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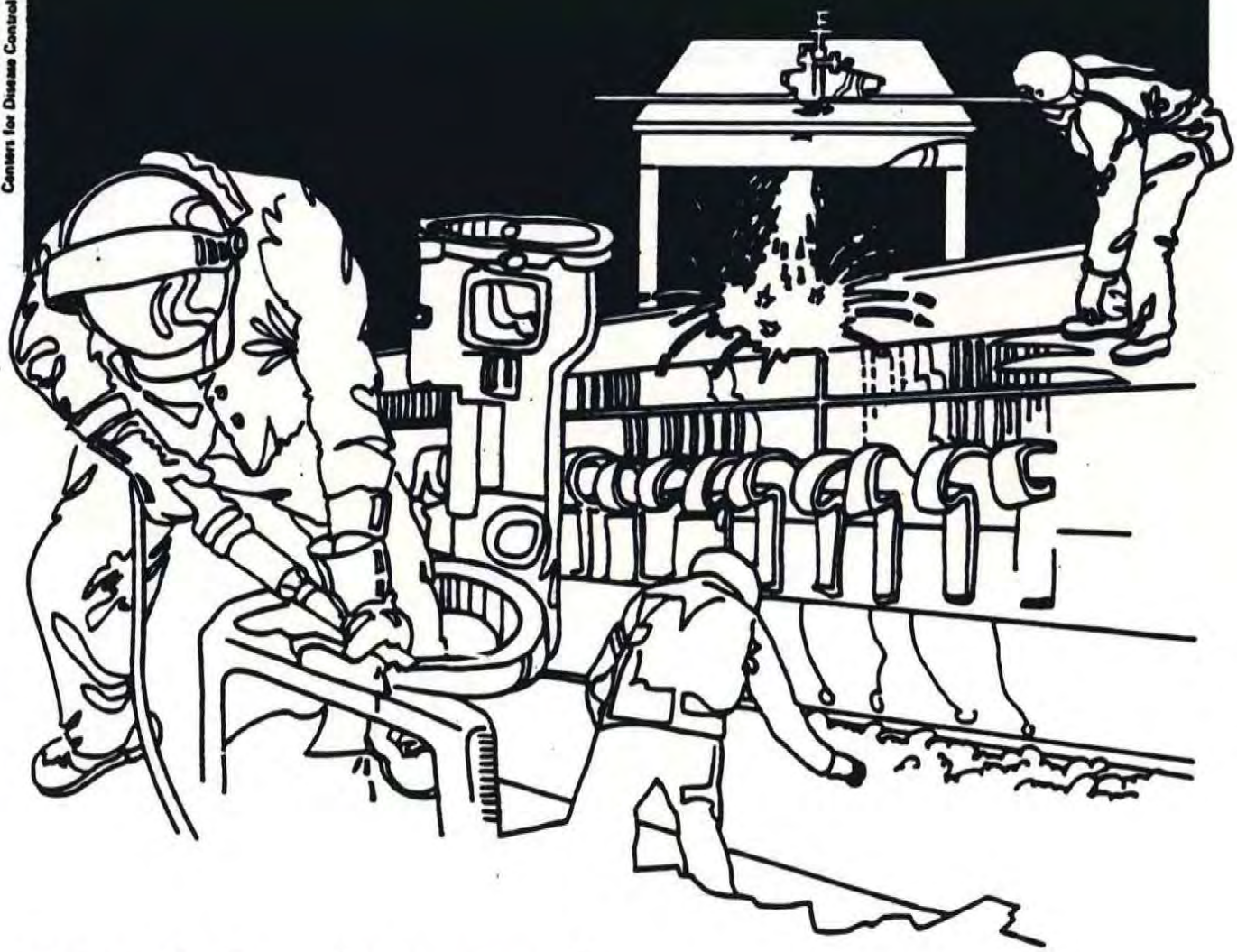
NIOSH



