Ammonium Nitrate 102

Aniline 7

WORKSHEET

Waste A _____

Source _____

Waste B _____

Source _____

Name of Waste
Evaluation _____

Date _____

<div> <div>WASTE A</div> <div>WASTE B</div> </div>		Reactivity Group No.					Name				
		Name					Reactivity Group No.				
							29				
							102				
							7				
	5	OK	OK	H							
	28, 103										
	16	/	/	/							
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INCIDENT MITIGATION AND TREATMENT METHODS

CLASS PROBLEM: NAMPA, ID

1. The groundwater aquifer underlying the city of Nampa, Idaho has been contaminated with a light petroleum-type material for a number of years. During certain times of the year, the water table is close to the ground surface resulting in these materials collecting in basement sumps and causing fumes to permeate buildings in the downtown area.

Using the information supplied (Table 1 and Nampa, Idaho map), design and carry out a groundwater study which will:

- a. Determine the direction of groundwater flow.
- b. Determine the extent of contamination of petroleum materials.
- c. Determine the possible source(s) of the contamination.

Approach

An approach to this study would be to:

1. Plot on the map the height of water in each test well from the piezometer readings (Table 1) and determine the direction of groundwater flow.
2. Determine (and plot) which wells indicate high, low, or no contamination.

MDE/EPA/1-85

ABBREVIATIONS USED ON MAP

A Trimbull Oil

B Townpump

C Sinclair

D Chevron

E Union

F Fleetway

G Ace Oil

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TABLE 1
DATA ON TEST WELLS

HOLE #	DATE DRILLED	LOCATION	DRILL LOG (ft)	ELEVATIONS	COMMENTS
1	7/20/81	NW corner of 1st St. S. and 14th Ave.	0-1 Asphalt & Concrete 1-3 Brown Silty Sand 3-12 Brown Sand - Medium 12-20 Coarse Sand & Fine Gravel	Top of Casing 2484.49' Depth of Water (7/30) 9.72 Water Table 2474.77	Nothing Observed 74.5 - 74.77 1-28
2	7/20/81	West side of 14th Ave. at alley between 1st St. S. and Front St.	0-1 Asphalt & Concrete 1-3 Brown Silty Sand 3-12 Brown Sand - Medium 12-20 Coarse Sand & Fine Gravel	Top of Casing 2482.46 Depth of Water (7/30) 8.12 Water Table 2474.34	Nothing Observed
3	7/21/81	Alley between 14th & 13th Ave. between 1st St. S. and Front St.	0-7 Asphalt & Fill 7-12 Sand, Brown & Silt 12-20 Sand & Fine Gravel	Top of Casing 2483.45 Depth of Water (7/30) 9.71 Water Table 2473.74	Gasoline odor. HNU Reading: 160 downhole 60 mud
4	7/21/81	40' west of alley that recovery sump is located on 13th Ave.	0-1 Asphalt 1-12 Brown Sand 12-20 Brown Sand & Fine Gravel	Top of Casing 2483.08 Depth of Water (7/30) 9.56 Water Table 2473.50	Gasoline odor. HNU - 150 down hole.
5	7/21/81	95' from F4 & 30' north of alley on 13th Ave. S. between 1st St. S. and Front St.	0-1 Asphalt & Fill 1-10 Fine Brown Sand 10-20 Sand & Fine Gravel	Top of Casing 2482.43 Depth of Water (7/30) 8.99 Water Table 2473.44	Slight smell. HNU - 2 in mud 6 in down hole.
6	7/21/81	Alley in block between 12th & 13th Ave behind 7 Seas Tavern.	0-5 Fill & Brick 5-12 Brown Sand 12-20 Sand & Gravel	Top of Casing 2483.05 Depth of Water (7/30) 9.86 Water Table 2473.19	Slight odor. HNU - 6 down hole.

WELL #	DATE DRILLED	LOCATION	DRILL LOG (ft)	ELEVATIONS	COMMENTS
7	7/21/81	SE corner of 13th Ave. S. and 1st St. S.	0-1 Asphalt 1-10 Brown Sand 10-20 Sand & Fine Gravel	Top of Casing 2483.88 Depth of Water (7/30) 9.93 Water Table 2473.95	Dark sand with gasoline odor. HNU > 200 in mud 130 down hole
8	7/22/81	On 1st St. S. at alley between 13th & 14th Ave.	0-1 Asphalt 1-15 Brown Sand 15-20 Fine Sand & Gravel	Top of Casing 2484.45 Depth of Water (7/30) 10.21 Water Table 2474.24	Smell of gasoline. HNU - 130 down hole.
9	7/22/81	On 1st St. S. between 14th & 15th Ave. in middle of street.	0-1 Asphalt 1-14 Brown Sand 14-20 Fine Sand & Gravel	Top of Casing 2485.70 Depth of Water (7/30) 10.06 Water Table 2475.64	No odor.
10	7/22/81	14th Ave. & 1st St. S. SE corner.	0-1 Asphalt 1-12 Brown Sand 12-20 Black Gravel & Sand	Top of Casing 2485.77 Depth of Water (7/30) 10.50 Water Table 2475.27	Strong smell of fuel oil. HNU - 150 in mud 50 down hole
11	7/21/81	14th Ave. between 1st and 2nd St. by Consumer's Market driveway.	0-1 Asphalt 1-10 Gray Sand Dark gray to black 10-20 Coarse Sand	Top of Casing 2487.25 Depth of Water (7/30) 11.92 Water Table 2475.33	Fuel oil smell. HNU > 200 in mud 120 down hole
12	7/23/81	Alley between 1st & 2nd in block between 13th & 14th Ave. S.	0-1 Asphalt and Fill 1-15 Brown Silty Sand 15-20 Brown Sand	Top of Casing 2487.95 Depth of Water (7/30) 13.01 Water Table 2474.94	Nothing observed.

HOLE #	DATE DRILLED	LOCATION	DRILL LOG (ft)	ELEVATIONS	COMMENTS
13	7/23/81	NE corner of 14th Ave. S. and 2nd St. S.	0-1 Asphalt 1-25 Brown Sand	Top of Casing 2491.56 Depth of Water (7/30) 16.03 Water Table 2475.53	Clean
14	7/23/81	Alley midway between 1st & 2nd St., block between 14th & 15th Ave. S.	0-1 Asphalt 1-15 Gray Sand 15-20 Gray Sand & Silt	Top of Casing 2488.25 Depth of Water (7/30) 12.20 Water Table 2476.05	Gasoline odor. HNU - 200 in mud.
15	7/23/81	Entrance to alley on 2nd St. S. between 14th & 15th Ave. S.	0-1 Asphalt 1-8 Brown Silty Sand 18-20 Brown Sand & Gravel 21-25 Sand	Top of Casing 2490.94 Depth of Water (7/30) 14.91 Water Table 2476.03	Clean
16	7/23/81	NE corner of 2nd St. S. and 15th Ave.	0-1 Asphalt & Fill 1-15 Brown Silty Sand 15-20 Fine Sand & Gravel	Top of Casing 2489.59 Depth of Water (7/30) 11.99 Water Table 2477.60	HNU - 5 in mud 8 down hole
17	7/23/81	N end of alley in block between 2nd & 3rd St. S. and 15th & 16th Ave. S.	0-1 Fill 1-20 Brown Coarse Sand	Top of Casing 2489.19 Depth of Water (7/30) 10.75 Water Table 2478.44	Clean
18	7/23/81	Alley about midway between 1st & 2nd in the block between 15th & 16th Ave. So.	0-1 Fill 1-10 Brown Sand 10-13 Silty Sand 13-20 Coarse Sand	Top of Casing 2487.33 Depth of Water (7/30) 9.75 Water Table 2477.58	Clean

HOLE #	DATE DRILLED	LOCATION	DRILL LOG (ft)		ELEVATIONS	COMMENTS
19	7/24/81	West side 15th Ave. S. between 1st & 2nd about ¼ block north of 2nd St. S.	0-1 1-12 12-20	Asphalt & Fill Silty Sand Black Sand (Oily)	Top of Casing 2488.14 Depth of Water (7/30) 11.31 Water Table 2476.83	HNU - 100 ppm down hole
20	7/24/81	West side of 15th about midway between 1st & 2nd St. S. (Back of curb)	0-3 3-10 10-20	Fill Brown Sand & Silt Coarse Sand	Top of Casing 2487.30 Depth of Water (7/30) 10.75 Water Table 2476.55	Clean
21	7/24/81	North corner at inter- section of 2nd St. S. & 15th Ave. S.	0-1 1-12 12-20	Asphalt & Fill Brown Sand Coarse Gray Sand	Top of Casing 2489.74 Depth of Water (7/30) 12.68 Water Table 2477.06	Oily
22	7/24/81	North side of 2nd St. S. at entrance to alley in block between 15th & 16th Avenue.	0-1 1-12 12-20	Asphalt Brown Sand Coarse Gray Sand	Top of Casing 2488.66 Depth of Water (7/30) 10.68 Water Table 2477.98	Clean
23	7/24/81	South corner of intersection of 15th Ave. at 2nd St. S.	0-1 1-8 8-20	Asphalt Brown Sand & Silt Coarse Sand & Silt	Top of Casing 2489.54 Depth of Water (7/30) 11.56 Water Table 2477.68	Clean
24	7/24/81	Behind American Legion in parking lot. About ¼ block N of 2nd (in alley).	0-1 1-12 12-20	Gravel Brown Sand Coarse Sand	Top of Casing 2488.96 Depth of Water (7/30) 11.26 Water Table 2477.70	Clean

