GSDMA

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GUJARAT STATE CHEMICAL DISASTER MANAGEMENT PLAN

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GSDMA

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REFERANCE NO.: GSDMA/2013/01 10 JUNE 2013

PROJECT TEAM

This project was commissioned by GSDMA to PRESTELS (Mumbai). PRESTELS partnered with IEM, Inc (USA) and NEERMAN (Mumbai) as well as several eminent national and international consultants to execute the project.

Dr Ranjit Bannerji, CEO, GSDMA led the project from GSDMA and provided overall policy guidance. The technical team members at GSDMA – Shri VN Patel (Industrial Advisor) and Shri Nisarg Dave (Sector Manager) – were instrumental in technical review and collaboration with PRESTELS on the project. The Project Management Unit at GSDMA supported in project management, contracting and communication tasks.

The Technical Team Leader was Lt Gen Dr. JR Bhardwaj, MD DCP PhD FICP FAMS FRC Pathology (London), Ex-Member NDMA. Mr. KC Gupta (Former Director General of NSC and DGFASLI) was the Chemical & Industrial Emergency & Response Planning Expert.

Mr Sumeet Patil (Research Director at NEERMAN and Principal Consultant at PRESTELS) was the project director on behalf of PRESTELS. Mr Wayne Thomas, Ms Angela Nelson, and Mr John Steinauer of IEM, Inc (USA) extensively collaborated with PRESTELS as a part of IEM, Inc (USA). Other consultants and staff from PRESTELS and IEM who supported the project include Dr George Abraham, Mr Don Broughton, Mr Louis Carrow, Ms Brinda Iyer, Mr Surendar Kumar, Dr Ajay Madgaokar, Mr AK Mhaskar, Mr Prakash Patil, Mr AB Pote, Dr GV Rao, Mr Gary Scronce, Dr Steven A. Stage, and Mr JJ Vaghela and Mr Mayoor Vaghela (of m/s HELPS, Vadodara).

PRESTELS

IEM

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ABBREVIATIONS

A

AAR	After Action Report
ABC	Airway Breathing and Circulation
ALOHA	Areal Locations of Hazardous Atmospheres
ALS	Advanced Life Support
APELL	Awareness and Preparedness for Emergencies at Local Level
APR	Air Purifying Respirator
ARMV	Accident Relief Medical Van

B

BLEVE	Boiling Liquid Expanding Vapour Explosion
BLS	Basic Life Support

C

CAEPPR	Chemical Accident (Emergency Planning Preparedness and Response)
CAIRS	Chemical Accident Investigation Reporting System
CBRN	Chemical, Biological, Radiological, and Nuclear
CBRNE	Chemical, Biological, Radiological, and Nuclear Emergency
CECAP	Chemical Emergency Community Awareness and Preparedness
CIDM	Chemical (Industrial) Disaster Management
CPAP	Continuous Positive Air Pressure
CS	Chief Secretary

D

DBMS	Database Management System
DC	District Collector
DCG	District Crisis Group
DDMA	District Disaster Management Authority
DEOC	District Emergency Operation Centre
DISH	Directorate of Industrial Safety and Health
DMP	Disaster Management Plan
DOT	Department of Transportation
DPMC	Disaster Prevention and Management Centre
DPO	District Project Officer

E

ECC	Emergency Control Centre
EIP	Emergency Information Panel
EMS	Emergency Medical Services
EOC	Emergency Operation Centre
ERC	Emergency Response Centre
ERF	Environmental Relief Fund
ERG2012	Emergency Response Guidebook, 2012

G

GACL	Gujarat Alkalises and Chemicals Limited
GAIL	Gas Authority of India Limited (previously known as)
GIDC	Gujarat Industrial Disaster Corporation
GIDM	Gujarat Institute of Disaster Management
GNFC	Gujarat Narmada Valley Fertilizers and Chemicals Limited
GPCB	Gujarat Pollution Control Board
GSDM	Gujarat State Disaster Management (Act, 2003)
GSDMA	Gujarat State Disaster Management Authority

ABBREVIATIONS

H

HAZCHEM	Hazardous Chemicals
HAZMAT	Hazardous Material
HAZWOPER	Hazardous Waste Operations and Emergency Response

I

IAP	Incident Action Plan
IC	Incident Commander
ICP	Incident Command Post
ICU	Intensive Care Unit
ILS	Intermediate Life Support
IMO	Information and Media Officer
IRS	Incident Response System
IRT	Incident Response Team

L

LCG	Local Crisis Groups
LCR	Local / LCG Control Room
LEL	Lower Explosive Limit
LERT	Local Emergency Response Team
LO	Liaison Officer
LPG	Liquefied Petroleum Gas
LS	Logistics Section
LSC	Logistics Section Chief

M

MAH	Major Accident Hazard
MARG	Mutual Aid Response Group
MARPLOT	Mapping Application for Response, Planning, and Local Operational Task
MFR	Medical First Responders
MOEF	Ministry of Environment and Forests
MSDS	Material Safety Data Sheets
MSIHC	Manufacturer, Storage and Import of Hazardous Chemicals

N

NDMA	National Disaster Management Authority
NGO	Non-Governmental Organization
NIDM	National Institute of Disaster Management
NOAA Administration	National Oceanic and Atmospheric
NPIC	National Poison Information Centre

O

OMC	Oil Marketing Companies
OSC	Operations Section Chief
OSHA	Occupational Safety and Health Administration

P

PASS	Personal Alert Safety System
PESO	Petroleum and Explosives Safety Organization
PID	Photo-Ionization Device
PLI	Public Liability Insurence
PNGRB	Petroleum and Natural Gas Regulatory Board
PPE	Personal Protective Equipment
PS	Planning Section

Q

QRMT	Quick Response Medical Teams

R

RC	Response Commander
RRT	Regional Response Team

ABBREVIATIONS

S

SCBA	Self Contained Breathing Apparatus
SDM	Sub-Divisional Magistrate
SERT	State Emergency Response Team
SEOC	State Emergency Operation Centre
SFAC	Standing Fire Advisory Council
SFED	State Forests and Environment Department
SO	Safety Officer
SOP	Standard Operating Procedure
SSP	Site Safety Plan

T

TIH	Toxic Inhalation Hazard
TREMCARD	Transport Emergency Card
TSDF	Treatment Storage and Disposal Facility

U

UEL	Upper Explosive Limit
UNEP	United Nations Environmental Protection Program
USEPA	United States Environmental Protection Agency

V

VCE	Vapour Cloud Explosion
VMI	Vendor Managed Inventory
VWEMCL	Hazardous Waste Management Facilities

DEFINITIONS AND GLOSSARY OF KEY TERMS

RELEVANT DEFINITIONS AS PER CAEPPR RULES (1996) AND MSIHC RULES (1989)

Chemical Accident means an accident involving a fortuitous, or sudden or unintended occurrence while handling any hazardous chemicals resulting in continuous, intermittent or repeated exposure to death, or injury to, any person or damage to any property but does not include an accident by reason only of war.

Hazardous Chemical means

(i) Any chemical which satisfies any of the criteria laid down in Part I of Schedule 1 or is listed in Part 2 of the said schedule

(ii) Any chemical listed in Column 2 of Schedule 2

(iii) Any chemical listed in Column 2 of Schedule 3.

Industrial Activity includes an operation or process:

(i) Carried out in an industrial installation referred to in Schedule 4 involving or likely to involve one or more hazardous chemicals

(ii) On-site storage or on-site transport which is associated with that operations or process as the case may be;

(iii) Isolated storage

(iv) Pipeline.

Industrial Pocket means any industrial zone earmarked by the Industrial Development Corporation of the State Government or by the State Government.

Isolated Storage means storage of a hazardous chemical other than storage associated with an installation on the same site specified in Schedule-4 where that storage involves at least the quantities of that chemical set out in Schedule-2.

Major Chemical Accident means an incident involving loss of life inside or outside the installation or ten or more injuries inside and / or one more injuries outside or release of toxic chemicals or explosion or fire or spillage of hazardous chemicals resulting in on site or off site emergencies or damage to equipment leading to stopping of process or adverse effect to the environment.

Major Accident Hazards (MAH) Installations means isolated storage and industrial activity at a site, handling (including transport through carrier or pipeline) of hazardous chemicals equal to or, in excess of the threshold quantities specified in column 3 of Schedules 2 and 3 respectively.

Note: In Gujarat state, DISH also identified Type A and Type B industries along with MAH. Units where chemical quantities handled are below the threshold quantity for MAH units as mentioned above are known to be Type 'A' industries. Those handling of hazardous solvents and highly inflammable liquids are known to be Type 'B' industries. (Communication with Assistant Director DISH, AK Jani)

Off-site Emergency Plan means the off-site emergency plan prepared under rule 14 of the Manufacture, Storage and Import of Hazardous Chemicals Rules1989.

DEFINITIONS AND GLOSSARY OF KEY TERMS

Pipeline means a pipe (together with any apparatus and works associated therewith) or system of pipes (together with any apparatus and works associated therewith) for the conveyance of a hazardous chemical other than a flammable gas as set out in column 2 of Part II of schedule 1, at a pressure of less than 8 bars absolute.

Site means any location where hazardous chemicals are manufactures or processed, stored, handled, used, disposed of and includes the whole of an area under the control of an occupier and includes pier, jetty or similar structure whether floating or not.

Transport means movement of hazardous chemicals by any means over land, water or air.

RELEVANT DEFINITIONS AS PER DM ACT 2005

Affected area means an area or part of the country affected by a disaster

Disaster means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area

Disaster management means a continuous and integrated process of planning, organising, coordinating and implementing measures which are necessary or expedient for:

(i) prevention of danger or threat of any disaster
(ii) mitigation or reduction of risk of any disaster or its severity or consequences
(iii) capacity-building
(iv) preparedness to deal with any disaster
(v) prompt response to any threatening disaster situation or disaster
(vi) assessing the severity or magnitude of effects of any disaster
(vii) evacuation, rescue and relief
(viii) rehabilitation and reconstruction.

District Authority means the District Disaster Management Authority constituted under sub-section (1) of section 25.

Local authority includes Panchayati raj institutions, municipalities, a district board, cantonment board, town planning authority or Zila Parishad or any other body or authority, by whatever name called, for the time being invested by law, for rendering essential services or, with the control and management of civic services, within a specified local area.

Preparedness means the state of readiness to deal with a threatening disaster situation or disaster and the effects thereof.

GLOSSARY OF OTHER KEY TERMS

Acute exposure: A sudden single exposure.

Chronic exposure: A continuous or recurrent exposure over an extended period of time.

Consequence: Result of specific event, without consideration of exposure.

Criterion: An agreed reference on which a decision or judgement is based.

DEFINITIONS AND GLOSSARY OF KEY TERMS

Danger: A popular expression covering the subjective perception of hazard or risk.

Dose: Quantity of an agent absorbed over a specified period of time.

Effect: Immediately or delayed result of an exposure.

Event: The realization of a hazard.

Exposure: State of a specific target being open and vulnerable to the consequence of an event.

Frequency: An expression of how often a considered occurrence takes place in a given time.

Hazard: An inherent property of a substance, agent, and source of energy or situation having the potential of causing undesirable consequences and/or effects.

Hazard study: (equivalent terms: hazard survey, hazard analysis, etc.) Identification of individual hazards of a system, determination of the mechanisms by which they could give rise to undesired events, and evaluation of the consequences of these events.

Individual risk: Risk to which an individual person within a specific population is subjected.

Major hazard: A hazard having the potential of causing a major accident; i.e. a major emission, a fire or an explosion which leads to considerable social disruption as the result of serious adverse effects on the following targets:

- Death, severe intoxication or injuries requiring extended hospitalization of number of people and/or
- Significant damage to property, animals, crops or plants, or significant contamination of water, soil or air, with considerable economic impact.

Probability: An expression of the chance that a considered occurrence will take place.

Reliability: An expression of the ability of

- Numerical data or assumptions to be a true representation of the required parameter
- Methods and procedures to be able to give, for the circumstances of the case, the result that is required of them
- Equipment and people to perform the function that is required of them.

Residual risk is the risk still remaining after the implementation of risk management.

Risk is the combination of a stated effect and its probability of occurring.

Risk assessment: The procedure to identify risk by combining the results of a hazard study with the probabilities of the events considered and their effects.

Risk management: The whole of actions taken to achieve and maintain the safety of an installation and its operation.

Safety: A situation without risks.

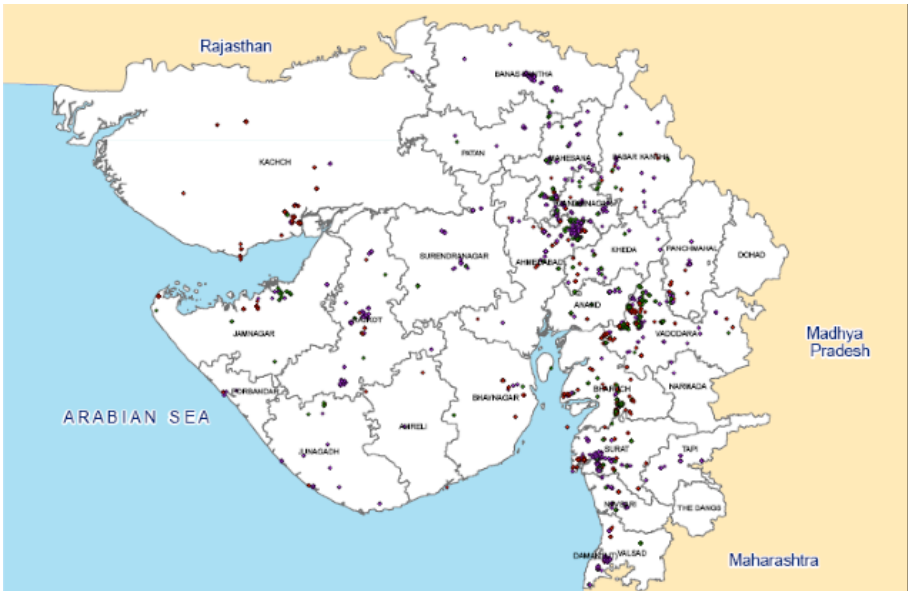
Societal risk: Risk to which a defined group or number of persons within a specific population is subjected simultaneously.

Uncertainty: An expression of the doubt about numerical data, an assumption, model used or the result of a method.

EXECUTIVE SUMMARY

INTRODUCTION

As one of the most developed and industrialized states in India, Gujarat is home to a high number of hazardous chemical industries. In addition to the chemical and industrial hazards posed due to such heavy industrialisation, Gujarat is also vulnerable to natural hazards such as cyclones, earthquakes, flooding, tsunamis, and storm surges. Particularly, the chemical industry occupies a preeminent position in the industrial sector of Gujarat, contributing to more than 40% of the industrial output. Almost the entire range of the chemical process industry exists in Gujarat, including hydrocarbon processing/refining products, petrochemicals-polymers and man-made fibres, fertilizers, health care products, plant protection chemicals, dyes, pigments and intermediates, fine chemicals, surface coating products, salt and salt-based products, ceramics, glass, cement, vegetable oils, fats, and detergents. Currently, Gujarat has 36,179 factories registered under the factories act. Out of these 25,206 are working as on January, 2011. Based on the chemical database provided to us by DISH, currently there are 380 MAH, 1019 Type-A and 758 Type-B industries[1]. Out of these 41 MAH, 173 Type-A, 232 Type-B are closed. The figure below shows the location of MAH, Type A and Type B units in Gujarat.



Location of MAH type A and type B industries in Gujarat

SCOPE OF WORK

Currently, under MSIHC rules, state response plan and district offsite plans are being prepared in Gujarat. Gujarat is one of the first states to adopt 2010 National Guidelines for Offsite Emergency Plan by MoEF. The industrial safety is also being ensured as per Factories Rules by DISH. However, GSDMA felt a need to prepare a "model" plan that is futuristic and aspires to meet international standards for effective chemical emergency management. Need for such a plan is acute given the high growth prospects of Gujarat and need for coordination of emergency response structure under MSIHC and CAEPPR Rules and DM Act and GSDM Act. GSDMA appointed a team of international consultants led by m/s PRESTELS to prepare a model state CDMP based on NDMA guidelines as well as meeting the international norms with an objective of rapid and effective response to chemical emergencies to save lives, environment and property.

[1]SCG Emergency Response Plan of 2008 had listed 433 Major Accident Hazard (MAH) units in Gujarat. However, the most recent database provided to us by DISH identifies 380 unique MAH units in the state. Please contact DISH for more up to date information on chemical industries in the state.

EXECUTIVE SUMMARY

The DMP is a plan that will identify what needs to be done and how. However, the action plan to achieve the recommended objectives (how, when, funds, who, etc.) must be prepared by each department assigned the responsibility under this plan. Often, the responsibility is on the group such as SCG and not individual departments or authorities. However, without such detailed action plans, this CDMP cannot be effectively implemented in a time bound manner.

APPROACH

This model state Chemical Disaster Management Plan (CDMP) is based on key recommendations and findings from following reports developed as a part of preparatory modules under the contract with GSDMA:

Module 1

1. Capability assessment and gap analysis
2. Vulnerability assessment
3. Antidotes plan
4. Synchronization between onsite and offsite plans

Module 2

1. Improvement in response mechanism
2. Community sensitization strategy
3. Performance improvement of DISH, PESO and CEI
4. GIS based database system for chemical disaster management

DIFFERENCE IN OFFSITE PLAN AND THIS CDMP

Offsite plans prepared by the DCG or pocket plans by LCG are specific for the response to chemical emergencies with some supporting information to strengthen the preparedness for achieving the desired level of response. In many respects the offsite plan is the ready reckoner in time of chemical emergency and necessarily based on resources available "now". On other hand, the CDMP deals with the entire cycle of disaster management: Prevention and Mitigation, Preparedness, Response, Recovery and Rehabilitation with a special focus on capacity building and preparedness to provide effective response. CDMP also tries to come with an emergency response organisation that can function under different types and scale of disasters and not only chemical emergencies. Offsite plan which is more "response" centric – though we acknowledge that it has some preparedness related information – can be a part of a comprehensive CDMP. Figure below depicts cycle of disaster management.

Considering the recommendations in this plan seek to build the level of preparedness to international standards, the response plan is also based on the assumption that such high level of preparedness is possible. Clearly, the CDMP is not, and should not be used as, a ready reckoner or a SOP for emergency response "now". Instead, the existing SCG response plan (2008) should be continued to be used until the level of planning and preparedness in Gujarat are commensurate with recommendations and assumptions in this CDMP. Therefore, in addition to offsite plans under MSIHC Rules, this CDMP is a major contribution and step towards taking a comprehensive approach and constituting a futuristic plan for chemical disaster management in Gujarat.

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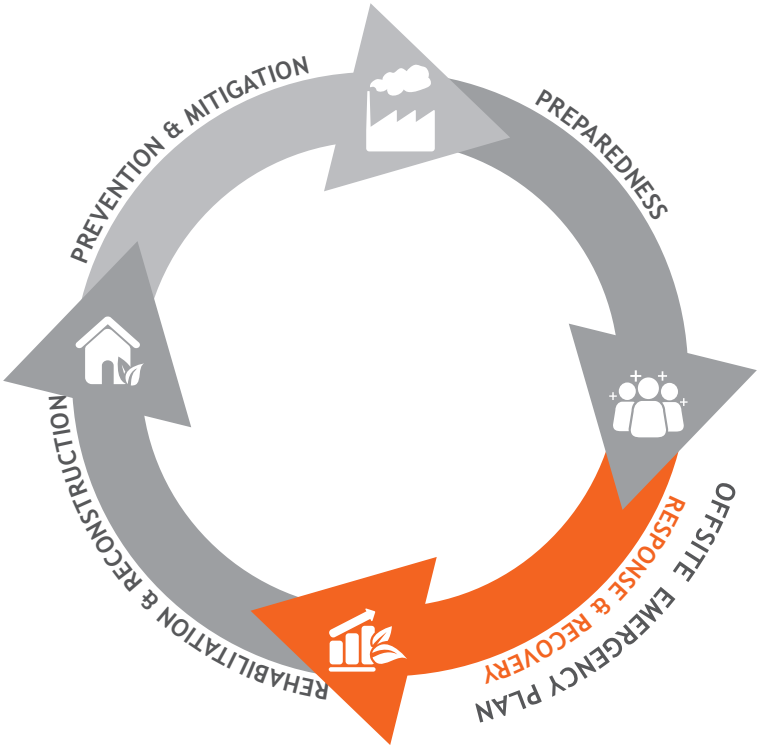

HIERARCHY OF EMERGENCY MANAGEMENT PLANS

As depicted in the figure above, the onsite plan of the industry, prepared under MSIHC Rules is the most important and basic element. The pocket plan (if applicable) or the DCG offsite emergency plan (and thus District CDMP) is based on the information contained in the onsite plans and pocket plans (if available). The state and national level plans are based on the information in district plans. For example, the onsite plans identify emergency scenarios which have potential for offsite consequences and thus need the assistance of offsite agencies at the local level. The local (LCG) or district level (DCG) plans for assistance to industries and identify scenarios that need state level support. The state level plan provides for assistance to the district and also identifies scenarios which need national assistance. Each plan has procedures to request higher levels of assistance.

LOCAL RESPONSE TO CHEMICAL EMERGENCY - EMERGENCY ORGANISATION STRUCTURE

The response to a chemical disaster is always local with resources segmented from district and state levels. Under MSIHC Rules, LCG is the lowest level of group available at industrial cluster level whereas DCG is the next level of response. In the case LCG is not available, then DCG is the lowest level of response. As per DM Act 2005, the local authorities and Panchayati Raj Institutions can plan for, prepare, and respond to emergencies. Therefore, Taluka or block level administration can prepare for and co-ordinate the response to chemical emergencies, provided Taluka level CDMPs are prepared including management of Chemical Disasters, although such plans are not currently available. The key stakeholders who are responsible for chemical disaster management in the state can be categorised into two broad areas by function:

1. Agencies/ organisations responsible for Planning, Regulation, Co-ordination, capacity building and management; and
2. Agencies/organisations who co-ordinate and carry out response actions to chemical emergencies

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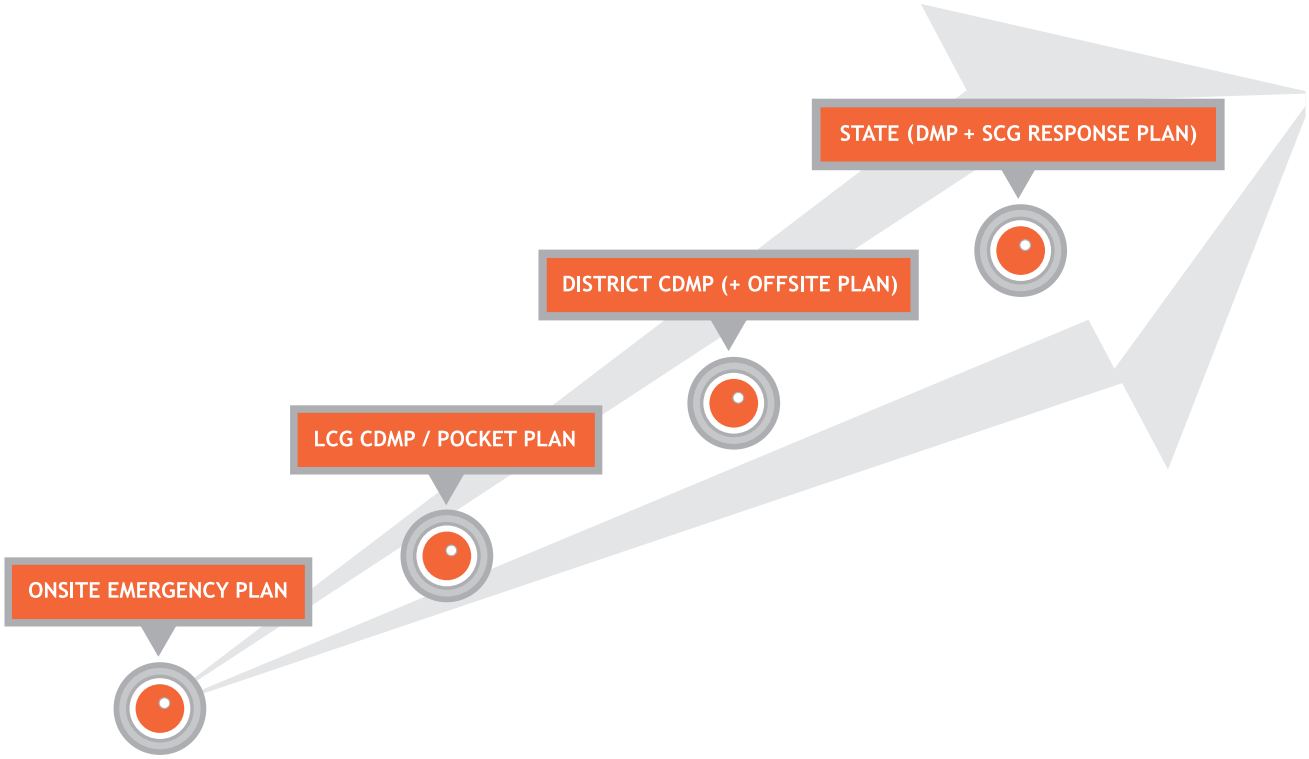

At the State level, agencies such GSDMA, DISH, GPCB, PESO, CEI , SCG, GIDC etc. are responsible for regulation, planning, and management; and agencies and bodies such as, SDRF, SEOC, Fire Services, Emergency Medical Services and Police are entrusted with providing chemical emergency response. Similarly at the district level the DDMA, DCG and LCG are responsible for planning and management and DEOC, Fire services, Emergency medical services and Police are entrusted with chemical emergency response.

Intended coordination in the SCG-DCG-LCG mechanism under the MSIHC rule and the SDMA-DDMA mechanism under the DM Act is automatically achieved at the district level because the district collector is a head of both. It is clear that SCG, DCG, and LCG are not response agencies themselves but include members that are response agencies. Similarly GSDMA and DDMA are not response agencies but include member departments that provide response. However, NDMA guidelines provides for emergency organization where different departments, agencies and even private resources (e.g., industries) temporarily align their priorities with the emergency response objective under a unified command. This system is called Incident response System (IRS) and discussed in detailed in the text.