Health Hazard Evaluation Report

HETA 83-194-1779
DADE COUNTY FIRE DEPARTMENT
MIAMI, FLORIDA

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 83-194-1779
FEBRUARY 1987
DADE COUNTY FIRE DEPARTMENT
MIAMI, FLORIDA

NIOSH INVESTIGATORS:
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I. SUMMARY

In March 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation from the International Association of Fire Fighters (IAFF). The request concerned potential exposures to "hazardous waste" solvents allegedly used for starting "practice fires" at an aircraft fire training facility at the Opa-Locka Airport, Dade County Florida. NIOSH had been asked to assist with the identification of hazardous wastes found at the site, and to assess the potential for adverse health effects from exposures to these materials or their combustion products.

In response to this request, a NIOSH industrial hygienist met with representatives from the Metro-Dade County Fire Department (MDCFD), the IAFF, the Florida Department of Environmental Regulation, and the Dade County Health Department. At this meeting plans were discussed for removing hazardous materials from the training facility. Because the IAFF was concerned that site cleanup would begin before hazardous materials found on site could be identified, the NIOSH investigator agreed to review the results from the laboratory tests performed by the site cleanup contractor. To identify organic compounds and toxic heavy metals which may have contaminated the fire training site, NIOSH also analyzed a portion of all composite samples collected by the contractor.

Trace amounts of several common industrial solvents were identified from the laboratory analyses of the soil and ground-water samples taken from the burn pits, and from the accumulated water samples taken from open 55-gallon drums (previously used by the fire fighters to start practice fires). Pesticides and polychlorinated biphenyls (PCBs) were not detected. Only trace amounts of toxic heavy metals were detected. Qualitative analyses of composite samples taken from closed drums found mostly common organic solvents.

The practice of accepting solvents donated by waste handlers or local industries created a potentially hazardous situation for fire fighters with possible adverse effects to the surrounding environment. However, based on the above results, the NIOSH investigator concluded that adverse effects to the surrounding environment were apparently prevented by prompt and proper removal of hazardous wastes from the site by a qualified contractor. It was extremely difficult to assess the past health risks to fire fighters who may have used this facility or who opened and dumped drums of flammable materials to start practice fires. Flammable solvents should not be accepted for use in fire training exercises unless proper documentation certifying the composition and potential combustion products of these materials is provided.

KEYWORDS: SIC 9224 (Fire Protection), fire-fighters, hazardous waste, fire-training

II. INTRODUCTION

On March 15, 1983, the Safety and Health Coordinator for the International Association of Fire Fighters (IAFF) requested a NIOSH health hazard evaluation on behalf of IAFF Local 1403. Although no specific health complaints were reported, the IAFF was concerned that fire fighters may have been exposed to hazardous waste solvents allegedly used for starting "practice fires" at an aircraft fire training facility at the Opa-Locka Airport in Metro-Dade County, Florida. The IAFF wanted NIOSH to identify and characterize the hazardous materials found at the site, and to assess the potential for adverse health effects for fire fighters exposed to these materials or their combustion products.

On March 28, 1983 a NIOSH industrial hygienist visited the Opa-Locka training facility to obtain background information about the site and to discuss plans for a future site cleanup. On April 7, 1983, NIOSH submitted an interim report to the MDCFD and the IAFF, outlining NIOSH's preliminary findings and recommendations.

III. BACKGROUND

In response to an anonymous complaint, inspectors from the Dade County Department of Environmental Resources Management (DERM) visited the Opa-Locka Airport fire training site on February 1, 1983. At the site they found about sixty 55-gallon drums containing hazardous materials. Some of these drums were labeled "toluene", "methyl ethyl ketone", "hexane", and "kerosene." Fifteen drums were labeled "EPA Hazardous waste." Over 50 drums of other unknown materials, plus several drums of waste oil were also found. Many of the drums were lying horizontally and several were leaking onto the ground. A Captain from the Aviation Division, MDCFD told the DERM inspectors the drums had been discovered in January 1983, but that no decisions had been made to have the drums removed. The DERM inspectors informed the MDCFD that the drums posed a potential hazard to the surrounding environment. The MDCFD was ordered to stop using the site until the potentially dangerous materials were transported to an approved hazardous waste disposal site.

