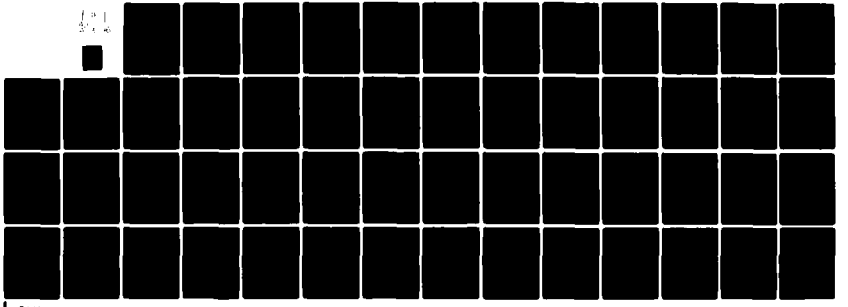
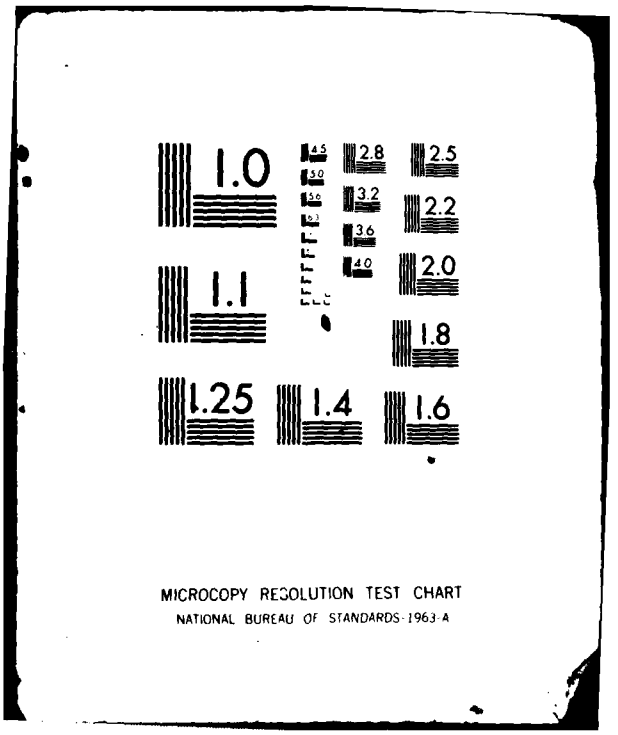
AD-A113 196 PORTLAND OFFICE OF EMERGENCY MANAGEMENT OR F/G 13/12
HAZARDOUS MATERIALS MANAGEMENT SYSTEM VALIDATION: A COMPARISON --ETC(U)
MAR 82 EMW-C-0326

UNCLASSIFIED NL



END
DATE FILMED
6-82
DTIC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

HAZARDOUS MATERIALS MANAGEMENT SYSTEM VALIDATION:

A Comparison of the Hazard Analysis and Resource Inventories Conducted by Multnomah County and the City of Portland

Final Report

for the Federal Emergency Management Agency
Washington, D.C. 20472

Contract Number EMW-C-0326
Work Unit Number 4521F

March, 1982

DETACHABLE SUMMARY

This report describes the City of Portland's validation of the hazard analysis and resource inventory methodologies developed by the Multnomah County Office of Emergency Management. The hazard analysis and resource inventory methodologies were developed as initial components of a more complete model for local government hazardous materials management systems.

The City of Portland is the major municipal government within Multnomah County. Most of the hazardous materials risk in Multnomah County lies within the emergency planning and response jurisdiction of the City of Portland. The Portland Office of Emergency Management is, therefore, in a unique position to validate the methodologies and products of the Multnomah County project.

This report addresses the methodologies described in the planning guide Hazardous Materials Management System: A Guide for Local Emergency Managers. The Planning Guide was developed by the Multnomah County Office of Emergency Management and was based on its experience working closely with its respective Fire Service (Fire District 10) to implement a hazardous materials management system. This validation report also addresses the products which resulted from the County project: the Hazard Analysis Report and the Resource Inventory information system.

The analysis is based on the available documentation of the methodologies and discussion with Hazardous Materials Response Unit managers. The scope of this analysis is limited to the Planning Guide, the Hazard Analysis and the resource inventories.

It is not a comparison of all hazardous materials related activities of the two Fire Bureaus.

The methods for conducting a hazard analysis and resource inventory described in the Planning Guide are basically valid--to the extent of detail in which they describe the procedures. The Guide provides specific suggestions useful to local managers conducting a hazard analysis or risk inventory. It also provides a useful overview of many fundamental components of a complete hazardous materials management system.

It is important to note that the Multnomah County Hazard Analysis Report was developed as a function of a regional government. Although the City of Portland lies within the geographic boundries of Multnomah County, the County has no responsibility or authority for emergency planning or response within the City of Portland. Joint data collection and planning procedures were not established by the two jurisdictions. Consequently, the hazard analysis report and available raw data did not address many of the information needs of the City of Portland. The project was not intended to, nor did it, provide information sufficiently detailed to assist the Portland Fire Bureau in responding to a hazardous materials emergency. It also did not assist program planners or policy makers in establishing appropriate emergency response, mitigation, and prevention programs. As part of the validation activities, an independent hazard analysis was conducted jointly by the City of Portland Office of Emergency Management and Portland Fire Bureau to obtain this needed information.

To assist FEMA in developing hazard analysis planning aides, the specific procedures used by both the Portland and the Multnomah County projects are described and compared. Based on

this comparison, and the experience of the Portland Project, it is recommended that the following be considered in developing planning aides:

--The Planning Guide provides an overview. A more complete description of alternative approaches to hazard analysis and procedures for conducting them would also be useful to local managers.

--The objectives of a hazard analysis can vary between communities and levels of government. Identifying information needs and setting specific objectives should be a first activity in hazard analysis.

--The advantages and disadvantages of choosing between consultants, local agencies, or private industries to conducting a hazard analysis should be considered.

--Transportation hazards can be identified and described in a number of levels of specificity, depending on the use and availability of information.

--"Key hazards" or "risk locations" should be identified through multiple criteria, including past accident records.

--The Standard Industrial Classification system, in conjunction with local guides to business, provides a mechanism to identify and classify industries which utilize hazardous materials.

The Multnomah County Resource Inventory methodology and product were determined quite adequate to meet City of Portland needs, and valid as established. Consequently, they were not validated through replication. However, based on the experience of both projects, it is recommended that planning guides recognize the opportunity for combining hazard analysis and resource inventory data collection procedures.

The hazard analysis process of the Portland project identified a problem for which an appropriate component of a hazardous materials system should be considered. Inter-organizational and inter-jurisdictional coordination is needed at a community level to insure that programs and policies are developed effectively and efficiently. This should be addressed in a planning guide.

Based on the experience of the Portland project, there is a need for more detailed technical assistance documents developed for local fire, police and emergency managers. In addition to addressing hazard/vulnerability/risk analysis*, they should address the on-going development of new equipment. There is also a need for clarity from the U.S. Department of Transportation regarding the appropriate role for State and local governments in the development of programs and policies to prevent transportation accidents. *Planning and training aids specifically* geared to the functions performed by fire, emergency management, and police personnel are also needed.

* See Gunderloy and Stone, p. 3-9 for discussion of differencies in analytic focus.