HOLE #	DATE DRILLED	LOCATION	DRILL LOG (ft)	ELEVATIONS	COMMENTS
25	7/25/81	S. 15th Ave. 50' from 1st St. on west side.	0-1 Asphalt & Gravel 1-12 Brown Sand 12-20 Coarse Sand & Fine Gravel	Top of Casing 2485.14 Depth of Water (7/30) 9.36 Water Table 2475.78	Clean - water heard running into hole.
26	7/25/81	150' from 1st St. on S. 13th Ave., east side between 1st St. S. & 2nd St. S.	0-3 Asphalt & Concrete 3-7 Brown Sand 7-20 Brown Silt	Top of Casing 2486.70 Depth of Water (7/30) 12.43 Water Table 2474.27	Clean
27	7/25/81	25' N. of 1st St. on 15th Ave, west side.	0-1 Asphalt 1-7 Brown Sand 7-20 Brown Silt	Top of Casing 2484.32 Depth of water(7/30) 8.92 Water Table 2475.40	Odor, but not fuel. HNU - 15 down hole.
28	7/25/81	150' N. of 1st St. on 15th Ave, west side.	0-1 Asphalt & Gravel 1-12 Light Brown Sand 12-20 Coarse Sand	Top of Casing 2483.53 Depth of Water (7/30) 8.89 Water Table 2474.64	Negative
29	7/25/81	End of 15th Ave. 300' N. of 1st St. S., west side.	0-1 Gravel 1-20 Brown Sand	Top of Casing 2482.70 Depth of Water (7/30) 8.90 Water Table 2473.80	Negative
30	7/27/81	1st St. S. at NE corner of Wall Street.	0-1 Asphalt 1-8 Brown Sand 8-12 Silty Sand 12-20 Coarse Sand	Top of Casing 2484.33 Depth of Water (7/30) 10.93 Water Table 2473.40	Negative

HOLE #	DATE DRILLED	LOCATION	DRILL LOG (ft)	ELEVATIONS	COMMENTS
31	7/27/81	Across street from Zip Inn Lounge on Wall St. about 2/3 block south of Front St. in parking lot.	0-1 Asphalt 1-2 Light Sand 2-8 Dark Sand Encountered a basement floor. 8-14 Dark Sand 14-20 Gray Sand	Top of Casing 2483.10 Depth of Water (7/30) 10.04 Water Table 2473.06	Odor 120 HNU reading down hole.
32	7/27/81	Front St. at foot of 13th Ave. S.	0-2 Asphalt 1-4 Brown Sand 4-20 Silty Sand	Top of Casing 2481.17 Depth of Water (7/30) 7.94 Water Table 2473.23	Negative
33	7/27/81	Front St. at foot of Wall St.	0-1 Asphalt 1-4 Brown Sand 4-20 Silty Material	Top of Casing 2481.74 Depth of Water (7/30) 8.90 Water Table 2472.36	Negative
34	7/27/81	Front St. at foot of 12th Ave. S.	0-1 Asphalt 1-20 Coarse Sand	Top of Casing 2482.57 Depth of Water (7/30) 10.21 Water Table 2472.36	Strong Odor
35	7/27/81	12th Ave 150' south of Front St. on east side.	0-1 Asphalt 1-20 Coarse Sand	Top of Casing 2482.42 Depth of Water (7/30) 9.86 Water Table 2472.56	Odor
36	7/27/81	East side of 12th Ave S. about midway between Front and 1st St. S.	0-1 Asphalt 1-5 Silty Sand 5-20 Coarse Sand	Top of Casing 2484.03 Depth of Water (7/30) 11.13 Water Table 2472.90	Strong Odor Black, stained sand.

OLE #	DATE DRILLED	LOCATION	DRILL LOG (ft)		ELEVATIONS	COMMENTS
37	7/27/81	1st St. S. and 12th Ave., NE corner.	0-1	Asphalt	Top of Casing 2484.92	Negative
			1-5	Brown Sand	Depth of Water (7/30) 11.84	
			5-20	Coarse Sand	Water Table 2473.08	
38	7/27/81	Front St. 25' east of alley between 11th & 12th Ave. S., north side of street.	0-1	Asphalt	Top of Casing 2482.93	Black, stained sand 10-11 feet.
			1-3	Silty Sand	Depth of Water (7/30) 10.85	Odor
			3-20	Coarse Sand	Water Table 2472.18	
39	7/28/81	Front St. on east side of 11th Ave S.	0-1	Asphalt	Top of Casing 2483.84	Oily sand - lighter than other holes on Front Street.
			1-3	Silty Brown Sand	Depth of Water (7/30) 11.85	
			3-20	Coarse Sand	Water Table 2471.99	
40	7/28/81	Alley between 11th Ave. S. and 12th Ave, midpoint between Front & 1st St. S.	0-1	Asphalt	Top of Casing 2484.09	Negative
			1-20	Coarse Sand	Depth of Water (7/30) 10.21	
					Water Table 2472.36	
41	7/29/81	Front St. about 100' west of 11th Ave. underpass.	0-1	Asphalt	Top of Casing 2484.91	Clean
			1-20	Sand, Medium Brown	Depth of Water (7/30) 13.48	
					Water Table 2471.43	
42	7/29/81	About midway in alley between Front & 1st in block between 10th & 11th Ave. S.	0-1	Asphalt	Top of Casing 2486.02	Well encountered coarse sand, stained black and having odor of stove oil.
			1-15	Sand & Silt, Brown	Depth of Water (7/30) 13.36	
			15-20	Sand, Black Stained Coarse	Water Table 2472.66	

HOLE #	DATE DRILLED	LOCATION	DRILL LOG (ft)	ELEVATIONS	COMMENTS
43	7/29/81	1st St. at entrance to alley between 10th & 11th Ave. S., north side.	0-1 Asphalt 1-3 Sand, Fine Gray 3-12 Silt & Fine Gray Sand 12-15 Sand, Gray to Brown 15-20 Sand, Coarse Brown	Top of Casing 2485.16 Depth of Water (7/30) 12.65 Water Table 2472.51	Negative
44	7/29/81	East side of 10th Ave. S. about midway between Front and 1st Street.	0-1 Asphalt 1-12 Silt & Brown Sand 12-20 Sand, Medium Brown	Top of Casing 2485.12 Depth of Water (7/30) 13.23 Water Table 2471.89	Negative
45	7/29/81	North side of 1st St. S. at corner of 10th Ave. S.	0-1 Asphalt 1-15 Silt & Sand, Brown 15-20 Sand & Fine Gravel, Gray	Top of Casing 2484.51 Depth of Water (7/30) 12.35 Water Table 2472.16	Slight odor of gasoline.
46	7/30/81	Northwest corner of 15th Ave at 3rd St. S.	0-1 Asphalt 1-18 Sandy Clay 18-25 Clay	Top of Casing 2490.34 Depth of Water (7/30) 11.34 Water Table 2479.00	Negative
47	7/30/81	North side of 3rd St. S. about 20' west of alley in block between 15th and 16th Avenue.	0-1 Asphalt 1-20 Sandy Clay	Top of Casing 2489.99 Depth of Water(7/30) 10.13 Water Table 2479.86	Negative
48	7/30/81	Northeast corner of 16th Ave and 3rd St. S.	0-1 Asphalt 1-20 Sandy Clay	Top of Casing 2488.86 Depth of Water (7/30) 7.11' Water Table 2481.75	Negative

E #	DATE DRILLED	LOCATION	DRILL LOG (ft)		ELEVATIONS	COMMENTS
49	7/30/81	Center of 1st St. S. at alley in the block between 18th & 19th Ave S.	0-1 1-20	Asphalt Sandy Clay	Top of Casing 2489.10 Depth of Water (7/30) 11.01 Water Table 2478.09	Negative
51	7/30/81	Parkway at southeast corner of Front St. and 10th Ave S.	0-1 1-20	Fill Silt and Sand	Top of Casing 2485.99 Depth of Water (7/30) 14.65 Water Table 2471.34	Negative
52	7/30/81	North side of Front St. near mid block between 13th & 14th Ave.S.	0-1 1-20	Asphalt Silt and Sandy Brown	Top of Casing 2481.03 Depth of Water (7/30) 7.26 Water Table 2473.77	Negative
57	6/30/81	18th Ave N and Railroad St.			Top of Casing 2479.22 Depth of Water (7/31) 4.86 Water Table 2474.36	Constructed by Southwest Idaho Health District.
58	6/30/81	16th Ave N and 1st St N beneath overpass.			Top of Casing 2475.27 Depth of Water (7/31) 3.28 Water Table 2471.99	
51	7/28/81	West side of railroad property 150' north of tracks. 100' east of 11th Ave underpass.	0-1 1-20	Gravel Coarse Sand & Silt	Top of Casing 2482.49 Depth of Water (7/30) 12.15 Water Table 2470.34	Negative