As part of their routine training program, the MDCFD had been conducting fire training exercises at the Opa-Locka site for the past four years. Contaminated aviation gas and jet fuel were the primary fuels used to generate these training fires. To start a fire, the burn pit, which also held an old aircraft fuselage, was flooded with water. Fuel was then sprayed onto the surface of the water from an underground storage tank, through one of two permanently installed spray nozzles. The floating fuel was then spiked with one or two drums of flammable solvent, and ignited with a flare. Firemen assisted with dumping of the drums by puncturing the top of the drums with an ax, and then pouring the contents into the burn pit. After a fire was started, it was immediately brought under control with water and then reignited. Firemen trained at the site twice

a year. The MDCFD estimated an individual fire fighter's cumulative exposure to smoke and heat from the training fires was less than ten minutes per year.

Drums of flammable solvents used to spike the fuel were normally donated by various local industries; however, these industries were not required to certify the contents of these drums. In some cases the donated solvents did not burn.

At the time of the NIOSH site visit on March 28, 1983, two hundred and fifty one 55-gallon drums of unknown materials were located at the training site. Eighty-eight drums were believed to contain only rain water collecting in empty drums left on site after firemen had opened and dumped their contents to start a fire. Fifteen drums, labeled as "EPA Hazardous Waste", had been previously labeled by DERM inspectors at a hazardous waste site cleanup of Gold Coast Oil, an industrial solvent reclaiming operation that was shut down because of repeated violations of environmental regulations involving the storage and transport of hazardous wastes. The remaining 148 drums were believed to also contain hazardous wastes. As many as 61 drums, those lying horizontally, were thought to have been brought on site by the solvent waste hauler who operated Gulf Coast Oil. Several of these drums showed signs of leaking. The grass was stained with various colors and some of the material had formed a hard paint-like crust. On February 18, 1983, a DERM inspector had numbered 151 drums of suspected hazardous wastes. The remaining drums were either empty or were thought to contain only water.

IV. EVALUATION DESIGN AND METHODS

On the morning of March 28, 1983, a NIOSH investigator met with representatives from the MDCFD, DERM, IAFF Local 1403, Dade County Health Department, Dade County Risk Management, and the Florida Department of Environmental Regulation. The purpose of the meeting was to discuss current conditions at the site and plans for site cleanup. Following the meeting, the NIOSH investigator visited the site and met with the Captain of the MDCFD Aviation Division. Accompanying the NIOSH investigator were the Safety and Health Coordinator for the IAFF, the President and the Treasurer of IAFF Local 1403, an industrial hygienist with the Dade County Health Department, and a representative from the Florida Department of Environmental Regulation. During the visit, photographs were taken and the MDCFD Aviation Division Captain explained how the site had become a depository for potentially hazardous industrial wastes.

In August 1983, a "Request for Proposals" (RFP) was prepared by DERM to contract for cleanup of the Opa-Locka Fire Training Facility. The RFP solicited bids for "the laboratory analyses and, if required, the removal, transportation and disposal of hazardous wastes by qualified, permitted firms, subject to the EPA regulations and in conjunction with NIOSH sampling procedures."

The IAFF was concerned that site cleanup would occur before NIOSH could identify the toxic materials contaminating the site or evaluate the potential health hazards for fire fighters who may have come in contact with these contaminants. To respond to this concern, NIOSH arranged to receive and review the cleanup contractor's laboratory test results. The cleanup contractor was required to collect and analyze soil and sub-surface samples for the 129 chemicals designated by the Environmental Protection Agency (EPA) as priority pollutants.[1] Also required was the analysis of liquids found in open drums which were assumed to contain only rain water. A composite sample of the water from the open drums was to be analyzed by NIOSH. In order to identify specific components for the remaining closed drums, NIOSH arranged to receive for analysis, portions of each composite sample to be collected by the contractor during their compatibility field tests. The contractor was also required to test all composite samples for polychlorinated biphenyls (PCBs).