HAZARDOUS MATERIALS MANAGEMENT SYSTEM VALIDATION:

A Comparison of the Hazard Analysis and
Resource Inventories Conducted by
Multnomah County and the City of Portland

Final Report

for the Federal Emergency Management Agency
Washington, D.C. 20472

by the Portland Office of Emergency Management
Portland, Oregon

Contract Number EMW-C-0326
Work Unit Number 4521F

March, 1982

Approved For Public Release;
Distribution Unlimited

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 4521F	2. GOVT ACCESSION NO. AD-A113196	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) HAZARDOUS MATERIALS MANAGEMENT SYSTEM VALIDATION: A Comparison of the Hazard Analysis and Resource Inventories Conducted by Multnomah County and the City of Portland		5. TYPE OF REPORT & PERIOD COVERED Final Report 9/80 to 3/82 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) City of Portland Office of Emergency Management		8. CONTRACT OR GRANT NUMBER(s) EMW-C-0326
9. PERFORMING ORGANIZATION NAME AND ADDRESS Portland Office of Emergency Management 1020 S.W. Front Avenue Portland, Oregon 97204		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4521F
11. CONTROLLING OFFICE NAME AND ADDRESS Federal Emergency Management Agency Mitigation and Research Washington, D.C. 20472		12. REPORT DATE March, 1982 13. NUMBER OF PAGES 53
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)
Approved For Public Release; Distribution Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)
Hazardous Materials, Hazardous Materials Local Government Planning, Hazard Assessment, Risk Assessment

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report describes the validation of the Multnomah County hazardous materials hazard analysis and resource inventory. The validation was conducted by the City of Portland, which lies within the geographic boundaries of Multnomah County but which maintains separate emergency response and planning authority.

The hazard analysis prepared under contract to the County project did not meet the information requirements for City of Portland planning or emergency

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

BLOCK 20

response procedures. Because the County analysis was for a regional government and the City analysis for a municiple government their objectives were quite different. To validate the data in the County project and to meet the needs of the City of Portland, an independent hazard analysis was conducted; the methodology for this independent analysis is described in this report and compared to that of the Multnomah County project.

The resource inventory was determined complete as developed and was not validated through replication. The methodologies described in Hazardous Materials Management System: A Guide for Local Emergency Managers are valid, to the extent of detail in which the tasks and activities are addressed. It should be useful to FEMA in preparing planning aids for local governments. Suggestions for such planning aids are also made in this report.

CONTENTS

I. INTRODUCTION

The intent of this validation contract was to provide the Federal Emergency Management Agency (FEMA) an evaluation of the hazardous materials management system described in the Hazardous Materials Management System: A Guide For Local Emergency Managers (hereinafter referred to as the Planning Guide). The limits of the contract focused this evaluation on only two elements of the Planning Guide, the hazard analysis and resource inventory. This information is intended to be useful to FEMA in developing instructional materials to aid local communities in planning hazardous materials programs.

For reasons described further in this report, the work supported by this contract focused on the development of a City of Portland hazardous materials hazard analysis planning process and report. The bulk of this report similarly focuses on the methods of conducting a hazard analysis. It is an attempt to document how two public jurisdictions--a County and a municipality within that county--differently conducted a hazard analysis. Brief discussions of the Resource Inventory conducted by Multnomah County and the City of Portland will also be found in this report.

Section II outlines the specific objectives of this contract.

Section III describes how the validation of the Multnomah County Hazard Analysis and Resource Inventory was conducted.

Section IV compares the methods used by the Multnomah County and Portland projects to conduct a hazard analysis and resource inventory. It focuses on hazard analysis and documents in detail how it was conducted by the City of Portland. The fundamental differences between the two methods and resulting products are

described. The reader most interested in the specific techniques of hazard analysis is directed to this section.

Section V compares the data resulting from the two projects. By describing the differences between each of the reports, one may gain a clearer idea of the importance of the methodological issues.

Section VI contains the recommendations to FEMA for review of the Planning Guide and development of others.

II. CONTRACT OBJECTIVES

Objective A: To validate the methodology developed by the Multnomah County Office of Emergency Management for conducting a hazard analysis, as documented in the Planning Guide Hazardous Materials Management System: A Guide for Local Emergency Managers.

Activities

1. Analyze the hazard analysis methodology developed by Multnomah County to determine which specific aspects of it are most useful when applied within a city jurisdiction.
2. Conduct a field validation of the hazard analysis data collected by Multnomah County. This validation considered the specific information needs of a municipality relevant to the quantities and characteristics of hazardous materials used and transported within its jurisdiction.

Objective B: To determine the adaptability of Multnomah County's methodology for conducting a resource inventory, as documented in the Planning Guide Hazardous Materials Management System: A Guide for Local Emergency Managers.

Activities

1. Verify the completeness of the County's catalog of private and public resources available for dealing with hazardous materials incidents. This includes a survey of local hazardous materials handlers, government agencies, and neighboring jurisdictions to identify resources available to the City of Portland in a hazardous materials emergency.

2. Develop specific prccedures for the acquisition and use of resources identified by the City of Portland and the Multnomah County projects.

Objective C Prepare an analytical report presenting the findings of the City of Portland's validation of the County methodology.

Activities

1. Describe those apsects of the County methodology which were useful to the Portland project.
2. Identify methods for hazard analysis and resource inventory which are uniquely appropriate to a city setting.

III. METHODS

III.A.Overview

This analytical report addressed two separate outputs of the County's work: 1) the Planning Guide and 2) the products of the hazard analysis (i.e. the report) and resource inventory data. The analysis of the Planning Guide is based on the experiences of the City of Portland Office of Emergency Management and Portland Fire Bureau in establishing a local hazardous materials management system and other emergency planning.

The steps used by the Portland project to field validate the hazard analysis and resource inventory are briefly summarized below, in sequential order.

(1) Determine City of Portland information needs.

(2) Assess the adequacy of Multnomah County products to satisfy City of Portland information needs, based on the following criteria:

  (a) did it facilitate Portland Fire, Police and Emergency Management response to a specific hazardous materials emergency; and,

  (b) did it provide information and analysis useful for development of improved emergency response, mitigation and prevention programs or policies (i.e. direction for on-going planning).

(3) Establish a City methodology and an independent risk analysis and resource inventory, as determined necessary, to fulfill City of Portland information needs.

(4) Compare and contrast the methodologies and products developed by the City of Portland and Multnomah County projects (the basis for this analytical report).

III.B. Hazard Analysis Field Validation

Although useful for initial planning, the hazard analysis developed by the Multnomah County project did not satisfy the City's information needs. The information was not presented in a level of detail that would facilitate emergency response or provide direction for development of procedures, policies or programs which would mitigate the current risk. Consequently, an independent hazard analysis was designed and conducted cooperatively by the Portland Office of Emergency Management and Fire Bureau.

The City of Portland Hazardous Materials Hazard Analysis report is attached. The experience gained in the process of developing this Hazard Analysis has provided the basis for the discussion which follows in Section IV.A.

III.C. Resource Inventory Field Validation

The Multnomah County Resource Inventory methodology and product were assessed as adequate. The taxonomy of resources--technical assistance, equipment and supplies--and the more detailed classification system within these three areas, cover resources determined useful in an emergency. The actual list of resources was determined valid and it was considered unnecessary to replicate in full the data gathered for the Portland-Multnomah County metropolitan area. Some additional information was gathered, however, in the Portland hazard analysis process.

Procedures for the acquisition and use of resources are established by the Multnomah County project. Mutual aid agreements between the Portland Fire Bureau and Multnomah County Fire District 10 makes these resources similarly available to the City of Portland. Procedures to utilize the primary back-up resources of private clean-up firms, State and Federal agencies are also established by the Portland Fire Bureau.

IV. RESEARCH ACCOMPLISHED

IV.A. Hazard Analysis Methodology

IV.A.1. Multnomah County Methodology

Consistent with one of the options outlined in the Planning Guide, the Multnomah County project retained private consultants to conduct a hazard analysis for the geographic area within Multnomah County. The objectives of the contract were generally consistent with the objectives outlined in the Planning Guide.

It is important to note that considerable information relative to hazard analysis had been collected prior to establishing the consultants contract. The consultants were guided towards collecting information which would fill specific gaps of knowledge. Furthermore, detailed information similar to that collected in the Portland Fire Bureau pre-fire surveys (described in Section IV.A.2.a.) is maintained by Fire District 10. Such information can essentially be considered as facility-specific hazard analysis.