It is important to recognize that organization under IRS and the existing structures of LCG and DCG are not in conflict although there can be differences in terminologies for some positions in the emergency organization. IRS gives an emergency organization structure called Incident response Teams (IRTs) that are pre-designated as per the identified emergency scenarios. While there is a general structure IRTs are not prescriptive about who must fulfil what position or role; instead, the decision rests with the local or district level authorities. Therefore, the organizations and people that are given specific roles as per existing LCG and DCG structure can be given similar roles or positions in the IRT structure and a coordination between IRTs as per IRS and those as per existing LCG/DCG structures is achieved.

However, IRS provides additional advantage of being scalable by including additional and higher levels of response in the

same unified command structure, being flexible by transferring command and other sections of IRS to qualified people as scale and nature of emergency changes, and with a unified command so that there is one authorized, and accountable (technically qualified) incident commander and the command can be transferred up as the scale of emergency increases. IRS also requires documentation of decisions, actions, and learning so that not only continuous improvement can be achieved but also accountability is fixed.

HAZARD IDENTIFICATION AND VULNERABILITY ASSESSMENT

Gujarat faces not only natural hazards such as cyclones, earthquakes, flooding, tsunamis, and storm surges, but also man made hazards due to heady industrialization of the state. The chemical industry occupies a pre-eminent position in the industrial sector of Gujarat, contributing to more than 40% of industrial output. A stretch of 400 kilometres from Ahmedabad to Vapi is known as the "Golden Corridor." In the Bharuch district, Ankleshwar, situated on the Narmada estuary, is Asia's largest chemical zone. To support the rapid development of the textile industry in the state post-independence, a large integrated chemical complex came up at Atul in Valsad district. The discovery of oil and gas in Ankleshwar and the surrounding areas led to the building of Gujarat Refinery Ltd, and the downstream units in the form of petrochemical complex (IPCL) and fertilizer complex (GSFC) at Vadodara. The major hydrocarbon complexes are located in Vadodara, Bharuch, Surat, and Jamnagar districts. The caustic/chlorine manufacturing plants are located in Mithapur, Veraval, Surendranagar, Vadodara, Dahej, Jhagadia, and Atul. Toxic chemicals such as cyanides are produced in GACL Baroda, Cyanides & Chemicals at Olpad (Surat District). The refinery and the petrochemical complex triggered the development of small and medium scale chemical industries for the production of chemicals first in Nandesari, followed by Vapi, Vatva, Ankleshwar, and other places. The state has a Chemical Port Terminal at Dahej. Kandla Port Trust imports and handles the majority of petrochemical products in India. Additionally, two ports in the private sector located in Mundra and Pipavav, handle major petrochemical products. It is expected that port-based mega-chemical industrial estates would be further developed.

In addition to the manufacturing industries, there is significant infrastructure for handling chemicals such as pipelines, transportation (rail and road), and isolated storages. A cross-country 2300 Km Hazira-Bijapur-Jagdishpur (HBJ) gas pipeline originates from Hazira. A hydrocarbon supply pipeline runs from Kandla to Bhatinda (Punjab). A pipeline network of more than 17000 kilometres is present in the state. Major LNG terminals are proposed at Pipavav, Dahej and Hazira. The crude oil carrying pipelines are also proposed. Railways, state highways and national highways running through the state carry chemical cargo that originates in or transits through the state. There are several isolated storages mainly at Vadodara, Kheda, Sanand, Bavla, Rajkot, and Bhavnagar. Gujarat also has several airports that not only store aviation fuel but may also hold hazardous chemical cargo. Several defence and nuclear installations in the state also pose the risk of chemical emergencies. Additionally, the state is also vulnerable to chemical or industrial disasters as an aftermath of a natural disaster. For example, Kandla cyclone of 1998 affected oil terminals, jetties, transportation facilities, factories, buildings, warehouses, and storage tanks. There have been reports of chemical spill in Kandla port in the wake of January 26 earthquake in 2001.

Under this project, the consultants conducted vulnerability assessment for MAH, Type A and Type B chemical units in the state as per the best available data. Figures below delineate the vulnerability zones for different types of hazards. Separate reports on vulnerability figures and atlas are prepared.

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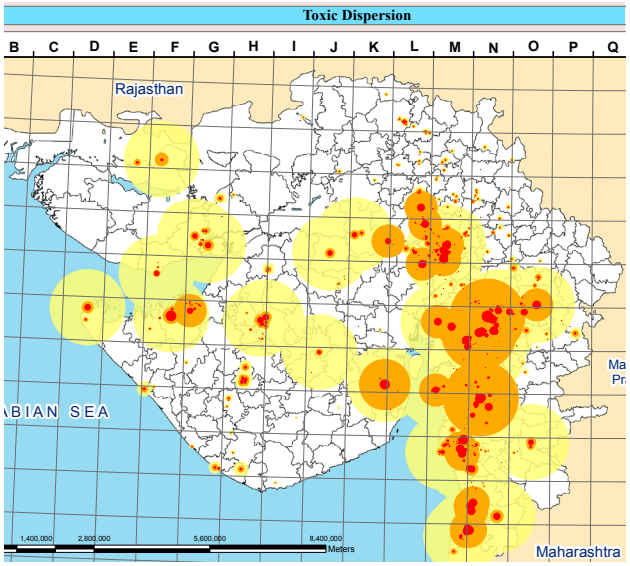
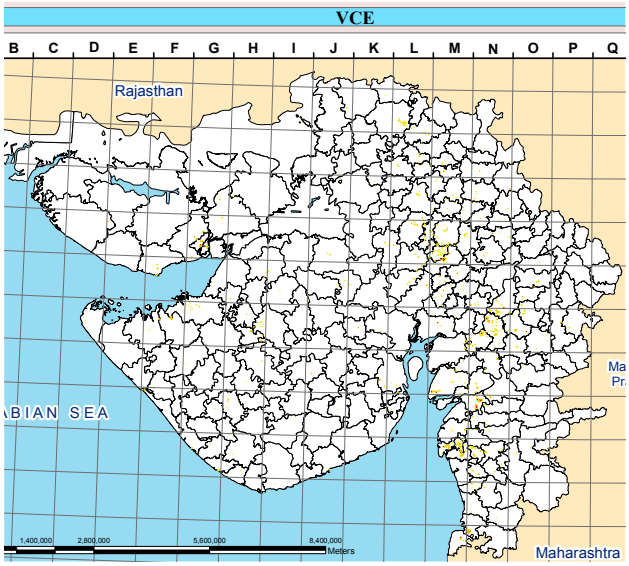
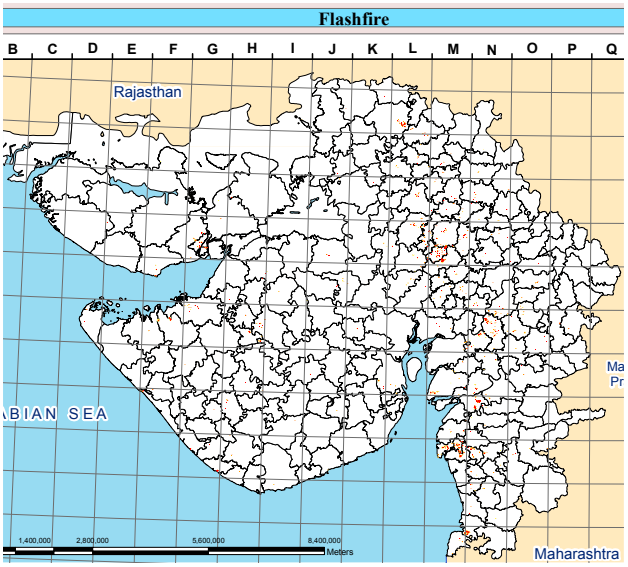


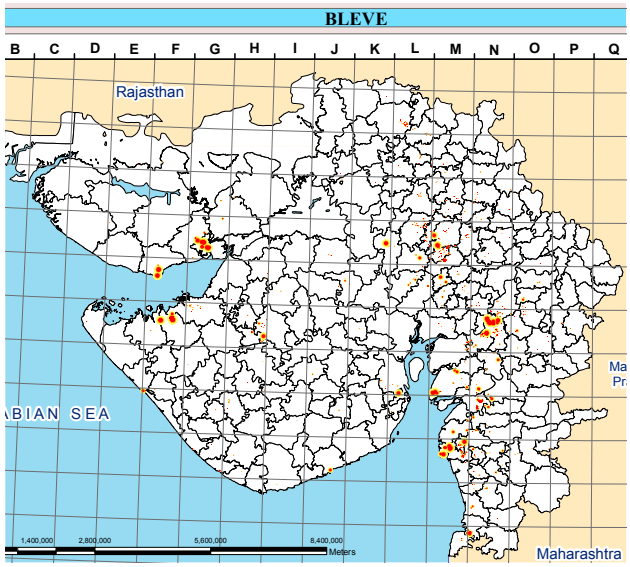
Vulnerable Areas in Gujarat for Toxic Hazards



Vulnerable Areas in Gujarat for Vapour Cloud Explosion Hazards



Vulnerable Areas in Gujarat for Flash Fire Hazards



Vulnerable Areas in Gujarat for BLEVE Hazards

EXECUTIVE SUMMARY

PREVENTION AND MITIGATION

This chapter deals with the prevention and mitigation of the risks posed by hazardous chemical manufacturing, storage, handling, and transportation at the state level. The approach to prevention and mitigation is focused on regulatory and planning strategies. A hierarchy of concepts has been developed for reducing the risks of chemical disasters which is an important guide to prioritize the activities required to operationalize this plan.

These include:

1. Eliminating or reducing the use of toxics
2. Implementation of risk management programs to minimising opportunities for release to occur and mitigation of any release at source.
3. Implementation of land use restrictions
4. A rapid, timely and qualified emergency response capacity to control and reduce the quantity of hazardous chemicals leaked and to reduce the duration of such a leak
5. Establish plans, develop public warning systems, and conduct public outreach and training on evacuation and shelter-in-place actions.

One of the key approaches to prevention and mitigation is strengthening of the legal framework. This CDMP identified relevant National Level recommendations by NDMA expert group for strengthening the legal gaps as follows:

- Enforcement of safety provisions for isolated storages should be with CIF (or DISH) in place of SPCB/CPCB
- Enforcement of MSIHC rules to include intermediate, minor and private ports (Other ports) that do not fall under the category of major ports
- Using "Worst Case scenario" as the basis for risk assessment, selection of process technology, and designing of safety systems measures and procedures including emergency responses capabilities by MAH installations.
- Land use policy for buffer zone around MAH installations (Handling/ storing extremely/ highly toxic chemicals)
- Applicability of rules regarding safety reports and safety audit reports should be extended to all MAH installations instead of only certain MAH installations having the threshold quantities of identified hazardous chemicals. Additionally, this project's consultants recommend that Type A and Type B industries be also included.

In addition to the above national level recommendations, some state level regulatory recommendations are provided by the project consultants:

- Harmonisation of state acts and rules with respect to DM Act, 2005 for effective dovetailing of frameworks under MSIHC and NDMA guidelines
- Requirement of Emergency Management Plans for hazardous waste management facilities.
- Framing of State rules and regulation to bridge legal gaps under GSDM Act 2003 as the GSDMA has the authority to form state rules to manage chemical emergencies.
- Several guidelines – for example, responder safety and training needs, immediate notification of chemical leaks, incident response system, etc. – are recommended. Guidelines are usually more efficient and less resistant approach to making a policy change. On basis of experience with these guidelines, the state should consider forming appropriate rules to provide statutory support to these guidelines.

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The next focus area in prevention and mitigation is strengthening of enforcement agencies themselves. The project reviewed performance of DISH, PESO and CEI and on basis of this study made the following recommendations. These recommendations may also be applicable to other regulatory agencies such as GPCB which were not studied exclusively.

- **Strategic Re-Organization of the Agencies** - Organizational structure on the basis of subject or function at the top level, and by geographic reach at the field level is most suitable for regulatory agencies. For example, the state-level head office of the regulatory agency can have a specialist chemical emergency planning cell that will be helpful in preparing guidelines and procedures for the inspection, enforcement, and legal compliance by the industry, and serve as a key knowledge resource in planning for and responding to chemical emergencies.
- **Programmatic approaches for compliance** - Programme mode approach to safety promotion brings together regulators and industries on a common platform to seek mutually agreeable solutions. This approach seeks to improve efficiencies by removing redundancies in overlapping regulations by different regulators, to combine resources of regulators, to build consensus with industries, to partner with industry for funding, technology and knowledge, and to develop guidelines and systems for ease of compliance under the programme. An example of Toxic Risk Reduction Programme is provided.
- **Use of third Party professionals to Strengthen Enforcement** - To resolve the manpower crunch in regulatory agencies, we recommend a third party professionals/competent persons to carry out usual inspections, report filing, checking, collection of fees, scrutiny of applications, checking of onsite plans, and several such routine tasks. A necessary pre-condition is that such competent persons (a) are selected after a rigorous selection, training, and certification process; (b) undergo continuous training to upgrade skills and knowledge; (c) demonstrate no conflict of interest in discharging their role; and (d) are subject to a credible audit system to make them accountable. Example of environmental audits by third party by GPCB is identified.
- **Significant reliance on E -Governance** - Web and internet based technology not only helps in efficiency but also in accountability. Several systems are suggested including information on compliance by industry, the inspection reports and accident investigations, and safety and audit reports, GIS based modelling, database and decision support system, hazard and vulnerability profiles of areas, and others.
- **Developing inspection manuals** - Regulatory agencies should update detailed inspection manuals and conduct regular training of their staff and third party professionals on these. These manuals must detail the procedure of inspection, industry specific guidelines, standard templates, and check lists for inspections, and SOPs for action after inspection. There should be a system of maintaining inspection records on a web-platform.
- **Using accident reporting system** - MOEF has developed web-based Chemical Accident Investigation Reporting System (CAIRS) to register chemical accident and investigation information. While CAIRS can be much improved, the use of CAIRS is recommended or Gujarat can develop its own system over time.

In addition to the above, the following strategies and actions are recommended for prevention and mitigation

Promoting preventive programs in industry- Prevention programs in industry for capacity building can include safety reviews and training for workers and contractors, implementing maintenance management systems, written safety procedures and work aids for employees and contractors and conducting compliance audits.

- Co-ordination between enforcement agencies- There are several key regulatory and technical agencies that play a role in prevention and mitigation of chemical emergencies. However, a common platform for effective coordination amongst them does not exist. Therefore, a key role for GSDMA will be to improve coordination between DGFASLI, Airport Authority, Western Railways, PNGRB, GMB, PESO, CEI, DISH, GPCB, DOT, and others to meet the common objective of reduced risk of chemical accidents. Some suggested mechanisms include:
- Quarterly meeting of SCG as envisioned in the CAEPPR Rules. Ideally GSDMA CEO and / or the Chief Secretary should chair these meetings to take a stock of progress as per the plan and any other relevant issues.
- Preparation of offsite plans and CDMP is a bottom-up participatory process. We recommend that these plans be prepared by multiple members of LCG, DCG and SCG in collaboration instead of only the member secretary (DISH) alone.
- Establishing programmatic approaches, use of third party professionals and accident investigation system can improve coordination among regulatory agencies.
- Table top exercises, functional drills, and full scale mock drill are multi agency tasks and need coordination. They should be promoted instead of only full scale mock drills.
- A quarterly/yearly magazine on hazardous chemical incidents, accident report findings, new technologies, and other chemical emergency related information can be published.

TRAINING AND CAPACITY BUILDING

Regulatory agencies must maintain and upgrade their knowledge and skills continuously. The staff needs specialized, focused training of fresh recruits and continuing education for other staff. The training material, examination pattern, and certification requirements can be developed internally, or in collaboration with other agencies and training institutes with similar purpose. Capacity building efforts should include regular internal and external seminars and workshops. Also, the regulatory agencies are responsible for building the capacity of the industry they regulate. Strong internal training materials for regulatory agencies can be used as outreach and safety promotion material for the industry with minor modification. Regulatory agencies can also develop certification and training programmes in collaboration with professional training institutes for the industries (e.g., training requirement for contract workers, training for workers handling Hazardous chemicals, etc.).

PREPAREDNESS

At the State level, the key responsibility of planning and monitoring of preparedness is with the GSDMA and SCG, who will be responsible for revision and updating this CDMP, training and capacity building and industry co-ordination. The key recommendations are as follows.

DEVELOPMENT OF AN AGENCY-DEPARTMENT-SPECIFIC ACTION PLAN

Preparedness actions plans are critical to move from planning to implementation. Each offsite response agency and the state government department assigned a role in the CDMP must develop a preparedness action plan and present it to the SCG and GSDMA. The annual review and updating of the state DMP should also review the progress of offsite agencies and state departments, as per their own preparedness action plans.

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IMPROVEMENT IN CHEMICAL DISASTER MANAGEMENT PLANNING

- Co-ordination between GSDMA and SCG, DCG, and LCG in planning, preparedness and capacity building should be strengthened. Some suggestions include establishing a chemical emergency cell at GSDMA, developing a system for mock drills, integrating role or DDMA and DCG, develop guidelines needed for implementing the CDMP, and truly participatory development of LCG and DCG level emergency plans.
- We have recommended that GSDMA be given an expanded role as a "response coordinating agency". As per international best practices, a single accountable and responsible agency is required to coordinate response to chemical emergencies and build capacity of individual response agencies to provide such qualified, integrated and coordinated response. In fact a single emergency response office is useful even in all hazard context.
- GSDMA may consider appointing a technical officer to provide support in CIDM activities to DDMA and DCG. A more suitable person would be a chemical engineer with training in industrial safety, HAZMAT response, and use of CAMEO models.
- Strengthening of onsite plans and synchronization with the offsite plans. Consultants have provided guidelines for onsite plans, a model onsite plan and a check list
- Develop Emergency Responder Safety Guidelines to deal with training needs, work experience requirement, PPEs, safe work practices and policies, equipments for monitoring, medical assessments, decontamination, and others. We have given reference to a similar standard from US (HAZWOPER) that can be adapted in Indian contexts.
- Develop guidelines for immediate reporting of hazardous chemical leak. These guidelines seek that quantitative criteria be established to help industry proactively inform offsite authorities of chemical leaks.
- Use Chemical Accident Investigation Reporting system (CAIRS) developed by the MoEF at the state level for formal after action reporting. Alternatively, an improved system can be developed at the state level.
- Develop GIS based CAMEO suite for developing a database for planning and decision support during response. The CAMEO suit includes: (a) CAMEOfm for chemical related hazard information as per their MSDS; (b) ALOHA to model leakage scenario and estimate threat zones; (c) MARPLOT – to integrate ALOHA output on GIS layers to identify vulnerable population, installations, and areas and export the same to Google Earth or other GIS platforms; (d) databases – various relational databases for chemical industry location and contact information, accident reporting and investigations, resources available, routes, and others. However, CAMEO is most appropriate in US context and Gujarat should consider developing own system in long term once experience of working with CAMEO is established.

ENHANCE CHEMICAL DISASTER RESPONSE CAPACITY

- Government or public agencies should preferably lead offsite chemical emergency responses but the industry personnel can be integrated in this response structure.
- Chemical response capability builds on the basic emergency response capacity especially that of the fire services at local levels. The fire stations in Gujarat need to be strengthened with adequate manpower, equipments and finances as per NDMA guidelines on improving fire services. Additionally, it is recommended to create a department for fire services at the state level for standardisation, capacity development, and solving jurisdictional issued faced by fire stations of individual municipalities.
- Local emergency response team (LERT) should be formed at local fire departments. The LERT should be well-trained and well-equipped to deal with small scale and frequent local emergencies (90% of chemical incidents). At least 1 LERT per LCG or DCG must be available.
- The state has already planned five regional Emergency Response Centres (ERC) and four mini ERCs modelled on

the DPMC Ankleshwar in a PPP model. We recommend creation of specialist Regional Response Teams (RRT) at ERCs to augment LERT capacity as required.

- The State Emergency Response Team (SERT) will augment the capacity of RRT to provide qualified HAZMAT response for high-risk, high-volume, and thus, less frequent incidents that surpass the capacity of RRTs. SERT should be housed as a part of an agency or force where personnel are not transferred frequently because significant resources, training, and funds are invested in raising and building capacity of SERT and because SERT develops higher levels of skills through experience of working together as a team. Therefore, it will be prudent not to lose such investment and asset to staff transfers. In discussion with GSDMA we have identified that the proposed SDRF would be most suitable for this purpose.

PLAN FOR TRAINING, EQUIPMENT AND RESOURCES FOR HAZMAT RESPONSE

A start of a good resource plan is recognition that "the emergency responders at all levels are an important community asset and they form the basis of the community's response and resiliency to all chemical and industrial disasters". Adequate knowledge and safe operations are imperative resources that need to be provided through training, teaming, equipments, tools, and supplies.

This CDMP includes a resource plan for Police, Emergency Medical Services (GVK-EMRI 108 and other ambulances), Fire Departments and the recommended Local Emergency Response Teams (LERT's), Regional Response Teams (RRTs) and the State Emergency Response Team (SERT). For effective response to any emergency including chemical emergencies, the state needs strong fire and emergency response capability as per SFAC recommendations. Effective HAZMAT response capability can only be built on such fire and emergency response service capability. Based on a recent assessment by NDRF, Gujarat has only 35% of the required number of fire stations and even in the existing fire stations, the shortage of manpower is more than 90%. Therefore, this CDMP provides recommendations on building general capability of fire stations in addition to HAZMAT response capability and recommends that capability of fire stations be built as a precursor to building specialist HAZMAT response capability.

PUBLIC PRIVATE PARTNERSHIPS (PPP) FOR DISASTER RESPONSE

PPP allows us to combine the authority and resources of government with skills, technology and resources of the private agencies. Partnerships can also be formed between two public agencies to give structure to their joint training, resource sharing and other such plans instead of responding to ad-hoc cries for help. Some suggestions are:

- Expand mutual aid between large industries
- Replicate successful model of DPMC – Ankleshwar elsewhere
- Public private partnership to respond to road emergencies
- Forming mutual aid between neighbouring districts
- Improving preparedness of ports and forming mutual aid with corresponding DCG
- Improving preparedness of airport and forming mutual aid with DCG
- Improving preparedness of railways and forming mutual aid with DCG

STRENGTHENING OF RESPONSE MECHANISM

The following measures have been recommended to strengthen the response mechanism

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INCIDENT RESPONSE SYSTEM

It is recommended to establish an Incident Response System (IRS) to provide a scalable and flexible response structure for different types and scales of chemical emergencies managed at different levels. The IRS provides a system for all responsible parties – government authorities, industries, offsite response agencies, NGOs, private business, communities to participate and respond in a coordinated way. The IRS allows for one incident command structure to prioritize and accomplish multiple objectives. While this plan uses the guidelines for incidence response team structure at the local level as per NDMA guidelines on IRS, we make specific recommendations most suitable for chemical emergencies.

ESTABLISH INCIDENT INTIMATION AND NOTIFICATION PROCESSES

Setting up an incident intimation system that can aid rapid response by public agencies without waiting for the incident to potentially become offsite is critical. We have recommended that the industry notify a leak as per a quantitative criteria and proactively. We suggest that LCR and DEOC be designated as official notification points for the occupier, but the occupier can additionally call police, 108, medical department and others for faster communication. SEOC will be notified by the DEOC as per the needs.

IMPROVING CONTROL ROOM MANAGEMENT

The control room is a critical asset for effective response. We have recommended strengthening of SEOC to do the following:

- Ability to receive and direct notification of emergency
- Adequate equipment to ensure the self-sufficiency of the control room
- Avoiding conflicting agency-specific control rooms for coordinated response and better communication
- Establishing procedures for deactivation and demobilization of the local control room
- Additionally, communication among different stakeholders must be significantly improved through state-wide communication plan and regular communication exercises.

SITUATIONAL AWARENESS

- It is proposed to use the CAMEO software suite developed by the USEPA and NOAA for planning the response.
- The use of the Emergency Response Guidebook (2012) is also recommended to provide quick and adequate information to first responders and others. Basic training of users of ERG (2012) is necessary even though the guide is organized for easy understanding. First responders will need a hard copy of the same translated in Gujarati.
- Situational awareness is not a one time but continuous activity.

HIERARCHICAL HAZMAT RESPONSE SYSTEM

A hierarchical Chemical Emergency Response team structure is proposed as follows:

- **Level 1- The Local Emergency Response Team**
- **Level 2 - The Regional Response Team**
- **Level 3- The State Emergency Response Team**

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EMERGENCY PUBLIC INFORMATION

The community in immediate vicinity of a hazardous chemical unit may face very high levels of hazard within very short time in case of a chemical leak. They should be immediately intimated through a public address system. We recommend that such system be either in control of LCR or DEOR or the industry is authorized to warn the communities directly using sirens.

MASS CARE AND MANAGEMENT OF DEAD

Each district should identify appropriate structures or buildings to be used as emergency shelters following a chemical or industrial incident as well as develop capacity to manage a large number of fatalities through a plan and procedures to locate, activate, mobilize, and provide additional personnel, transportation, last rites, and temporary cold storage facilities for a mass fatality incident.

MEDICAL PREPAREDNESS FOR CHEMICAL EMERGENCIES

Medical preparedness is aimed to prepare medical and other authorities to develop capacities of first responders and upgrade infrastructure to the extent that they can handle a mass casualty event.

The following recommendations have been made:

- Establish a Public Private Partnership model to augment medical resources, considering that 70% of medical resources in the country lie within the private sector
- A chemical-specific medical management process needs to be established for the treatment of exposed/ contaminated patients
- Creation of a trained Medical First Responder (MFR) and Quick Response Medical Team (QRMT)
- Work with EMS partner agencies to assess the possibility of tracking ambulances on a real-time basis. GVK-EMRI has developed these capabilities for 108 ambulances
- Creation of stationary decontamination facilities onsite as well and offsite in hospitals as well as mobile decontamination facilities.
- Create uniform casualty profile and classification of casualties
- Up gradation of Poison Centres / toxicological laboratories/plan for on-site medical resource inventory
- Stocking for antidotes and chemical casualty treatment kit onsite at \ MAH units, medical posts, ambulances, and earmarked health facilities
- Develop Crisis Management Plan at earmarked Hospitals.