HOLE #	DATE DRILLED	LOCATION	DRILL LOG (ft)	ELEVATIONS	COMMENTS
N2	7/28/81	RR property 150' east of FN1	0-1 Topsoil 1-6 Fill, Stone 6-12 Clay 12-20 Coarse Sand & Clay	Top of Casing 2482.94 Depth of Water (7/30) 12.78 Water Table 2470.16	HNU - 15 down hole
N3	7/28/81	11th Ave. N, 1st N, SE corner just off pavement.	0-1 Gravel 1-5 Brown Sand 5-20 Coarse Sand	Top of Casing 2473.83 Depth of Water (7/30) 6.52 Water Table 2467.31	HNU - 6 down hole
N4	7/28/81	1st St. N 250' east of 11th Ave.	0-1 Asphalt 1-5 Brown Silty Sand 5-20 Coarse Sand	Top of Casing 2474.15 Depth of Water (7/30) 6.45 Water Table 2467.70	No HNU readings.
N5	7/28/81	1st St. N 150' east of 11th Ave.	0-1 Asphalt 1-6 Silty Brown Sand 6-20 Coarse Sand	Top of Casing 2474.29 Depth of Water (7/30) 6.85 Water Table 2467.44	Negative
N6	7/28/81	1st St. N 11th Ave northwest corner of intersection.	0-1 Asphalt 1-20 Silty Brown Sand	Top of Casing 2473.52 Depth of Water (7/30) 6.05 Water Table 2467.47	Negative
N7	7/29/81	1st St. 100' west of 11th Ave, north side of 1st St. N. North side of 1st St. No.	0-1 Asphalt 1-20 Silty Brown Sand	Top of Casing 2473.24 Depth of Water (7/30) 5.79 Water Table 2467.45	Negative

WELL #	DATE DRILLED	LOCATION	DRILL LOG (ft)	ELEVATIONS	COMMENTS
N8	7/29/81	1st St. N 200' west of 11th Ave, N., south side of 1st St. N.	Heavy Clay	Top of Casing 2473.35 Depth of Water (7/30) 6.35 Water Table 2467.00	HNU - 100 ppm
N9	7/29/81	1st St. N 200' east of 12th Ave N.	0-1 Asphalt 1-3 Silty Brown Sand 3-20 Coarse Brown Sand	Top of Casing 2474.24 Depth of Water (7/30) 5.89 Water Table 2468.35	Negative
N10	7/29/81	Alley between 11th N and 12th N 200' from 1st St. N.	Coarse Sand	Top of Casing 2473.51 Depth of Water (7/30) 6.44 Water Table 2467.07	Negative
N11	7/29/81	South of Goodyear Store vacant 1st in lot behind curb and sidewalk.	0-2 Silty Sand 2-20 Clay	Top of Casing 2471.53 Depth of Water (7/30) 5.03 Water Table 2466.50	Negative
N12	7/30/81	North side of Railroad St about 200' west of large drainage ditch. (to Indian Creek)	0-2 Fill 2-20 Silt and Sand, Brown	Top of Casing 2481.12 Depth of Water (7/30) 0.00 Water Table 2481.12	Negative Flowing artesian well about 30' north. Area is water logged.

Houston, Missouri PCP Incident

Class Problem

- INCIDENT: An above ground storage tank collapsed from its supports causing breach of the tank and subsequent discharge of a large amount of oil containing a high concentration of pentachlorophenol (PCP).
- LOCATION: Houston Chemical Co., 2-1/2 miles south of Houston, Mo.
- BACKGROUND: A representative of the Cairo Treating Plant of Houston Chemical Company in Houston, Missouri, called the EPA Regional Office at 8:30 a.m., June 18, 1979 to report a four-day-old spill of an estimated 15,000 gallons of oil and penta-chlorophenol (5% PCP by volume). This PCP/oil mixture is used by the Cairo Plant as a preservative in a wood treatment process. The initial spiller's report stated that the material had been contained by a dike and was being removed by a pump truck. The spiller reported no problem with the clean-up and no potential for the product to enter drinking water supplies.

At approximately 4:30 p.m., June 18, a Missouri Conservation Commission Agent called the Regional Spill Line and reported that an estimated 90% of the spilled product had escaped the plant containment structures and had been temporarily caught in a small farm pond, a tributary to Hog Creek and Big Piney River. The pond reportedly was covered with a layer of PCP/oil and had very little free board to prevent discharge if rain, which was predicted, occurred.

The threat of heavy rains and subsequent contamination of public drinking water supply (Big Piney River) mandated immediate action. On June 19, representatives of the U.S. Environmental Protection Agency (EPA); Coast Guard (USCG); Occupational Safety and Health Administration (OSHA); U.S. Food and Drug Administration (FDA); U.S. Army Corps of Engineers (USCE); Missouri Department of Health, Natural Resources, Conservation, and Highways; and a commercial clean-up contractor, met in Houston to determine the course of action to be followed to alleviate the threat to public health and the environment.

An early morning investigation revealed that the large storage tank (21,300 gallons) collapsed after being filled to capacity from a nearby mixing plant (see map). The west (front) end of the tank struck the ground, the drain valve and pipe sheared off causing continuous discharge. Total spillage was estimated at 15,000 gallons. The PCP/oil ran down a dirt driveway. Some of the material filled the holding pit behind the mixing facility and overflowed through a drain pipe and into a drainage ditch. The remainder of the mixture ran down the drive into the same drainage ditch. The PCP/oil ran down the ditch, through a culvert, under a side road, then through a culvert under U.S. Route 63 into a water catch basin. The material then traveled

underground approximately 75 feet, leaching into a 7/10 acre pond (roughly 250' X 122'). At the time of the investigation the pond was covered with a 1/2" layer of PCP/oil. Under high water conditions the water overflows the pond at the Northeast corner spillway, draining into Hog Creek, then to the Big Piney River. Further studies provided the following information:

- . There was a total fish kill in the pond.
- . The tank was located in an undiked area, at the top of the ridge to the west.
- . The pond is at a 20' lower elevation than the spill site.
- . The well located just south of the mixing facility was fouled by the PCP/oil.
- . There are a number of residential wells in the vicinity.
- . The average depth of the pond is 6.6'.
- . The average temperature is 68°F (20°C).

Representatives of the Missouri Department of Conservation and the U.S. Fish and Wildlife Service recommended a treatment level of 10 ppb in order to restore inhabitable conditions for aquatic life.

- TASK: (1) Develop a control and clean-up plan for this situation.
- (2) Using the information provided in the scenario and supplemental information solve the following problems:
- a. Determine the volume (gallons) of water in the farm pond.
 - b. Determine the volume (gallons) of spilled material on the surface of the pond.
 - c. Determine the percentage of the spilled material collected on the surface of the pond.
 - d. Determine the amount of PCP, in grams, in the pond water. What, if any, assumptions must you make to solve this problem?
 - e. Under laboratory conditions it has been determined that one brand of activated carbon has an adsorption capacity of 40 mg PCP/gm carbon. How much of this carbon is required to remove all the PCP in the water? Is this answer realistic? Why or why not?

CONVERSION FACTORS

1.06 qt/l
1 U.S. gallon = 0.1337 ft³
2.2 lb/kg
Sp. Gr. (PCP) = 1.978
Sp. Gr. (Oil) = 0.85

PCP Solubility: 14 mg/l
in H₂O @ 20°C

PENTACHLOROPHENOL SPILL NEAR HOUSTON, MO. - A FACT SHEET

A report of a "Penta" spill in Houston, Missouri, was received on the Environmental Protection Agency's Environmental Action Line, a toll-free telephone maintained in the Kansas City office. The information was immediately given to the Emergency Response Section.

Phenol is a compound produced from coal tar and is used in making explosives and synthetic resins. It is a strong corrosive poison. Pentachlorophenol is produced by mixing phenol with chlorine. It is used as a wood preservative to lengthen the life of structural wood products. It's sodium salts are widely used as pesticides.

Pentachlorophenol is toxic. A teaspoon to one ounce is a probable lethal dose to a 150 pound man. It causes contact dermatitis and is absorbed through the skin. Absorption and toxicity are increased by oils. The pentachlorophenol spilled in Houston was mixed with oil.

EPA was concerned about the chemical getting into drinking water supplies because ingestion causes lung, liver, and kidney damage.

EPA got involved when conversations with the spiller and a Missouri Conservation Commission agent revealed that the actions taken by the spiller were inadequate to protect public health.

The Regional Response Team was activated to evaluate the situation and determine if a Federal cleanup would be necessary to protect public health and environmental resources.

The Regional Response Team is composed of representatives from State and Federal agencies who can contribute to the identification of hazards and clean-up actions.