In September 1983 the Chemical Conservation Corporation, from Orlando, Florida, began an assessment and cleanup of the site consisting of the following activities:

1. To collect soil and sub-surface water samples the contractor had four test wells drilled in the burn pit area. The wells were drilled to a depth of 10 feet in two-inch casings and then 5 gallons of water was pumped from each well. Using a hand powered bellows pump, 950 cubic inches of water was pumped from each well and placed in a glass container containing 0.5% nitric acid. In the laboratory the four samples were composited by equal volume. The composite sample was split, with one portion going to the NIOSH laboratory, and the other analyzed for EPA's 129 priority pollutants by the Paul R. McGinnes and Associates, Consulting Laboratories. This laboratory also ran a 129 priority pollutant analysis of the soil composited from the four test well cores.

2. Samples from the open drums, thought to contain rain water, were collected using established EPA methods. Up to 300 milliliters (mL) of liquid were drawn from each drum. The samples were visually inspected and classified by physical characteristics. Samples with similar classifications were composited in groups of eight. The samples were then transported to the McGinnes Laboratories and further composited into one sample which was split, with one portion sent to the NIOSH laboratory and the other retained by McGinnes for mercury analysis by atomic adsorption spectrophotometry.

3. Samples drawn from approximately 150 closed drums were visually inspected, classified, and composited in groups of 20. One fourth of the sample volume withdrawn was used for the composite. When necessary, sampling devices were cleaned with methyl ethyl ketone (MEK), isopropanol, and deionized water. The composite samples were then transported to the McGinnes Laboratories where a split sample from each of the 8 composite samples was sent to the NIOSH laboratory.

NIOSH analyzed by gas chromatography a portion (about 100 mL) of the composited well water sample and open drum water sample, and about 1-2 mL from each of the 8 composite samples taken from the closed drums. Selected samples were further analyzed for organic compounds by gas chromatography / mass spectrometry (GC/MS). NIOSH also analyzed these samples for trace metals by inductively coupled plasma - atomic emission spectrophotometry (ICP/AES). The results from the NIOSH analyses were shared with the Chemical Conservation Corporation and included in their report to the MDCFD during March of 1984.

Because training exercises were stopped at Opa-Locka in early 1983 after the hazardous materials drums were discovered, it was impossible for the NIOSH investigator to evaluate exposures to toxic combustion products from actual practice fires. To evaluate potential toxic chemical exposures for fire fighters who trained at the Opa-Locka facility, the investigation focused on the identification of environmental contaminants collected from the site during site cleanup operations. Chemicals which contaminated the site environment also posed a health threat to fire fighters working at the site. The best indicator of environmental contamination was the analytical results from the soil and water samples taken from the burn pit monitoring wells. The analysis of rain water collecting in open drums also gave an indication of the types of fuels previously used to start practice fires. Although not a likely source of exposure for fire fighters, the identification of compounds found in the closed drums was also obtained.

V. EVALUATION CRITERIA

According to available statistics, fire fighting is the most hazardous profession in the United States. Fire fighters face many health hazards including toxic chemical exposures from direct skin and eye contact, inhalation of a wide variety of toxic combustion products, as well as physical hazards of heat, cold, noise and falling objects. Air monitoring during 240 residential fires in Boston, which focused on a small fraction of the possible combustion products, found exposures exceeded occupational exposure limits for carbon monoxide, carbon dioxide, hydrogen cyanide, benzene, nitrogen dioxide, hydrogen chloride, and acrolein.[2]

Exposures to respiratory irritants such as acrolein, hydrogen, chloride, and nitrogen dioxide may lead to acute and chronic respiratory problems. Disability due to pulmonary disease has long been recognized as a potential work-related hazard for fire fighters.