RESPONSE

The response plan detailed out in this report establishes a concept of operations and assigns specific functional responsibility to departments, agencies, and organizations within the Government of Gujarat for chemical and industrial disasters. It also provides for the systematic integration of emergency resources when activated on the basis of IRS suggested by NDMA guidelines. Furthermore, this document establishes a plan for coordination and support of local disaster operations. It aims to establish a chain of command at the state level to direct the activation and deployment of Regional Response Teams (RRTs) and the State Emergency Response Team (SERT).

Chemical disasters can be classified per their scales as: Minor, Moderate, Major and Catastrophic. Verifiable and

measurable criteria are developed to define these scales so that available and required resources can be assessed against these scales.

THE RESPONSE MECHANISM – RECOMMENDED PROTOCOL

TRIGGER MECHANISM - The occupier / manager of the establishment responsible for releasing or discharging a hazardous chemical will notify incident to the appropriate LCR (if available) and DEOC; the LCR and DEOC will be officially authorised to receive such notifications. The DEOC or LCR will intimate the local response agencies.

FIRST RESPONSE AND SITUATION ASSESSMENT -Ideally the fire department will be the first on-scene response agency, but police, EMRI ambulances, or other public agencies may also reach the site first. Irrespective, the agency who reaches first should determine a safe location for the Incident Command Post (ICP), gather all essential information, and report situation details to the LCR/DEOC. The LCR/DEOC will obtain MSDS for the leaked chemical from onsite plans of the industry or other sources to understand potential hazards, control measures, medical treatment, and other details. First responders on site may use ERG 2012 guidebook to determine protective actions and safety precautions. DEOC will seek help from SEOC if required (for example, if it is anticipated that support from RRT will be needed).

STAFFING AND ACTIVATES OF SEOC - On request from DEOC, the SEOC staff will decide whether and which members of SCG or others need to be convened at the SEOC to deal with the emergency situation. The SEOC is in support role because emergencies are always managed at local levels.

CONTROL AND PROTECTIVE ACTIONS THROUGH RESPONSE AGENCIES - Post intimation of emergency/ incident, the LERT will rush to the scene and assess if response by offsite agencies is required. If yes, protective actions will be determined on basis of situational awareness. If not, the LERT will stay on scene until the onsite personnel can effectively control the leak and LERT will leave after ascertaining that emergency is tackled.

If off site response is required, the Incident Commander will determine the appropriate protective actions. The following hazard control protocol will be followed:

- Establish ICP
- The district collector (for DCG) or SDM (for LCG) should formally declare a chemical emergency is taking place if indeed this is the case
- Activation of emergency response teams - LERT , Quick Response Medical Team (QRMT) GVK-EMRI, fire fighters and police officers as per the pre-designated IRT
- Warn the public
- Secure the site
- Ensure Site Safety for effective chemical response through a Site Safety Plan
- Control Zones will be established by the IC
- Conduct Initial Reconnaissance
- Site entry and exit
- Provision of short term relief to public (if required).

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MEDICAL EMERGENCY RESPONSE PROTOCOL

RESPONSE CAPACITY ASSESSMENT AND PLANNING DURING RESPONSE - To be undertaken by the department of health to assess the deployment needs of resources from outside, based on preliminary findings.

ACTIVATION OF QRMT - The QRMT is activated immediately on intimation based on impact assessment of the hazard.

MEDICAL RESPONSE - This will include on scene care, care in transit and transfer to definitive care. Key functions include triage, resuscitation and decontamination.

SEARCH AND RESCUE - In case of a chemical leak, sheltering in place and/or evaluation needs to be done as per the planning and specifics of the incidents that are unfolding. However, once a chemical incident is in a phase where the first responder can in fact enter an affected area either using personal protective equipment or when the chemical cloud is of low enough concentration, search and rescue of affected population is a key task, search and rescue can be done by the police, medical and/or fire first responders.

ACTIVATION OF CRISIS MANAGEMENT AT HOSPITALS - In case of chemical disasters, the crisis management at a hospital shall be immediately activated by triggering in built mechanisms for prompt emergency medical response.

PROTOCOL FOR MEDICAL MANAGEMENT- The department of health should develop a chemical-specific medical management protocol for treating exposed patients.

RAPID ASSESSMENT OF HEALTH CONSEQUENCES - A first assessment should be carried out within 24 hours following the emergency with a more comprehensive assessment carried out later. The DOH and GPCB should conduct this exercise.

PLAN FOR ANTIDOTES FOR CHEMICAL AGENT EXPOSURES - Responders must have antidotes, proper training on administration, and protective gear to save patients.

REQUISITION OF PHARMACEUTICAL STOCKPILE - It is assumed that a pharmaceutical stockpile is available in the state as per the antidotes plan provided to the GSDMA. The SEOC will coordinate with the DEOC so that stockpile assets can be efficiently received and distributed upon arrival at the site

VENDOR MANAGED INVENTORY - It is assumed that an appropriate VMI programme is established in the state to obtain additional supplies within 24 to 36 hours.

PSYCHOSOCIAL CARE - In chemical emergencies, the psychological shocks in addition to actual exposure related complications pose a challenge.

MEDICAL RESPONSE TO LONG TERM EFFECTS - In the post-disaster scenario some of the casualties may develop sequels due to chemical injuries. These cases may need regular follow-up, medical care, reconstructive surgery and rehabilitation.

RESPONSE TO HAZCHEM TRANSPORTATION EMERGENCIES

The organization structure for response, concept of emergency operations, and roles and responsibility of key stakeholders remains almost the same in case of emergencies involving the transportation of hazardous chemicals. The special considerations while responding to transportation emergencies are:

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PIPELINE TRANSPORTATION - The initial notification may be done by the occupier/owner of the pipeline or by the local community or by the contractor who caused the damage to the pipeline. Therefore, it is important that all pipelines nodes and routes clearly display the emergency contact information in case of any accident with the pipeline. Once the initial notification of an accident is obtained the response operations are similar to other chemical accidents.

ROAD TRANSPORTATION- In case of an emergency involving a road tanker carrying hazardous chemical, the driver of the tanker is expected to be well-trained to handle emergency situations and have up-to-date contact information. The notification will be done by the driver by calling DEOC (# 1077) and Local Police Station. The consigner and consignee may also make these calls. The tanker must display emergency information panel and driver should carry the Transport Emergency Card or TREMCARD which has detailed instructions on response actions for fire, spillage or leakage. Driver should take protection actions by stopping traffic and general citizens from approaching the accident site until police arrive for help. The driver can try to stop the leak (if any) only if he is adequately trained and equipped to do so. The police officer on scene will most likely be the first IC until a more qualified response team arrives. The most important action by the police is to cordon off the site of the accident, divert and regulate traffic, and evacuate/shelter in place citizens in close proximity on a priority basis. The ERG (2012) which has been developed primarily for response to chemical emergencies during road transport should be followed. It is also important that untrained and unequipped first responders should not try to stop the leak or enter the hot zone and should instead wait for a qualified response.

RECOVERY

The recovery phase of disaster management involves disaster relief, or the provision of immediate shelter, life support and human needs to persons affected by, or responding to, a disaster. The broader disaster recovery involves the coordinated process of supporting affected communities in the reconstruction of the physical infrastructure, restoration of the economy and of the environment, and support for the emotional, social, and physical wellbeing of those affected. The recovery phase of a disaster is headed by State Relief Commissioner, Revenue department, Gujarat. The main aspects of recovery are grouped into four functions -

- Infrastructure
- Human -Social
- Economic and livelihood
- Environment

It is important to acknowledge that the four functions of recovery overlap and recovery arrangements must reflect the inter-relationship between each of these functions.

TRANSITION FROM RESPONSE TO RECOVERY

As recovery activities commence within the response phase, the transition to recovery requires detailed planning and a hand over from disaster response operations to disaster recovery operation teams to ensure continuity of disaster operations. The major steps taken during transition include -

1. Preliminary Damage Assessment
2. Identification of the type of public or individual aid and assistance necessary in an emergency declaration
3. Mobilization of essential resources to a temporary location of emergency mass care/Disaster recovery Centres
4. Deployment of community groups to the affected community areas for information dissemination.

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RECOVERY ACTIONS

In addition to the immediate actions, the following immediate and long term recovery actions are required

- Counselling and rehabilitation of victims to address psychological impact
- Immediate financial relief to victims under the provision of the Public Liability Insurance Act, 1991
- Restoration and regeneration of the eco-system for the remediation of the affected environment
- Repair and reconstruction of damaged structures and services
- Accident investigation
- Payment of penalty and compensation or relief from the responsible industry, the Prime Minister's Relief Fund, National Disaster Response Fund and the State Disaster Response Fund.

PLAN MAINTENANCE AND UPDATING

The State CDMP should be reviewed annually because we have recommended that the district offsite plans and CDMP be updated at least annually after the full scale district level offsite mock drill. State CDMP is based on district CDMP and should make provisions for specific gaps and needs of the districts so that an annual review is necessary. The updating of State CDMP can be necessary after specific instances such as post response to a state level chemical emergency which identifies any lack in response and thus a need to plan to avoid the same in future.

This section of CDMP also includes formal approval of the plan from Chairman SCG (Chief Secretary) and CEO (GSDMA), and a table for record of change in the plan. The plan should be shared with all concerned stakeholders with their undertaking that they would fulfil the responsibilities entrusted under the plan. All revisions and updating of the plan must be made in a participatory manner. The quarterly meetings of SCG (as required by CAEPPR Rules) can be used for reviewing, updating and other relevant discussions.

1 INTRODUCTION

As one of the most developed and industrialized states in India, Gujarat is also vulnerable to chemical and industrial hazards. Therefore, the State must build capacity for prevention, preparedness, response and recovery from chemical emergencies and disasters. While every chemical emergency does not lead to an offsite emergency, some of these emergencies can affect public and private infrastructure, the population at large, and the environment. Safety provisions and other mitigation measures in the industry may reduce the probability, frequency, or severity of chemical emergencies, but the risk of such emergencies exists.

Therefore, it is essential for the chemical industry, public agencies and departments, and citizens – to be prepared at all times. While Gujarat has made significant progress in improving overall industrial safety and managing chemical emergencies, much more needs to be done to improve chemical emergency management especially when the vision is to prepare the state for rapid industrial growth while ensuring world class system for chemical disaster management.

This model state Chemical Disaster Management Plan (CDMP) is a result of the study commissioned by the Gujarat State Disaster Management Authority (GSDMA) to achieve international standards of prevention, mitigation, preparedness, and response to chemical emergencies.

1.1 PURPOSE

The purpose of this plan is to define the actions and roles necessary to provide a coordinated, qualified, and quick response for chemical and industrial disasters. This plan provides guidance to state agencies within Gujarat with a general concept of potential disaster assignments before, during, and following chemical disasters. It also provides for the systematic integration of emergency resources when activated on the basis of the IRS and the Incident Response Teams (IRT) is formed.

1.2 SCOPE AND OBJECTIVES

GSDMA has commissioned this project to prepare a chemical and industrial disaster management plan. Specifically, the terms of reference seek that:

- Based on international best practices, prepare State level Disaster Management Plan for Chemical and Industrial Hazards. The Plan shall include measures for disaster prevention and mitigation, response, relief, post disaster rehabilitation and reconstruction. The Plan shall be developed on the basis of guidelines published by the National Disaster Management Authority (NDMA), Government of India and considering the existing State level plan prepared by Labour & Employment Department, Government of Gujarat
- Prepare a trigger mechanism for emergency quick response with the aim of implementing prevention & mitigation measures without any loss of time, with the primary objective of reduction to the extent possible human misery and loss of resources
- Take stock of infrastructure available to meet wide scale industrial accidents, and suggest types of equipment and organizational structures for not only prevention, but early detection and combating of industrial disasters

Currently, under MSIHC rules, state response plan and district offsite plans are being prepared in Gujarat. Gujarat is one of the first states to adopt 2010 National Guidelines for Offsite Emergency Plan by MoEF. The industrial safety is also being ensured as per Factories Rules by DISH. However, GSDMA felt a need to prepare a "model" plan that is futuristic and aspires to meet international standards for effective chemical emergency management. Need for such a plan is acute given the high growth prospects of Gujarat and need for coordination of emergency response structure under MSIHC and CAEPPR Rules and DM Act and GSDM Act. GSDMA appointed a team of international consultants led by m/s PRESTELS to prepare a model state CDMP based on NDMA guidelines as well as meeting the international norms with an objective of rapid and effective response to chemical emergencies to save lives, environment and property.

1.3 APPROACH TO PREPARATION OF STATE CDMP

The international consultant team appointed by GSDMA has prepared the CDMP in a participatory and modular approach. The following reports developed as a part of preparatory modules under the contract with GSDMA provide the basis for the State CDMP:

Module 1

1. Capability assessment and gap analysis
2. Vulnerability assessment
3. Antidotes plan
4. Synchronization between onsite and offsite plans

Module 2

1. Improvement in response mechanism
2. Community sensitization strategy
3. Performance improvement of DISH, PESO and CEI
4. GIS based database system for chemical disaster management

All these interim reports were prepared in participatory manner by inclusion of all key stakeholders and provide much more in-depth information than that summarized in this state CDMP. The purpose of state CDMP is not to provide a page heavy report by consolidating all information but to provide a "plan" that will help us identify what must be done to achieve high level of preparedness and capability. The required information for preparing the reports was collected from secondary data provided by various agencies, one-on-one interviews, group interviews, workshops, and organizational assessments by experts.

In addition, the study team has built upon the State Chemical Emergency Response Plan prepared by the State Crisis Group in 2008. The study team has also considered NDMA guidelines in preparation of the plan. This CDMP is not an attempt to replace the available state response plan that is based on current realities, but it is a plan to achieve international levels of preparedness considering the existing administrative and legal set up in India. The recommendations here in range from easy short term solutions to complex longer term strategies. This CDMP was discussed with all stakeholders and their comments were incorporated

1.4 DIFFERENCE AND SYNERGIES BETWEEN CDMP AND OFFSITE PLANS

MOEF took the leadership in setting up legal and institutional framework for managing chemical emergencies in industries through MSIHC Rules (1989) and CEAPPR Rules (1996) for more than two decades following the Bhopal Tragedy. One of the instruments for chemical management is offsite emergency plan by DCG and SCG. It is highly credible that MOEF has been effective in making such plans based on realities on the ground. However, the DM Act (2005) and GSDM Act (2003) were the paradigm shift in management of disasters in the country, including chemical disasters. DM Act (2005) and GSDM Act (2003) envision "All Hazard" concept to disaster management. These acts also mandated creation of state and district (and local) disaster management authorities. In some ways, this created a parallel structure to manage chemical emergencies, but in other ways these authorities or the crisis groups under MSIHC are not the response agencies themselves. Therefore, the responsibility for response is still with individual departments. DM Acts also required preparation of DMP that consider the entire cycle of Prevention and Mitigation, Preparedness, Response, Recovery and Rehabilitation. On other hand, offsite plan under MSIHC Rules focus on response to chemical emergencies and preparedness to provide such response. The offsite plan thus included information that must be readily available during response to a chemical emergency, but offsite plans do not provide a "plan" to take a comprehensive approach to disaster management. While, nothing in MSIHC Rules stops the offsite from being developed in to a comprehensive plan for disaster management, the fact is that the newer DM Act use the term DMP to distinguish itself from Offsite Plan. As demonstrated in Figure 1 below, ideally an offsite plan can be an element of a more comprehensive DMP.

1.5 HIERARCHY AND RELATIONSHIP OF THE PLANS

MSIHC Rules 1989, CEAPPR Rules 1996, GSDM Act 2003, and DM Act 2005 recognize that disaster management is a participatory and bottom-up process. Therefore, all

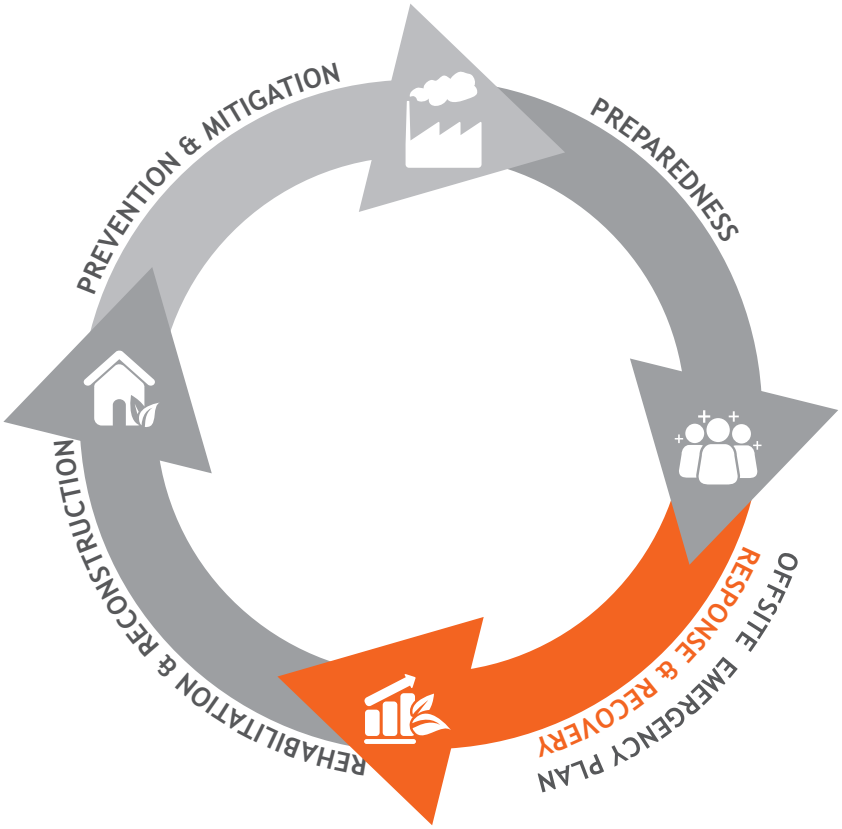


Figure 1. Disaster Management Cycle and Focus of Offsite Plan

these Acts and Rules can work together to achieve the desired level of planning and preparedness. As depicted in Figure 2, the onsite plan of the industry prepared under MSIHC Rules is the most important and basic element. The DCG offsite plan (and thus District CDMP) is based on the information contained in the onsite plans.

The state and national level plans are based on the information in district plans. For example, the onsite plans identify emergency scenarios which have potential for offsite consequences and thus need the assistance of offsite agencies at the local level. The local (LCG) or district level (DCG) plans for assistance to industries and identify scenarios that cannot be managed at local or district levels and must be scaled up to regional or state level. The state level plan provides for assistance to the district and also identifies scenarios which need national assistance. Each plan has procedures to request higher levels of assistance.

The CDMP assigns roles to different offsite response agency and government departments. These offsite agencies and state departments need to develop Preparedness Action Plans to develop their capacity and preparedness commensurate with their own roles and responsibilities.

1.6 COORDINATING STRUCTURES UNDER CAEPPR RULES AND DM ACTS

MSIHC Rules and DM Act both provide for a different mechanism to plan for and respond to chemical disasters, but both assign the chief secretary and district collector a pivotal role in planning and response as shown in Figure 3.

The chief secretary is the chairman of SCG under CAEPPR Rules as well as a designated member of GSDMA under DM Act and GSDM Act. The CEO of GSDMA can also be a member of state crisis group which ensures coordination of the structures at the state level. The District Collector (DC) is assigned the chairmanship for both the DCG and DDMA under CAEPPR Rules and DM Acts. Therefore, he is

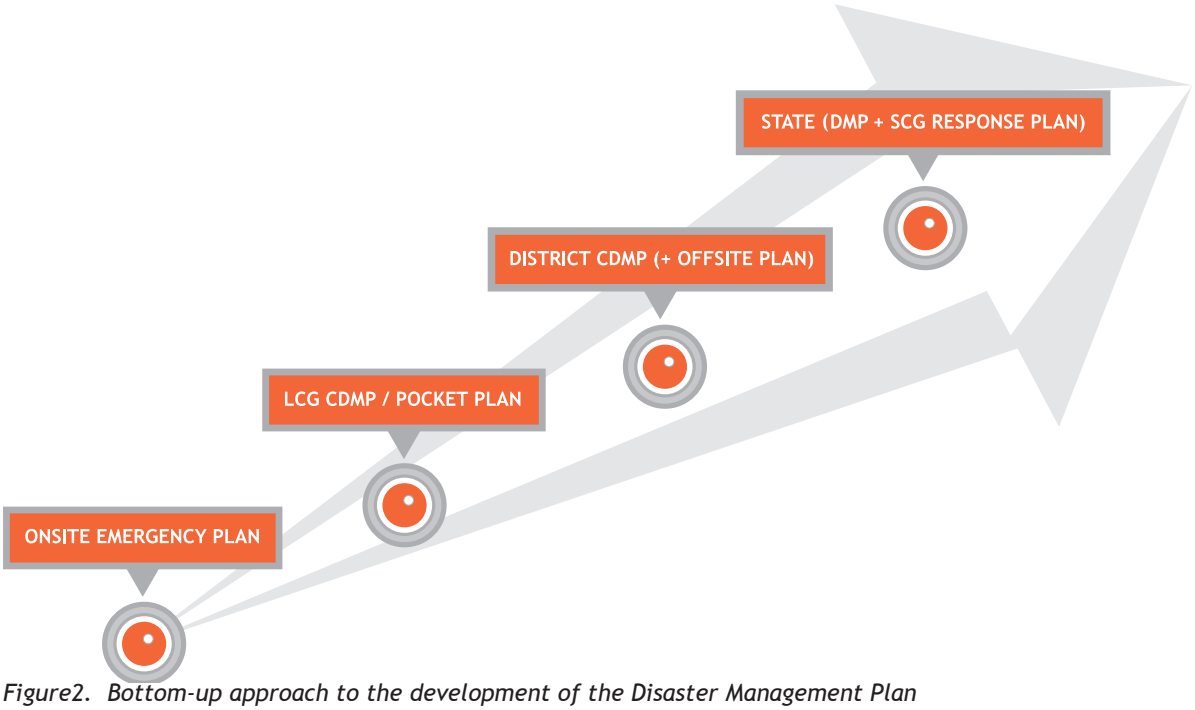


Figure2. Bottom-up approach to the development of the Disaster Management Plan

the appellate district emergency authority at the district level and the coordination between these two structures is automatically achieved at the district and LCG levels.

However, the Incident Response System recommended by NDMA requires appointment of Incident Commander (IC) to manage all response related activities and he is appointed by the DC who is designated as Responsible Officer (RO) under the IRS. This new terminology can create some confusion because MSIHC has defined "similar sounding" roles for incident controller and district emergency authority. Incident controller is at the unit level and responsible for managing the response activities there whereas the incident commander manages the entre response operation when the emergency is offsite. The IC can in fact be the incident controller if the RO has appointed him as such. Further the RO and the DEA are both the district collector at district level, but the DC may appoint the IC to manage the response activities under his authority. At state level the chief secretary is the Responsible Officer under IRS and can designated a state level IC in case the emergency has to be managed by state level assets. In spite of these confusing terminologies, it must be noted that the IRS is an advanced emergency organization structure that is scalable, flexible and unified under one command for effective response. More discussion of IRS is provided later.

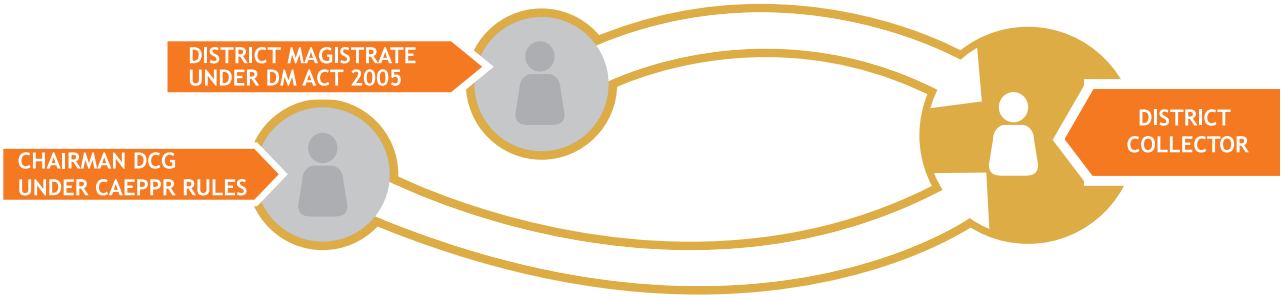


Figure 3. Coordination of Structures under DM Act 2005 and CAEPPR Rules 1996.

1.7 LOCAL RESPONSE TO CHEMICAL DISASTERS – EMERGENCY ORGANISATION STRUCTURE

Although the regional, state and national agencies can provide assistance, the response to a chemical disaster is always local. LCG is the lowest level of group available at industrial cluster level whereas DCG is the next level of response. Often LCGs are not available in which case the DCG level is the lowest level of response. As per DM Act 2005, the local authorities and Panchayati Raj Institutions can plan for, prepare, and respond to emergencies. Therefore, even Taluka or block level administration can prepare for and co-ordinate the response to chemical emergencies, provided Taluka level CDMPs are prepared including management of Chemical Disasters, although such plans are not currently available.

The stakeholders for chemical disaster management at the state and district level have been categorised into agencies responsible for planning and co-ordination and agencies responsible for response. While a majority of the agencies /teams/groups exist, some additional ones are already planned in Gujarat and some new ones are proposed in this CDMP. Table 1 lists these agencies with their roles in Disaster Management. Details of their roles and responsibilities are included in the subsequent chapters. The composition of the SCG, DCG and LCG are illustrated in Figure 4 and 5 and 6 respectively.

As per the CAEPPR Rules, the role of the SCG is as follows:

1. Be the apex body in the state to deal with major chemical accidents and to provide expert guidance for handling major chemical accidents
2. Assist the State Government in the planning, preparedness and mitigation of major chemical accidents in the State
3. Assist the State Government in managing chemical accidents at a site
4. Continuously monitor the post-accident situation arising out of a major chemical accident in the State and forward a report to the Central Crisis group
5. Review all district off-site emergency plans in the State for its adequacy and forward a report to the Central Crisis Group
6. Review the progress report submitted by the District Crisis groups
7. Respond to queries addressed to it by the District Crisis groups
8. Publish a list of experts and officials in the State who are concerned with the management of chemical accidents.