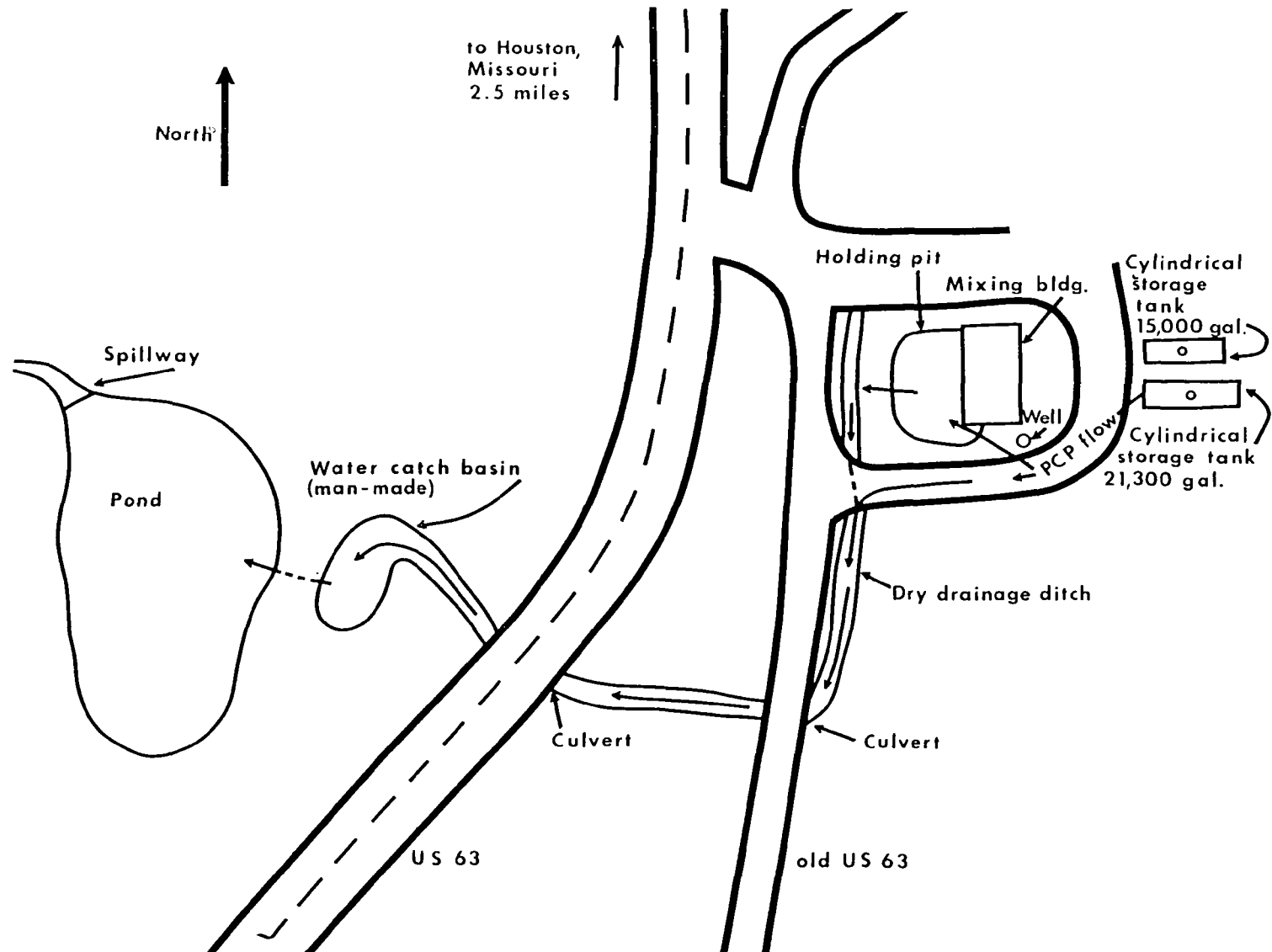
Federal and State involvement is recommended for spills from 10 pounds up. The Houston spill amounted to approximately 4,000 pounds.

The contaminated soil must be removed because the chemical will remain toxic for an indefinite period of time. Children playing in a spill area a year or more from now could suffer severe health effects from the mixture of oil and Pentachlorophenol which saturated the soil.

The contaminated soil will be disposed of in Bob's Home Service Landfill in Wright City, Missouri. This is an approved, permitted, hazardous waste disposal site.

If the spiller had provided for on-site spill retention, the cost of the cleanup would have amounted to approximately \$5,000. Without such precautions, the estimated clean-up cost is \$500,000.

Under the Clean Water Act, the spiller may be responsible for the costs incurred by the U.S. Government for the removal of the material.



Garland, Texas Derailment

CLASS PROBLEM

- INCIDENT: A train derailment involving approximately 5,500 gallons of styrene monomer from a punctured railcar.
- LOCATION: The derailment occurred in a residential area on the south side of Garland, Texas near the intersection of two heavily travelled roads.
- DATE: June 6, 1980
- SITUATION: Seven cars derailed. Three were empty boxcars and four were tankcars. One of the tankcars contained LPG, one contained transformer oil, and the two others contained styrene monomer. The cars containing LPG and transformer oil were righted without any significant discharge and removed from the site. One of the two styrene cars was upside down and leaked only minimally from its dome before it could be righted and removed. The other styrene car was punctured near the middle of the front bulkhead. The majority of the styrene was discharged from this car.

Although no fire erupted after the derailment, a hazard still existed. Vapors from the leaking styrene reached at least 20% of the lower explosive limit near the site. This, coupled with the hazards associated with rerailling the LPG car, prompted the local Civil Defense Director to initiate an evacuation of residents in the immediate vicinity of the derailment and those living in a downwind area affected by the styrene vapors. An estimated 12,000 people were temporarily displaced from their homes.

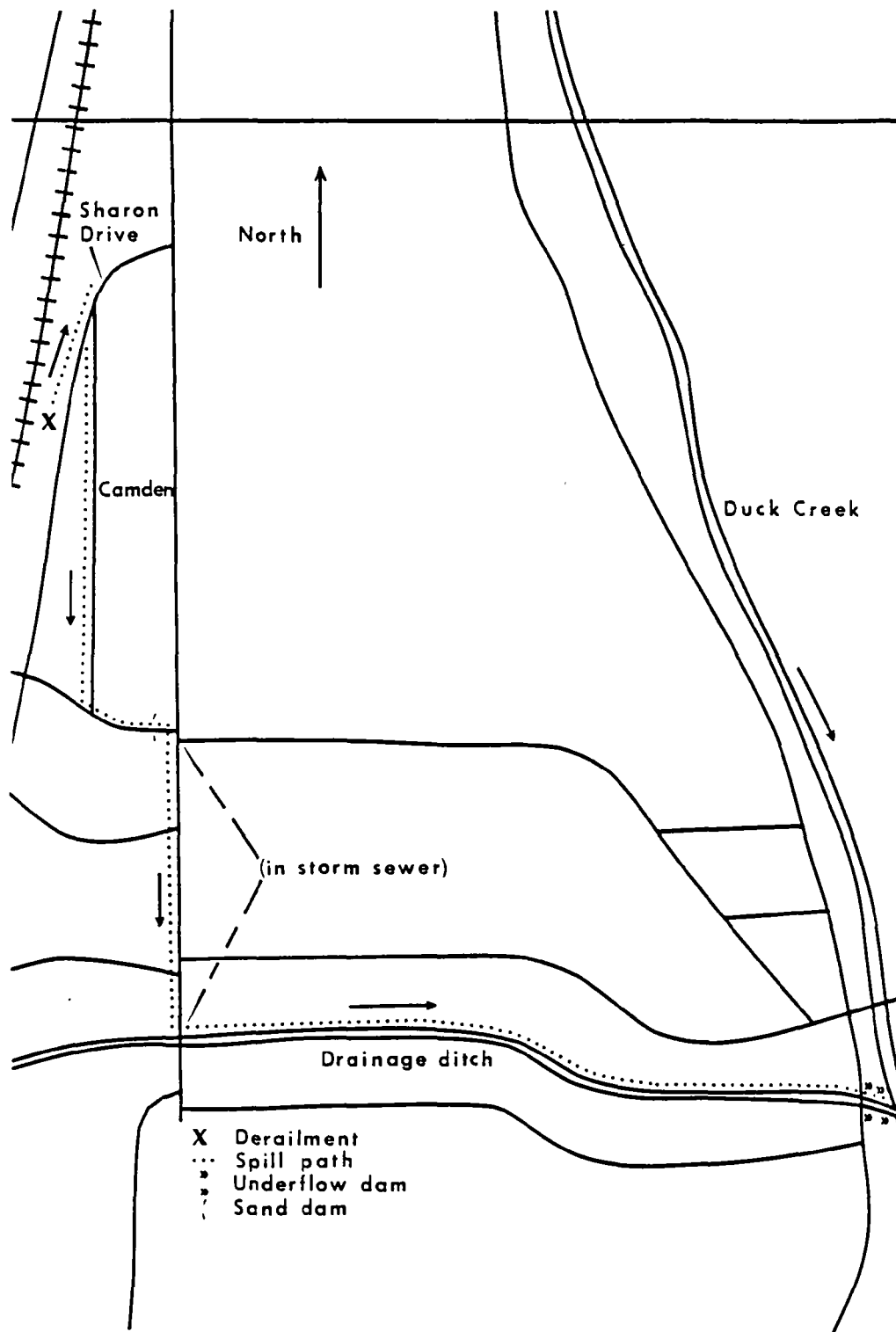
Before any attempts were made to re-rail the LPG car, the leaking styrene car was plugged by a contractor hired by the railroad. The Garland Fire Department doused the derailed cars to reduce vapor emissions and to keep the cars from becoming excessively heated by the mid-day sun. Although only 5,500 gallons of styrene was discharged, the additional 300,000 to 400,000 gallons of water used by the fire department magnified the problem. Some of this styrene-water mixture overflowed into the yards of adjacent residential lots. Much of the material flowed through the yards into the street where it entered into a storm sewer. The storm sewer eventually opened into a short drainage ditch that flowed into a creek.