There is an increasing concern about a fire fighter's exposures to carcinogens released from the combustion of synthetic materials. Carcinogens such as benzene or polynuclear aromatic compounds may be released by the burning of a wide variety of materials. Acrylonitril and other carcinogens may be released by the burning of plastics and other materials. Fire fighters must also respond to incidents such as chemical spills where exposures to carcinogenic chemicals may occur.

Unfortunately, little information is available on the cancer risk for fire fighters. Two mortality studies failed to show an increased risk, but the deaths in those studies may not have reflected the effects of more recent exposures. Several more recent studies have suggested an increased risk of: brain cancer among Washington fire fighters; brain, prostrate, colon, and lung cancer among Los Angeles fire fighters; and digestive tract cancers. Further studies are needed to better define these risks.

To put in proper perspective the significance of the health threat resulting from exposures to the contaminated burn pit soils, the laboratory results obtained from the soil samples were compared to the limits suggested by the EPA Carcinogen Assessment Group (CAG). The CAG has developed a table of relative carcinogenic potencies among 54 potential carcinogens.[3] Although these values were developed with cancer as the only toxicological concern, limits based on cancer risks are normally the most stringent. To estimate carcinogenic risks for soils containing known or potential carcinogens, the recommended limits were based on the CAG's potency index and action level of 1 ppm for 2,3,7,8-tetrachlorodibenzo-p-dioxin in residential soil.

VI. EVALUATION RESULTS AND DISCUSSION

A list of the chemical compounds identified by the NIOSH laboratory from the composite samples collected at the Opa-Locka cleanup operation is presented in Table 1. The chemicals identified from open drums of collected rain water may reflect the types of solvents previous used to start practice fires; however, several of the solvents listed in Table 1 are non-flammable. This would explain why some of the waste solvents fire fighters dumped in the burn pit failed to ignite. Dichlorobenzene was the only compound found in the open drums which has been designated as a suspect carcinogen.[4] Other potential carcinogens identified by the NIOSH laboratory included methylene chloride[5] and perchloroethylene.[6]

These are common industrial chemical which were only found in the composite samples taken from the closed drums. The contents of these drums had never been used to start a practice fire. Compounds identified from the water samples taken from the burn pit test wells included: various alkyl substituted benzenes, indane, methyl amyl ketone (MAK), methyl indane, methyl naphthalenes, tetrahydronaphthalene, naphthalene, and toluene. No pesticide, pesticide related compounds, or PCBs were detected in any of the closed drums of potentially hazardous materials.

Shown in Table 2 are the organic compounds found by the cleanup contractor's consulting laboratory in the test well soil and water samples. Only trace levels were found. Carcinogens detected included benzene, methylene chloride, and n-nitrosodiphyenylamine. Analysis was performed only for the organic compounds on EPA's list of 129 priority pollutants. The highest concentration for any contaminant found was 11.2 ppm of bis-2-ethylhexylphthlate (DEHP), a commonly used plasticizer of low toxicity. None of the potential carcinogens identified in the burn pit soil exceeded the CAG recommended limits.

Table 3 shows the relative concentrations of trace elements, including toxic heavy metals such as chromium, cobalt, and lead found by the NIOSH laboratory. These results are for the composite samples taken from open drums of collected rain water, test well sub-surface water, and closed drums of potentially hazardous wastes. As expected, the higher concentrations were found in the closed drums. Analysis of the composite water sample taken from the burn pit test wells indicated only low level contamination of the sub-surface water. The higher iron concentration in collected rain water was likely caused by the rusting 55-gallon drums. The lead content (5 ppm) in rain water taken from open drums was low. The estimated global average concentration for lead in lakes and rivers is 1-10 ppm.[7]

The consulting laboratory results for heavy metals testing of well water and soil samples is presented in Table 4. None of the potential carcinogens identified in the burn pit soil exceeded the CAG recommended limits. The highest concentration detected in the burn pit soil was 18 ppm lead. However, the lead content in normal garden soil averages 163 ppm.[8] Only trace amounts of other heavy metals were detected. These results agreed with the NIOSH investigator's finding that ground water under the burn pits was generally free of heavy metal contamination.