Based on a review of the products of this contract (i.e. the Hazard Analysis report) and other documentation, the following aspects of the actual methodology used by the consultants are surmised. The types of industries and facilities which use, store, manufacture or transport hazardous materials were identified through those knowledgeable with Portland metropolitan industries. This list was augmented by use of the Standard Industrial Classification codes and the Contacts Influential index to local businesses. The information was gathered through a telephone interview during which the purpose of the survey was explain-

ed and confidentiality assured. Only materials with hazardous characteristics in one of the following U.S. Department of Transportation hazard classes were included in the survey: flammables, combustibles, corrosives, and poisons (including several compressed gases which act as poisons, such as chlorine and anhydrous ammonia). The survey requested information about the quantities of materials within the four hazard classes that were on location or transported to and from the facility.

Geographical areas where hazardous materials firms are clustered were identified as key hazard areas. Three such areas were identified.

Hazardous materials truck routes were identified by knowledgeable local officials and through identification of all streets and roads within the following classifications: minor arterials, principal arterials, expressways, and freeways. County-wide volumes of traffic within each of the four hazard classes of concern were estimated. The routes which service industrial and storage facilities and major expressways which handle traffic through Portland were identified as "Key Hazard Routes." Four Key Hazard Routes were identified.

All mainline rail corridors and three switching yards were identified as the routes and locations where hazardous materials are transported by rail. "Key Hazard" rail locations were not specifically identified*. It was noted in the report that the main rail lines parallel the key hazard highways, and switch yards are located near key hazard areas. Volumes of rail traffic within the four hazard classes of concern were estimated.

---

* Key hazard rail locations are identified by Fire District 10, not documented in the hazard analysis report.

Through review of accident records available from a state truck safety regulatory group (Oregon Public Utility Commission), past truck accidents were described. Locations of accidents involving commodities of two hazard classes (flammables and combustibles) were displayed in a tabular form. Past rail accidents were addressed only briefly because the existing accident records were apparently unavailable to the consultants.

The Hazard Analysis report also described a methodology which could be used by local planners to predict the probability of a transportation accident. The data which would be necessary to compute this probability were also described.

In addition to the information collected by the consultants, the county hazardous materials managers have established contacts with local firms which present significant hazards. These activities are described in the Planning Guide as prevention and industrial relations. In addition to providing more detailed information about the hazards associated with each firm, the industrial relations activities assess facility vulnerability and establish emergency plans.

IV.A.2. City of Portland Methodology

As has been stated, the City of Portland determined that the Hazard Analysis report prepared under contract to Multnomah County did not provide sufficiently detailed information to facilitate emergency response, nor did it provide direction for future program development. This should not be construed as criticism of the work of Multnomah County of the contractors. The document was prepared by and for a County level of government. This level of government can use the hazard analysis process to encourage further planning by the jurisdictions within their geographic boundaries. Although a county may not have the authority

or responsibility for emergency planning or response (as with Multnomah County and the City of Portland), such a report can generally describe the risk. Multnomah County's report achieved this. The City of Portland took the planning process a logical step further and developed more detailed information.

As implied by the criteria used to evaluate the County Hazard Analysis, the objectives of the Portland Hazard Analysis were to begin an on-going planning process which would assist emergency responders and to outline priorities for program development. To these ends, it would be more than just a document or report. The hazard analysis project included the collection and documentation of data about hazardous materials in Portland. This project also created a forum by which a consensus could be reached as to how Portland could reduce the hazardous materials risk. The Hazardous Materials Hazard Analysis was prepared to provide an overview discussion of the risk and to formally propose new programs and policies to City officials.

The City of Portland chose the second option described in the Planning Guide--local agencies collected the data and prepared the report. The Portland Fire Bureau, in conjunction with its annual pre-fire planning process, identified and inventoried hazardous materials "target hazard" fixed facilities. The Portland Office of Emergency Management collected relevant information about the transportation of hazardous materials. The Portland Office of Emergency Management also conducted a series of interviews with managers involved in the safe transportation and use of hazardous materials to assess unique local risks and opportunities for reducing them. Based on this information, the Portland Office of Emergency Management developed the Hazard Analysis report.

IV.A.2.a. Portland Project Data Collection Procedures

Hazardous materials target hazard facilities surveyed by the Portland Fire Bureau were defined as:

> "those facilities which contain materials identified by the U.S. Department of Transportation and in quantities that pose unusual risks to emergency response personnel and/or may require an evacuation of nearby residents or businesses during an accident or fire."

A list of potential target hazards was established from the following sources: a relevant permit system of the Portland Fire Marshal; industries within relevant Standard Industrial Classification Codes; firms identified by the Portland Bureau of Sanitary Engineering (for waste water pre-treatment and spill prevention); and state and federal agencies administering hazardous waste programs. Fire Officers used their discretion to determine those facilities on the list which met the target hazard definition.

Specific hazardous materials within each facility were identified by their trade and chemical names, and by the U.S. Department of Transportation proper shipping name and identification number (See 1980 Hazardous Materials Emergency Response Guidebook[1]). Information about product characteristics, storage locations, NFPA 704 hazard diamonds[2], and other information was also collected. Those facilities in which an accident may require an evaucation were specified. A retrieval system for this information has been established at the Portland Fire Bureau dispatch center, and will be extremely useful in responding to emergencies in the target hazard facilities.

In addition to the above information, firefighters gathered information about emergency preparedness procedures established

by the management of each target hazard facility*. This information will be helpful in working with facilities to insure that adequate emergency procedures are established.

The inventory of hazardous materials which are transported within the City of Portland was conducted by staff of the Portland Office of Emergency Management. Four transport modes were addressed: rail, pipeline, highway and marine. (After discussion with airline regulators and responders, quantities of hazardous materials shipped by air did not seem to warrant detailed attention at this phase in planning.)**

Information about quantities of commodities shipped by rail was relatively easy to gather. Oregon Public Utility Commission Rail Division administrative rules require each of the three primary railroads which service Oregon to report to local fire bureaus the annual number of hazardous materials carloads which are hauled through their jurisdiction. The commodities are reported in a format generally consistent with U.S. Department of Transportation hazard classes.

Information about pipelines was similarly easy to gather. One natural gas company serves the Portland metropolitan area and could easily identify main and high pressure lines. Smaller natural gas piping is widespread throughout the City. In addition, there are three other major pipelines within the City, each of which transports petroleum products. The firms owning these pipelines, and the state regulatory agency, easily identified locations and products.

Secondary data sources were used to estimate the commodities and volumes transported by highways and waterways (ship and barge).

---

* Similar data is continuously gathered by Fire District 10.

** This is not to imply that Fire Departments should have no interest in hazardous materials moved by air. On the contrary, hazards have been identified and are monitored at airports within the jurisdiction of the County project. These airports are not within the planning or response jurisdiction of the City of Portland Fire Bureau.

Consistent with the note in the Planning Guide, the most pertinent information was available from public agencies, such as the State Public Utilities Commission, and port officials.

Secondary data sources for highway and marine transportation were relied upon for several reasons. Consistent with local responsibilities, the initial priority for local planning appeared to be to facilitate emergency response. It was agreed early in the project that no information would be gathered from local industry which was not useful for planning or emergency response decision-making. The Portland Fire Bureau determined that highly specific information about which carriers haul which commodities would not be useful for this phase of planning. During an emergency involving hazardous materials, the most critical information needed is the actual product involved and its characteristics. No pre-accident survey can assist in identifying the specific product in an accident. Tactical information is most readily available from local manufacturing and storage facilities (through CHEMTREC or other procedures) and from standard reference materials. The information collected through the fixed facility surveys will provide further information about product characteristics which will be useful in a transportation accident.