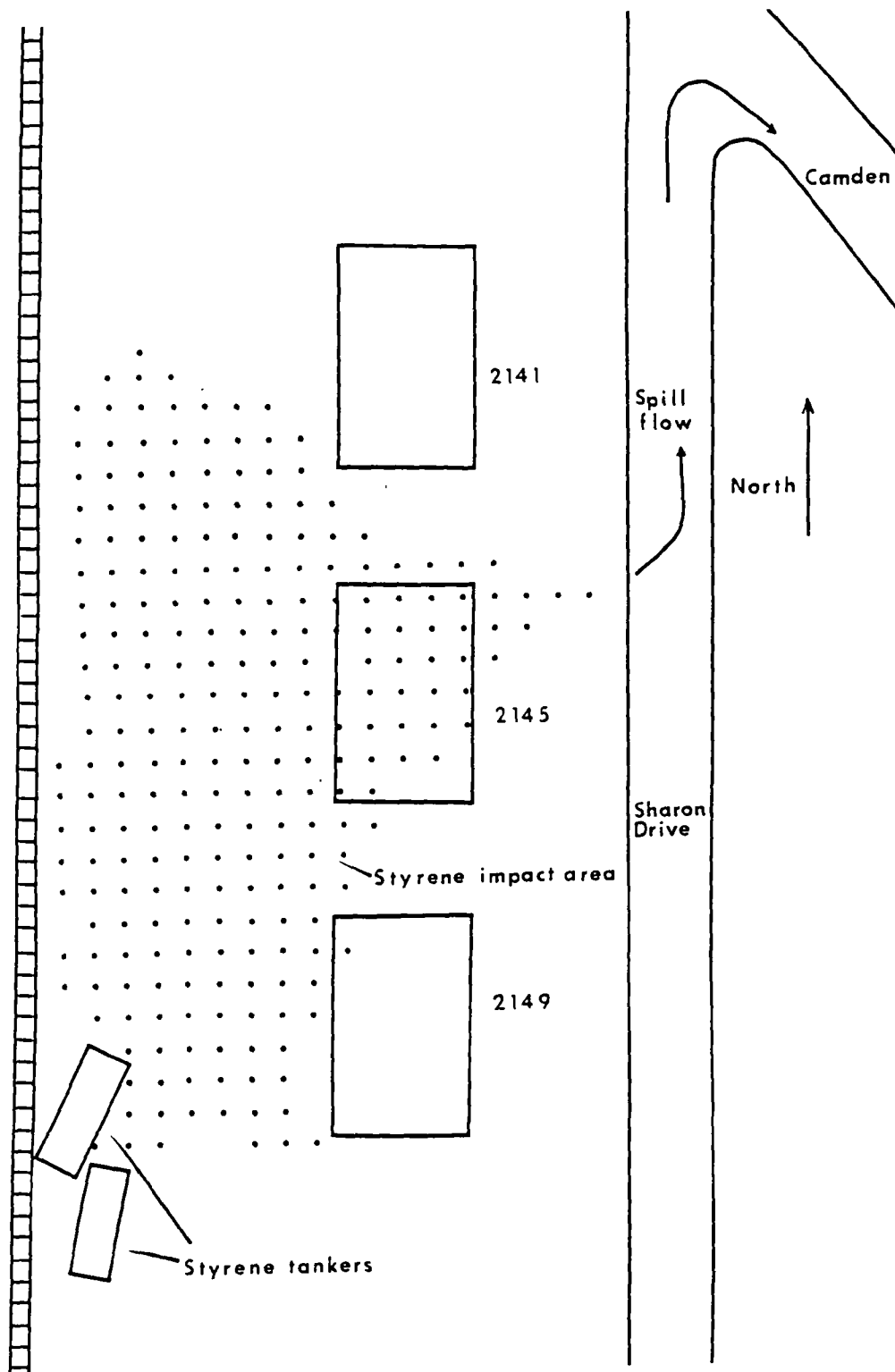
When the explosive hazard was thought to be minimal, the two remaining cars were righted, rerailed, and removed. By Monday, June 9, all but three of the evacuated families were permitted to return home. The three remaining homes at 2149, 2145, and 2141 Sharon Drive, still had significant styrene vapor concentrations inside the living quarters. These homes were most directly impacted by the run-off of styrene and water when the fire department hosed-down the derailed cars. The soil near the derailment and in the yards of the three homes was

saturated with styrene and water. Two of the homes were built on concrete slabs, so the water could not get underneath the houses. The third house, at 2145, was built on a pier and beam foundation, which allowed the crawl space to be soaked with styrene/water mixture.

In a meeting of railroad, federal, state, and city officials on Monday morning, June 9, it was agreed that further measures were required to handle this problem.

TASK: Define the hazards of the situation and determine what mitigative measures are necessary to remedy the problem.





PHENYL ETHYLENE. Syns: *vinyl benzene, styrene (monomer), cinnamene*. Colorless, refractive, oily liquid. $C_6H_5CHCH_2$, mw: 104.14, mp: -31° , bp: 146° , $l_{el} = 1.1\%$, $u_{el} = 6.1\%$, flash p: $88^\circ F$, d: 0.9074 @ $20^\circ/4^\circ$, autoign. temp.: $914^\circ F$, vap. d: 3.6, fp: -33° , ulc: 40-50.

Acute tox data: Inhal LC_{Lo} (human) = 10,000 ppm for $\frac{1}{2}$ hr; inhal TC_{Lo} (humans) = 600 ppm \rightarrow irr effects; inhal TC_{Lo} (humans) = 376 ppm \rightarrow CNS effects; inhal TC_{Lo} (women) = 20 mg/m³ \rightarrow glandular effects; oral LD_{50} (rat) = 5000 mg/kg; oral LD_{50} (mice) = 316 mg/kg; inhal LC_{Lo} (mice) = 10,000 ppm. [3]

THR = MOD via inhal and oral routes. It can cause irr, violent itching of the eyes, lachrymation, and severe human eye injuries. Its toxic effects are usually transient and result in irr and possible narcosis. It is not considered a very toxic material, because under ordinary conditions it does not vaporize sufficiently to reach a conc that can kill animals, such as rats and guinea pigs, in a few min. Exper have found that 10,000 ppm was dangerous to animal life in from 30-60 min, 2,500 ppm was dangerous to life in 8 hrs, while 1,300 ppm was the high amount which was found to cause no serious systemic disturbances in 8 hrs. However, all animals exposed to these amounts did evidence eye and nasal irr, while those exposed to 2,500 ppm or more showed varying degrees of weakness and stupor, followed by incoordination, tremors and unconsciousness. To produce this unconsciousness required 10 hrs at a conc of 2,500 ppm. From a study to determine the chronic effects of this material, it was discovered that rats exposed to 1,300 ppm for from 7-8 hrs/day, 5 days/week, for 26 weeks, showed evidence and definite signs of eye and nasal irr and appeared unkempt, though they made a normal gain in weight and presented no significant microscopic tissue changes or changes in the blood picture. Twelve rabbits exposed to 1,300 ppm for the same period of time showed similar results with one unexplained exception.

Fire Hazard: Dangerous, when exposed to flame, heat or oxidants.

Explosion Hazard: Reacts violently with chlorosulfonic acid, oleum, H_2SO_4 . [19]

Disaster Hazard: Dangerous, upon exposure to heat or flame; on decomp, emits acrid fumes; can react vigorously with oxidizing materials.

Treatment and Antidotes: Personnel who show symptoms of irr or beginning narcosis due to exposure to this material should be removed from exposure and the symptoms will disappear. If the symptoms persist, consult a physician.

To Fight Fire: Foam, CO_2 , dry chemical.

Source: *Dangerous Properties of Industrial Materials*

8657. Styrene. *Ethenylbenzene*; styrol; styrolene; cinnamene; cinnamol; phenylethylene, vinylbenzene. C_6H_5 , mol wt 104.14. C 92.26%, H 7.74%. $C_6H_5CH=CH_2$. Isolated from storax by Bonastre in 1831. Obtained from ethyl benzene by dehydrogenation or by chlorination and subsequent removal of hydrogen halide. Multistep synthesis starting with 1-phenylethanol and leading to polystyrene: Wilen *et al.*, *J. Chem. Ed.* 38, 304 (1961). When heated to 200° it is converted into the polymer, *polystyrene*, which is a clear plastic having excellent insulating properties even at ultra-high radio frequencies. Monograph: W. C. Teach, G. C. Kiessling, *Polystyrene* (Reinhold, New York, 1960). Reviews of styrene monomer and polymers: Boyer *et al.*, "Styrene Polymers" in *Encyclopedia of Polymer Science and Technology* vol. 13 (Interscience, New York, 1970) pp 128-447; Coulter *et al.*, "Styrene and Related Monomers" in *Vinyl and Diene Monomers* (part 2), E. C. Leonard, Ed. (Wiley-Interscience, New York, 1971) pp 479-576.