As per CAEPPR Rules, the role of DCG is the following:

1. Assist in the preparation of the district off-site emergency plan
2. Review all the on-site emergency plans prepared by the occupier of Major Accident Hazards installation for the preparation of the district off-site emergency plan
3. Assist the district administration in the management of chemical accidents at a site lying within the district
4. Continuously monitor every chemical accident
5. Ensure continuous information flow from the district to the Centre and State Crisis Group regarding accident situation and mitigation efforts
6. Forward a report of the chemicals accident within fifteen days to the State Crisis Groups
7. Conduct at least one full scale mock-drill of a chemical accident at a site each year and forward a report of the strength and the weakness of the plan to the State Crisis Group.

The role of LCG as per CAEPPR Rules is to:

1. Prepare local emergency plan for the industrial pocket
2. Ensure dovetailing of the local emergency plan with the district off-site emergency plan
3. Train personnel involved in chemical accident management
4. Educate the population, likely to be affected in

a chemical accident, about the remedies and existing preparedness in the area

5. Conduct at least one full scale mock-drill of a chemical accident at a site every six months and forward a report to the District Crisis Group
6. Respond to all public inquires on the subject.

It is thus clear that LCG is predominantly a planning and preparedness related committee whereas DCG is not only planning and preparedness but also an emergency response management committee. However, none of them is the response agencies per se but includes members that are response agencies. This CDMP has recommended building government capability to have qualified HAZMAT response at the disposal of the local, district and state administration, and not relying entirely on the industry. This CDMP also envision organization as per IRS recommended by NDMA.

While the proposed emergency organization as per IRS is discussed later, we wish to right now address that the existing structures of LCG and DCG are not in conflict with IRS, and in fact quite synergistic. The IRS is not prescriptive about who must play which role but only suggestive so that the state administration can for itself decide which agency or person is best suited for a given role. In fact even industry personnel can be given a role in IRS just as they are in SCG. However, IRS provides additional advantage of being scalable by including additional and higher levels of response in the command structure, being flexible by transferring command and other sections to qualified people as scale and nature of emergency changes, and with a unified command so that there is one authorized, and accountable (technically qualified) incident commander.

1.8 LEGAL AND POLICY FRAMEWORK FOR DISASTER MANAGEMENT PLAN

The Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 and the Chemical Accidents (Emergency Planning, Preparedness and Response) (CAEPPR) Rules, 1996 provide a statutory structure for controlling major hazards posed by hazardous chemicals. These rules provide the structure for responding to chemical emergencies. The onsite plans prepared by the Major Accident Hazard (MAH) installation as per Rule 13(1) of MSIHC Rules provide vital information for the offsite plan to be prepared under Rule 14(1).

In 2005, the Disaster Management Act (DM Act) was enacted. The Gujarat State Disaster Management Act, 2003 (GSDM Act, 2003) was enacted before the national DM Act, 2005. Both these acts are a paradigm shift from response centric planning to a proactive prevention and mitigation, preparedness, and response and recovery driven plan. The scope of these acts includes chemical and industrial emergencies as well as man made disasters. As discussed in Section 1.3, the offsite plan required to be prepared as per MSIHC rules can be a part of CDMP prepared as per DM Act 2005 and GSDM Act 2003.

The above acts and rules are supported by several technical regulations such as the Gujarat Factories Rules, PNGRB Rules, Dock Safety Rules and others to improve the overall safety performance of the industry. MSIHC rules are also notified under the Gujarat Factories Rule, which can potentially give powers to DISH to extend these rules to all factories and not only MAH units.

1.8.1 LEGAL AUTHORITY

This plan derives its authority from the following acts and rules:

ACTS:

- The Factories Act, 1948, as amended in 1976 and 1987
- The Environment (Protection) Act, 1986
- Disaster Management Act, 2005
- The Public Liability Insurance Act, 1991 as amended in 1992
- The National Environment Tribunal Act, 1995
- Gujarat State Disaster Management Authority Act, 2003
- The Explosive Act, 1884
- The Petroleum Act, 1934
- Electricity Act, 2003
- Dock Workers (Safety, Health & Welfare) Act, 1986.

RULES:

- The Gujarat Factories Rules 1963 under the Factories Act, 1948 as amended in 1995
- The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 as amended in 1994, 2000 and 2004
- The Public Liability Insurance Rules, 1991 as amended in 1992
- The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996
- Explosive Rules, 2008
- Central Motor Vehicles Rules, 1989
- Hazardous Wastes (Management, Handling and Transbounary Movement) Rules, 2008.

1.8.2 KEY REGULATORY BODIES

The primary responsibility for dealing with chemical emergencies lies with the following:

Government of India: The Ministry of Environment and Forests has been designated as the nodal ministry for chemical accidents.

GOVERNMENT OF GUJARAT:

- Gujarat State Disaster Management Authority Under DM Act 2005 and GSDM Act 2003
- The Department of Labour and Employment via the Directorate of Industrial Safety and Health under MSIHC Rules
- The other regulatory authorities who are given a role in enforcing MSIHC Rules are the Chief Inspector of Dock Safety, appointed under the Dock Workers (Safety Health and Welfare) Act, 1986, the Chief Inspector of Mines, appointed under the Mines Act, 1952, the Atomic Energy Regulatory Board, appointed under Atomic Energy Act, 1972, and the Chief Controller of Explosives (now known as PESO), appointed under the Indian Explosives Act and Rules, 1983.

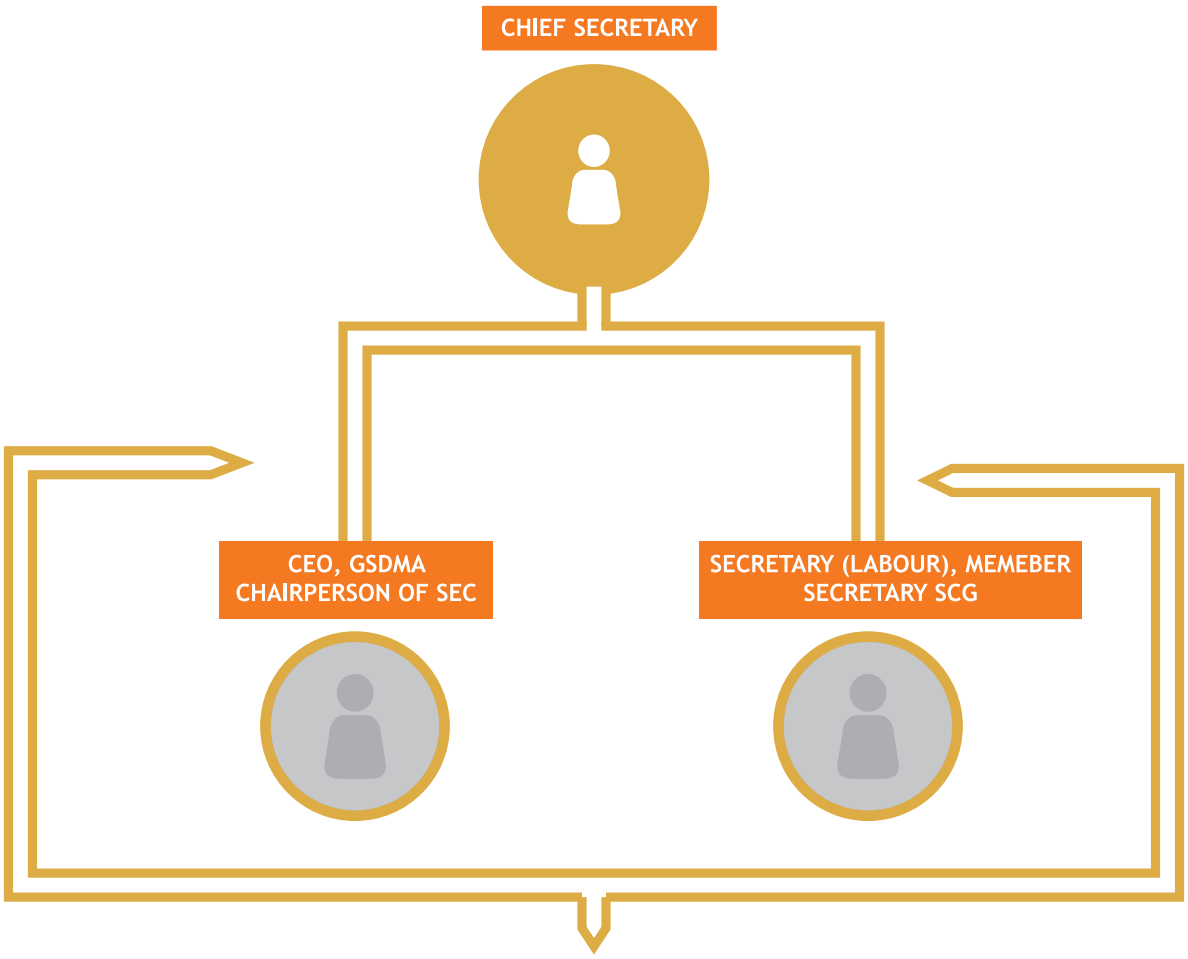
1.9 ORGANIZATION OF THE PLAN

Chapter one of this plan is the introduction to the background, need and processes of developing this State Chemical DMP. Chapter two describes the chemical hazards existing in the State with a brief synopsis of risks and vulnerability. Chapter three summarizes key recommendations for prevention and mitigation. Chapter four provides key recommendations to improve the preparedness to respond to chemical disasters. Chapter five is the response plan which is based on the assumption that the preparedness level as per chapter four is achieved. Chapter six summarizes key recommendations and activities for recovery and reconstruction post chemical disasters. Chapter seven describes the management and maintenance of this CDMP.

Table 1. Stakeholder Roles in Disaster Management and Response

LEGEND: Existing Organizations, Planned Organizations in Gujarat, Newly Recommended in this CDMP

	STATE	DISTRICT
POLICY FORMULATION /REGULATION/ ENFORCEMENT	DISH GSDMA GPCB PNGRB Western Railways PESO CEI, DOT GMB Airport Authority of India	District and regional level representatives of above organizations
PLANNING / CO-ORDINATION / CAPACITY BUILDING/ TRAINING	DISH GSDMA State Crisis Group (SCG) GIDC PESO Dept of Transportation GMB Airport Authority of India ERC	DCG LCG DDMA
RESPONSE CO-ORDINATION AND COMMUNICATIONS	SEOC ERC SDRF	As per IRS: Establish Incident Command Post (ICP) near emergency site. Primary response from ICP. Establishes communication with DEOC District Emergency Operations Centre (DEOC)
FIRST/PRIMARY RESPONSE	SDRF SERT RRT at ERC Fire Services Medical Services (108) Police Dept	LERT attached to local fire station (qualified HAZMAT response) Fire, medical and Police, or others as per IRT under command of IC Quick Response Medical Team (QRMT)
SUPPORT IN RESPONSE, AND RECOVERY AND REHAB	Department of Health Dept of Industries and Mines Public Works department GPCB Dept of Animal Husbandry Department of Agriculture Dept of Transportation Ministry of Railways Traffic Police Dept of Transportation	Dept of Revenue/ Relief Commissioner / Collector's office as main coordinator. District Level representatives of the State level Agencies IRT can be formed under IRS even for immediate recovery phase which is an extension of response



SECRETARY (ENVIRONMENT) MEMBER

SECRETARY (HEALTH)

SECRETARY (INDUSTRIES)

SECRETARY (PUBLIC HEALTH ENGG)

SECRETARY (INDUSTRIES & MINES)

CHAIRMAN, STATE POLLUTION CONTROL BOARD

4-EXPERTS (INDUSTRIAL SAFETY & HEALTH) TO BE NOMINATED BY THE STATE GOVERNMENT

SECRETARY / COMMISSIONER (TRANSPORT)

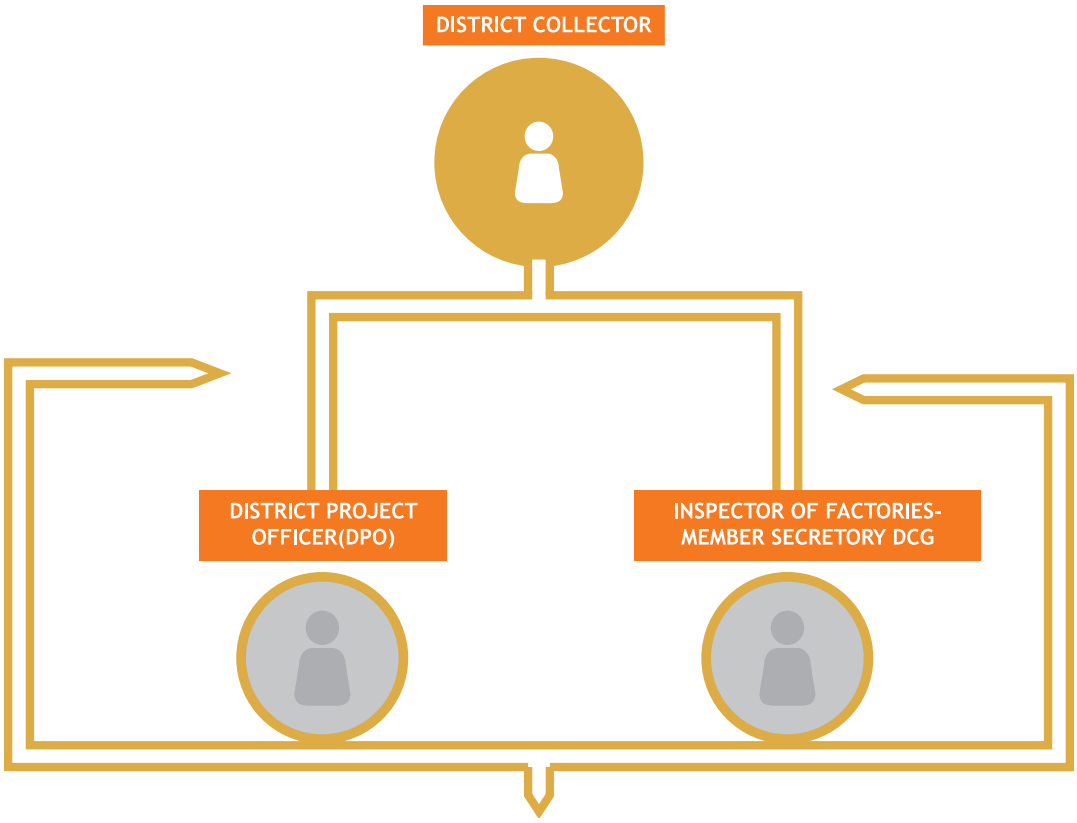
DIRECTOR (INDUSTRIAL SAFETY)

FIRE CHIEF

COMMISSIONER OF POLICE

ONE REPRESENTATIVE FROM THE INDUSTRY TO BE NOMINATED BY THE STATE GOVERNMENT

Figure 4. Composition of State Crisis Group



DISTRICT EMERGENCY OFFICER MEMBER

CHIEF FIRE OFFICER

DISTRICT INFORMATION OFFICER

CONTROLLER OF EXPLOSIVES

CHIEF, CIVIL DEFENCE

ONE REPRESENTATIVE OF TRADE UNIONS TO BE NOMINATED BY THE DISTRICT COLLECTOR

DEPUTY SUPERINTENDENT OF POLICE

DISTRICT HEALTH OFFICER/CHIEF MEDICAL OFFICER

COMMISSIONER, MUNICIPAL CORPORATIONS

ONE REPRESENTATIVE OF INDUSTRY TO BE NOMINATED BY THE DISTRICT COLLECTOR

REPRESENTATIVE OF POLLUTION CONTROL BOARD

DISTRICT AGRICULTURE OFFICER

GM TELECOM

4 EXPERTS (INDUSTRIAL SAFETY & HEALTH) TO BE NOMINATED BY THE DISTRICT COLLECTOR

COMMISSIONER (TRANSPORT)

CHAIR-PERSON/MEMBER-SECRETARY OF LOCAL CRISIS GROUPS

Figure 5. Composition of District Crisis Group

SUB-DIVISIONAL MAGISTRATE (SDM)

Inspector of Factories[Member Secretary]
Industries in the District / Member Industrial area / industrial pocket
Transporters of Hazardous Chemicals (2 Numbers)
Fire Officer
Station House Officer (Police)
Block Development Officer
One Representative of Civil Defense
Primary Health Officer
Editor of Local Newspaper
Community Leader / Sarpanch / Village Pradhan nominated by Chairperson
One Representative of Non-Government Orgnisation to be nominated by the chair person
Two Doctors eminent in the Local Area to be nominated by the Chairperson
Two Social workers to be nominated by the Chairperson

Figure 6. Composition of a Local Crisis Group

2 HAZARD ANALYSIS AND VULNERABILITY

2.1 HAZARD IDENTIFICATION

2.1.1 AN OVERVIEW OF THE INDUSTRIAL HAZARDS IN GUJARAT

Gujarat faces not only natural hazards such as cyclones, earthquakes, flooding, tsunamis, and storm surges, but also man made hazards due to industrialization of the state. The proximity to international borders also makes chemical terrorism a possible source of chemical disasters in the state. The chemical industry occupies a pre-eminent position in the industrial sector of Gujarat, contributing to more than 40% of industrial output. Almost the entire range of chemical process industry exists in Gujarat, including hydrocarbon processing/ refining products, petrochemicals-polymers and man-made fibres, fertilizers, health care products, plant protection chemicals, dyes, pigments and intermediates, fine chemicals, surface coating products, salt and salt-based products, ceramics, glass, cement, vegetable oils, fats and detergents. More than 50% of new investments in the state are in chemical and petrochemical sectors. Currently, Gujarat has 36,179 factories registered under the factories act[2]. Out of these 25,206 are working as of January, 2011. Based on the chemical database provided to us by DISH, currently there are 380 MAH, 1019 Type-A and 758 Type-B industries[3]. Out of these 41 MAH, 173 Type-A, 232 Type-B are closed.

A stretch of 400 kilometres from Ahmedabad to Vapi is known as the "Golden Corridor." In the Bharuch district, Ankleshwar, situated on the Narmada estuary, is Asia's largest chemical zone. To support the rapid development of the textile industry in the state post-independence, a large integrated chemical complex came up at Atul in Valsad district. The discovery of oil and gas in Ankleshwar and the surrounding areas led to the building of Gujarat Refinery Ltd. The downstream units in the form of petrochemical complex (IPCL) and fertilizer complex (GSFC) at Vadodara were logical steps in producing value added indigenous products. The major hydrocarbon complexes are located in Vadodara, Bharuch, Surat, and Jamnagar districts. These include Gujarat Refinery, Indian Petrochemicals Ltd. and Gujarat State Fertilizer Co. along with several downstream units in the Jawaharnagar (Koyali) petrochemical complex area; fertilizer plants at Vadodara, Hazira, Bharuch, Kalol, and Kandla, and petrochemical complexes at Vadodara, Dahej, Hazira, and Jamnagar. The caustic/chlorine manufacturing plants are located in Mithapur, Veraval, Surendranagar, Vadodara, Dahej, Jhagadia, and Atul. Toxic chemicals such as cyanides are produced in GACL Baroda, Cyanides & Chemicals at Olpad (Surat District). The refinery and the petrochemical complex triggered the development of small and medium scale chemical industries for the production of chemicals first in Nandesari, followed by Vapi, Vatva, Ankleshwar, and other places.

In addition to the manufacturing industries, there is significant infrastructure for handling chemicals such as pipelines, transportation (rail and road), and isolated storages. A cross-country 2300 Km Hazira-Bijapur-Jagdishpur (HBJ) gas pipeline originates from Hazira. A hydrocarbon supply pipeline runs from Kandla to Bhatinda (Punjab). A pipeline network of more than 17000 kilometres of oil and gas pipeline is present in the state. Major LNG terminals are proposed at Pipavav, Dahej and Hazira, which would necessitate laying of long cross-country pipelines for carrying natural gas. The crude oil carrying pipelines include Salaya-Mathura, Viramgam-Vadodara, and those proposed from Mundra to Punjab State. The petroleum products carrying pipelines include Vadodara-Sabarmati, Kandla-Bhatinda and Jamnagar-Kandla (off-shore). Railways, state highways and national highways running through the state carry chemical cargo that originates in or transits through the state. There are several isolated storages mainly at Vadodara, Kheda, Sanand, Bavla, Rajkot, and Bhavnagar. Gujarat also has

[2] www.labourandemployment.gov.in/dish/statistics/factories/office_wisehtm. Accessed on 15 March 2012

[3] As per MSIHC Rule 2 (ja), isolated storage and industrial activity at a site handling hazardous chemicals equal to or in excess of threshold quantities specified in column 3 of schedule 2 and 3 are known as MAH installations. Quantities handled below the threshold quantity as mentioned above are known to be Type 'A' industries. Handling of hazardous solvents and highly inflammable liquids are known to be Type 'B' industries. (communication with Assistant Director DISH)

several airports that not only store aviation fuel but may also hold hazardous chemical cargo. Several defence and nuclear installations in the state also pose the risk of chemical emergencies.

Because most of Gujarat faces earthquake risk, chemical industries are often situated in earthquake prone regions. Port based industries can face the risk of tsunami, storm surge and flooding as well. Therefore, the state is also vulnerable to chemical or industrial disasters as an aftermath of a natural disaster. For example, Kandla cyclone of 1998 affected oil terminals, jetties, transportation facilities, factories, buildings, warehouses, and storage tanks. There have been reports of chemical spill in Kandla port in the wake of January 26 earthquake in 2001.

2.1.2 DESCRIPTION OF CHEMICAL HAZARDS

The three principal types of hazards associated with chemical emergencies are fires, explosions, and toxic releases that affect the population and environment. Additional hazards include chemical spillage or spill over. Chemical corrosion too can cause damage to property and sometimes life. Chemical emergency or disaster can involve one or more of these hazards as described below.

2.1.2.1 FIRE HAZARD

Fires occur in industry more frequently than explosions and toxic releases. However, the consequences in terms of loss of life are generally less because a fire allows some time for people to escape and physical protection against it may be available. The effects of a fire on people usually take the form of skin burns due to exposure to thermal radiation. The severity of burns depends on the duration of exposure and the intensity of the heat. Heat radiation is inversely proportional to the square of the distance from the source.

There are several properties that measure how readily—that is, how easily—a chemical will catch on fire. The more volatile a chemical is, the faster it evaporates, and the quicker a flammable vapour cloud is formed. The flash point is the lowest temperature where a flammable liquid will evaporate enough to catch on fire if an ignition source is present. The lower the flash point, the easier it is for a fire to start. Flammability limits, also known as the Lower Explosive Limit (LEL) and the Upper Explosive Limit (UEL), are the concentration boundaries of the flammable area of a vapour cloud. A chemical will burn only if its fuel-air concentration is between the LEL and the UEL. To some extent, these properties are inter-related. Chemicals that are highly volatile and have a low flash point will usually also have a low LEL.

Once the chemical catches on fire, three things need to be present to keep the fire going: fuel (the chemical vapour), oxygen, and heat. This is often referred to as the fuel triangle. If any one of those components is eliminated, then the fire will stop burning.

Like other reactions, a fire can also generate by-products—smoke, soot, ash, and new chemicals formed in the reaction. Some of these reaction by-products can be hazardous themselves. For example, the combustion of polyurethane foam gives off cyanides fumes. In chemical industries, the following types of fire scenarios are possible:

Jet fires occur when a flammable liquid or gas is ignited after its release from a pressurized, punctured vessel or pipe. The pressure of release generates a long flame, which is stable under most conditions. Typically, jet fires have a length less than 50 meters and thus typically stay confined onsite. However, if this jet impinges on a neighbouring tank then that tank ruptures under heat stress or BLEVE. Therefore, it is important to control jet fires to avoid domino effects. In case of jet fire, it will be prudent to keep the neighbouring tanks and the burning tank cool by water spray only if water is indicated safe to use for the unfolding scenario.

A pool fire occurs on ignition of an accumulation of liquid as a pool on the ground or on water or another liquid. Pool fire diameters are usually confined to the Dyke area of the tank or tank farms. Pool fires can give rise to BLEVE under certain conditions. Pool fires in large tank farms can result in a major disaster by a cascading / domino effect. The IOC Jaipur fire of 2009 is an example of a pool fire.

A flash fire occurs when a cloud of flammable gas and

air is ignited. Usually, flash fire or vapour cloud explosion results depending upon the spread of flame post ignition and environmental conditions. In reality, it is difficult to predict whether a flash fire or VCE will happen. In a flash fire, within a few second of ignition the flame spreads both upwind and downwind of the ignition source. The duration of this fire is very short, but it can give rise to secondary fires that may take longer to control. A capable fire department should be able to respond to such secondary fires (these are not chemical emergencies but a domino effect).

Fireballs are a rapid turbulent combustion of fuel, usually in the form of a rising and expanding radiant ball of flame. When a jet fire or pool fire impinges on a vessel containing pressure-liquefied gas, the pressure in the vessel rises and the vessel wall weakens ultimately resulting in catastrophic failure of the vessel. This phenomenon is known as a Boiling Liquid Expanding Vapour Explosion (BLEVE). Although the duration of the heat pulse from a fireball is typically less than 30 seconds, the damage potential is high due to the fireball's massive surface thermal radiation emissive power. A fireball can also be expected to cause significant overpressures (blast). However, the thermal radiation generally results in higher damage of life and property and thus included as a threat scenario for BLEVE.

2.1.2.2 EXPLOSION HAZARD

Explosions are caused when a mixture of air and fuel gets ignited. Depending upon the characteristics of the explosive vapour, the ignition may also result in a flash fire. The Vapour Cloud Explosion (VCE) can be unconfined or confined. Confined explosions occur within some form of containment (e.g. vessels, pipe work), or in less obvious situations (e.g. between buildings), while unconfined explosions can occur in open air.