More product specific information about marine shipments will be gathered following this hazard analysis process. It has been determined by the Port of Portland, U.S. Coast Guard, and the Portland Fire Bureau that advance notification of hazardous materials marine shipments is feasible and would be beneficial. Upon implementation of pre-notification procedures, accurate information about the commodities that cross Portland's docks will be available.

The record keeping systems of most highway shippers and carriers make it quite difficult and expensive to detail transportation patterns and identify specific commodities. Many firms are also reluctant to identify specific commodities or destinations; they see this as an unwarranted violation of business privacy. Industry could most easily provide general impressions and estimates of commodities shipped, categorized by hazard class. This type of survey was conducted and documented by the Multnomah County project and was used in the Portland Hazard Analysis project. It was determined to be unnecessary to replicate such a study for this community. Furthermore, detailed highway shipping information is of little value to a local jurisdiction unless collected in the context of a specific decision, such as designating preferred truck routes. Until well into our data gathering, no clear mandate for collecting such information or precise purpose for it was established.

During much of the Portland project, it was incorrectly assumed that the U.S. Department of Transportation had preempted local authority in establishing highway routes for hazardous materials. This confusion was based on an incomplete analysis of several cases which have been addressed by the U.S. Department of Transportation. A U.S. Department of Transportation publication, Guidelines for Applying Criteria to Designate Routes for Transporting Hazardous Materials (FHWA IP-80-15)[3], did much to clarify local authority. It is recommended in the City's Hazard Analysis report that a study be conducted to assess the appropriateness of identifying specific hazardous materials truck routes.

IV.A.2.b. Hazard Analysis Report

The Hazardous Materials Hazard Analysis report prepared by the Portland Office Emergency Management is intended to serve as

a springboard for further planning. It was determined that a "white-paper" discussion of the problems associated with the safe use of hazardous materials would be a stimulus to develop a hazardous materials management program for Portland. It was written as a non-technical document addressing several audiences, including City Council policy makers, City Bureau managers and analysts, and the general public. To that end, the document addresses various issues, as briefly described on the following pages.

Definition of Hazardous Materials and Related Dangers--a brief discussion on the relationship between hazardous wastes and hazardous materials (somewhat confusing to many); a description of the U.S. Department of Transportation's hazard classification system; and a brief description of the inherent dangers of hazardous materials.

Levels of Emergency--a categorization of emergencies ranging from "normal" accidents to disasters; and a brief discussion of the potential consequences and probability of a major incident.

The Existing Accident Prevention and Emergency Response System--a description of the unique complexity of hazardous materials emergencies; an outline of the responsibilities of City of Portland Bureaus and other primary agencies; and recommendations which will improve the current system.

Hazardous Materials Incidents in Portland--a brief discussion of incidents to which the Portland Fire Bureau has responded (specific transportation accidents are discussed in the appropriate sections).

Fixed Facility Target Hazards--a description of the types of facilities and commodities within Portland; a general identification of the facility locations in which an accident may cause an evacuation (to the extent prudent in a public document); a summary of special safety procedures established by facility managers; and a discussion of the local safety and regulatory inspection groups.

The Transportation of Hazardous Materials--a brief discussion of the available information concerning commodity shipping patterns; and an overview of the relative risks associated with each mode of transportation, as described below.

Each mode was handled differently based on the nature of the risk and availability of information. The major issues addressed are:

Local Exposure: Discussion of the presence of which types of commodities, estimates of volumes, number of shipments, and routes and/or transfer facilities (including maps).

The Nature of Accidents: Highway and rail transport create the greatest risk in Portland. Policy makers and the public are concerned about the nature of the hazards; therefore, relevant available information was summarized.

Risk Locations: Likely accident sites were identified based on information regarding past accidents. An accident involving hazardous materials at one of these sites could become a major emergency.

Safety Programs: A discussion of special programs established by the industries or regulatory agencies which have been aimed at mitigating the hazards; and, identification of contacts for regulatory concerns.

IV.A.3. The Key Issues of Hazard Analysis: A Comparison of the Multnomah County and City of Portland Methods

IV.A.3.a. The Difference in Focus Between a County and a Municipal Hazard Analysis

The Multnomah County project was developed from the perspective of a county jurisdiction within which a municipality (the City of Portland) is located. In this instance, the authority and responsibility for emergency planning and operations within its own jurisdiction lies with the City of Portland. It is with this in mind that the Portland project was developed.

In most situations, the objective of a regional hazard analysis should be to: identify the most sensitive localities where more precise hazard assessments need to be conducted; encourage (or mandate if such authority is available) the formulation of programs and policies proportionate to the hazard; and, insure a rational and equitable distribution of resources[4]. The objective of a local hazard analysis should be to identify local hazards and cause the development of specific prevention, mitigation and response plans and programs. Local hazard analysis should be the first and fundamental step in program development and should guide such decisions as equipment purchase, evacuation planning, etc.

The Multnomah County Hazard Analysis achieved some of the objectives for a regional analysis. It identified areas and in-

dustries within the City where hazardous materials are likely to be found. Although not previously documented, most of these facilities and areas were known to the Portland Fire and Police Bureaus. For a variety of reasons, the planning conducted by Multnomah County has had the effect of increasing the attention to hazardous materials problems by the City of Portland. A hazard analysis appropriate to a municipality has now been conducted, and will be followed by program and policy development.

However, also for a variety of reasons (not subject to thorough analysis in this report), the Multnomah County Hazard Analysis did not facilitate or result in a rational or equitable distribution of public resources throughout the Portland metropolitan risk area. Each of the 3 "Key Hazard Areas" and a majority of the "Key Hazard Routes" identified in the County hazard analysis report lie within the City of Portland. The Hazardous Materials Response Unit--an expensive and sophisticated emergency response vehicle containing multijurisdictional communications and information systems--is sited 5 miles from the City's eastern boundary. Although centrally located in Fire District 10, it is not optimally placed if one considers the location of key hazard areas as identified in the County Hazard Analysis report.

The decision of where to site the unit was not based on risks identified by the Multnomah County hazard analysis report. A cooperative and coordinated planning effort by all relevant jurisdictions, from the beginning of the project, may have facilitated a more central placement of the vehicle.

IV.A.3.b. The Choice Between Consultants or Local Agencies for Conducting the Hazard Analysis

Hazard analysis is the first step in planning. In addition to identifying the commodities that are stored or moved in the

area, it should provide some insight for local policy makers and other officials regarding the nature of the risk and how that risk can be minimized. Hazard analysis can also provide the mechanism for identifying and working cooperatively with the major actors in the complex system of hazardous materials management. It cannot be assumed that the information gathered and contacts established by consultants will be available after completion of the initial contract.

The County project retained consultants to conduct a county-wide inventory which was necessary for the hazard analysis report. Fire District 10 had also surveyed and prepared emergency plans with the major firms within its response area.

The Portland project chose to have the inventory of fixed facility target hazards for the Hazard Analysis report conducted by the Portland Fire Bureau. Fire Bureau authority provided an opportunity for firefighters to prepare specific pre-fire plans for each facility, and to gather information in a level of detail not possible by consultants. Furthermore, propriatory and confidentiality concerns were reduced in that it was clear to industries how the information was to be used by firefighters in a potential emergency. By incorporating the fixed facility hazard analysis data gathering within the standard pre-fire planning of the Fire Bureau, a mechanism for its periodic up-dating has been established.

Although information about transportation patterns was collected by the Portland Office of Emergency Management, much of it (especially for rail and highway) could have been collected by the firefighters. This would have been advantageous in that the information sources and significant contacts would have been that much more clear to the Fire Bureau.

The Office of Emergency Management helped design the data collection procedures, summarized the information, and prepared the Hazard Analysis report. It also worked closely with Fire Bureau policy makers to evaluate local emergency response, mitigation and prevention programs. Through this cooperative effort, the hazard analysis project became the beginning of a continuous planning process.