Colorless to yellowish, very refractive, oily liq; penetrating odor. On exposure to light and air it slowly undergoes polymerization and oxidation with formation of peroxides, etc. d_{20}^{20} 0.9059, fp -30.6° , bp $145-146^\circ$, n_D^{20} 1.5463. Sparingly sol in water; sol in alcohol, ether, methanol, acetone, carbon disulfide. LD_{50} orally in rats: 4.92 g/kg. *Toxic Substances List*, H. E. Christensen, Ed. (1973) p 885.

Polystyrene, *Dylene, Trycite*. Physical properties of unmodified polystyrene: d_{20}^{20} 1.04-1.065; n_D^{20} 1.60; water-clear solid plastic, begins to soften at about 85° . Dielectric constant at 100 megacycles: 2.4-2.65.

USE: Manuf plastics; synthetic rubber; resins; insulator. Caution: May be irritating to eyes, mucous membranes, and, in high concns, narcotic.

Source:

The Merck Index

styrene monomer (vinylbenzene; phenylethylene; cinnamene) $C_6H_5CH=CH_2$.

Properties: Colorless, oily liquid; aromatic odor. F.p. $-30.63^\circ C$; b.p. $145.2^\circ C$; sp. gr. (25/25 $^\circ C$) 0.9045; wt/gal (20 $^\circ C$) 7.55 lbs; flash point $88^\circ F$. Autoignition temp $914^\circ F$. Insoluble in water; soluble in alcohol and ether. Readily undergoes polymerization when heated or exposed to light or a peroxide catalyst. The polymerization releases heat and may become explosive.

Derivation: From ethylene and benzene in the presence of aluminum chloride to yield ethylbenzene, which is catalytically dehydrogenated at about $630^\circ C$ to form styrene.

Grades: Technical 99.2%; polymer 99.6%.

Containers: Glass bottles; carboys; steel drums; tank cars and tank trucks.


Hazard: Moderately toxic by ingestion and inhalation. Tolerance, 100 ppm in air. Flammable, moderate fire risk. Explosive limits in air 1.1 to 6.1%. Must be inhibited during storage. Safety data sheet available from Manufacturing Chemists Assn., Washington, D.C.

Uses: Polystyrene plastics; SBR, ABS and SAN resins; protective coatings (Styrene-butadiene latex; alkyds); styrenated polyesters; rubber-modified polystyrene; copolymer resins; intermediate

Shipping regulations: (Rail) Not listed. (Air) (inhibited) No label required; (uninhibited) Not acceptable.

Source:

The Condensed Chemical Dictionary

STY		STYRENE																																					
<div>Common Synonyms Styrol Vinybenzene Phenylethylene</div>		<div>Watery liquid Colorless to light yellow Sweet pleasant odor</div> <div>Floats on water. Flammable, irritating vapor is produced</div>																																					
<div>Avoid contact with liquid and vapor. Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Sweep discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</div>																																							
<div>Fire</div>		<div>FLAMMABLE CONTAINERS MAY EXPLODE IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Combat fires from safe distance or protected location. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</div>																																					
<div>Exposure</div>		<div>CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</div>																																					
<div>Water Pollution</div>		<div>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shrimps. May be dangerous if it enters water-intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</div>																																					
<div>1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - air contaminant Mechanical containment Should be removed Chemical and physical treatment</div>		<div>2. LABEL </div>																																					
<div>3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Phenethylene, Phenylethylene, Styrol, Styrene, Vinylbenzene 3.2 Coast Guard Compatibility Classification: Olefin 3.3 Chemical Formula: C₈H₈, CH=CH₂ 3.4 IMCO/United Nations Numerical Designation: 3.3/2055</div>		<div>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweet at low concentrations, characteristic pungent, sharp disagreeable</div>																																					
<div>5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air-supplied mask or approved canister, rubber or plastic gloves, boots, goggles or face shield 5.2 Symptoms Following Exposure: Moderate irritation of eyes and skin. High vapor concentrations cause dizziness, drunkenness, and anesthesia. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, keep warm and quiet, use artificial respiration if needed. INGESTION: do NOT induce vomiting, call physician, no known antidote. SKIN OR EYE CONTACT: flush with plenty of water, for eyes get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limit: 100 ppm for 30 min 5.6 Toxicity by Ingestion: Grade 2.1, D₅₀ 0.5 to 5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure, may cause secondary burns on long exposure. 5.10 Odor Threshold: 0.148 ppm</div>																																							
<div>6. FIRE HAZARDS 6.1 Flash Point: 93°F O.C., 88°F C.C. 6.2 Flammable Limits in Air: 1.1% - 6.1% 6.3 Fire Extinguishing Agents: Water, fog, foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. At elevated temperatures such as in fire conditions, polymerization may take place which may lead to container explosion. 6.7 Ignition Temperature: 914°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.2 mm/min</div>		<div>8. WATER POLLUTION 8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TLM/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 18% (theor.) 412 days 8.4 Food Chain Concentration Potential: None</div>																																					
<div>7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: May occur if heated above 150°F. Can cause rupture of container. Metal salts, peroxides, and strong acids may also cause polymerization. 7.6 Inhibitor of Polymerization: Tertiary-butylcatechol 10-15 ppm</div>		<div>9. SELECTED MANUFACTURERS 1. Amoco Chemicals Corp. 910 South Michigan Ave. Chicago, Ill. 60605 2. Dow Chemical Co. Midland, Mich. 48640 3. Monsanto Co. Monsanto Polymers & Petrochemicals Co. 800 North Lindbergh Blvd. St. Louis, Mo. 63166</div>																																					
<div>11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-T-U-Z</div>		<div>10. SHIPPING INFORMATION 10.1 Grade or Purity: 99.5+ % 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)</div>																																					
<div>12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation:</div> <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>3</td></tr><tr><td>Health</td><td></td></tr><tr><td> Vapor Irritant</td><td>2</td></tr><tr><td> Liquid or Solid Irritant</td><td>2</td></tr><tr><td> Poison</td><td>2</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td> Human Toxicity</td><td>1</td></tr><tr><td> Aquatic Toxicity</td><td>3</td></tr><tr><td> Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td> Other Chemicals</td><td>2</td></tr><tr><td> Water</td><td>0</td></tr><tr><td> Self-Reaction</td><td>3</td></tr></tbody></table> <div>12.3 NFPA Hazard Classifications:</div> <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>3</td></tr><tr><td>Reactivity (Yellow)</td><td>2</td></tr></tbody></table>		Category	Rating	Fire	3	Health		Vapor Irritant	2	Liquid or Solid Irritant	2	Poison	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	2	Water	0	Self-Reaction	3	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	2	<div>13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 104.15 13.3 Boiling Point at 1 atm: 293.4°F = 145.2°C = 418.4°K 13.4 Freezing Point: -23.1°F = -30.6°C = 242.6°K 13.5 Critical Temperature: 703°F = 373°C = 646°K 13.6 Critical Pressure: 80.0 atm = 39.46 atm = 4.00 MN/m² 13.7 Specific Gravity: 0.909 at 20°C (liquid) 13.8 Liquid Surface Tension: 32.14 dynes/cm = 0.03214 N/m at 19°C 13.9 Liquid-Water Interfacial Tension: 35.48 dynes/cm = 0.03548 N/m at 19°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.074 13.12 Latent Heat of Vaporization: 156 Btu/lb = 86.8 cal/g = 3.63 x 10³ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: -277 Btu/lb = -154 cal/g = -6.45 x 10³ J/kg</div> <div>(Continued on pages 3 and 6)</div>	
Category	Rating																																						
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Source: OHMTADS