Based on the above results, it appears that adverse effects to the surrounding environment were prevented by prompt and proper removal of hazardous wastes from the site by a qualified contractor. However, it is extremely difficult to assess the past health risks to fire fighters who may have used this facility or who were involved in dumping drums to start practice fires.

The greater health hazard to fire fighters is from inhalation of the wide variety of combustion products that are produced from any practice fire. A study done by the University of Texas at a similar type facility found fires fueled by diesel oil generated aerosol concentrations as high as 300 mg/M^3 in the down wind smoke plume. Chemical analysis of the plume found a complex mixture of organics containing alkanes, polynuclear aromatic hydrocarbons, and other compounds.[9] Although not all constituents of the complex organic mixture were identified, GC/MS analysis confirmed the presence of several potential carcinogens, including benzofluoranthene, dibenzofluoranthene, and benzo(a)pyrene.[10]

VII. CONCLUSIONS

The practice of accepting solvents donated by waste handlers or local industries created a potentially hazardous situation for fire fighters and to the environment. Waste solvents should never be accepted unless proper documentation certifying the composition of these materials is provided. From the analysis of the composite samples collected by the site cleanup contractor, it appears that serious damage to the environment was prevented.

VIII. RECOMMENDATIONS

1. The practice of using unknown solvents to help start practice fires should be eliminated. If spiking with flammable solvents is required, the flammables should be purchased to help assure their composition and flammability.

2. Fire fighters should not be required to break open solvent drums with a fire ax. Spray and splashes directly in the face and eyes could occur, or clothing could become saturated causing latent skin irritation. A more automated delivery system for these spiking solvents should be devised, or fuel used for practice burns should be flammable enough to light easily without using spiking solvents.

3. Burn pits should be designed to contain the fuel and water to prevent contamination of the soil, surface water, and ground water.

4. Fire fighters should not enter the smoke plume unless properly protected with appropriate protective equipment and NIOSH approved self-contained breathing apparatus (SCBA) operated in a positive pressure mode.

5. Fire fighters should be given toxicity information on the contents and expected combustion products of any flammable materials used for starting or fueling practice fires. This should be done as part of the training exercise.

IX. AUTHORSHIP AND ACKNOWLEDGMENTS

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X. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Publications Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After ninety (90) days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati, Ohio address.

Copies of this report have been sent to:

1. International Association of Fire Fighters
2. International Association of Fire Fighters, Local 1403
3. Metro-Dade County Fire Department
4. U.S. Department of Labor, OSHA, Region IV
5. NIOSH Atlanta Region
6. Designated State Agencies

For the purpose of informing the "affected employees," the employer will promptly "post" this report for a period of thirty (30) calendar days in a prominent place(s) near where the affected employees work.

XI. REFERENCES

1. Section 307 (A)(1), 1977 Clean Water Act. (33 USC 466; Committee Print, H.R. 3199)

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9. Atlas E.I., Donnelly K.C., Giam C.S., McFarland A.R. Chemical and biological characterization of emissions from a fireperson training facility. American Industrial Hygiene Association Journal, 46(9): 532-540, 1985.

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TABLE 1

QUALITATIVE ANALYSIS RESULTS OF WASTE SOLVENT DRUMS

DADE COUNTY FIRE DEPARTMENT
AIRCRAFT FIRE TRAINING SITE
OPA LOCKA AIRPORT
METRO-DADE COUNTY, FLORIDA
HETA 83-194

DESCRIPTION OF COMPOSITE SAMPLES

OPEN DRUMS: Composite of ninety three 55-gallon drums found in the following conditions: (1) no cover of any form, (2) covered but inadequate or improper, (3) covered but no bung covering, (4) cover or sides punctured, (5) cover or sides rusted through. By visual inspection the durms were assumed absent of solvents through evaporation, were assumed to contain rain water, with several containing iron oxide particulates and sediments.