IV.A.3.c. Identification of Hazardous Materials Facilities

Both projects used a combination of sources to generate a list of facilities which may have been considered "target hazards." These included: lists of companies regulated by local, state and federal agencies; local firefighters' familiarity with hazardous materials facilities within their districts; and the Standard Industrial Classification (SIC) system combined with the Contacts Influential guide to local businesses. The Standard Industrial Classification codes and Contacts Influential were very useful in Portland's project, and presumably would be appropriate in other jurisdictions.

IV.A.3.d. Identification of Relevant Transportation Modes

Land transportation modes--rail and highway--are clearly the highest risk in the Portland metropolitan area. They were addressed in both projects. Marine transportation was also included in the Portland Hazard Analysis. This was due to the potential for serious environmental damage (i.e. bulk petroleum spills) and the fact that emergency response to a waterway or port terminal accident is within the jurisdiction of the Portland Fire Bureau. Marine shipments were not included in the Multnomah County Hazard Analysis.

At the direction of the County project managers, the contractors did not collect or document information about pipeline,

because this information had already been gathered by the Fire District 10. Similarly, Fire District 10 had some knowledge of air-bound hazards and did not direct the contractors to collect such information.

IV.A.3.e. Identification of Hazardous Materials Carriers

The Multnomah County project identified and surveyed the three primary railroads which serve the Portland metropolitan area. Marine, air, and pipeline modes were not addressed in the Hazard Analysis report, although Fire District 10 personnel are aware of the particular local risks. Estimates of truck volumes were obtained by surveying major shippers and receivers. This resulted in a lack of information about through traffic. Collecting information about shipments which do not originate or terminate within a community will remain a problem for any local government.

Identifying all public (for hire) and private truck firms which haul hazardous materials through Portland is not currently possible. This will require roadside observations, which will be collected as part of a highway routing study, if such a study can be financed. A recent survey by the Oregon State Public Utility Commission, the state agency which issues truck permits, has identified most of the haulers garaged in or near the Portland metropolitan area. There are approximately 360 such firms. This is extremely useful information which could not have been collected by a municipality, but required the resources and authority of a state agency. Although identifying many of the firms which haul hazardous materials through Portland could have been done by this state agency, it was not included in the survey.

The Portland project identified rail and pipeline carriers with relative ease. Marine carriers could have been identified

and surveyed through local shipping agents, had this been considered timely for the Portland project.

IV.A.3.f. Identification and Classification of Hazardous Materials

Both projects used the U.S. Department of Transportation hazardous materials identification and classification system for each transportation mode and fixed facility. It provides a system which is relatively encompassing of all commodities and with which local industries and emergency responders are familiar. For general planning purposes, it is necessary and useful to collect and/or summarize information by hazard class. However, for more specific planning decisions (such as the proposed route analysis and the pre-fire facility planning), it is necessary to identify commodities more precisely.

The Portland project addressed commodities within all U.S. Department of Transportation hazard classes. It is assumed that any material permitted to be transported by the Department of Transportation could be involved in an accident within Portland. Consequently, pre-accident information should focus on all hazard classes. The Multnomah County Hazard Analysis report excluded radioactive materials and explosives and placed several multi-hazard products into one of four general hazard classes. The Multnomah County project is, however, aware of the local radioactive materials and explosives risks.

IV.A.3.g. Computing the Probability of an Accident and other Approaches to Quantifying Risk

A hazard analysis identifies hazardous commodities, locations, and possible accident sites. A risk analysis, on the other hand, attempts to estimate the probability that an accident will occur[5].

Consistent with the recommendation of the Planning Guide, the Portland project conducted a hazard analysis. The Multnomah County Hazard Analysis report, although entitled a Risk Analysis, was also primarily a hazard analysis. It did, however, also present a methodology and the data requirements for computing the probability of a highway accident. It did not compute this probability for any section of highway.

Quantifying risks has not been determined necessary by either Multnomah County or the City of Portland. Experiences in other communities make it quite clear that Portland has the necessary mix of commodities and transport modes to create a major hazardous materials emergency. Familiarity with local hazards provides information on likely accident locations. No decisions or procedures would have been altered by a risk analysis.

Other methods for computing risks associated with specific commodities by specific modes, and which focus on a particular geographic area, have been developed by Battelle Northwest Labs[6][7]. A method for quantitatively rating a community's vulnerability has been developed by Zajic and Himmelman[8]. Although perhaps useful as analytic guides, the process of quantification implicit in these methodologies was not determined cost-effective for the Portland project. The Portland project will compare accident rates, population densities, and other variables, probably in some quantified format, while in the process of analyzing the need for specifying truck routes.

IV.B. Resource Inventory Methodology

As previously noted, the Resource Inventory methodology and product were assessed as adequate to meet City of Portland information needs. Each of the resources identified may be used to assist Portland's emergency responders. Discussions with

representatives of these same resources have also been helpful in assessing the nature of the risk and setting policy/program directions for future planning.

The City of Portland did collect information which will augment the County Resource Inventory. Concurrent with the pre-fire planning for fixed facilities, Portland firefighters identified each firm's available resources (equipment, expertise, supplies).

V. FIELD VALIDATION OF HAZARD ANALYSIS DATA

V.A. Identification of Facilities and Quantities of Materials

Both the Multnomah County and Portland projects relied upon the Standard Industrial Classification codes to identify facilities which utilize hazardous materials. In addition, the Portland project left to the discretion of fire officers the determination of whether the facility was a "target hazard", based on risk to firefighters and adjoining neighborhoods. Risk was based on both the commodity and the volumes involved. Many facilities which had received considerable pre-emergency planning--such as petroleum storage facilities--were not included in the Portland project. The consultants to the Multnomah County project were guided by Fire District 10's familiarity of the manufacturing community and volumes of commodity within the broad categories of flammable, combustible, poison and corrosive.

The Portland project has identified seventy-three target hazard facilities. (The identification process has not been finalized, since pre-fire planning is an on-going process as new industries are developed and storage facilities change.) The Multnomah County project identified one hundred thirty-seven facilities to be surveyed within the county. Ninety-nine (or 72.2%) of the facilities surveyed by Multnomah County were located within the City of Portland.

There was little comparability between the firms surveyed by the County project and the target hazards identified by the Portland Fire Bureau. Of the seventy-three Portland target-hazards, only twenty-three were surveyed by the County project. This can be explained somewhat by the different focus of the two projects.

The Portland data collection was conducted by firefighters preparing specific plans for any facility which may cause an off-plant evacuation or present unusual risks to emergency responders. The Multnomah County project, because of resource limitations, focused on facilities involving large volumes of commodities falling into four general hazard classes.

V.B. Identification of Key Hazard Locations

The Multnomah County project identified three key hazard areas. Although the Portland project did not formally identify key hazard areas, the data on target-hazard facilities support the Multnomah County information.

The Multnomah County project identified five key hazard truck routes, based on assumed volumes of hazardous materials laden trucks and discussions with carriers which serve the Portland area. A procedure for calculating the relative probability of an accident on these routes is also presented. The calculations of accident rates or probabilities was not done.

Based on similar volume assumptions, the Portland project added to the County list two sections of local roadway. Locations where trucks are likely to be involved in accidents which might result in a spill were also documented and termed "risk areas." As discussed previously, a more detailed study of hazardous materials traffic routes and safety statistics is warranted for the purpose of determining safest routes.

The Multnomah County hazard analysis report identified all rail lines and three local switch years; "key hazard" rail locations were not identified in the report. Key hazard rail areas are, of course, known to Fire District 10 personnel. Like

the County project, the City also identified all rail lines. In addition, the Portland project identified one "risk area" section of rail line. This designation was based on limited access for emergency responders, relatively high population density, and two previous derailments in this area. All switch yards were identified by the City; three were highlighted since hazardous materials cars are concentrated there. The County project identified only three switch yards, one of which was consistent with the City's identification of high-concentration yards.