It is sometimes difficult to make a distinction between a fire and an explosion. Often an explosion is followed by a fire, with damage and casualties being caused by both. Probably the greatest danger arises from the sudden massive release of flammable material producing a large cloud of flammable and possibly explosive vapour. If this cloud were ignited, the effects would depend on a number of factors including wind speed and the degree of dilution of the cloud with air. It could lead to large number of casualties and damage both onsite and beyond. However, the effects are generally limited to less than 300-400 meters.

2.1.2.3 TOXIC HAZARD

Continuous or sudden releases of toxic vapours have the potential to cause death and severe injuries at a much greater distance. In theory, such a release could produce lethal concentrations at several kilometres from the point of release. In practice, the actual number of casualties depends on the meteorological conditions, density of population in the path of the cloud, and the effectiveness of the emergency arrangements. Toxic materials can also be carried considerable distances by water. Their release into the public sewerage system, rivers, canals and other water courses, either directly, or through contaminated water used in fire fighting, can result in serious threats to public health.

While fire and explosion hazards can be controlled and responded by basic (but capable) fire resource capability. However, response to toxic leaks needs specialist training, equipment, and procedures. We have recommended creation of HAZMAT teams (at local, regional and state levels) to respond to all types of chemical emergencies including toxic.

2.1.3 ENVIRONMENTAL CONSEQUENCES

The possible environmental consequences of a chemical emergency include:

- The release into the atmosphere of toxic or corrosive gases, aerosols or particulate materials which could ultimately harm the aerial, terrestrial or aquatic environments
- The release of liquids or solids which could adversely affect land or water courses and the flora and fauna therein
- Fires or explosions causing damage to buildings or natural environment
- The effects of environmental impact can be direct or indirect, immediate or delayed, temporary or persistent. The persistent effects are of particular importance, such as damage caused to habitats by fire.

2.1.4 MEDICAL CONSEQUENCE OF CHEMICAL EXPOSURE

Human exposure to chemical releases can occur through air, food and drink, water or direct dermal contact with the chemical. Epidemiologists need to be aware that apparently inexplicable disease outbreaks may be the first evidence of a toxic release into the community. Chemical-induced disorders can manifest themselves in any organ system. Because the body has only a limited repertoire of disease responses, the signs and symptoms may resemble diseases arising from other causes. Unless the disorder is highly specific to the particular agent, epidemiological studies may be necessary to determine whether the occurrence of a disease in a population has increased as a result of chemical exposure. In general, the adverse responses to toxic exposures may be:

1. Effects that are local or arise at the site of contact with the chemical, such as broncho-constriction from respiratory irritants or irritation of the skin and eyes by irritant gases
2. Effects that are systemic or affect organ systems remote from the site of absorption, such as depression of the central nervous system from the absorption of solvents through the skin, or necrosis of the liver from the inhalation of carbon tetrachloride
3. Effects on mental health arising from real or perceived releases, which depend on the psychological stress associated with an incident.

The timing of the adverse health effects after exposure may vary.

1. Acute effects appear within seconds or minutes, and include eye irritation, broncho-constriction or pulmonary oedema
2. Sub-chronic effects appear within hours or days, and include delayed pulmonary oedema from phosgene, or renal failure in arsenic poisoning
3. Chronic effects appear weeks to years after exposure. These may be of the greatest concern in an incident, even in the absence of any casualties with acute or sub-chronic effects, and may include cancer and reproductive abnormalities.

2.1.5 CLASSIFICATION OF SCALE OF DISASTERS

One of the ways of classifying chemical disaster is by the consequences according to the provisions of Manufacture, Storage and Import of Hazardous Chemicals, Rules 1989. Table 2 classifies chemical disasters as minor, moderate, major and catastrophic based on the consequence as per USEPA criteria. These classifications are useful for response capacity assessment and also help in standardizing definition of scale of disasters. This classification is different than NDMA levels of emergency (Levels 0 to 3) discussed in the next section.

2.1.6 LEVELS OF EMERGENCY

NDMA guidelines on chemical disasters have defined Levels of Emergencies which are useful in communicating the level of response needed or provided.

- Level – 0: A non-emergency period when mock drills, trainings, exercises and other preparedness activities for effective response should be done.
- Level – 1: The emergency will spill over to offsite (outside factory) and within the capabilities of the district administration to deal with.
- Level – 2: The emergency will require assistance and help from the state government and within their capability.
- Level – 3: A National level disaster requiring major direct intervention of centre.

For communication purpose we recommend adding following level because NDMA levels ignore onsite emergencies or emergencies that require support from district or local response agencies.

- Level – 0A: An emergency that has only onsite consequences but requires support from local or district response agencies.

2.1.7 HAZARD WISE CLASSIFICATION OF DISTRICTS

The Government of Gujarat has categorized its districts on the basis of chemical and industrial hazards as per Table 3. This table may also help GSDMA prioritize the locations of RRTs. We understand that ERC are for multi-hazard responses and not only chemical, but the above table identifies districts as per only chemical hazard.

Table 2. Classification and Scale of Chemical Disasters

PARAMETERS	CLASSIFICATION AND SCALE OF CHEMICAL DISASTERS			
	MINOR	MODERATE	MAJOR	CATASTROPHIC
Potential for Human Injuries and Fatalities	Low potential for serious human injuries and no potential for human fatalities	Up to 10 human fatalities and 100 injuries requiring medical treatment or observation	Up to 100 potential human fatalities or up to 300 Injuries	More than 100 potential human fatalities and 300+ injuries
Need for Protective Actions	No need for formal evacuation or shelter or other public protective action	Limited evacuation of immediate response control zones of up to 2,000 people and no other public protective action	Requires protective actions of a discrete population managed by ICS for up to 20,000 people	Requires protective actions for a significant population > 20,000 people, or sensitive receptors, and pre-planning and preparedness programs
Contamination of Environment	Negligible contamination of any environmental media with minimal cleanup costs	Localized, rapidly resolved, non-persistent contamination of environmental media	Spreading and/ or persistent contamination of an environmental media that can be readily remediated with existing resources	Widespread and/ or persistent contamination of one or more environmental media with long-term remediation or need for outside resources
Need for External Resource Support	Response by facility response team (organic to facility)	Local HAZMAT team response (organic to local jurisdiction)	Community HAZMAT team response from an outside but local jurisdiction	Full reliance on state, intrastate, or national HAZMAT team resources
Advanced Equipment and Lab Support	Basic PPE, materials and tools, limited detection and monitoring, and no lab support	Specialized PPE, some specialized materials, basic tools, and detection and monitoring equipment, and basic lab support	Specialized PPE, materials, and response tools, intermediate detection and monitoring equipment, and lab support	Specialized PPE, materials, tools, and advanced equipment and lab support
Sensitive Receptors	Impact on 4 or fewer sensitive receptors	Impact on 5 to 10 sensitive receptors	Impact on 11 to 20 sensitive receptors	Impact on more than 20 sensitive receptors

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PARAMETERS	CLASSIFICATION AND SCALE OF CHEMICAL DISASTERS			
	MINOR	MODERATE	MAJOR	CATASTROPHIC
Critical Infrastructure	Impact on 1 or no critical infrastructure locations with no or minor operational disruptions	Impact 1 to 4 critical infrastructure locations with serious operational disruptions	Impacts 4 to 10 critical infrastructure locations with total operational disruptions and degradation of services	Impacts 10 or more critical infrastructure locations, that disables response operations and services
Property and Economic Damages	Less Than $100,000 in property or economic losses	$100,000 to $1,000,000 in property or economic losses	$1,000,000 to $10,000,000 in property or economic losses	More than $10,000,000 in property or economic damages
Public Confidence and Social Stability	No impact on public confidence in government or social stability	Minor impact on public confidence in government, social stability unchanged	Major impact on public confidence in government and some disruption of social stability	Major impact on public confidence in government with widespread disruptions of social stability

Table 3.Hazard Wise Category of Districts in Gujarat

SN	CATEGORY	DISTRICTS
1	AA Category (Highly Hazardous)	Bharuch and Vadodara
2	A Category (Hazardous)	Ahmedabad, Jamnagar, Kutch, Rajkot, Surat, and Valsad
3	B Category (Less Hazardous)	Anand, Bhavnagar, Gandhinagar, Kheda, Mehsana, Panchmahals and Porbandar
4	C Category (Much less Hazardous)	Amreli, Banaskantha, Dahod, Dangs, Junagadh, Narmada, Navsari, Patan, Sabarkantha and Surendranagar

2.1.8 TRANSPORTATION OF HAZARDOUS MATERIALS

Industrial installations, especially those handling highly hazardous substances are well-protected simply by the virtue of self-preservation and the ability to better control a hazard that is stationary and confined. However, once the hazardous substance leaves the premises of a factory, it also leaves the safety of a well-controlled environment. Consequently, accidents during transportation of hazardous chemicals are more frequent than industrial accidents. Also, depending upon the chemical transported and the population density of the accident area, the consequences can be grave. Pipeline transport is generally safest. Pipelines are well-designed, well-maintained and have several safety features. They are often underground. The main cause for accidents

involving pipelines is negligence in digging up the ground which can puncture pipelines.

Rail transport and water way transport are less risky because these methods face lesser uncertainty on exogenous factors such as traffic on their route, accidents of other vehicles on route, densely populated areas enroute, and others.

Road transportation of hazardous chemicals poses the highest risk due to the higher probability of accidents. A risk of an accident is present when:

- Vehicles carrying dangerous goods are left to stand unattended
- The vehicle or container runs loose because it is not properly connected or secured
- The load starts to move during transport
- Spillage is not quickly washed away from the vehicles or containers
- Spillage is not properly cleaned
- Incompatible substances mix with each other (e.g. using same tanker for different chemicals)
- Driver is not properly trained to manger the emergency as per laid down norms
- Vehicle is not well-maintained (especially for pressured tanks)
- Vehicles not following dedicated routes and times of travel.

2.1.9 CHEMICAL EMERGENCIES IN AFTERMATH OF NATURAL DISASTERS

Gujarat has been struck by natural disasters frequently in the recent past. These disasters have impacted industries considerably.

- The Kandla cyclone of 1998 affected oil terminals, jetties, transportation facilities, factories, buildings, warehouses, storage tanks, timber industry and, most important, the salt industry.
- There have been reports of chemical spill in Kandla port in the wake of January 26 earthquake in 2001.
- Oil production also suffered since the Hindustan Petroleum shifted its operations from Vizag to Kandla after the event of fire.

The impact of these natural disasters could trigger a serious chemical accident in Gujarat, particularly in the port-based industries in coastal area that are vulnerable to earthquakes, tsunamis and flooding. Therefore, it is important to consider resilience against natural disasters while locating and designing the new chemical industry. For existing chemical industries, a retrofitting of infrastructure to remain safe in case of earthquakes and flooding should be prioritized by the industry. There are two considerations in case of a combination of natural and chemical disasters.

First, the causation of chemical emergency as a result of natural disasters depends on two factors: (a) what is released? Where? and how much? and (b) under what environmental/climate conditions? Toxic leaks caused by heavy winds have lesser of an impact because the weather helps in faster dissipation of the toxic cloud. Fire sparked by lightning in flammable liquid storage can be made worse by high levels of oxygen in the heavy winds, but this is possible only if flammable matter is available for ignition by lightening. In case of floods, both above ground and below ground tanks containing chemicals less dense than water tend to float. Even the tanks with denser chemicals can get caught in strong water currents that tear them from moorings. In flooding, chemical leaks in water bodies can cause significant environmental pollution. In case of heavy rains combined with toxic leaks, the rains may in fact be beneficial for chemicals such as Chlorine and Ammonia but it may produce problems with run offs.

Second, a serious concern is the extraordinary resource demands and limitations of responders, equipment, water, and others materials that will be needed to respond to a chemical emergency during a natural hazard event. Large-scale natural disasters can degrade or destroy the very infrastructure needed to respond to the chemical emergency. Earthquakes or Tsunamis may also initiate chemical events but the challenge will be the competing priorities for resources for these different types of emergencies.

The IRS structure in case of natural disasters plus chemical emergencies would typically have the collector or other such senior officer as Incident commander. Chief of the LERT/RRT/SERT will head chemical response branch as Operational Section Chief (OSC). Another response team for, say, rescue for floods, will be headed by another OSC, and so on. The IC will coordinate these multiple teams and make executive decisions about setting priorities. Like with any large scale event, situational awareness allows the control room to set priorities. Lifesaving comes first, and then IRS should focus on interrupting the dominos or cascading effects to cause additional events (limit the causation), and protect property and the environment. In large scale complex events, we cannot expect IRS to fix everything all at once, but IRS should take the best decisions possible with resources available. Setting priorities will be challenging with recognition that lives and properties will be lost and we can only minimise the damage.

2.1.10 DOMINO EFFECTS IN CHEMICAL EMERGENCIES

Domino effects in chemical emergencies mean that an accident at one location causes accident at another location. Therefore, by default domino effects are a spatial concept. These are possible when multiple tanks are within each other's vulnerability zone or when two industrial units are in close proximity. The simplest way to interrupt the domino effect is to stop the hazard from reach the neighbouring site. This can be done by ensuring enough spacing between two tanks or units, reducing tank sizes such that vulnerable distances are lower, erecting blast walls, or other such measures. Planning and prevention are important to manage the risk of domino effects. We recommend the following:

- Industrial units who pose risk to neighbouring industrial units because of domino effect should clearly identify and mention the same on their onsite plans.
- Industrial units having tank yards of flammable chemicals should conduct worst case scenario on the basis of multiple tank failures (if such scenario is possible)
- Industry, DISH, DCG should collectively discuss and identify solutions for avoiding and responding to domino effects in DCG/LCG forum
- The affected units should be a part of the local mutual aid, conduct joint exercises and mock drills in association with LCG/DCG members, and develop their communication protocols to reduce the potential for and damage from domino effects
- LERT and RRT should identify clusters where domino effect scenario are possible in their areas of operations and develop tactical plans to respond to such emergencies.

2.2 VULNERABILITY ASSESSMENT

2.2.1 DISTRIBUTION AND TYPES OF INDUSTRIES

Table 4 lists the number of MAH, Type A and Type B factories by the districts and by type of hazard as per data reported by DISH. We only list industries with fire (explosion and fire is combined as "fire hazard") or toxic hazard with offsite potential. There are 836 Type A, 563 Type B, and 331 MAH industries active in Gujarat. Of these, 1427 pose fire and explosion hazard and 1730 pose toxic hazard.The Gujarat Industrial Development Corporation (GIDC) has a total of 183 industrial estates distributed across all the districts of Gujarat. Out of these estates, the GIDC has designated 13 estates as chemical zones as follows:

1. Ankleshwar - Bharuch
2. Dahej - Bharuch
3. Jhagadia - Bharuch
4. Nandesari - Vadodara
5. Naroda - Ahmedabad
6. Odhav - Ahmedabad
7. Panoli - Bharuch
8. Petrochemical Complex - Vadodara
9. Ranoli - Vadodara
10. Sachin - Surat
11. Sarigam - Valsad
12. Vapi - Valsad
13. Vatva - Ahmedabad

The GIDC encourages installation of chemical units in these industrial estates. The GIDC also maintain fire tenders in all these estates for dealing with chemical emergencies.

Figure 7 depicts the location of MAH, Type A and Type B industries in Gujarat. It suggests that Ahmedabad, Bharuch, Vadodara, Valsad, Surat, and Kutch face more chemical hazards than the other districts. These districts except Kutch are situated along a north-south alignment, and it is therefore prudent to develop local and regional response capabilities in this geographical region as a priority before other regions.

2.2.2 WORST CASE SCENARIO ASSESSMENT

A separate Vulnerability Assessment report includes "Directory of Hazard Identification by Industry" that describes, by district, the chemical industries in alphabetical order, their type (MAH, A or B), address, latitude-longitude, the chemicals in each industry, maximum unit storage quantity of the chemical, whether chemical has offsite consequence and hence modelled in ALOHA or not, and type of hazard possible for the chemical. The report is of thousands of pages and thus not included as appendix to this CDMP.

The detailed section of above report provides a detailed assessment for each chemical for each MAH, Type A and Type B industry for which we have data and where a consequence scenario is possible. We have estimated vulnerability of population, forests, water bodies, electrical installations, police stations, fire stations, and medical facilities. Based on this vulnerability assessment, in Table 5 we list chemicals in the state with possible consequence. Overall, we could identify over 350 unique chemicals in Gujarat. Of these, 114 have a consequence scenario that may have offsite consequence resulting in at least 10 deaths and may be assumed to require state-level response support. Of these 114, 102 pose hazard of BLEVE, 44 pose hazard of VCE or Fire, and 96 pose toxic hazard. Vulnerability assessment of pipelines or transportation corridors was not included in the scope of work because for planning purposes vulnerability assessment of only MAH units for worst case scenario will prepare the state for any type of chemical emergency. However, ALOHA and CAMEO suit can be readily used for vulnerability assessment of pipelines or any other source of hazard.

Figure 8, 9, 10, 11 delineate vulnerable areas for toxic, vapour cloud explosion, flash fire and BLEVE hazards in Gujarat. The scale of the map makes it hard to know the exact areas affected but a separate vulnerability atlas provides more detailed information.

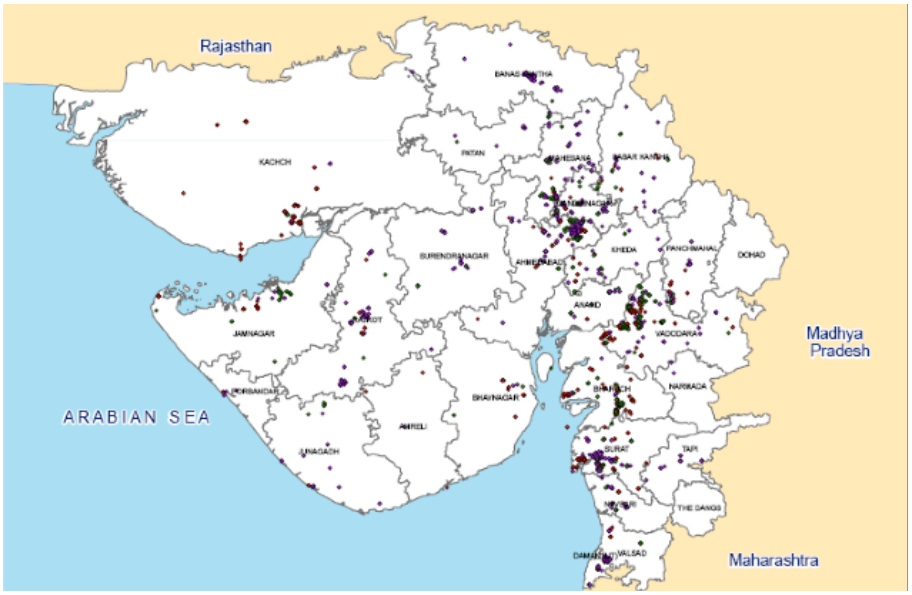

Figure 7. Location of MAH, Type A and Type B industries in Gujarat

Table 4.Number of MAH, Type A and Type B Factories by District and by Type of Hazard Posed

DISTRICT	A			B			MAH			A + B + MAH		
	Fire	Toxic	Total	Fire	Toxic	Total	Fire	Toxic	Total	Fire	Toxic	Total
Ahmedabad	127	165	165	89	93	93	19	29	29	235	287	287
Amreli	1	1	1			0	2	2	2	3	3	3
Anand	4	4	4	10	10	10	3	6	6	17	20	20
Banaskantha	51	51	51	2	2	2			0	53	53	53
Bharuch	44	73	73	162	165	165	42	75	75	248	313	313
Bhavnagar	2	3	3	2	2	2	5	5	5	9	10	10
Gandhinagar	48	58	58	25	25	25	8	11	11	81	94	94
Godhra	12	13	13	9	9	9	6	8	8	27	30	30
Jamnagar	3	6	6	16	18	18	8	8	8	27	32	32
Junagadh	37	37	37	5	5	5	1	3	3	43	45	45
Kutch	3	3	3	1	1	1	34	35	35	38	39	39
Mehsana	39	40	40	18	18	18	3	6	6	60	64	64
Nadiad	10	11	11	6	6	6	4	4	4	20	21	21
Navsari	17	20	20	1	4	4	2	2	2	20	26	26
Patan	5	5	5	4	4	4			0	9	9	9
Porbandar	6	6	6			0	1	1	1	7	7	7
Rajkot	20	39	39	8	8	8	8	8	8	36	55	55
Sabarkantha	17	17	17	9	9	9	7	7	7	33	33	33
Surat	95	101	101	28	38	38	25	26	26	148	165	165
Surendranagar	13	15	15	6	6	6			0	19	21	21
Tapi	5	5	5			0			0	5	5	5
Vadodara	58	75	75	99	121	121	43	65	65	200	261	261
Valsad	51	88	88	16	19	19	22	30	30	89	137	137
All State	668	836	836	516	563	563	243	331	331	1427	1730	1730

Table 5. Identification of Chemicals, their Maximum Storage, and Possible Consequence as per Vulnerability Assessment

CHEMICAL NAME	MAX UNIT QTY (MT)	TOXIC	VCE	BLEVE
1,1-dichloroethane	3223.8	1	1	1
1,3-butadiene	1371.5	1	1	1
1-butene	1000	0	1	1
1-hexene	868.2	1	1	1
1-octene	1573	1	1	1
2-ethylhexyl acrylate	1021.7	1	0	1
Acetic acid, glacial	8505	1	0	1
Acetone	1867.1	1	1	1
Acetonitrile	0.2	1	1	1
Ammonia	20000	1	0	1
Benzaldehyde	62.4	1	0	1
Benzyl chloride	0.2	0	0	1

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CHEMICAL NAME	MAX UNIT QTY (MT)	TOXIC	VCE	BLEVE
Butane	9183.5	1	1	1
Butyl acrylate	3000	1	0	1
Chlorine	0.9	1	0	0
Chlorobenzene	11655	1	0	1
Chlorosulfonic acid	200	1	0	0
Cyclohexane	1374.9	1	1	1
Cyclohexanone	9075.2	1	0	1
Dichloromethane	2378.3	1	1	1
Dimethyl sulphate	25	1	0	1
Dimethylamine	0.2	1	1	1
Dipropylene glycol methyl ether	0.2	0	0	1
Ethanolamine	200	1	0	1
Ethyl acrylate	0.2	1	0	1
Ethyl mercaptan	3.7	0	0	1
Ethylene chlorohydrin	1	0	0	1
Ethylene glycol monobutyl ether	1936.4	1	0	1
Ethylene glycol monomethyl ether	0.3	1	0	1
Ethylenediamine	0.2	1	0	1
Hexylamine	1	0	0	1
Hydrogen chloride	170	1	0	0
Hydrogen fluoride	50	1	0	0
Isobutanol	1887.2	1	0	1
Isobutylene	75	1	1	1
Methanol	11911	1	0	1
Methyl benzoate	1443.2	1	0	1
Methyl isobutyl ketone	16	1	1	1
Methyl tert-butyl ether	26	1	1	1
Monopropylamine	18	1	1	1
N,n-dimethylaniline	0.2	1	0	1
N-aminoethylpiperazine	738	1	0	1
N-heptane	90718.5	1	1	1
Nitric acid, anhydrous	80	1	0	0
N-nonane	35.9	1	0	1
N-pentane	4779.2	1	1	1
O-dichlorobenzene	20	0	0	1
O-xylene	4234.6	1	0	1
Phosphorus oxychloride	52.5	1	0	0
Propyl mercaptan	32	1	1	1
Propylene oxide	2490	0	0	1
Styrene monomer	5870.9	1	0	1
Sulfur trioxide	200	1	0	0
Tetrahydrofuran	22.2	1	1	1
Toluene	11438.7	1	1	1

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CHEMICAL NAME	MAX UNIT QTY (MT)	TOXIC	VCE	BLEVE
Toluidine	0.2	1	0	1
Vinyl acetate	2854.3	1	1	1
1-bromopropane	0.3	0	0	1
1-chloro-2,3-epoxypropane	17	1	0	1
1-nonene	967.2	1	0	1
2-ethyl hexanol	1166.2	0	0	1
Acetaldehyde	1035.9	1	1	1
Acetic anhydride	43.2	1	0	1
Acetone cyanohydrin	689.7	1	0	1
Acrylonitrile	7000	1	1	1
Aniline	20.4	0	0	1
Benzene	37464.2	1	1	1
Bromine	93.1	1	0	0
Butyl acetate	44	1	0	1
Carbon bisulfide	487.6	1	1	1
Chloroacetyl chloride	10	1	0	1
Chloroform	5637.3	1	0	0
Cumene	17.2	1	0	1
Cyclohexanol	0.2	0	0	1
Cyclohexylamine	0.2	1	0	1
Diisopropylamine	0.1	1	1	1
Dimethyl sulphide	16.9	1	1	1
Dimethylaminopropylamine	0.2	1	0	1
Ethanol	2525	1	0	1
Ethyl acetate	717.6	1	1	1
Ethyl butyl ether	3542.1	0	1	1
Ethyl methyl ketone	11.3	1	1	1
Ethylene dichloride	7062.5	1	1	1
1,2,4-trichlorobenzene	0.3	0	0	1
1-bromopropane	0.3	0	0	1
1-chloro-2,3-epoxypropane	17	1	0	1
1-nonene	967.2	1	0	1
2-ethyl hexanol	1166.2	0	0	1
Acetaldehyde	1035.9	1	1	1
Acetic anhydride	43.2	1	0	1
Acetone cyanohydrin	689.7	1	0	1
Acrylonitrile	7000	1	1	1
Aniline	20.4	0	0	1
Benzene	37464.2	1	1	1
Bromine	93.1	1	0	0
Butyl acetate	44	1	0	1
Carbon bisulfide	487.6	1	1	1
Chloroacetyl chloride	10	1	0	1
Chloroform	5637.3	1	0	0