- (1) Accession Number 7216911
- (2) CAS Registry Number: 100-42-5
- (3) SIC Code: 3255; 2821; 3644
- (4) Material Name: \$\$\$ STYRENE \$\$\$
- (5) Synonyms: STYROL, STYROLENE, CINNEMENE, DINNAMOL, PHENYLETHYLENE, VINYL BENZENE
- (7) Chemical Formula: C₆H₅CH:CH₂
- (8) Species in Mixture: 99% PURE
- (9) Common Uses: PLASTICS, RUBBER, RESIN, INSULATORS
- (10) Transport, Rail (%): 40.4
- (11) Transport, Barge(%): 1.7
- (12) Transport, Truck (%): 56.5
- (14) Containers: GLASS BOTTLES, 1- TO 5-GALLON CANS, 55-GALLON METAL DRUMS, TANK TRUCKS, TANK CARS, TANK BARGES.
- (15) General Storage Procedure: PROTECT AGAINST PHYSICAL DAMAGE. OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A STANDARD FLAMMABLE LIQUIDS STORAGE ROOM OR CABINET. STYRENE MONOMER VAPORS ARE UNINHIBITED AND MAY FORM POLYMERS IN VENTS OR FLAME ARRESTERS OF STORAGE TANKS, RESULTING IN STOPPAGE OF VENTS. THE MONOMER MUST BE CHECKED AT LEAST WEEKLY TO DETERMINE INHIBITOR AND POLYMER CONTENT IF THE MATERIAL IS BEING STORED FOR ANY PERIOD OF TIME IN EXCESS OF 30 DAYS AT 90 DEGREES FAHRENHEIT.
- (16) General Handling Procedure: FIRE HAZARD IS NOT GREAT, BUT SHOULD BE CAUTIONED AGAINST ANY IGNITION SOURCES NEAR HANDLING AREA.
- (17) Production Sites: AMOCO CHEMICALS CORP., TX; CITY, TX; BORG WARNER CORP. (MARCON CHEMICAL DIV.), BAYTOWN, TX; COSDEN PETROLEUM CORP., BIG SPRING, TX; DOW CHEMICAL CO., MIDLAND, MI; FREEPORT, TX; FOSTER-GRANT CO., INC., BATON ROUGE, LA; KOPPERS CO., INC., KOBUTA, PA; MONSANTO CO., TX; CITY, TX; ODESSA STYRENE CO., ODESSA, TX; SHELL CHEMICAL CO., TORRANCE, CA; SINCLAIR-KOPPERS CHEMICAL CO., HOUSTON, TX; SUNTIDE REFINING CO., CORPUS CHRISTI, TX; UNION CARBIDE CORP., CHEMICALS DIV., INSTITUTE, WV; SEADRIFT, TX.
- (19) Additive(%): TERT-BUTYLPYROCATECHOL
- (21) Corrosiveness: CORROSIVE TO COPPER AND COPPER ALLOYS
- (25) Detection Limit (Lab; Techniques, Ref) (ppm): .001, GC, (BNW 2801)
- (26) Standard Codes: EPA 311; NFPA - 2,3,2,P; NO ICC LABEL REQUIRED; SUPERFUND DESIGNATED (HAZARDOUS SUBSTANCES) LST.
- (27) Flammability: QUITE FLAMMABLE, COMBUSTION PROBABLE.
- (28) Flammability Limit(%), Lower: 1.1
- (29) Flammability Limit(%), Upper: 6.1
- (30) Toxic Combustion Prod.: HAZARDOUS - EMPLOY SELF-CONTAINED BREATHING APPARATUS.
- (31) Extinguishing Method: WATER MAY BE INEFFECTIVE. USE CO₂, CARBON TETRACHLORIDE, DRY CHEMICAL, WATER FOG OR FOAM.
- (32) Flash Point (C.): 32.2
- (33) Auto Ignition Point(C.): 490
- (34) Explosiveness: REACTIVE AT ELEVATED TEMPERATURES OR PRESSURES
- (35) Explosive limit(%), Lower: 1.1
- (36) Explosive Limit(%), Upper: 6.1
- (37) Melting Point (C.): -33
- 39) Boiling Point (C.): 145
- .41) Solubility (ppm @ 25C): 320

(43) Specific Gravity: .909
 (44) Vapor Pressure (mm Hg): 100
 (45) Vapor Pressure Text: 100 MM HG AT 82 DEGREES CELSIUS
 (46) Vapor Density: 3.6

49) Biochemical Oxygen Demand Text:

(Lb/Lb)	%Theo	Days	Seed	Method	Reference
< 1	18%	.412	ACTIVATED SLUDGE	TREATMENT PLANT	C10
< 1	11%	36		CO2 ANALYSIS	E86
> 1	65%	5	SEWAGE SEED	BOD	R118
> 1	65%	10	SEWAGE SEED	BOD	R118
> 1	78%	15	SEWAGE SEED	BOD	R118
> 1	87%	20	SEWAGE SEED	BOD	R118
< 1	8%	5	SEWAGE SEED	SALTWATER BOD	R118
< 1	12%	10	SEWAGE SEED	SALTWATER BOD	R118
< 1	21%	15	SEWAGE SEED	SALTWATER BOD	R118
> 1	80%	20	SEWAGE SEED	SALTWATER BOD	R118

(50) Persistency: BIODEGRADES SLOWLY. EXPOSURE TO AIR AND LIGHT CAUSES OXIDATION AND SUBSEQUENT FORMATION OF PEROXIDES.

(51) Potential for Accumulation: NEGATIVE

(58) Fresh Water Toxicity Text:

Conc.	Expos	Specie	Effect	Test Environment	Reference
(Hr)					
51	96	FATHEAD MINNOW	TLM	TEMPERATURE CON	E3
25.05	24-96	BLUEGILL	TLM	25 DEGREES	R202
				CELSIUS, SOFT	
22	96	BLUEGILL	TLM	TEMPERATURE CON	E3
56.73	24	FATHEAD MINNOW	TLM	25 DEGREES	R202
				CELSIUS, SOFT	
68	96	GOLDFISH	TLM	TEMPERATURE CON	E3
53.58	48	FATHEAD MINNOW	TLM	25 DEGREES	R202
				CELSIUS, SOFT	
68	96	GUPPY	TLM	TEMPERATURE CON	E3
46.41	96	FATHEAD MINNOW	TLM	25 DEGREES	R202
				CELSIUS, SOFT	
62.81	24-48	FATHEAD MINNOW	TLM	25 DEGREES	R202
				CELSIUS, HARD	
59.30	96	FATHEAD MINNOW	TLM	25 DEGREES	R202
				CELSIUS, HARD	
64.74	24-96	GOLDFISH	TLM	25 DEGREES	R202
				CELSIUS, SOFT	
74.83	24-96	GUPPY	TLM	25 DEGREES	R202.
				CELSIUS, SOFT	

(62) Salt Water Toxicity Text:

Conc.	Expos	Specie	Effect	Test Environment	Reference
(Hr)					
68	24	BRINE SHRIMP	TLM	STATIC	R118
52	48	BRINE SHRIMP	TLM	STATIC	R118

(64) Animal Toxicity Text:

Value	Time	Species	Param.	Route	Ref.
376		HMN	TCLO	INH	R1
PPM					
4920		RAT	LD50	ORL	P19.

(79) Major Species Threatened: WATERFOWL

(80) Taste Imparting Characteristics (ppm): .25

- (81) Taste Imparting Characteristics (Reference): (Q10)
- (82) Inhalation Limit (Value): 420
- (83) Inhalation Limit (Text): (MG/M3)
- (84) Irritation Levels (Value): 400
- 86) Direct Contact: ITCHING OF EYES, LACRIMATION
- (87) General Sensation: SWEET PLEASANT ODOR WHEN DILUTE. ODOR DETECTABLE AT .148 PPM IN AIR VAPOR PRESSURE 44 TIMES ODOR THRESHOLD; DISAGREEABLE ODOR AT HIGHER CONCENTRATIONS. (R63); ALDEHYDES OR PEROXIDES MAY FORM WHEN EXPOSED TO AIR, INCREASING SHARP ODOR. GOOD WARNING PROPERTIES. ANESTHETIC, ORAL INTAKE ACTS AS IRRITANT RATHER THAN POISON. 10,000 PPM DANGEROUS TO ANIMALS IN 1 HR., 2,500 PPM DANGEROUS TO LIFE IN 8 HOUR
- (88) Odor Threshold, Lower (ppm): .02
- (89) Odor Threshold, Lower (Reference): (E63)
- (90) Odor Threshold, Medium (ppm): .73
- (91) Odor Threshold, Medium (Reference): (E63)
- (92) Odor Threshold, Upper (ppm): 2.6
- (93) Odor Threshold, Upper (Reference): (E63)
- (108) Personal Safety Precautions: WEAR GOGGLES AND SELF-CONTAINED BREATHING APPARATUS. WHERE POOLS OF LIQUID ARE PRESENT, IMPERVIOUS OUTERWEAR SHOULD BE WORN.
- (109) Acute Hazard Level: LETHAL CONCENTRATION TO RATS IN AIR 2000 PPM. (D2) IRRITANT. MODERATELY TOXIC WITH INGESTION OR INHALATION. TOXIC TO FISH. LOW TASTE THRESHOLD. WILL PRODUCE SOME BOD.
- (110) Chronic Hazard Level: REPEATED EXPOSURE MAY CAUSE COMPOUNDED LOCAL PROBLEMS. RATS AND RABBITS EXPOSED TO 1300 PPM FOR 7-8 HOUR/DAY, 7 DAY/ WEEK FOR 26 WEEK SHOWED DEFINITE SIGNS OF EYE AND NASAL IRRITATION.
- (111) Degree of Hazard to Public Health: IRRITANT. MODERATELY TOXIC WHEN INGESTED OR INHALED. AMBIENT TEMPERATURES ARE USUALLY TOO LOW TO CAUSE SIGNIFICANT INHALATION THREAT.
- (112) Air Pollution: HIGH
- (113) Action Levels: NOTIFY FIRE AND AIR AUTHORITY. IF INTENSE HEAT PREVAILS, EVACUATE AREA. ENTER FROM UPWIND. REMOVE IGNITION SOURCES. ATTEMPT TO CONTAIN SLICK.
- (114) In Situ Amelioration: USE OIL SKIMMING EQUIPMENT AND SORBENT FOAMS ON SLICK. APPLY CARBON OR PEAT TO UNDISSOLVED PORTION. SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660.
- (115) Beach/Shore Restoration: PRODUCES ACRID FUMES ON BURNING.
- (116) Avail. of Countermeasure Material: OIL SKIMMING EQUIPMENT - STORED AT MAJOR PORTS; SORBENT FOAMS (POLYURETHANE) - UPHOLSTERY SHOPS; CARBON - WATER TREATMENT PLANTS, SUGAR REFINERIES; PEAT - NURSERIES, FLORAL SHOPS
- (117) Disposal Method: CAN BE BURNED UNDER CONTROL. CAN BLOW AIR THROUGH CONTAMINATED WATER AND BURN THE EXIT GASES.
- (118) Disposal Notification: LOCAL AIR AUTHORITY
- (119) Industrial Fouling Pot.: SLICK MAY REDUCE HEAT TRANSFER OR CAUSE HOT SPOTS OR SCALING. POSES RUPTURE HAZARD IF CONFINED WITH BOILER FEED OR COOLING SYSTEM WATERS.
- (121) Major Water Use Threatened: RECREATION, POTABLE SUPPLY, FISHERIES, INDUSTRIAL
- (122) Probable Location and State of Material: COLORLESS LIQUID. WILL FORM SLICK ON SURFACE AND SLOWLY DISSOLVE.
- 24) Water Chemistry: OXIDIZES AND FORMS PEROXIDES OR ALDEHYDES WITH PENETRATING ODOR WHEN EXPOSED TO AIR AND LIGHT. ELEVATED