For several reasons, it is not possible to compare the estimated quantities of flammables, combustibles, poisons and corrosives which are presented in the Multnomah County Hazard Analysis Report. As explained earlier, the Portland project presented this type of "local exposure" data differently for each transportation mode and for fixed facilities, based on the availability and utility of such information. Also, the Portland project did not survey major petroleum storage facilities or request facility-specific shipping patterns for this phase in planning.

A more valuable comparison is the universe of facilities upon which the different studies focused. The attached Appendix is a listing of all Standard Industrial Classification codes which contain industries identified by the Portland and Multnomah County projects. Due, in part, to confidentiality agreements made by the consultants in the Multnomah County project, it is not possible to compare the specific information collected on each facility. Review of this list does, however, provide some indication of how the studies differed in focus.

The attached list may also provide a basis for constructing a more complete list of those Standard Industrial Classification codes which may include facilities that should be identified by other communities conducting a hazard analysis. Also included in this list are the Standard Industrial Classification codes identified in a recent study conducted by the Puget Sound Council of Governments[9]. That study used Standard Industrial Classification codes to conduct a hazard analysis for a multi-county substate region.

VI. RECOMMENDATIONS FOR REVIEW OF THE PLANNING GUIDE AND DEVELOPMENT OF OTHER PLANNING AIDS

The Planning Guide was developed to be a very general outline of the components of the Multnomah County hazardous materials management system. It also outlines some of the basic steps a manager can take to implement such a program.

The hazard analysis and resource inventory methodologies described in the Planning Guide are basically consistent with those used by the City of Portland and valid to the extent of detail in which they describe the procedures. The "Objectives", "Activities", "Deliverables", and "Considerations and Examples" contain tips which will surely be useful to local managers. Because it was developed as a general guide, there are useful and important details which were not included in the manual.

The systemic approach of the manual is also important and useful. It recognizes and explains the importance of the several components of a hazardous materials management program including tactical information, specialization of response apparatus and personnel, training, and the role of local emergency managers in preventing accidents. This conceptualization has been useful to the Portland project and each system component is directly or indirectly addressed by the recommendations of the Portland Hazard Analysis report.

There are several ways in which the Portland project differed in focus. Based on those differences, and consistent with the intent and objectives of this contract, the following comments and suggestions for review of the Planning Guide and development of more detailed guides are presented on the following page.

IV.A. Hazard Analysis

Hazard analysis is the first step in establishing a hazardous materials management system. It can be much of the base upon which programs are established. It is, therefore, important that a hazard analysis be done thoroughly. Inaccurate or incomplete data will provide a weak base upon which to build a program. Local managers of private firms will also evaluate the competence of public managers based on this first step. The necessary cooperative planning environment can easily be soured in these initial phases of establishing a program.

The literature describing hazard analysis methodologies which are appropriate and useful to local governments appears to be incomplete and not effectively organized or available to those who need it most. There is a need for more detailed descriptions of how a local government can proceed in identifying hazards, in evaluating the nature of the risks which they pose and in assessing the community's vulnerability. Such descriptions should be addressed to an audience of local emergency management, fire and police personnel. A national clearing-house for this information should be established and its existence should be made known to all local governments.

In developing hazard analysis guides for local governments, the issues described below should be addressed.

IV.A.1.

Hazard, vulnerability and risk analysis are each somewhat different (See Gunderloy and Stone). It is useful that local governments recognize these differences in order to focus their information gathering on that needed for their planning purposes.

More detailed discussion of hazard and vulnerability analysis would be particularly useful to local planners.

VI.A.2. Objectives

An effective hazard analysis planning process and/or report should be tailored to the specific needs of a community. As suggested in the Planning Guide, it should address the local hazards (i.e. identify commodities, quantities, locations, and risk areas). It may also address vulnerabilities in the local planning and emergency response system, and provide some direction for future program development. Also beneficial in a planning guide would be a thorough discussion of the variety of uses to which a hazard analysis could be put.

Setting specific objectives for a hazard analysis should be a first "activity". In determining objectives, consideration should be given to the decisions and procedures which will be facilitated by the information collected. The audience or audiences for whom a final report is being developed should also be identified.

VI.A.3. Consultants or Local Agencies

There are advantages and disadvantages in choosing consultants or local agencies. (See Gunderloy and Stone, p. 3-6) A discussion of these may be useful for local managers.

The Planning Guide lists the "steps involved in negotiating a contract with a consultant". It does not provide a parallel description of procedures for developing a local agency work plan or establishing cooperative agreements between local agencies. Describing the contracting process to the exclusion of the work planning process tends to emphasize the choice of consultants over local agencies. However, many professional managers are

probably familiar with these procedures and it may not be necesary to state them in such detail.

The Portland project found considerable advantages to combining the hazard analysis process with the standard pre-emergency planning conducted by the Fire Bureau. By considering the specific authority and needs of the local Fire Bureau, only relevant information was collected and proprietary concerns minimized. It may be useful to address in detail the importance of cooperation between Fire and other emergency managers in a planning guide.

Another option would be to secure the assistance of industry in conducting the hazard analysis. This was, to some extent, the approach taken by the Puget Sound Council of Governments study for the Seattle-Tacoma region. In addition to sharing the work load with well-informed experts, such an approach would incorporate the industries into the planning process from the beginning*.

VI.A.4. Categorization of Facilities

The Planning Guide recommends that facilities be categorized "according to whether hazardous materials are manufactured, used, stored, sold, distributed, or transferred." An explanation of the need for this particular categorization scheme is not provided. The Portland project conducted no such categorization.

Both the Portland and Multnomah County Hazard Analysis reports used the Standard Industrial Classification system to categorize industries according to the type of products manufactured or stored. This type of classification will be useful to local officials in anticipating the types of commodities which

* The idea of industry leadership in conducting a hazard analysis was first discussed by Fire District 10 personnel.

may be related to an industry and directing the on-going identification of hazards.

IV.A.5. Identification of Target-Hazard Facilities

The combined use of the Standard Industrial Classification system and the Contacts Influential guide to local businesses is an extremely important key to identifying specific industries which involve hazardous materials. It directed the Portland Fire Bureau to firms which had not previously been identified. The use of this system should perhaps be described in a planning guide. A thorough description of all Standard Industrial Classification codes which may contain industries relevant to a hazard analysis was not discovered by the Portland project. It would have been useful. If such a listing is not available, it should be developed. Any such description should be made readily available to local governments.

VI.A.6. Identification of Transportation Hazards

Depending on the availability of secondary information and the purpose for which information will be used, different levels of specificity about transportation hazards are appropriate. Locally found hazardous materials can be described by each commodity, U.S. Department of Transportation hazard class, or combination of hazard classes (such as is used in the County project). A community may focus an analysis on any one or all of the four transport modes. Identifying specific carriers may or may not also be possible and advisable. A discussion of the choices and complexities of collecting such transportation information would be useful for local managers.

VI.A.7. Identification of "Key Hazards"

Criteria for determining "key hazards" are proposed in the Planning Guide. Included in this list of criteria should be records of previous accidents, to the extent such records are available. Previous accident information was included in both the County and City Hazard Analysis report. This information is also recommended in the U.S. Department of Transportation guidelines for determining truck routes.

VI.B. Resource Inventory

The City of Portland combined much of the inventory of resources with the hazard analysis data collection. During the pre-fire visit Fire officers noted the significant resources which had been established within each target hazard facility. This made clear to the firms that, in addition to recognizing the hazard they may pose, there is a recognition of their efforts and responsibilities for emergency preparedness.

Similar coordination of hazard analysis and resource inventory procedures are employed by the Multnomah County project. It may be useful for a Planning Guide to reference this opportunity to combine functions.