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CHEMICAL NAME	MAX UNIT QTY (MT)	TOXIC	VCE	BLEVE
Cumene	17.2	1	0	1
Cyclohexanol	0.2	0	0	1
Cyclohexylamine	0.2	1	0	1
Diisopropylamine	0.1	1	1	1
Dimethyl sulphide	16.9	1	1	1
Dimethylaminopropylamine	0.2	1	0	1
Ethanol	2525	1	0	1
Ethyl acetate	717.6	1	1	1
Ethyl butyl ether	3542.1	0	1	1
Ethyl methyl ketone	11.3	1	1	1
Ethylene dichloride	7062.5	1	1	1
Ethylene glycol monoethyl ether	20	1	0	1
Ethylene oxide	19	1	1	1
Hexamethylene diisocyanate	262.5	0	0	1
Hydrazine	0.2	1	0	1
Hydrogen cyanide	5463	1	1	1
Isoamyl alcohol	0.2	1	0	1
Isobutyl acetate	218.8	1	0	1
Isopropanol	1906.3	1	1	1
Methyl acetate	18.6	0	1	1
1,2,4-trichlorobenzene	0.3	0	0	1
1-bromopropane	0.3	0	0	1
1-chloro-2,3-epoxypropane	17	1	0	1
1-nonene	967.2	1	0	1
2-ethyl hexanol	1166.2	0	0	1
Acetaldehyde	1035.9	1	1	1
Acetic anhydride	43.2	1	0	1
Acetone cyanohydrin	689.7	1	0	1
Acrylonitrile	7000	1	1	1
Aniline	20.4	0	0	1
1,2,4-trichlorobenzene	0.3	0	0	1
1-bromopropane	0.3	0	0	1
1-chloro-2,3-epoxypropane	17	1	0	1
1-nonene	967.2	1	0	1
2-ethyl hexanol	1166.2	0	0	1
Acetaldehyde	1035.9	1	1	1
Acetic anhydride	43.2	1	0	1
Acetone cyanohydrin	689.7	1	0	1
Acrylonitrile	7000	1	1	1
Aniline	20.4	0	0	1
Benzene	37464.2	1	1	1
Bromine	93.1	1	0	0
Butyl acetate	44	1	0	1
Carbon bisulfide	487.6	1	1	1

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CHEMICAL NAME	MAX UNIT QTY (MT)	TOXIC	VCE	BLEVE
Chloroacetyl chloride	10	1	0	1
Chloroform	5637.3	1	0	0
Cumene	17.2	1	0	1
Cyclohexanol	0.2	0	0	1
Cyclohexylamine	0.2	1	0	1
Diisopropylamine	0.1	1	1	1
Dimethyl sulphide	16.9	1	1	1
Dimethylaminopropylamine	0.2	1	0	1
Ethanol	2525	1	0	1
Ethyl acetate	717.6	1	1	1
Ethyl butyl ether	3542.1	0	1	1
Ethyl methyl ketone	11.3	1	1	1
Ethylene dichloride	7062.5	1	1	1
Ethylene glycol monoethyl ether	20	1	0	1
Ethylene oxide	19	1	1	1
Hexamethylene diisocyanate	262.5	0	0	1
Hydrazine	0.2	1	0	1
Hydrogen cyanide	5463	1	1	1
Isoamyl alcohol	0.2	1	0	1
Isobutyl acetate	218.8	1	0	1
Isopropanol	1906.3	1	1	1
Methyl acetate	18.6	0	1	1
Methyl chloride	1.5	1	0	1
Methyl methacrylate monomer	1474.3	1	1	1
Methylamine	0.2	1	1	1
Morpholine	50	1	0	1
N,n-dimethylformamide	45	1	0	1
N-butyl alcohol	1258.6	1	0	1
N-hexane	44682	1	1	1
Nitrobenzene	72	0	0	1
N-octane	43362.8	1	1	1
N-propanol	929.6	1	0	1
O-nitrotoluene	200	0	0	1
Phosgene	0.4	1	0	0
Propane	26718.5	1	1	1
Propylene	1316.8	1	1	1
P-xylene	15931.4	1	0	1
Sulfur dioxide	204.1	1	0	0
Tert-butylamine	7	1	1	1
Thionyl chloride	45	1	0	0
Toluene-2,4-diisocyanate	305	1	0	1
Trimethylamine	16	1	1	1
Vinyl chloride	1250	1	1	1

Note: based on Worst Case Analysis where at least 10 people are vulnerable for fatality

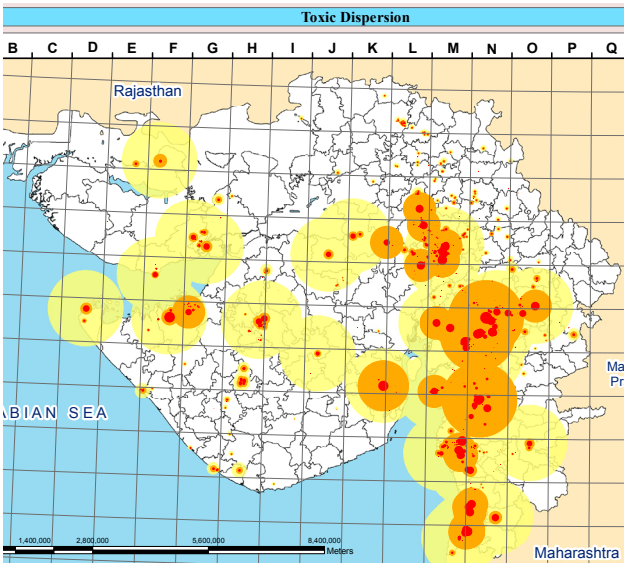

Figure 8. Vulnerable Areas in Gujarat for Toxic Hazards

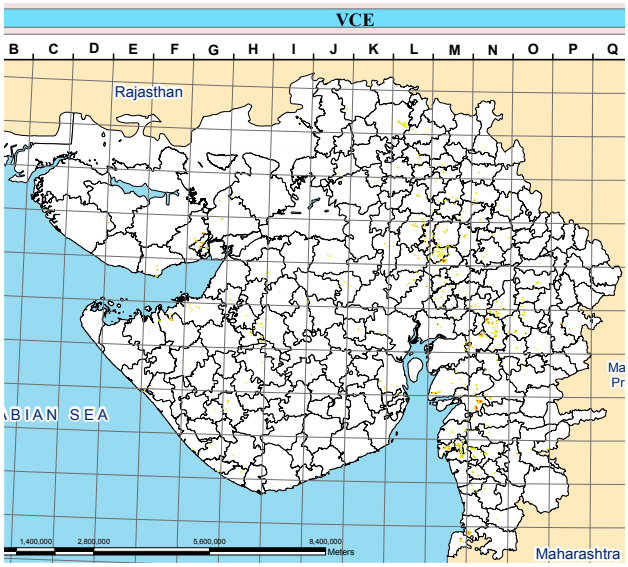

Figure 9. Vulnerable Areas in Gujarat for Vapour Cloud Explosion Hazards

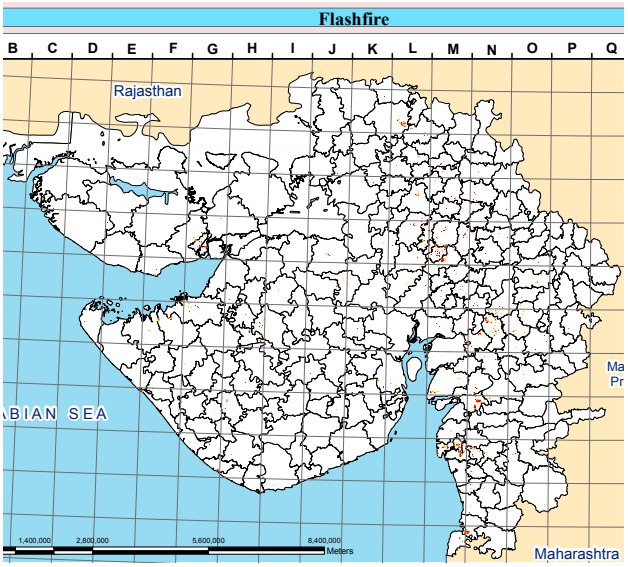

Figure 10. Vulnerable Areas in Gujarat for Flash Fire Hazards

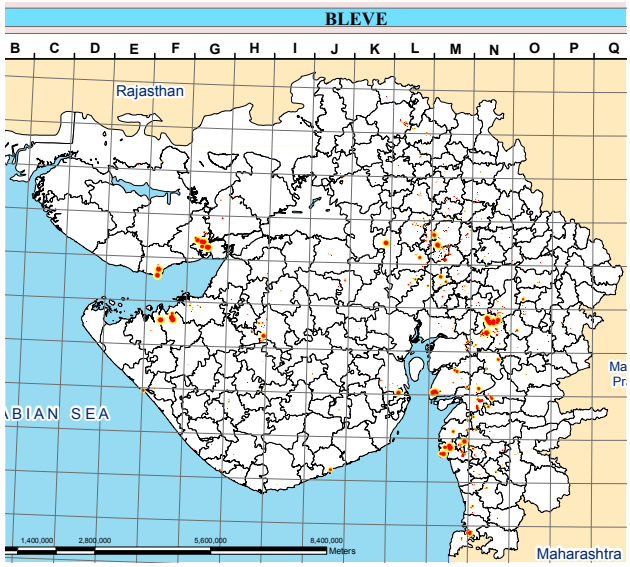

Figure 11. Vulnerable Areas in Gujarat for BLEVE Hazards

3 PREVENTION AND MITIGATION

3.1 INTRODUCTION

This chapter deals with the prevention and mitigation of the risk posed by hazardous chemical manufacturing, storage, handling, and transportation at the state level. The approach to prevention and mitigation is focused on regulatory and planning strategies. Prevention and mitigation activities are carried out in peace time or prior to any incident and in a continuous manner.

The history of prevention for industrial accidents dates back to 1881 with the enactment of the first Factories Act. The legislations have undergone many amendments that reflect the development and growth of new technologies, processes, and hazards. However, prior to the Bhopal disaster, the focus of chemical safety was on workers safety. Since then, there is a greater focus on prevention of major chemical accidents to protect communities and environment by improving safety processes. Ministry of Home Affairs (MHA), Government of India deals with overall disaster management related activities and NDMA is the advisory body for these activities, including those related to chemical disaster management. MOEF is the nodal ministry for chemical disaster management that has enacted MSIHC Rules, 1989 and CEAPPR Rules, 1996, which are in line with the international best practices adopted in a consultative process under the UNEP's APELL project.

Therefore, the current body of legislations on chemical (industrial) disasters is in line with industrially advanced countries. However, their improvement and implementation has not kept pace with changes in the chemical industry. Statutes need updating and their enforcement must be strengthened based on the current hazard scenario in the state.

In this chapter, we summarize the key recommendation provided in the interim module reports. Particularly relevant interim reports are: (a) Capability and Gap Analysis; (b) Performance Improvement of DISH, PESO and CEI; and (c) Strengthening of response mechanism. The recommendations provided herein are medium to long-term in nature whereas the recommendations given in Chapter 4 on preparedness are of immediate nature considering they are directly linked with the response capability of the state.

Next, we present the hierarchy of concepts in reducing the risks of chemical disasters, which is an important guide to prioritising the activities required to operationalize this plan.

3.2 HIERARCHY OF CONCEPTS FOR REDUCING RISKS

Below is a hierarchy of concepts that when implemented correctly will significantly reduce the risk of a chemical accident by seeking to prioritize those efforts that eliminate risk directly at the source. Used collectively these concepts address risk both from the probability and consequence of incidents. All concepts can be implemented simultaneously or independently but effective risk management would require that the concepts higher in the list be pursued at every opportunity. The following hierarchy can thus provide a guide for the prioritization of activities.

1. Eliminate use of toxics and replace them with a less or non-toxic alternative at each source.
2. Reduce use of toxics through minimizing use and/or storage volumes.
3. Implement risk management programs designed to minimize opportunities for releases to occur, and mitigate any release that does occur at the source with fail (passive) safe systems, and install secondary active mitigation systems (like water curtains), flairs, vent stacks, etc.
4. Implement land-use restrictions to provide minimum safe distances from sources to public and sensitive receptors. This is especially critical for a zone where even a rapid and qualified response may not be able to save lives. (detailed in State CDMP)
5. Plan for both or a combination of sheltering in place and evacuation programs where they are complimentary. A "key-hole" sheltering concept is ideal and is such that the population within a plume shelter and adjacent populations are

evacuated. Both concepts require public warning systems that initiate the community action immediately and are either automatic or initiated by the releasing facility through a formal system.

6. Maintain basic emergency capability to respond to everyday emergencies such as fire and medical. A strong emergency response (fire, police, medical) is essential building block to build chemical emergency response capability. Maintain a rapid (timely) and qualified (well trained and equipped) chemical emergency response capacity to control and reduce the quantity of hazardous chemical leaked and duration of such leak. This requires an extremely effective trigger mechanism for an immediate response.
7. Establish plans, develop public warning systems, and conduct public outreach and training on evacuation and shelter in place. The public needs to be trained on what actions are expected of them based on the warning systems. Without training the public, neither sheltering-in-place nor evacuations will be effective.

3.3 STRENGTHENING OF LEGAL FRAMEWORK

The Capability Assessment and Gap Analysis report discussed the existing legal and institutional framework in the State. Based on the review and discussions with the stakeholders through personal interviews and workshops, the consultants have identified major recommendations to improve prevention and mitigation of chemical emergencies by bridging the legal gaps.

3.3.1 NATIONAL LEVEL RECOMMENDATIONS BY NDMA EXPERT GROUP

NDMA expert group on chemical disasters has made several recommendations to the group of empowered ministers for further review and action at the national level. Below, we summarize relevant recommendations that may help strengthen prevention at the state level.

1. **Responsibility for enforcement of safety provisions for isolated storages should be with CIFs:** In schedule 5 of MSIHC rules, the power for enforcement of these rules applicable to the isolated storages has been given to CPCB / SPCB. It has been observed at the ground level that CPCB and SPCB's are mostly devoting their full time in enforcing various provisions under the environmental legislations such as the Water Act, Air Act, EP Act and rules framed there-under. Amendments are suggested in schedule 5 of the MSIHC rules to assign responsibility for enforcement in the mentioned isolated storages to CIF's in place of CPCB/ SPCB's. This is a key gap in existing enforcement of MSIHC rules and should be addressed on priority basis.
2. **Enforcement of MSIHC rules in intermediate, minor and private ports (Other ports) that do not fall under the category of major ports:** Under the dock workers (safety, health and welfare) act, 1986, state government is the appropriate authority for "other ports." However, the Gujarat state government has not provided rules covering "other ports;" and therefore has not designated any enforcement authority. In Gujarat, the rules under the dock workers (safety, health and welfare) act, 1986 have already been sent to the legal department by the labour & employment department, but the matter is not yet resolved. Considering this is a major legal gap in legal enforcement, the above matter should be resolved on priority basis.
3. **Worst Case Scenario for risk assessment:** Add rule 4 (a) under the MSIHC Rules as follows: 4 (a) Basis of risk assessment by MAH installation, " Worst Case scenario" shall be used as the basis for risk assessment, selection of process technology, and designing of safety systems measures and procedures including emergency responses capabilities by MAH installations. This will also be described in the safety and safety audit report prepared by MAH installations as per Rule 10. Definition of "Worst case scenario" would be given by adding Rule 2(O) in the rules.
4. **Inventory corresponding to containment provision:** Add rule 4 (b) under MSIHC Rules requiring an occupier maintain an inventory

of "extremely toxic" and "highly toxic chemicals" corresponding to the capacity of the containment system (neutralization, destruction, absorption etc.).

5. **Extension of applicability of rules regarding safety reports and safety audit reports to all MAH installations:** The provision of rules 10-12 of MSIHC Rules are applicable to certain MAH installations that have the threshold quantities of identified hazardous chemicals, as given in column 4 of schedule 2 and schedule 3. It is suggested that the provision of rules 10-12 as explained above be made applicable to all MAH installations handling the hazardous chemicals listed in column 2 of schedule 2 and schedule 3 and for threshold quantities given column 3 schedule 2 & 3. Accordingly, column 4 from schedule 2 and schedule 3 be deleted and rules 10-12 be added in the title of column 3 in both the schedules.

   Additionally, the consultants wish to add that onsite plans are prepared for MAH units as per MSIHC rules. The offsite plans are based on the onsite plan of only MAH units. While consideration of only MAH units is adequate for planning purposes, for coordinated response it is necessary that even smaller units have assessed their offsite risks as well as prepared an emergency response plan that can help responders. Given that MSIHC rules are incorporated in Gujarat Factories Rule, legal provisions to extend the requirement for onsite and offsite plans and safety reports to all chemical industries exist. Under section 68(o) of Gujarat Factories Rules, a third party safety audit can also be required. Therefore, we recommend that onsite plan and safety audit requirement be extended from only MAH to MAH, Type A and Type B industries where for smaller and less hazardous industries the state government may consider easier compliance requirements.

6. **Public liability Insurance Act, 1991 and rules made there under:** Under Section 3, there is a liability on the person who owns or has control over handling any hazardous substance to give relief as prescribed in the schedule for injury to any person (other than a workman) and damage to any property from an accident. The consultants suggest the schedule in the PLI act is amended and the amounts prescribed therein are substantially enhanced to meet the present day requirements of interim relief.

   List of chemicals with quantities for application of Public Liability Insurance Act is given in the Table (part 1 &2) of Appendix 1 of the Act. Part 2 of Table 8 given in Appendix 1 of the PLI act is suggested to be amended to bring it in line with the latest list given in Part – 2 of Schedule 3 of MSIHC rules.

7. **Multiplicity of regulations for hazardous chemicals:** Many occupiers of MAH units have expressed concern during meetings at different forums on the existing multiplicity/overlapping of the regulations for control and management of hazardous chemical that they handle. Inter and intra ministry in-depth review is required by the concerned ministries for simplification/removal of the overlapping provisions in the rules under various acts given in the proceeding column.

8. **Fixing absolute liability on "occupier", (reference Supreme Court judgment of 17/2/1986 in oleum gas leak case):** The Supreme Court observed that the measure of compensation be related to the magnitude and capacity of the enterprise because such compensation must have a deterrent effect. Presently, there is no specific legislation placing responsibility on the occupier of Major MAH installation (Factory and / Isolated storage) for payment of compensation to the victims of a major chemical accidents/ disaster, both onsite and offsite. A separate enactment is required to make it mandatory that the enterprise will have absolute liability for compensating victims of a hazardous chemical accident. The proposed enactment would prescribe the criteria for determining the liability as per the paying

capacity of the enterprise and also for the amount of compensation to be paid to the victim. As per the Supreme Court judgment, there is a non-delegable responsibility on the enterprise.

9. **Land use policy for buffer zone around MAH installations (Handling/ storing extremely/ highly toxic chemicals):** Under the CPCB guidelines and also under industrial policy these installations are permitted to be set up only 25 Kilometres away from major population hubs (5 lacs) in case of environmental guidelines and (10 lacs) in case of industrial policy guidelines. It is necessary to have in place a mandatory mechanism by which the concerned authorities are able to regulate the development of population settlements in the proximity of theinstallations. A "no-population buffer zone" of 500 meters around the perimeter of the MAH installations is to be set up for future installations. There should be a specific provision in the central legislation on land use planning requiring the concerned authorities in the (centre or state as the case may be) to maintain a no population buffer zone of approximately a 500 meter width around the perimeter of an MAH installation as defined under schedule 2(a) of the MSIHC rules 1989. After the provision suggested above is made in the land use planning legislation, the necessary amendment shall be made in the MSIHC rules, 1989 and the "environmental impact assessment notification 2006" to give necessary effect for implementation.

3.3.2 STATE LEVEL UPDATES TO THE LEGAL FRAMEWORK

The following recommendations for strengthening the legal and institutional framework for chemical disaster management are not yet being considered at state or national levels and are an area of improvement.

1. **Harmonisation of state acts and rules with respect to DM Act, 2005 for effective dovetailing of frameworks under MSIHC Rules and NDMA guidelines:** DM Act 2005 and NDMA guidelines on Chemical Disaster and the MSIHC Rules propose two mechanisms for planning and response with significant overlap. For effective coordination, we recommend that the GSDMA CEO be made a member of SCG. Reciprocating, the chairman of SCG (Chief Secretary) is already a member of GSDMA ex officio. Additionally, the member secretary of SCG (Secretary, Labour and Employment) may also be made a member of GSDMA. At district level, the DPO should be the part of DCG and support member secretary of DCG (DISH). District collector is chairperson of both DCG and DDMA so coordination at district level can be easily achieved.
2. **Emergency Management Plans for hazardous waste management facilities:** Sufficient number of Transport, Storage, and Disposal Facilities (TSDF) for hazardous wastes is a critical need to protect the environment. However, these TSDF facilities pose a hazard to population and environment. These facilities are not identified as MAH factories under the MSIHC rule, so they currently are not mandated to prepare onsite plan and safety reports. However, as MSIHC rules are notified under the Gujarat Factories rules, DISH may require TSDF facilities (as they can be defined as factories under the Factories Act) to submit annual safety report, conduct safety audit and prepare an onsite plan. GPCB may also frame such rules. Additionally, rules are required for disposal of hazardous waste generated after a disaster, site remediation, protection and remediation of other environmental assets.
3. **Framing of State rules and regulation to bridge legal gaps:** Enactments of new act and amendments of the existing acts at a central level is a time consuming, laborious process. Meanwhile framing of State rules and regulations wherever permitted by central acts should be helpful to legally support disaster management plan recommendations. GSDM Act 2003 permits formation of rules by the State for any activities related to disaster management. Such rules

may bridge existing legal gaps identified in this report.

However, a more serious gap is not enactment of new rules or regulations but enforcement of existing rules. Therefore, care must be taken not to create new rules that are orthogonal to or confound interpretation of existing rules, or create parallel structures and compliance requirements that could be addressed under existing rules under other Acts. However, rules that can increase coordination between different agencies, set standards for "qualified" response capacity, and ensure an effective trigger mechanism can be helpful.

4. **Converting Guidelines into Rules and Regulations:** The consultant teams have recommended guidelines for responder safety, quantitative criteria for immediate notification of emergency, and IRS that can be formed on a more immediate basis. Depending on the experience with these guidelines and learning from implementing them, formal rules can be developed at a later stage. Rules developed in such a manner will not only be more practical and applicable in the context of Gujarat but will also face lower resistance from industry and agencies who have experience with the guidelines.

3.4 STRENGTHENING OF ENFORCEMENT AGENCIES

The key agency responsible for industrial safety is DISH. DISH is also given responsibility under MSIHC rules for onsite plans of MAH installations. DISH officers also serve as members or member secretary of SCG, DCG, and LCG and thus are entrusted with the responsibility to prepare offsite plans. In addition to DISH, PESO is responsible for storages and transport of certain chemicals and pressure vessels. They are also members of DCG. The Chief Electrical inspector (CEI) is not assigned any specific role in MSIHC Rules with respect to preparation of onsite and offsite plans. However, electricity is cited as a prime cause (short circuit, failure, etc.) of most fires so that the department may indeed play a crucial role in prevention of electrical accidents that lead to chemical emergencies. Other agencies such as GPCB, Department of Transport, GIDC, and others also play a role in prevention and response to chemical disasters. As per the statement of work of the consultants, performance assessment of DISH, PESO and CEI office were done as case studies to identify unifying themes for performance improvement, as well as opportunities for operational synergy between these three organizations. The recommendations provided herein are generalized so that they may apply to other regulatory and technical agencies, as well.

Strengthening regulatory and technical agencies is a great challenge because over time the roles and responsibilities and the requirements for enforcement on these agencies have increased significantly without corresponding improvement in the capacity. Strengthening regulatory and technical agencies cannot be achieved merely by adding more man power,but by re-organizing the agencies (within and together) on strategic lines, developing inspection and enforcement strategies in a public-private partnership framework, using information technology to develop transparent and effective systems, and continuously developing the knowledge and skills of agency staff. The following recommendations are based on international model approaches and ILO recommendations.

3.4.1 STRATEGIC RE-ORGANIZATION OF THE AGENCIES

Organizational structure plays a vital role in effectiveness and efficiency of any organization. Usually organizational structure on the basis of subject or function at the top level, and by geographic reach at the field level is most suitable for regulatory agencies. Aligning by the core function allows each division to develop plans and goals specific to the division, develop specialized capacity in the subject matter, and better monitor staff performance. For example, the state-level head office of the regulatory agency can have a specialist chemical emergency planning cell that will be helpful in preparing guidelines and procedures for the inspection,

enforcement, and legal compliance by the industry,and serve as a key knowledge resource in planning for and responding to chemical emergencies. This cell can advise the training courses for its staff on chemical emergency management and monitor the training effectiveness. This cell can even itself conduct internal training of regional and field staff on special chemical emergencies related topics not covered in a formal training institute.

3.4.2 PROGRAMMATIC APPROACHES FOR COMPLIANCE

Establishing a programme to meet the end objective of a regulation has proven to be an effective model. Programme mode approach to safety promotion brings together regulators and industries on a common platform to seek mutually agreeable solutions. This approach seeks to improve efficiencies by removing redundancies in overlapping regulations by different regulators, to combine resources of regulators, to build consensus with industries, to partner with industry for funding, technology and knowledge, and to develop guidelines and systems for ease of compliance under the programme. Programme mode also takes a holistic approach from sensitization to education and capacity building to compliance to evaluation of the compliance. Such an approach yields richer dividend in compliance by the industry than inspection or command and control approaches.

For example, we recommend the establishment of a Toxic Risk Reduction Programme. The programme can be established by the state and national level agencies such as DISH, GPCB, GIDC, DoT, PESO and others such that it is well informed and supported by the industry. The programme should be tailored to identify priority toxic chemicals in fixed industrial installations, as well as on road, and utilize the full range of available tools to reduce the probability or consequences of an accidental chemical release. The industry should be a partner in identifying comprehensive, yet flexible set of tools. The programme should be well supported by e-governance systems and have appropriate level of marketing and outreach component. The programme can even seek international collaboration with agencies such as USEPA and OSHA for technical partnerships. Dedicated staff from regulatory agencies can be assigned to this programme so they can develop domain expertise over time. Some examples of tools the programme can seek to develop are:

- Replace more toxic chemicals with less toxic chemicals
- Reduce chemical volume in storage and transportation
- Eliminate potential public exposure with land-use planning and restrictions and route planning and infrastructure enhancements
- Install fail-safe process controls and inherently safe system design approaches
- Develop and implement good practices for equipment maintenance and management of (staff) change.