TEMPERATURES CAN SPONSOR VIOLENT POLYMERIZATION. SUBJECT TO
BIODEGRADATION.

(125) Color in Water: COLORLESS

(126) Adequacy of Data: FAIR

Valley of the Drums, Kentucky

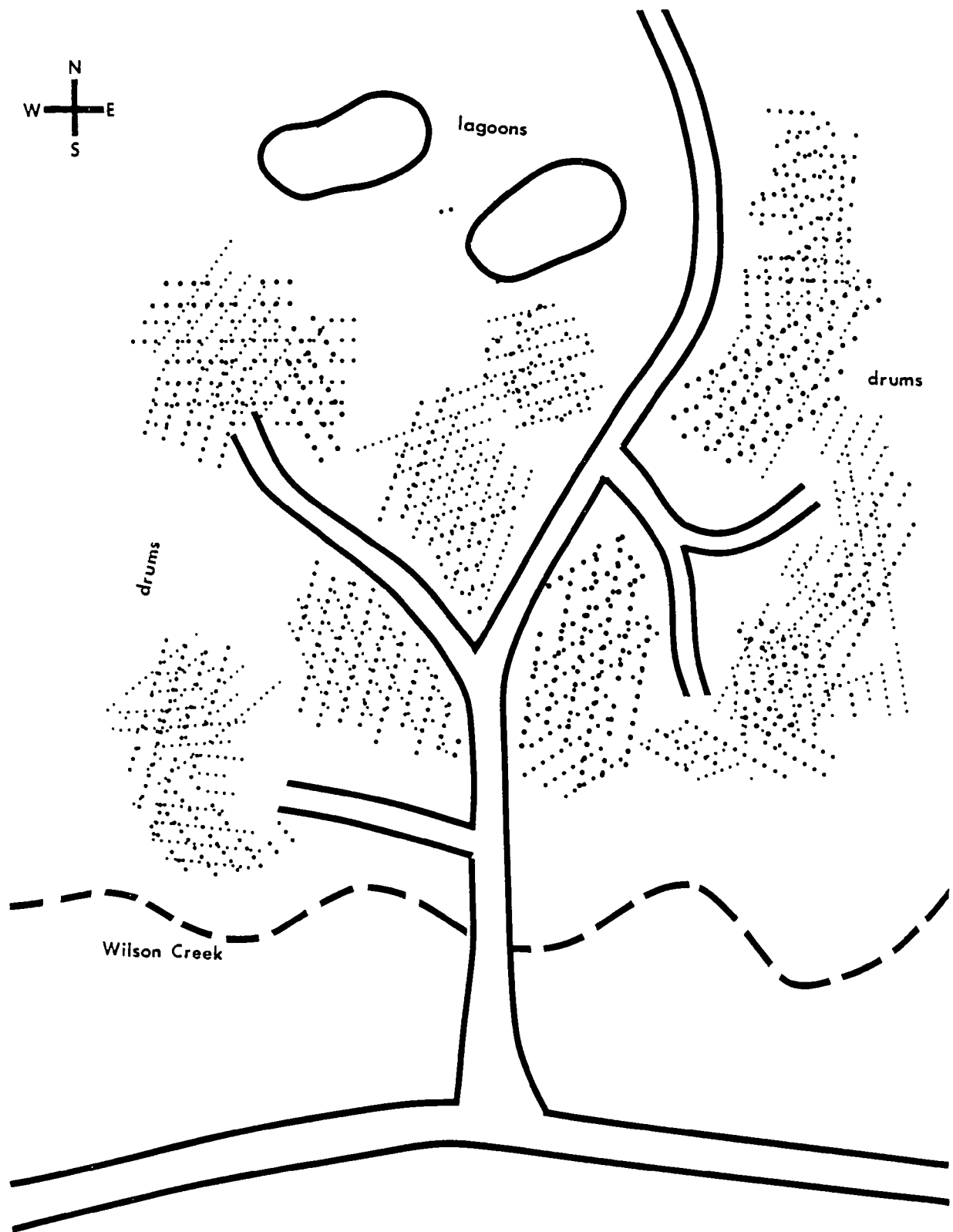
CLASS PROBLEM

- INCIDENT:** During the period from 1967 until 1978 an uncontrolled industrial waste disposal facility was operated in the knob region of Kentucky just south of Louisville. Presenting himself to area industries as a waste hauler and barrel recycler, the owner/operator of the site amassed over twenty-seven thousand drums of chemical waste at the location later to be known as the Valley of the Drums. In March of 1979, the EPA responded to a report that oil and chemical substances were draining from "the Valley" into adjacent surface waters.
- DESCRIPTION:** The site occupied an area of approximately ten acres in a small valley. Bordering the site to the north is an undeveloped section of Jefferson Memorial Forest; to the south is the L & N Golf Course; to the east and west are sparsely populated residential properties. Several homes are within 100 yards of the dump.
- The general slope of the land is to the southeast, where Wilson Creek absorbs run-off from the site. The site appears to be isolated from groundwater supplies by thick layers of clay and shale.
- The site consists of empty, partially empty, and full drums that had been dumped, piled, stacked or buried on the ten acre plot. Aerial photographs indicate approximately 18,000 drums on about six acres. Three areas containing buried drums were located. Company records of undetermined accuracy indicate Taylor received approximately 27,500 55-gallon drums. A number of these have obviously been emptied into two lagoons on site. The balance are presumed to be buried.
- The drums are in various stages of deterioration; bungs, plugs, and lids are missing. Drums are rusted out with gashes and cuts observed in many drums. Pools, ponds and streams of multi-colored material are observed on the ground and a variety of odors and stench perceived. Many empty or partially empty drums are observed in various stages of deterioration. Due to the March snow melt, visual contamination is apparent in Wilson Creek, a tributary to the Ohio River watershed.
- SITE INVENTORY:** Industrial records indicate that the majority of wastes at the site are paint and oil sludges, waste solvents and oils, and distillation bottoms. Analysis of water and sediment collected from various locations within the site have identified 142 distinct organic compounds. Out of these 142 compounds, 12 appear on the 311 designated hazardous substance list, 40 are included in the "Human Effect" section of the Registry of Toxic Effects, 27 are included in the "Carcinogenic Effects" section and 6 are in the "Teratogenic Effects" section of the Registry. Analysis of many samples from various locations showed the presence of heavy metals, specifically cadmium, chromium, mercury and lead.

Analysis of water and sediment samples in Wilson Creek, which drains the site, revealed the presence of 50 of the 142 organic compounds identified in the samples collected on the site. Among the organics, 2 PCB mixtures were found in fish and macroinvertebrates collected from Wilson Creek. Oil was also found in fish and macroinvertebrates collected from Wilson Creek. Oil was also found on the site although only small quantities were in the stream itself.

TASK:

1. Establish emergency containment and/or treatment measures in Wilson Creek downstream of the site.
2. Design a collection and treatment system for site runoff.
3. Propose remedial action at the site, in as many phases as seem necessary, to result in ultimate cleanup at the site.



POINT SOURCE DISCHARGE INTO WILSON CREEK
(Typical of Values Found Around Site)

<u>COMPOUND</u>	<u>AMOUNT</u>
2 - Butanone (methyl ethyl ketone)	14.79 ppm
2 Butanol	20.74 ppm
4 - Methyl, 2 Pentanone (methyl isobutyl ketone)	7.0 ppm
4 Methyl, 2 Pentanol	4.0 ppm
Toluene	0.5 ppm
2 - Hexanone (methyl butyl ketone)	0.2 ppm
Xylenes (ortho, meta, para)	1.0 ppm
Phenol	0.4 ppm