VI.C. The Need for Community-Wide Planning: An Additional "Problem" and Recommended System Component

The Portland Hazard Analysis project identified a problem which is probably not unique to this community. This problem may need to be addressed in a planning guide developed for a national audience. There is a need to formally coordinate the efforts of public and private groups involved with hazardous

materials safety. Emergency response, mitigation, and prevention will be most efficiently and effectively addressed if the programs and policies are developed if those with hazardous materials responsibilities are working together. This is implicity addressed in the Planning Guide, especially in the introduction and prevention program section. It could be more directly pointed out if listed as a problem and if an acitivity to address the problem were described.

The Portland Hazard Analysis report recommended that an informal community planning body be established to coordinate hazardous materials programs. The group would be composed of representatives of the relevant public and private groups with hazardous materials responsibilities. If implemented, the recommended group will focus on the entire Portland metropolitan area.

VI.D. The Need for More Detailed Planning Guides

The Planning Guide presents an overview of a system and very general steps for its completion. As recommended above, there is a need for more specific guides to hazard analysis. There is also a need for more specific planning aids, which detail options for other components of hazardous materials management systems.

A number of different approaches to emergency response teams, specialized vehicles and other equipment are found just within the Pacific Northwest. And, local and state accident prevention efforts (such as highway routing, time of day restrictions, rail yard prohibitions, etc.) are creating an extremely complex set of inter-governmental questions. Based on the experience of this project, the thorough discussions with those in other communities, there appears to be a need for more specific information useful in developing programs.

The recent FEMA publication "Planning Guide and Check List for Hazardous Materials Contingency Plans" approaches the more complete planning aid which is being recommended here. It describes in detail the planning process and alternative ways of documenting plans.

A similar document describing options for equipment would be useful. For example, now that a hazard analysis has been completed, the City of Portland is considering what new equipment is necessary. Replicating the vehicle established by the Multnomah County project is not necessary. However, there is some equipment necessary for any fire bureau to contain an incident prior to the arrival of back-up assistance.

Assistance in selecting or designing such equipment would be useful. Fire services journals and the "Hazardous Materials Newsletter"[10] (John R. Cashman, Editor) have been helpful in assessing the options. Recommended standards for how a fire department should be equipped to adequately handle their responsibilities during a hazardous materials emergency would be helpful.

The appropriate local and state role in preventing transportation accidents is not clear. The debate involved with the 1981 reauthorization of the Hazard Materials Transportation Act, and the numerous court cases challenging Department of Transportation inconsistency rulings, suggest that a consensus on this issue has not been developed. Such a consensus is probably not possible. However, it would be useful for local planning to have a much clearer statement from the U.S. Department of Transportation about the regulatory opportunities available to local governments. The recent administrative rulings on the highway transportation of radioactive materials (HM-164), and the recommended

guidelines for selecting highway routes are a positive step in providing this clarity. (Although the Portland Office of Emergency Management is concerned about some of the specific limits on local governments which were instituted by HM-164.) More complete information describing the existing inter-governmental relationships would be helpful. Such plannings aids should address all transport modes.

APPENDIX

STANDARD INDUSTRIAL CLASSIFICATION CODES RELEVANT TO HAZARDOUS MATERIALS HAZARD ANALYSIS

SIC CODE	INDUSTRY	PORTLAND PROJECT	MULTNOMAH COUNTY PROJECT*	PSCOG PROJECT
Contracting				
Major Group 07--				
Agriculture Services				
0711	Soil prep			+
0723	Crop prep			+
0783	Tree services (spraying)		+	+
Manufacturing				
Major Group 20--				
Food & Kindred Products				
2017	Poultry & Egg Processing		+	
2021	Creamy, Butter	+	+	
2082	Malt Beverages		+	
Major Group 23--				
Fabric Products				
2339			+	
2393			+	
Major Group 24--				
Lumber and Wood Products (Except furniture)				
2431	Millwork	+	+	
2435	Hardwood Veneer & Plywood		+	
2436	Softwood Veneer & Plywood		+	
2449	Wood Containers		+	
2491	Wood Preserving	+	+	+

SIC CODE	INDUSTRY	PORTLAND PROJECT	MULTNOMAH COUNTY PROJECT	PSCOG PROJECT
Major Group 26--				
Paper and Allied Products				
2611	Pulp Mills			+
2641	Paper Coating & Blazing	+		
2642	Envelopes		+	
2651	Folding paperboard boxes		+	
2653	Corrogated and solid fiber boxes		+	
Major Group 27--				
Printing, Publishing and Allied Industries				
2741	Misc. Publishing		+	
2711	Newspapers		+	
2752	Commerical printing, lithograph		+	
2753	Engraving & Plate Printing	+	+	
2793	Photo Engraving	+	+	

SIC CODE	INDUSTRY	PORTLAND PROJECT	MULTNOMAH COUNTY PROJECT	PSCOG PROJECT
Major Group 28--	**Chemicals & Allied Products**			
2812	Alkalies and Chlorine	+	+	+
2813	Industrial Gases	+	+	+
2819	Ind. Inorg. Chem., NEC			+
2821	Plastics materials		+	+
2822	Synthetic Rubber		+	
2833	Medicinal Chemicals	+	+	
2834	Pharmaceutical Preps	+	+	
2841	Soap & Other Deterg.	+	+	
2842	Specialty Cleaning Preps		+	
2851	Paints, etc.	+	+	+
2865	Coal, Tar, Crudes		+	
2869	Ind. Ore. Chem. NEC	+		+
2873	Nitrogenous fertilizer	+	+	+
2879	Pesticides & agric. Chem., NEC		+	
2891	Adhesives	+	+	+
2892	Explosives			+
2893	Printing Ink		+	
2899	Chemicals & Chem. Preps, NEC		+	+
Major Group 29--	**Petroleum Refining & Related Industries**			
2911	Petroleum Refining	+	+	+
2951	Paving Mixtures & Blocks		+	
2952	Asphalt felts and Coatings		+	

SIC CODE	INDUSTRY	PORTLAND PROJECT	MULTNOMAH COUNTY PROJECT	PSCOG PROJECT
Major Group 30--	**Rubber and Misc Plastics Products**			
3011	Tires & Inner tubes		+	
3069	Rubber Products, NEC		+	
3079	Misc Plastics Products		+	
Major Group 32--	**Stone, Clay, Glass and Concrete Products**			
3221	Glass Containers		+	
3295	Minerals and earths, ground or otherwise treated		+	
Major Group 33--	**Primary Metal Industries**			
3312	Blast furnances, steelworks		+	+
3321	Gray Iron Foundries			+
3324	Steel Investment Foundries			+
3325	Steel Foundries, NEC		+	+
3334	Primary Aluminum Products		+	+
3341	Secondary smelting of non-ferrous metals	+	+	
3361	Aluminum Foundries		+	
3369	Non-ferrous Foundries, NEC		+	

SIC CODE	INDUSTRY	PORTLAND PROJECT	MULTNOMAH COUNTY PROJECT	PSCOG PROJECT
Major Group 34--	Fabricated Metal Products, except Machinery and Transportation Equipment			
3411	Metal Cars	+	+	
3412	Metal Shipping barrels		+	
3429	Hardware, NEC	+	+	
3433	Heating Equipment		+	
3444	Sheet Metal Work		+	
3449	Misc Metal Work		+	
3469	Metal Stampings		+	
3471	Electroplating	+	+	
3479	Coating Engraving, NEC	+	+	
3483	Ammunition	+	+	+
3489	Ordnance & Access, NEC		+	+
Major Group 35--	Machinery, except Electrical			
3532	Mining machinery		+	
3537	Industrial Trucks		+	
3554	Paper Industries		+	
3563	Air & Gas Compressors		+	
3592	Carburetors, pistons, etc.		+	
Major Group 36--	Electrical and Electronic Machinery Equipment and Supplies			
3612	Power and specialty transformers		+	
3679	Electronic components		+	
3691	Storage Batteries		+	+