3.4.3 USE OF THIRD PARTY PROFESSIONALS TO STRENGTHEN ENFORCEMENT

All regulatory agencies are certainly facing a manpower crunch given the significant increase in the scale and scope of the responsibilities entrusted upon them. One effective approach to bridge this gap is engaging third party professionals/competent persons to carry out usual inspections, report filing, checking, collection of fees, scrutiny of applications, checking of onsite plans, and several such routine tasks. A necessary pre-condition is that such competent persons (a) are selected after a rigorous selection, training, and certification process; (b) undergo continuous training to upgrade skills and knowledge; (c) demonstrate no conflict of interest in discharging their role; and (d) are subject to a credible audit system to make them accountable. Also, development of a third party system needs effort to assess and build capacity of private sector to provide such man power. With third party system, the regulatory agencies can better concentrate to serve as a knowledge resource agency that develops specific knowledge and guidelines to help industry and third party professionals, conduct rigorous accident investigations, monitor activities of third party professionals, and other core functions. Additionally, regulatory agencies can develop a common third party system to bring in efficiency through economy of scale. For example, a common set of industries need

to be inspected annually by PESO, CEI and DISH. Thus, these three agencies can develop a common inspection guideline by third party professionals.

3.4.4 SIGNIFICANT RELIANCE ON E-GOVERNANCE

E-governance systems help in many types of functionality and services by the agencies such as government to businesses, government to government, Government to public, and other. While PESO is a notable exception to effective use of e-governance, other organizations can benefit immensely by establishing e-governance system on priority basis. Most of the legal compliance related activities can be automated. E-governance can also make organizations more transparent and accountable. Some examples of e-governance systems that can help in chemical disaster management cycle are given below.

1. Hazard and vulnerability profiles of areas: Systematically assess the potential for chemical hazards by different regions and make available to general public for review. This system can track how the risk levels have increased or decreased over time in different areas.
2. Information on compliance by industry: All regulatory agencies can publish not only a summary but also individual, industry-specific information on compliance, inspection notes, notices, etc. to the extent the privacy of the industry is not compromised. List of defaulting industries for non-compliance can also be displayed to the public and media.
3. The inspection reports, accident investigations, and audit reports may be analysed to generate actionable and usable information for LCG, DCG and SCG in disaster planning and response functions. Statistics on industrial accidents, offsite emergencies, and chemical emergencies in non-industrial settings can also be maintained on the website.
4. GIS database based software should be used for storing disaster management related information, planning, and support during response. We have recommended CAMEO suit to be adopted for hazard identification, accident information, facility information, disaster scenarios, vulnerability assessment, and GIS based display of threat zones for a given scenario. It is important that the use of this system is standardized across industries and regulatory agencies.
5. Considering the lack of information and the uncertainty of chemical transport are major concerns in road transportation, a web-based system can be developed to log in information of the vehicle, driver, and chemical being transported by the consignor. The consignee can report receipt of such chemical cargo in the system, as well. The system can also print a fresh TREMCARD to be carried in the tanker with all relevant information including the date. Such a system can effectively deal with the problems of dated/old TREMCARDS, multiple TREMCARDS, and uncertain information about the chemical.
6. Several other recommendations are provided in the reports on GIS based system and performance improvement.

3.4.5 DEVELOPMENT OF INSPECTION MANUALS

Regulatory agencies should update inspection manuals and conduct regular training of their staff and third party professionals on these. These manuals must detail the procedure of inspection, industry specific guidelines, standard templates, and check lists for inspections, and SOPs for action after inspection. They should develop a system of maintaining inspection records on a web-platform and sending reminders / notices to industry for compliance (e-governance).

3.4.6 SYSTEM FOR ACCIDENT INVESTIGATION, REPORTING AND FOLLOW-UP

Accident investigation and reporting systems are of immense help in planning for and responding to disasters. As per MSIHC rules, offsite emergencies should be reported within 48 hours and a detailed follow up report should be submitted within 90 days. Such reports should be investigated by DISH, PESO or GPCB as the case may be, and “lessons” for future references should be developed. This entire documentation should be available on the web. Learning from accidents, even the small ones, is

critical and not only major ones such as Jaipur fire.

MOEF has developed Chemical Accident Investigation Reporting System (CAIRS). It is a Web Based System where concerned authorities as mentioned in schedule 5 of MSHIC Rule 1989 can register chemical accident information in the pre-set formats. While this system can be much improved, the use of CAIRS is very limited to say the least. Gujarat State can either use CAIRS or develop own system that is more user friendly and relevant to the needs of the state. Most importantly, the state should investigate all reported accidents, and learn from each incident.

CAIRS is available at http://cairs.nic.in/

In India, at least major accidents reported in media or resulting in deaths are investigated to some extent, and higher the damage more in-depth is the investigation. What does not happen often is the implementation of the recommendation post such investigations. Without that, there is not much benefit of investigating an accident. This CDMP wishes to highlight a case of IOCL fire at Jaipur in 2009 as a case study. Jaipur Fire Accident took place on 29th October 2009 at IOCL terminal. The Petroleum and Natural Gas ministry constituted an independent enquiry committee under the chairmanship of Shri M.B. Lal to investigate into the causes of fire and to suggest remedial measures to prevent recurrence of such incidents in future. The Committee gave 113 recommendations which were accepted in April 2010 for implementation at existing locations of all oil marketing companies at a specified time frame. However, in spite of such high level oversight by the ministry, the standing committee on petroleum and natural gas of the Parliament found that only 56% of the recommendations were implemented by March 2012. A comment by the parliamentary joint committee summarises aptly the challenge of implementing recommendations related to prevention on ground *"…found that the recommendations especially pertaining to procurement and installation of important safety equipments are still pending. This reflects poorly on the managements of OMCs and their planning and implementation abilities. The Committee strongly deprecate the dilatory tactics of the OMCs and inefficient supervision of the Ministry resulting in inexplicable delays in the implementation of safety standards…"*

We recommend that the state government should cause DISH, PESO and regulatory bodies to review the status of implementation of the important recommendations given in the investigation reports of major accidents happened in the past. This review can be done as a part of regular SCG meetings recommended in this CDMP.

3.5 DISASTER RISK REDUCTION THROUGH LAND USE PLANNING

As per the NDMA recommendations, it is necessary to have in place a mandatory mechanism by which the concerned authorities are able to regulate the development of population settlements in the proximity of the installations. A "no-population buffer zone" of 500 meters around the perimeter of the MAH installations is to be set up for future installations.

The consultants wish to further note that the time to provide effective response to chemical emergencies is a key determination for buffer zone dimensions. For example, even with rapid and qualified response, population within a certain zone cannot be protected. On other hand, without a qualified response, a buffer zone of 500 meter may not be adequate. Therefore, the land use planning and permissions for new infrastructure development should consider existing hazards and vulnerability to them.

We recommend that the DCG and LCG be given a role in approval of new developments in the area on basis of vulnerability assessment. Additionally the environment department and GPCB may consider chemical vulnerability assessment as a part of chapter on disaster management in the environmental impact assessment report as a key decision factor to permit new industry.

3.6 PROMOTION OF PREVENTION PROGRAMMES IN INDUSTRY

Numerous prevention programmes and tools can also be employed by hazardous chemical industries to educate workers and reduce risk by effectively managing all processes involving the presence of hazardous chemicals. Some example prevention tools are listed below:

- Conduct safety review before starting
- Establish employee participation and access to process safety analysis and management programmes
- Prepare written safety procedures and work aids for employees and contractors
- Conduct worker and contractor safety training
- Conduct daily safety briefings for employees and contractors
- Identify process best practices and develop a plan to implement changes
- Ensure on-going integrity of equipment and implement maintenance management
- Conduct compliance audits
- Conduct incident investigations to identify and address root causes of releases
- Identify expected equipment lifecycle; schedule and budget to replace or upgrade equipment
- MSDS sheets and Do and Don'ts
- Provide help in terms of technical and other resources for emergency response planning and training with local responders, district disaster management authorities, the LCG or DCG, and the public.

3.7 COORDINATION BETWEEN ENFORCEMENT AGENCIES

There are several key regulatory and technical agencies that play a role in prevention and mitigation of chemical emergencies. However, a common platform for effective coordination amongst them does not exist. Therefore, a key role for GSDMA will be to improve coordination between DGFASLI, Airport Authority, Western Railways, PNGRB, GMB, PESO, CEI, DISH, GPCB, DOT, and others to meet the common objective of reduced risk of chemical accidents. The main mechanism to achieve improved coordination between these agencies is provided for under MSIHC rules by constituting SCG, DCG, and LCG. GSDMA needs to play a significant role in ensuring this mechanism functions in the true spirit of the law. Some examples of the activities are as follows:

- All regulatory and technical agencies may be invited by GSDMA individually or as a group to present to GSDMA about their roles in DM as per their own assessment,and status of prevention efforts, and the preparedness measures by the industry they regulate. The meeting of SCG should also be regularly -4 times in a year as required by CAEPPR Rules - convened where these agencies can be requested to make a presentation and engage in discussions to improve the disaster planning and response mechanism in the state.
- DCG and LCG offsite plans should be developed by the DCG/LCG as a group and not by DISH "alone".The plans are meant to be developed in a participative manner by the entire group where DISH plays the coordination role of the member secretary. SCG should provide the budget and the framework for other members of DCG/LCG to participate in preparation or updating of offsite plans / DMPs, and regularly review and update them, as necessary.
- Recommendations in Section 3.4 can improve coordination among regulatory agencies.
- Table top exercises, functional drills, and full scale mock drill are multi agency tasks and need coordination. GSDMA can support these activities in terms of funding and technical support.
- As recommended in the Bharuch DCG meeting, GSDMA may help in publishing a quarterly/yearly magazine on hazardous chemical incidents, accident report findings, new technologies, and other chemical emergency related information. The industries can significantly contribute in terms of content, recommendations for improving existing systems by interpreting the lessons from accident investigation, and in sharing publishing costs. This magazine will be a valuable resource for regulatory agencies, response agencies, line departments, and the industries alike.
- The Person Action Communication (PAC) sheet is a good tool to establish clarity of roles and

co-ordination among the various responders during an emergency. The PAC sheets for sample scenarios have been provided in Appendix C and Appendix D. The details of PAC analysis are available in the MoEF offsite plan guidelines 2010. The PAC analysis of different emergency scenarios can be one of the agenda items of DCG meets and subsequently these sheets could be annexed to the plan for records. It should be clarified that PAC sheets are prepared by DCG members in discussion and not to be outsourced to an external consultant.

3.8 TRAINING AND CAPACITY BUILDING

Regulatory agencies must maintain and upgrade theirknowledge and skills continuously to keep in line with best international practices and emerging new technologies, processes, and hazards. The regulatory and enforcement agencies need specialized, focused training of fresh recruits and continuing education for other staff. The training material, examination pattern, and certification requirements can all be developed internally, or in collaboration with other agencies and training institutes with similar purpose. Capacity building efforts should include regular internal and external seminars and workshops. There should be an on-going arrangement for training and capacity building in-house as well as at other institutes at state, national, and international levels with adequate funding. For example, GIDM may provide training of trainers from regulatory agencies, response agencies and industries in specialized chemical disaster management topics.

Also, the regulatory agencies are responsible for building the capacity of the industry they regulate. Strong internal training materials for regulatory agencies can be used as outreach and safety promotion material for the industry with minor modification. Regulatory agencies can also develop certification and training programmes in collaboration with professional training institutes for the industries (e.g., training requirement for contract workers, training for workers handling Hazardous chemicals, etc.). Regulatory agencies and State training institutes may develop guidelines and standardize training protocols for first responders within the industries. These guidelines should consider joint training and exercise of industry first responders with offsite response agencies for coordinated response.

3.9 STAKEHOLDER ROLES AND RESPONSIBILITIES IN PREVENTION AND MITIGATION

The table below summarizes the key activities required for prevention and mitigation and the responsible agencies.

Table 6.Stakeholder Roles in Prevention and Mitigation

SN	PREVENTION AND MITIGATION ACTIVITY	PRIMARY RESPONSIBILITY AT STATE/DISTRICT LEVEL	SECONDARY RESPONSIBILITY/ SUPPORT AT STATE OR DISTRICT LEVEL
1	Ensuring safety of chemical storage vessels regulated by PESO	PESO	DISH
2	Enforcement of safety provisions for isolated storages	DISH (Recommended)	GPCB
3	Overall chemical safety of the unit including process safety, PPE, staff training, etc.	DISH	
4	Ensuring no or minimal environmental impact owing to operations and possible accidents at the site	GPCB	DISH
5	Ensure safe electrical conditions and that electrical hazards will not trigger chemical accidents	CEI	DISH
6	Reducing/Eliminating use of toxic materials and /or using alternative non-toxic materials	Industry	DISH
7	Risk management programs and installation of passive and active mitigation systems	Industry	DISH
8	Dovetailing of Structures under MSIHC Rules, 1898 and the DM Act, 2005.	GSDMA	SCG, Chief Secretary of State
9	Extension of requirement of Onsite Emergency Plans to include MAH as well as and Type A and Type B industries	DISH, CEI,PESO,GIDC,DoT	Industry
10	Requirement of Onsite emergency plans for Hazardous Waste Management Facilities (TSDF)	TSDF facility	Regional GPCB
11	Onsite Emergency plans and enforcement of MSIHC rules in intermediate, minor and private ports in addition to major ports	Respective Port Authority	Regional GPCB, DISH
12	Onsite emergency plans for isolated storage facilities	Isolated storage facility, Regional GPCB	DISH
13	Emergency response plans for transport of HAZCHEM	DISH	Department of Transport, Western Railways, Traffic Police

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SN	PREVENTION AND MITIGATION ACTIVITY	PRIMARY RESPONSIBILITY AT STATE/DISTRICT LEVEL	SECONDARY RESPONSIBILITY/ SUPPORT AT STATE OR DISTRICT LEVEL
14	Land use policy on 'no-population buffer zone around MAH industries. Vulnerability Assessment based siting of chemical industries	State level Land use and town Planning related agencies/ dept	GPCB,GSDMA,DC DCG, Revenue Dept
15	Implementation of programmes such as Toxic Risk Reduction Programme	DISH, GPCB ,GIDC, DoT, PESO	
16	Use of Third Party professionals for strengthening enforcement	PESO,CEI,DISH	
17	Implementation of E-Governance	GSDMA, DISH	DCG,DDMA, LCG (all for data and implementation support)
18	Development of Inspection manuals	All relevant Regulatory Agencies	
19	Promotion of preventive programs in industry	DISH, PPP models like DPMC	GSDMA, DCG, DDMA, collaboration between multiple regulatory agencies
20	Coordination between different enforcement agencies	GSDMA	GFASLI, Airport Authority, Western Railways, PNGRB, GMB, PESO, CEI, DISH, GPCB, DOT
21	Training and Capacity Building	GIDM, SPIPA	Regulatory Agencies, DISH, DDMA and DCG

4 PREPAREDNESS

The following are recommendations to improve the preparedness for responding to chemical emergencies in the state, as per the response plan in Chapter five. It is critical to note that the response plan assumes that the recommended level of preparedness is achieved.

4.1 DEVELOPMENT OF PREPAREDNESS ACTION PLAN

Preparedness actions plans are critical to move from planning to implementation. This CDMP will only identify the key "preparedness objectives" that need to be achieved whereas the action plan must identify the timeline, funds, personnel, and strategies to achieve these objectives. Without such action plans, the following recommendations will remain only aspirations and the response plan based on an assumption that the level of preparedness is achieved cannot be implemented. Each offsite response agency and the state government department assigned a role in the response plan (Chapter 5) must develop a preparedness action plan and present it to the SCG and GSDMA. After the plan is finalized and timeframe is assigned to implement the planned actions, these preparedness action plans should be annexed to this chapter. The annual review and updating of the state DMP should also review the progress of offsite agencies and state departments, as per their own preparedness action plans. It is critical that GSDMA takes a leadership role in ensuring that individual departments prepare an action plan to meet the agreed recommendations of this CDMP.

4.1.1 WHAT IS AN ACTION PLAN?

The action plan describes how an organisation or department will meet its objectives (roles and responsibilities) for CDMP. It consists of a number of action steps with each step describing the following:

1. What will be done?
2. Who will do it?
3. When will it be done?
4. What resources (money, manpower, technology) are needed?
5. How will the resource needs be met?
6. Who should know what and will report what to whom?

4.1.2 ASSIGN SPECIFIC ROLES AND RESPONSIBILITIES

Based on the state, district and local area CDMP, each department should be assigned roles responsibility. In this step, the role of SCG, DCG and LCG is important as a coordinating body and a common platform of various relevant departments and organisations. The objectives of the action plan for a given department or organisation will be to fulfil the roles and responsibilities assigned to them.

4.1.3 ESTABLISH A CORE PLANNING GROUP WITHIN THE ORGANISATION

Each department should identify a core group of few (3-6) people who are interested in the subject of CDMP, have some relevant experience or expertise, and can devote some of their time and resources to making of and monitoring the action plan. Particularly, budgets and people (their time share) should be assigned for: (1) preparation of detailed action plan; (2) monitoring of implementation of action plan; and (3) actually discharging the duties as per the plan.

4.1.4 MAKE PREPAREDNESS ACTION PLAN

Assess resource and skill requirements as per the assigned role. Compare what is needed with available resources and skills. Such needs assessment will result in a list of specific goals or tasks. These goals should be time bound in immediate (0-2 years), short (1-4 years), medium (3-7 years), and long term (6-10 years). The goals should be measurable (quantitative, verifiable, etc.).

For each goal or task, prepare a comprehensive and detailed list of activities to be conducted within next 3 years, 1 year, and 3 months. Each activity should be assigned to a specific person or a group so that their progress can be monitored. Such detailed planning is essential for successful implementation

Next, identify who, what, when, how. Essentially, each goal/task or activity should be assessed for

required resources (manpower, skills, equipment, technology, budget).

4.1.5 DEVELOP EMERGENCY RESPONSE PROTOCOLS

Preparedness action plans are made so that the organisation is ready to discharge its roles during an actual emergency. Therefore, a critical component of the action plan should be allocation of staff, technology, equipment and budget during emergency. In addition, each department should develop SOPs for their response during an emergency.

4.1.6 MAKE TRAINING PLAN

Training and capacity building is integral part of action plan. The department and organisation should identify their learning objectives and resources available. Online training and internal material is often the best source, but external training institutes and professionals can also be proposed in the action plan.

4.1.7 FLOW DOWN ACTION PLANS

Preparation of action plans should be top down starting with the state head quarter and going to the district and then local/block levels. The state plan should be internally discussed and presented to regional/district or other such lower units in organisation. Each such sub-unit should prepare their own action plans.

4.1.8 DISCUSSION OF THE PLAN IN LCG/DCG/SCG MEETINGS

The action plans should be discussed in appropriate SCG, DCG, LCG meetings so that a coordination with the plans of other organisations is achieved. As discussed in Section 3.7, the PAC sheet is a good tool to establish clarity of roles and co-ordination among the various responders during an emergency.

4.1.9 IMPLEMENTATION, MONITORING AND EVALUATION OF ACTION PLAN

Monitoring and evaluation of the action plan is as important as rigorous planning itself to ensure implementation. Therefore, an independent internal monitoring and evaluation group who is not directly responsible for implementation of the plan should be formed. This group should be accountable and reporting to the head of the organisation and should make at least quarterly presentation to the top executives and administrator of the organisation.

4.2 IMPROVEMENT IN CHEMICAL DISASTER MANAGEMENT PLANNING

4.2.1 GSDMA SUPPORT TO SCG, DCG, AND LCG IN PLANNING AND PREPAREDNESS AND COORDINATION OF RESPONSE

GSDMA is already playing a key role in planning and preparedness for responding to chemical disasters through technical guidance, financial support for infrastructure, constituting GIDM, and other such activities. GSDMA is also helping key municipal corporations procure HAZMAT vans for chemical response. GSDMA is helping district authorities to establish ERC in five locations. We recommend additional support by GSDMA on the following.

- GSDMA needs to do role as a “response coordinating” agency. Currently, no single agency or department is made responsible for coordinated response for chemical emergency. In practice, the collector is expected to fulfil the role of coordinating response. The international best practices are to have a single agency responsible for coordinating response of multiple response agencies during disasters, ensuring that individual response agencies are prepared to required level, and develop integrated response capability for the state. Such single “emergency response office /agency” is advised not only for chemical emergencies but in all hazard context as well.
- Establish a Chemical Cell within GSDMA for community outreach and education, as per CECAP strategy report developed under this project. GSDMA may coordinate with SCG entrusted with the similar functions under CAEPPR Rules
- Develop a system to conduct and learn from regular table top exercises, functional drills and full scale mock drills, as per the recommendations in this plan later, and ensuring that the system is implemented by relevant DCG and LCG in coordination with SCG.

- DPOs at district levels support the chairman of DDMA (the collector) to discharge his duties. DISH is a member secretary to support the chairman of DCG (also, the collector) as per CAEPPR Rules. Considering the support activities for chemical disasters and those under "all hazard" concept will overlap, DISH and DPO both should provide support to the DC for preparedness of Chemical Emergencies. While DISH can provide technical support, the DPO can provide support in administration, community outreach and other tasks. However, DISH officers and DPOs should be trained in topics of CIDM.
- Additionally, GSDMA should consider appointing a CIDM specialist at district levels. This person can be a chemical engineer with training in industrial safety, HAZMAT response, CAMEO suit modelling. He can also be used by DCG as a technical resource to prepare offsite plans, SOPs for the districts and other such technical activities.
- In collaboration with SCG and by providing technical and financial support, GSDMA should prepare guidelines on chemical disaster planning for LCG and DCG for: (a) chemical hazard identification and facility inventory; (b) collection of planning information; (c) identification of sensitive populations and environmental receptors; (d) chemical release notification system procedures; (e) initiation triggers and activation for initial public protective actions; (f) mobilization of chemical emergency response teams; (g) establishment of the IRS and communications system; (h) transition from emergency to remediation phase; and (i) equipment and material support requirements.
- GSDMA may support SCG with technical and financial support to develop and standardize vulnerability assessment procedures, assumptions, data and software, and annual updates for the same, maintaining database of industrial units and their chemical storage data, and providing modelling support to estimate vulnerability, and developing a vulnerability atlas and other maps.
- Help establish a system for stakeholder participation in planning, review, and preparedness activities. One of the critical gaps in participatory planning and preparedness processes is that regular meetings of SCG, DCG, and LCG do not happen as envisioned in CAPPR Rules except when a mock drill is planned. Such meetings between industry or their associations and public authorities are very rare as well in spite of being critical to build trust between industry and public agencies, and to develop joint capability for response. Therefore, GSDMA may take leadership in organizing and coordinating such meetings and through active participation in these meetings as member of SCG.

4.2.2 STRENGTHENING OF ONSITE PLAN AND ITS SYNCHRONIZATION WITH THE OFFSITE PLAN

To strengthen preparation of onsite plans and their synchronization with the district offsite plans or with district CDMPs, the following three documents can be issued by DISH to the industry after they are approved in deliberations with the stakeholder:

- Onsite Plan guidelines
- Onsite plan model plan
- Check list

The consultants, under contract with GSDMA, have prepared the above three documents. These documents need to be reviewed and adopted by DISH. DISH also needs to make conscious and timely efforts to ensure that the industries follow hese guidelines.

4.2.3 DEVELOP EMERGENCY RESPONDER SAFETY AND TRAINING GUIDELINES

The safety of responders is paramount, not only to prevent any potential harm and suffering they may experience, but also to preserve a critical disaster response asset. State government should adopt and implement a responder health and safety standard on lines of Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) developed by the US (see Appendix G: HAZWOPWER Standard by OSHA, USA). In brief, this standard requires that responders be provided

with the following.

- Training and supervised work experience at several increasing levels of competency sufficient for responders to safely work in chemical emergency events.
- Personal Protective Equipment (PPE), safe work practices and policies, and/or engineering controls to appropriately to protect responders from harmful chemical exposures.
- Equipment capable of identifying chemicals and monitoring chemical levels in the environment and to identify when PPE may no longer be effective.
- Medical assessments to establish the ability of the responders to work in a hazardous environment and wear the respiratory protection that may be necessary for certain incidents.
- Medical monitoring to identify if exposure may have occurred and to ensure that responders have not been harmed while responding to an incident.
- Briefing on the contents of site safety plans (SSPs) developed for each facility—both written and oral—prior to entry into a hot zone. SSPs are developed by the responders prior to entry based on MSDSs, safety plans, input from DISH, facility staff, etc. It is the primary decision making tool to determine PPE and provide for responder safety. The facilities could develop these in advance, but the details would likely change dynamically in an emergency. Appendix B includes an example template for SSP.
- Capacity for teams consisting of at least two people for low-hazard assessment work and six-person teams for entry into any site where the hazards are high-level, high-volume, unknown, or poorly understood.
- Decontamination upon exit from a hot zone and sanitation to be performed when responders are done working for the day.

4.2.4 DEVELOP GUIDELINES FOR IMMEDIATE NOTIFICATION OF HAZARDOUS CHEMICAL LEAK

Under MSIHC Rules 1989, the occupier needs to notify the offsite agencies in case the onsite emergency has potential for or poses offsite consequences. However, for an effective response to chemical emergencies that can save lives and properties, time is a critical factor. The time to respond to and effectively control chemical leaks is measured in several minutes, not hours. Therefore, it was identified in State, District and Local workshops that a critical gap is a trigger mechanism for immediate response.

The recommendation is to develop guidelines to help industries determine when an onsite emergency can potentially become offsite based on quantitative criteria. Such guidelines and precautionary and not reactionary and thus may require notification to offsite agencies even when the emergency does not become offsite eventually. The point is that as the emergency is unfolding, it is often difficult to determine whether off site agencies should be notified for help and when, and such decisions are subjective. This results in valuable loss of time to notify offsite agencies. On other hand early notification will enable response agencies to mobilize teams and keep resources on alert even if in some cases the emergency does not become offsite.