WELL WATER: Composite of 4 ground water samples (5-gallons each) pumped from test wells drilled (2-inch casings, 10 feet deep) in the burn pit area

DRUM SAMPLES: Composites of the contents of approximately 20 drums per sample drawn from closed drums containing suspected paint solvents, sludges, oils, and other flammable materials.

Sample S-1: possible paints, acetone, xylene, toluene
Sample S-2: possible paints, acetone xylene, toluene, heavy with sludges
Sample S-3: possible paints, acetone, xylene, toluene
Sample S-4: possible shellacs and solvents
Sample S-5: possible oils
Sample S-6: possible paints, acetone, xylene, toluene, with measurable water phase
Sample S-7 possible paints, acetone, xylene, toluene, with multiple clear colored phases
Sample S-8 possible paints, acetone, xylene, toluene

COMPOUNDS IDENTIFIED	OPEN D.	WELL	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8
acetone			x	x	x	x				
acetophenone	x							x		
2-butanol							x			
n-butanol	x						x		x	
2-butoxyethanol (butyl cellosolve)			x	x	x	x		x	x	x
2-butoxyethanol acetate			x	x	x	x				
n-butyl acetate			x	x	x	x			x	
2,6 di-t-butyl-p-cresol (BHT)							x			x
C8-C12 alkanes			x	x	x	x				
C8-C12 aliphatics/aromatics									x	
C9H12 alkyl subst. benzenes	x	x	x	x	x	x				
C10H14 alkyl subst. benzenes	x	x	x	x	x	x				
C10 and higher alaphatics										x

TABLE 1 CONTUINED

QUALITATIVE ANALYSIS RESULTS OF WASTE SOLVENT DRUMS

COMPOUNDS IDENTIFIED	OPEN D.	WELL	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8
chlorotoluene	x									
cyclohexanone			x	x	x	x		x		
diacetone alcohol	x								x	
dichlorobenzene*	x									
dioctylphthalate							x		x	x
ethanol			x	x	x					
2-ethoxyethanol (cellosolve)			x	x	x	x				
2-ethoxyethanol acetate								x	x	x
thyl amyl ketone	x									
heptane									x	
2-heptanol	x									
2-hexanol	x									
indane		x								
isobutanol			x	x	x	x	x		x	
isobutyl isobutyrate (IBIB)									x	x
isopropanol			x	x	x	x				
isopropyl acetate			x	x	x	x				
mesityl oxide	x							x		
methanol			x	x	x					
methyl amyl alcohol	x									x
methyl amyl ketone (MAK)	x	x						x	x	x
methyl butyl ketone (MBK)	x							x		x
methyl cyclohexane									x	
methyl ethyl ketone (MEK).			x	x	x	x		x	x	
methyl hexanes									x	
methyl indane		x								
methyl isobutyl ketone (MIBK)	x		x	x	x	x		x	x	x
methyl naphthalenes		x								
methylene chloride*			x	x	x	x				
naphthalene		x	x	x	x	x			x	
perchloroethylene*			x	x	x	x	x			
n-propyl acetate			x	x	x	x				
tetrahydronaphthalene		x								
toluene	x	x	x	x	x	x	x	x	x	x
1,1,1-trichloroethane	x		x	x	x	x				
trichloroethylene			x	x	x	x				
unresolved alaphatics (oil)							x			
xylenes	x		x	x	x	x	x	x	x	x

* = Potential Carcinogen

NOTE: All composite samples (S-1 through S-8) were screened for PCBs, halogenated pesticides or similar halogenated organic compounds. No such compounds were detected.