SIC CODE	INDUSTRY	PORTLAND PROJECT	MULTNOMAH COUNTY PROJECT	PSCOG PROJECT
Major Group 37--	Transportation Equipment			
3711	Motor Vehicles & car bodies		+	
3714	Motor Vehicle parts		+	
3721	Aircraft		+	
3728	Aircraft parts		+	
3731	Ship building & repairing		+	+
3743	Railroad Equipment		+	+
3751	Motorcycles, Bicycles, parts		+	
Major Group 38--	Measuring, Analyzing and controlling Instruments, photographic, medical and optical goods; watches and clocks			
3825	Electricity measuring instruments		+	
3851	Ophthalmic Goods		+	
Major Group 39--	Misc. manufacturing industries			
3914	Silverware, plated-ware	+		

SIC CODE	INDUSTRY	PORTLAND PROJECT	MULTNOMAH COUNTY PROJECT	PSCOG PROJECT
	Transportation, Communication, Gas, Electrical, and Sanitary Services			
4000	Railroad Transportation	+	+	+
4200	Motor Freight Transportation and Warehousing	+	+	+
4400	Water Transportation	+	+	+
4500	Transportation by Air		+	+
4600	Pipelines, Except Natural Gas	+	+	+
4922	Natural Gas pipeline	+	+	+
4941	Water Supply			+
4952	Sewage Systems	+	+	+
	Major Group 50--Wholesale Trade--Durable Goods			
5039	Construction Materials	+	+	
5085	Industrial Supplies	+		
5086	Professional Equipment and supplies	+	+	
	Major Group 51--Wholesale Trade--Non-durable Goods			
5161	Chemicals & Allied Products	+	+	
5191	Farm Supplies	+	+	
	Services			
	Major Group 73--Business Services			
7342	Disinfecting & exterminating	+	+	
7397	Commercial Testing labs	+		

REFERENCES

1. U.S. Department of Transportation, 1980 Hazardous Materials Emergency Response Guidebook. International Association of Fire Chiefs: Washington, D.C. 1980.

2. National Fire Protection Association, Fire Protection Guide on Hazardous Materials, 7th Edition. NFPA: Boston, Mass. 1978.

3. U.S. Department of Transportation, Guidelines for Applying Criteria to Designate Routes for Transporting Hazardous Materials. U.S. Department of Transportation: Washington, D.C. 1980.

4. Gabor, Ron and Griffith, Terri K., "The Assessment of Community Vulnerability to Acute Hazardous Materials Incidents", Journal of Hazardous Materials, Volume 3 (1980), p. 323-333.

5. Gunderloy, Frank C. Jr., and Stone, Wayne L., Planning Guide and Checklist for Hazardous Materials Contingency Plans. Federal Emergency Management Agency: Washington, D.C. 1981.

6. Rhoads, R.E. Project Coordinator, An Assessment of the Risk of Transporting Gasoline by Truck. NTIS: Springfield, VA. 1978.

7. Andrews, William B., et. al. Hazardous Material Transportataion Risks in the Puget Sound Region. NTIS: Springfield, VA. 1981

8. Himmelman, W.A. and Zajic, J.E. Highly Hazardous Materials Spills and Emergency Planning. Marcel Dekker, Inc.: New York. 1978.

9. Puget Sound Council of Governments. Hazardous Materials Study for the Central Puget Sound Region. PSCOG: Seattle, WA. 1981.

10. John R. Cashman, Hazardous Materials Newsletter. P.O. Box 204, Barre, Vermont.

Contacts Influential: Commerce and Industry Directory. Influential Contacts: Portland, Oregon 1981-82.

Standard Industrial Classification Manual. Office of Management and Budget. Government Printing Office: Washington, D.C.

ENCLOSURE A

DISTRIBUTION LIST

Defense Technical Information Center Cameron Station Alexandria, VA 22314	5
Myra Lee, Manager Office of Emergency Management Multnomah County Oregon Division of Public Safety 12240 N.E. Glison Portland, OR 97230	2
National Fire Protection Library Batterymarch Park Quincy, MA 02269	1
Director Defense Nuclear Agency Attn: Technical Library Washington, D. C. 20305	1
National Bureau of Standards Attn: Fire Research Library Technology Building 225 Washington, D. C. 20234	1
Document Library Johns Hopkins University Applied Physics Laboratory 8621 Georgia Avenue Silver Spring, MD 20910	1
Mr. B. Cohn Gage-Babcock & Associates, Inc. 9836 W. Roosevelt Road Westchester, IL 60153	1
Ryland Research Inc. 5266 Hollister Avenue Suite 324 Santa Barbara, CA 94025	1
Mr. C. Wilton Scientific Service Inc. 517 E. Bayshore Redwood City, CA 94063	1
Factory Mutual Attn: Dr. Raymond Friedman 1151 Boston-Providence Turnpike Norwood, MA 02062	1

UNCLASSIFIED

HAZARDOUS MATERIALS MANAGEMENT SYSTEM VALIDATION: A Comparison of the Hazard Analysis and Resource Inventories Conducted by Multnomah County and the City of Portland

City of Portland Office of Emergency Management

March, 1982

49 pages

Contract Number EMW-C-0326
Work Unit Number 4521F

This report describes the validation of the Multnomah County hazardous materials hazard analysis and resource inventory. It describes in detail how a hazard analysis was conducted by the City of Portland.

UNCLASSIFIED

HAZARDOUS MATERIALS MANAGEMENT SYSTEM VALIDATION: A Comparison of the Hazard Analysis and Resource Inventories Conducted by Multnomah County and the City of Portland

City of Portland Office of Emergency Management

March, 1982

49 pages

Contract Number EMW-C-0326
Work Unit Number 4521F

This report describes the validation of the Multnomah County hazardous materials hazard analysis and resource inventory. It describes in detail how a hazard analysis was conducted by the City of Portland.

UNCLASSIFIED

HAZARDOUS MATERIALS MANAGEMENT SYSTEM VALIDATION: A Comparison of the Hazard Analysis and Resource Inventories Conducted by Multnomah County and the City of Portland

City of Portland Office of Emergency Management

March, 1982

49 pages

Contract Number EMW-C-0326
Work Unit Number 4521F

This report describes the validation of the Multnomah County hazardous materials hazard analysis and resource inventory. It describes in detail how a hazard analysis was conducted by the City of Portland.

UNCLASSIFIED

HAZARDOUS MATERIALS MANAGEMENT SYSTEM VALIDATION: A Comparison of the Hazard Analysis and Resource Inventories Conducted by Multnomah County and the City of Portland

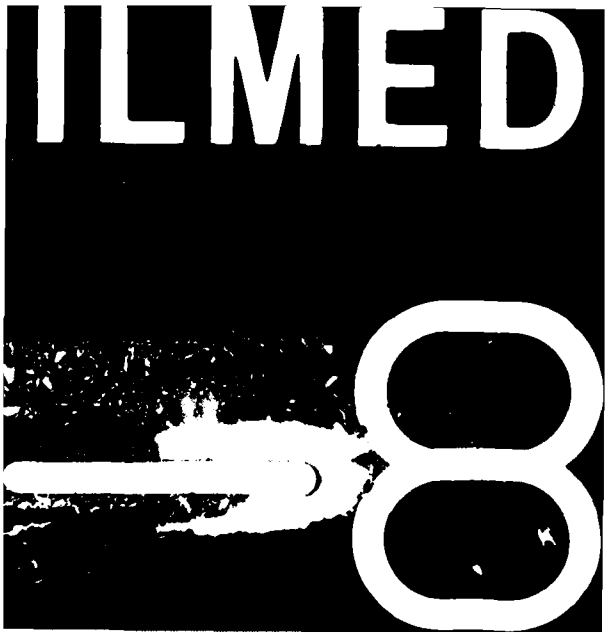
City of Portland Office of Emergency Management

March, 1982

49 pages

Contract Number EMW-C-0326
Work Unit Number 4521F

This report describes the validation of the Multnomah County hazardous materials hazard analysis and resource inventory. It describes in detail how a hazard analysis was conducted by the City of Portland.


ILMED
8