TABLE 2

OTHER ORGANICS IDENTIFIED BY HAZARDOUS WASTE CLEAN-UP CONTRACTOR

DADE COUNTY FIRE DEPARTMENT
AIRCRAFT FIRE TRAINING SITE
OPA LOCKA AIRPORT
METRO-DADE COUNTY, FLORIDA

HETA 83-194

COMPOUNDS IDENTIFIED[1]	WELL WATER (ppm)	BURN PIT SOIL (ppm)	CAG SOIL LIMIT[3] (ppm)
benzene*	0.023	N.D.	1000
bis-2-ethylhexylphthlate (DEHP)	N.D.	11.2	--
cyanide	N.D.	1.4	--
1,1-dichloroethane	0.041	N.D.	10,000
methylene chloride*	0.023	0.01	100,000
n-nitrosodiphyenylamine*	N.D.	0.2	--
phenols	0.09	N.D.	--
toluene[2]	0.023	0.1	--
1,1,1-trichloroethane	0.38	N.D.	10,000

* = Potential Carcinogen
N.D. = None Detected
ppm = parts per million or micrograms per gram

Notes: 1. No organic compounds were detected in rain water samples taken from open drums.

2. Also found in well water composite sample analyzed by NIOSH

3. As recommended by the EPA Carcinogen Assessment Group

TABLE 3

ANALYSIS RESULTS OF WASTE SOLVENT DRUMS FOR HEAVY METALS
AND OTHER ELEMENTS

DADE COUNTY FIRE DEPARTMENT
AIRCRAFT FIRE TRAINING SITE
OPA LOCKA AIRPORT
METRO-DADE COUNTY, FLORIDA
HETA 83-194

DESCRIPTION OF COMPOSITE SAMPLES (see Table 1)

	as micrograms per mL* (ppm)									
COMPOUNDS IDENTIFIED	OPEN D.	WELL	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8
almunium	3	39	16	38	50	22	<1	<1	9	15
barium	2	<1	2	5	10	9	<1	<	4	14
calcium	64	97	26	60	97	195	53	126	580	438
cobalt	<1	<1	<1	<1	1	4	<1	2	9	31
chromium	1	<1	10	29	37	15	<1	<1	8	10
copper	<1	<1	10	15	13	<1	<1	<1	<1	<1
iron	355	12	73	265	235	160	<1	38	158	96
magnesium	3	3	19	47	68	18	<1	6	20	24
manganese	2	<1	2	3	2	3	<1	3	5	4
molybdenum	<1	<1	4	9	10	<1	<1	<1	<1	<1
sodium	52	11	5	14	12	38	3	21	99	5
phosphorus	7	<1	13	25	36	8	50	<1	2	
lead	5	<1	26	94	48	141	<1	1	33	36
strontium	<1	<1	5	<1	11	1	<1	<1	11	44
titanium	9	<1	2	4	3	4	<1	<1	1	2
zinc	5	<1	100	85	193	13	<1	2	22	10
zirconium	<1	<1	<1	<1	3	<1	<1	<1	<1	5

The following elements were included in the analysis and were not seen in any of the samples: silver, arsenic, beryllium, cadmium, lanthanum, lithium, nickel, platinum, antimony, selenium, tellurium, thallium, vanadium, tungsten, yttrium.

* Semi-quantitative values

TABLE 4

HEAVY METALS IDENTIFIED BY HAZARDOUS WASTE CLEAN-UP CONTRACTOR

DADE COUNTY FIRE DEPARTMENT
AIRCRAFT FIRE TRAINING SITE
OPA LOCKA AIRPORT
METRO-DADE COUNTY, FLORIDA

HETA 83-194

COMPOUNDS IDENTIFIED	WELL WATER (ppm)	BURN PIT SOIL (ppm)	CAG SOIL LIMIT[3] (ppm)
beryllium*	0.001	0.014	1000
cadmium*	0.009	0.12	100
chromium*[1]	0.043	5.8	10
copper[1]	0.015	0.95	--
lead[1]	0.34	18	--
mercury[2]	0.012	0.16	--
nickel*	0.042	1.7	1000
thallium	0.008	0.16	--
zinc[1]	0.06	12	--

* = Potential Carcinogen
N.D. = None Detected
ppm = parts per million or micrograms per gram

Notes: 1. Also found in well water composite sample analyzed by NIOSH.

2. Rain water composite sample from open drums contained 0.22 ppm mercury.

3. As recommended by the EPA Carcinogen Assessment Group

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
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