Based on above need for a rapid trigger mechanism, USEPA has developed criteria to notify chemical leaks on the basis of amount (Kg) of chemicals leaked on the basis or animal toxicity, mobility in the atmosphere or environment, persistency or capacity to bio-accumulate in the environment, or presence of any form of significant physical or environmental hazard (See Appendix H: Guidelines on Reportable Quantities of Leaks by USEPA).

We recommend that DISH and GPCB with support from GSDMA develop the guidelines for the industry to report chemical leaks on basis of “quantity leaked” without waiting for the emergency to become offsite.

The focus of reporting and notification has traditionally

been on events that "directly" affect human populations but not on events that affect human health through environmental or ecological damage. Therefore, we recommend that incidents should be reported even when they threaten environment and ecology on basis of above USEPA rules as follows:

i. A release of any hazardous chemical or petroleum product (in any amount) to water bodies (lake, rivers, dams, canal, sea, creek, etc.) within the state of Gujarat.

ii. A release of any hazardous chemical or petroleum product, in a quantity of 95 Litres or more, to the surface of the land (whether or not there is evaporation or fire).

This is a key recommendation that will result in immediate notification and efficient trigger mechanism which were the requirement under the scope of work of this project. However, we propose that these be first developed as guidelines and industry and public agencies be allowed to implement it for some time. Depending on their experience, these criteria can be modified to suit Indian contexts and later developed in to statutory rules.

4.2.5 FORMAL AFTER ACTION REPORTING SYSTEM

1. MSIHC Rules require an accident be reported within 48 hours and a follow up report conducted within 90 days. MoEF has developed Chemical Accident Investigation Reporting system (CAIRS). Our assessment indicates that CAIRS is not used effectively. For example, only 11 accidents have been reported in Gujarat DISH in past 10 years. Therefore, use of CAIRS must be promoted rigorously in Gujarat. However, CAIRS itself needs a few revisions to make it more comprehensive, effective, and user friendly.
2. Whether CAIRS is improved or GSDMA develops a new state level accident reporting system, the system should be web based, use standard templates, and facilitate "automatic" information sharing on a common platform between local response agencies, district disaster management authorities, specialized response assets (e.g., SDRF, SERT), state agencies, and relevant national agencies. The system should:
   a. Allow entry by both the industry and authorities
   b. Have an event registry that records and tracks key quantitative data elements, enables trend analysis, and supports geographic information system (GIS) analysis
   c. Allow for the documentation of past, active, and threatening incidents
   d. Improve pre-planning for deployments
   e. Allow reports to be generated that summarise response incidents and impact for consideration by administrative and higher level government functionaries
   f. Play a critical role in ensuring all rehabilitation efforts and activities are documented and no incidents go without consideration for future mitigation
   g. Have a public information component.

4.2.6 DEVELOPMENT OF GIS BASED SYSTEM FOR PLANNING AND DECISION SUPPORT

Under this project from GSDMA, the consultants have identified and reviewed several GIS based planning and decision support systems. Based on this assessment, we have recommended the CAMEO suit to be used for response planning. The CAMEO suit includes: (a) CAMEOfm for chemical related hazard information as per their MSDS; (b) ALOHA to model leakage scenario and estimate threat zones; (c) MARPLOT - to integrate ALOHA output on GIS layers to identify vulnerable population, installations, and areas and export the same to Google Earth or other GIS platforms; (d) databases - various relational databases for chemical industry location and contact information, accident reporting and investigations, resources available, routes, and others.

We acknowledge that CAMEO is designed by NOAA and UPEPA in the context of US and several terminologies used therein or the reporting requirements are as per US standards. However, CAMEO is still very effective and useful in Indian contexts if we ignore the requirements

under US laws and focus only on the critical data and modelling needs. CAMEO is being used by many US and other country based emergency response managers and tested for usefulness. On other hand, developing a customized GIS based planning and decision support system for Gujarat or India will be time consuming and expensive. Therefore, the better strategy would be to use CAMEO in short term. As more experience is gained in use of CAMEO, GSDMA may consider developing or procuring a more advanced and customized GIS based system for Gujarat.

CAMEO system is a modelling and database system and as such useful only to the extent of data available. The consultants have limited data for chemical industries, chemicals stored and their quantities, and latitude/ longitude. From MoEF, GIS location data for fire stations, police stations, medical facilities is available for 6 districts. The collected data is not validated or verified and grossly inadequate to properly plan for and to use in an emergency response. A state-level survey has to be done to obtain information on resource infrastructure (contact, equipment, location, etc.), critical or sensitive installations (schools, government offices, etc.), routes (chemical transportation routes, evaluation, road traffic/ condition information), and industry specific information (chemicals, location, quantity). This information must be available in interactive GIS format. CAMEO suit (MARPLOT) can then be loaded with such GIS layers for effective response.

The GIS database is not a one-time activity but need to be updated and maintained regularly. The most effective strategy to ensure this is that the local authorities, response agencies, and the industry are entrusted with regular updating of information. For example, a LCG may be made responsible to collect and update chemical industry information on the web. Or, an industry can be provided access to update their own information on a web platform. Local fire, medical and police departments can also update their own information regularly on line. GSDMA may consider developing a web-based system to achieve this.

4.3 TRAINING, CAPACITY BUILDING, AND COMMUNITY PREPAREDNESS

4.3.1 IMPROVING THE CAPABILITY FOR AND EFFECTIVENESS OF OFFSITE MOCK DRILLS

Mock drills form the back bone of testing preparedness levels and learning lessons to improve the same. Our assessments find that while mock drills are conducted as per the MSIHC rules at the district level by the industry and the offsite response agencies, they are not standardized, and the feedback or lessons are not integrated with the offsite plans. Industrial cluster or LCG level mock drills are also required to happen twice in an year and the pocket plan needs to be updated accordingly as per CAEPPR Rules, but this is not being done. Further, smaller exercises and drills need to be conducted periodically leading to a full-scale mock drill so that all exercises are a continuous activity, and not only once-a-year mock drill. The following structure for mock drills is recommended to be followed at local, district and state levels:

1. Onsite mock drills should involve members from LCG and DCG and be completed as per the guidelines issues by DISH from time to time.
2. Table top exercises should be conducted to assess response capability and plan for resources and procedures during emergencies.
3. Functional drills are a practice of a specific aspect of emergency response. For example, we have recommended communication inter-operability exercises. Similarly functional drills for joint industry-offsite agency response, public information, site security, management of mass casualty, and others can be conducted.
4. The full scale mock drill may be conducted as follows:
    a. Invite independent observers to oversee the drill. GSDMA may develop and train a panel of pre-approved observers with a fixed tenure
    b. A special core team should be formed to plan the mock drill scenario. The team should communicate the date but no other detail to

response agencies

c. News media, public agencies, and target communities should be informed of mock drills so that unnecessary panic is not caused.

5. The observations from table top exercises, functional drill and full scale drills should be documented, key lessons and action items must be identified with suggested changes in DMPs or offsite plans, and the plans should be accordingly revised post discussion between SCG/DCG/LCG members.

4.3.2 DEVELOPING A SPECIALISED TRAINING COURSE ON INTEGRATED AND COORDINATED EMERGENCY RESPONSE SYSTEM

There is a strong need for developing such a specialised training course for the emergency planners and responders (both Onsite and Offsite), regulatory agencies, LCG/DCG members and other professionals in the field and industrial personnel. To assess the training needs of the target groups, feedback through group-discussions should be obtained from LCG/DCG members, regulatory bodies, safety professionals from industry, public response agencies etc. An electronic database to track training credentials of responders, SCG/DCG members, and others should be developed. Private industries should be encouraged to initiate a similar training programme for personnel exposed to hazardous substances, health hazards, or safety hazards. An example of Best Practice for such training courses is a part of the HAZWOPER standard developed by OSHA as referenced earlier (Appendix G). The HAZWOPER standard can be accessed at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9765

The following levels of trainings are recommended under HAZWOPER to achieve integrated and coordinated emergency response. GSDMA may cause GIDM to develop training criteria and material on this basis by adapting to the local context in discussion with DISH, PESO, GPCB, and the industry. We recommend that such training material be tested through comments of key experts in the field (national / international) and piloted before being scaled up.

1) General site workers initially require 40 hours of instruction, 3 days of supervised hands on training, and 8 hours of refresher training annually.
2) Workers limited to a specific task or workers on fully characterized sites with no hazards above acceptable levels require 24 hours of initial training, 1 day supervised hands on training, and 8 hours of refresher training annually.
3) Managers and supervisors require the same level of training as the people they supervise, plus 8 additional hours of training.
4) Workers who are working at a treatment, storage, or disposal facility that handles hazardous wastes require 24 hours of initial training and 8 hours of refresher training annually.
5) First Responder Awareness level training to demonstrate competency in their assigned duties for 16 hours.
6) First Responder Operations level training is awareness training plus 8 hours training.
7) Hazardous Materials Technician 24 hours training plus additional training to achieve competency in several areas.
8) Hazardous Materials Specialist 24 hours training at the technician level, plus additional training to achieve competency in several areas.
9) On Scene Response commander 24 hours training plus additional training to achieve competency in several areas.

Please see Section 4.5 for identified training needs of key response agencies for qualified chemical emergency response.

4.3.3 DEVELOPMENT AND IMPLEMENTATION OF CHEMICAL EMERGENCY COMMUNITY AWARENESS AND PREPAREDNESS STRATEGY

From the analysis of the relevant statutory requirements under key CIDM legislations, it is clear that the responsibility for Chemical Emergency Community Awareness and Preparedness (CECAP) rests with the local public emergency authorities with the active support of State and Central governments and proactive participation of the industry. Accordingly, a CECAP strategy is developed.

A dedicated CECAP cell should be established in GSDMA with a budget and action plan to provide funding support, technical guidance, and management of outreach in each district. The programme's overall objectives include:

- public **understanding** of protective actions (shelter in place and evacuation)
- public **acceptance** of the recommended protective actions during an emergency
- public **trust** in the emergency management system.

Outreach programmes should be tailored to each community's needs. The specific objectives of the programme will be to:

- Encourage residents to have a specific chemical disaster plan for themselves, their families, and their businesses
- Create awareness about the risk involved and safety actions required to be taken—sheltering-in-place or evacuating
- Develop a sense of participation/involvement/partnership of community in decision making
- Develop public willingness and readiness to co-operate and take self-protective actions as advised by the DDMA/DCG during real time chemical emergencies.

The CECAP cell of GSDMA should also play the following key functions:

- Coordinate communication between GSDMA, DDMAs, SCGs, DCGs, and LCGs to provide feedback, strategic direction, and impact evaluation (monitoring and evaluation, experimental impact evaluation, process audit, etc.) of outreach programmes
- Integrate the activities of key state agencies involved in development of IEC materials for CIDM
- Ensure that DDMA/DCG designate an active representative or trusted agency to deliver the public outreach messages
- Publish information for the general public such as vulnerability and hazard profiles, common social promotion material, guidelines for community outreach efforts by local agencies and appointed private parties, evaluation reports, and others.

The key responsibility for implementation of the CECAP strategy in the respective local areas lies with the DDMA in consultation with LCGs and the DCG. Therefore, each DDMA should have a pre-planned and approved budget, target, and schedule. The following are key components of implementation plan recommended in the CECAP strategy report:

1. Identification of vulnerable communities: We recommended that the onsite plan identify the vulnerable communities and not only estimate the distance of vulnerable zone so that DCG or LCG can identify vulnerable communities on basis of onsite plans developed by the industry. DCG or LCG can also use MARPLOT of other GIS based platforms to identify such communities and the risks (fire, explosion, toxic) they face.
2. Workshop based training of Master Trainers: The communities in vulnerable zone need special training to prepare them for the protective action. These communities need information on hazards, chemicals, the risks, expected response, communication protocols, contact for additional information, compensations, and available resources to help them in an emergency. We recommend that each block identify master trainers from the community who can be local leaders, school teachers or others and train them on above topics for their respective communities. These members can train their own neighbourhood or community with active support from the

block level trainers. Block level trainers can be trained at district and state level. Such block trainers can be a mix of DISH officials, industry representatives, DPO, and others. GSDMA may support in terms of developing training guides and providing funding for technical support. The local industry can contribute funds to hold the workshops at local levels and make necessary logistics arrangements.

3. General and wider outreach: While communities in vulnerable zones require specific information and training, general population also needs information on chemical emergencies and their role in them. These are the typical information, education and communication (IEC) strategies being used in the state. Such mass-communication approach will also serve to reinforce some of the training points for vulnerable communities as well. Developing such general and wider approach consists of three elements.
    a. Identify Communication Methods: Select one or more of the channels such as print material (brochures, calendars, news-paper), e-media (web, SMS, emails), radio, TV, special events.
    b. Develop and Produce Education Materials: The materials should include general information on chemical hazards and protective actions general population can take. The materials and should be clear, accurate, consistent, and conveyed in an authoritative manner.

4.4 ENHANCE CHEMICAL DISASTER RESPONSE CAPACITY

4.4.1 HAZMAT RESPONSE CAPACITY ASSESSMENT

Under this project, the consultants conducted a thorough capability gap analysis of CIDM at State and district levels. The thrust of the gap analysis was on self-reported assessment of capability on several factors against their international benchmark levels. At the district level, the assessment questionnaire was targeted to 12 types of organizations (Police, GPCB, Fire, Collectorate, etc.) and across thirteen capability areas such as the planning, communication, HAZMAT response, the management of dead, and other critical areas. At state level, we sought response from 15 different organizations. A capacity was considered perfect when the level of 10 out of 10 was reached. The analysis recognized that the self-reports would be biased towards reporting a more positive capability so that the consult teams validated several of the claims through field visits on a sample basis. Although we find few instances or high levels of self-ranking, the field visits clarified that such high ranking itself was based on improper understanding of the roles, responsibilities, and what international capability benchmark really meant. Majority of the respondents honestly self ranked their capability and we find that they fall short of the international benchmark.

The details of the analysis are available in a separate on Capability Assessment and Gap Analysis. This report is a critical compendium to the CDMP because it includes specific recommendations for the gaps we identified. Several of those recommendations are included in this CDMPS but several minor recommendations and their details are a part of the Capability Assessment and Gap Analysis report. Below we summarize key findings from our assessment in Table 7 and 8.

Overall the state and districts agencies have self-assessed their capabilities in moderate (4-6 out of 10 ranking) range. In addition, the team of PRESTELS and IEM consultants visited fire stations, police stations, medical facilities, MAH units, Type A units in Ahmedabad, Surat (Hazira), Vapi (Valsad), and Bharuch. Among other aspects that we evaluated a critical question we asked was *"For a given level of disaster would the public/government responders can provide qualified HAZMAT response that would be effective in saving lives and property?"* The assessment team included senior technical lead from IEM who has responded to hundreds of chemical emergencies, an experienced fire engineer from India, as well as Industrial safety experts. Essentially this is the assessment of HAZMAT response capacity of the fire stations because they are/will be the most qualified to provide a direct response whereas other responders such as Police or Medical will be in support role. We summarize our assessment in Figure 12.

Table 7. District Capability Assessment Results

Name of District	Planning	Control room management	Communications	Situational awareness and hazmatresponse	Responder safety and health	Securityand protective actions	Environmental health
Ahmedabad	7.4	7.8	5.4	--	--	5.3	--
Amreli	6.3	7.6	7.2	5.9	7.3	6.7	5.8
Anand	6.8	7.9	5.6	7.5	2.4	8.8	0.6
Bharuch	6.9	5.9	6.6	5.7	6.1	6.7	5.9
Bhavnagar	6.0	6.6	5.9	5.8	5.4	6.7	5.0
Dahod	4.3	4.0	4.1	2.6	1.8	2.5	--
Dang	--	0.0	0.0	0.0	0.0	0.0	0.0
Gandhinagar	8.6	7.0	8.8	5.1	7.2	8.4	6.3
Godhra	7.3	4.0	6.4	--	--	--	--
Jamnagar	7.1	5.3	3.7	6.1	5.0	3.6	6.0
Junagadh	7.9	8.4	7.7	5.0	7.2	8.4	5.2
Kheda	7.7	7.7	5.9	6.5	6.4	8.5	1.3
Kutch	6.8	6.7	5.3	7.3	5.6	7.1	--
Mehsana	--	--	--	--	--	--	--
Navsari	7.7	9.1	7.2	8.6	8.8	8.2	6.0
Panchmahal	5.9	7.7	6.6	5.4	4.0	6.8	4.2
Patan	4.4	5.7	4.0	3.0	--	--	--
Porbandar	7.0	6.7	6.9	6.9	6.4	7.3	6.8
Rajkot	5.4	7.4	8.6	8.3	8.4	7.6	8.0
Sabarkantha	4.4	6.4	6.4	4.6	4.2	5.8	3.5
Surat	4.6	5.4	3.9	5.8	3.9	6.2	4.3
Surendranagar	5.3	7.2	5.5	2.1	1.7	2.8	2.0
Tapi	1.3	1.0	1.9	1.2	1.0	1.4	1.0
Vadodara	8.3	8.3	7.4	7.1	7.8	7.8	2.0
Valsad	4.8	5.4	5.2	4.6	4.4	7.0	7.8
Summary	5.4	6.4	5.8	5.2	4.7	5.7	4.4

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Name of District	Environmental health	Public health and safety	Public outreach and education	Emergency public information	Emergency medical services	Management of dead	Mass care	Summary Ranking
Ahmedabad	--	--	5.6	6.9	7.0	6.7	6.3	6.5
Amreli	5.8	6.4	6.6	6.4	4.0	4.0	6.6	6.2
Anand	0.6	--	4.6	9.8	6.5	5.5	7.5	6.1
Bharuch	5.9	6.9	7.8	7.3	7.3	4.4	7.0	6.5
Bhavnagar	5.0	5.0	5.0	4.6	6.0	4.9	4.2	6.1
Dahod	--	--	1.5	3.9	--	3.8	6.0	3.4
Dang	0.0	0.0	0.0	0.0	0.0	0.0	--	0.0
Gandhinagar	6.3	7.4	4.4	8.4	8.3	8.4	7.6	7.4
Godhra	--	7.3	8.2	--	--	--	--	6.3
Jamnagar	6.0	5.7	6.8	4.8	3.6	4.5	4.3	5.1
Junagadh	5.2	8.9	10	10	4.8	3.6	10	7.5
Kheda	1.3	7.4	3.5	9.3	6.1	6.7	7.3	6.5
Kutch	--	5.3	7.2	7.9	7.3	--	6.4	6.6
Mehsana	--	--	--	--	--	--	--	--
Navsari	6.0	8.3	9.6	9.0	7.8	7.4	9.0	8.2
Panchmahal	4.2	--	5.4	4.9	4.0	3.3	--	5.3
Patan	--	--	6.4	5.4	--	--	2.2	4.4
Porbandar	6.8	6.3	6.6	7.7	7.4	6.2	--	6.8
Rajkot	8.0	7.1	8.0	8.3	9.0	7.6	8.1	7.8
Sabarkantha	3.5	3.8	4.3	4.5	3.8	4.9	5.5	4.8
Surat	4.3	4.4	3.6	0.0	3.0	1.9	2.0	3.8
Surendranagar	2.0	--	8.7	6.0	4.3	2.4	5.5	4.5
Tapi	1.0	2.8	1.0	1.3	1.0	1.6	1.2	1.3
Vadodara	2.0	7.0	5.8	8.0	4.1	4.6	2.5	6.2
Valsad	7.8	7.1	7.6	5.7	8.3	7.3	6.1	6.3
Summary	4.4	5.6	6.1	5.5	5.1	4.6	4.4	

Table 8. Capability Assessment Results for State Agencies

Name of state agency	Planning	Control room management	Communications	Situational awareness and hazmatresponse	Responder safety and health	Securityand protective actions
GSDMA	6.7	7.4	6.9	7.4	--	--
Police HQ	8.4	10.0	9.1		5.2	7.5
DISH	9.0	4.5	3.7	4.0	--	6.6
Relief Commissioner	7.4	7.9	7.4	2.2	1.0	7.3
GPCB	0.7	--	1.6	6.8	1.3	0.6
Transport Commissioner	--	--	--	--	--	--
PESO	7.0	--	6.6	6.6	--	--
Railways	6.4	10.0	5.6	3.0	7.4	8.6
GMB	6.3	4.6	5.8	5.4	5.6	6.7
Department of Agriculture	7.6	4.0	6.1	4.9	--	--
GVK EMRI	8.4	8.4	6.7	8.2	9.2	7.5
NDRF	5.1	8.7	5.4	2.7	4.0	4.6
Indian Red Cross Society	4.7	5.6	4.0	--	2.2	3.7
Electrical Inspectorate	5.8	--	3.5	5.0	--	--
State Crisis Group	8.7	7.7	7.4	8.4	9.0	8.8
Summary	6.6	7.2	5.7	5.3	5.0	6.2

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Name of state agency	Environmental health	Public health and safety	Public outreach and education	Emergency public information	Emergency medical services	Management of dead	Mass care	Summary Ranking
GSDMA	8.0	5.1	9.4	--	3.9	6.4	--	6.8
Police HQ	8.0	5.1	--	8.5	4.1	4.8	--	7.1
DISH	--	7.8	6.3	6.3	8.6	7.3	5.0	6.3
Relief Commissioner	--	6.8	4.6	7.6	7.4	6.3	5.9	6.0
GPCB	--	6.4	2.0	2.7	7.5	6.1	--	3.6
Transport Commissioner	--	6.9	--	--	5.6	6.1	--	6.2
PESO	--	5.0	--	--	4.6	6.0	--	5.8
Railways	--	--	8.6	9.4	--	--	9.2	7.6
GMB	--	--	--	5.3	--	--	--	5.7
Department of Agriculture	--	--	4.0	--	--	--	2.4	4.8
GVK EMRI	--	--	7.0	8.0	--	--	6.2	7.7
NDRF	--	--	1.2	7.5	--	--	5.3	4.9
Indian Red Cross Society	--	--	4.8	4.3	--	--	4.0	4.2
Electrical Inspectorate	--	--	--	--	--	--	--	4.8
State Crisis Group	--	--	3.4	7.6	--	--	4.8	7.3
Summary	8.0	6.1	5.1	6.7	6.0	6.1	5.4	

TYPE OF FIRE SERVICE	EMERGENCY LEVEL			
	MINOR - 1	MODERATE - 2	MAJOR - 3	CATASTROPHIC - 4
EXISTING				
MAH Units				
Municipal Fire Brigades				
RECOMMENDED				
Local Emergency response Teams				
Regional Response Teams				
State Emergency Response Team				
LEGEND FOR ASSESSMENT				
	Complete Capacity to Response			
	Capacity is Limited with serious deficiencies that can be addressed to majority extent through rigorous trainings and standardization			
	None. Investments in equipments, manpower, training, standardization required			
	Proposed level of capacity for a given team			

Figure 12. Assessment of HAZMAT Response Capacity

While the LCG-DCG-SCG mechanism is constituted to plan for and coordinate response to industrial chemical emergencies, the public agencies such as police, fire, and medical departments are responsible for actual responses at the scene. Traditionally, the role of offsite agencies has been supportive where as the industry is made responsible to provide a qualified and technical HAZMAT response. However, this approach ignores that not all industries would have high level of capability to respond to chemical emergencies or that a chemical emergency can exceed the available capability of the industry or that chemical accidents can happen elsewhere than chemical industries. In such situations, the responsibility for public protection on the government becomes critical and thus it is essential that a capability for qualified chemical emergency response is developed in the offsite agencies.

Past and recent experience in India and internationally has shown that the government cannot rely solely on private industry and must play a strong role for an effective response. After Bhopal disaster, internationally the approach was to put responsibility for chemical response on the industry and government played supportive role. However, the experience over time identified that government or public agencies should preferably lead chemical emergency responses because:

1) The government has the overall responsibility to protect the public health, safety, and the environment compared to the industry which may have conflict of interest regarding these tasks
2) The government response agencies at all levels have the institutional ethics of service to community
3) The government officials typically have the authority and the leadership capacity to take decisions/actions in emergency situations
4) Chemical emergencies may happen in non-industrial settings where the industry may not have any obligation to provide response.

Therefore, while statutory obligation to respond to chemical emergency rests with the industry, it is also a shared responsibility of the public authorities.

4.4.2 MULTI SCENARIO CHEMICAL RESPONSE CAPABILITY

Our discussions with various response agencies and planning units identified that there is a perception that a chemical emergency can either be fire/explosion or toxic scenario and a different structure or approach is needed as per the scenario unfolding. It is, therefore, essential to recognize that chemical emergency is only that and cannot be / should not be separated out as fire or toxic. A chemical fire is "rarely" only that. The fire by products are often toxic and of unclear nature. Even a simple burning car may give toxic fumes in case the rubber parts include bromine compounds. Therefore, the response team must approach a chemical fire as potential toxic event as well. On other hand, several chemicals pose both toxic and flammable hazards. It is more likely to have one or the other scenario, but the response team has to plan protective actions and response plan assuming that "anything can happen". The response team also needs to know that fire control measures may themselves give rise to toxic by-products. They may have to decide to even aid burning of certain chemicals in the best interest of the environment and exposed population because sometimes fire is actually a beneficial outcomes than the alternative of toxic leak.

Overall, we clarify that there will be one unified team structure under IRS to respond to chemical emergencies. The IRS is flexible enough to accommodate different people, skills and resources as per the unfolding scenario. The LERT, RRT and SERT described next are "multi-hazard" chemical response teams (and not only for toxic).

4.4.3 ESTABLISH UNIFIED STATE LEVEL FIRE SERVICE

Chemical emergency response capability is not a standalone capability but something that is built on and integrated with the existing response capability for all types of emergencies and disasters. In case of chemical disasters, the role of fire department is important in responding to chemical fires. A fire station must have the basic capability to respond to typical fires that can happen in its jurisdiction including chemical fires as per NDMA guidelines. Therefore, availability of and preparedness of local fire stations is a basic precursor to improving chemical emergency response capability. Our assessment of fire stations identifies that fire departments in larger municipal corporations such as Ahmedabad and Surat are comparatively well equipped, staffed, and trained, but all lacked sufficient trained man power and equipment as discussed in the gap analysis report and response mechanism report. Because the fire departments are attached to the municipalities, we also find lack of standardization in procedures related to staffing, training, equipment, and response between different fire departments. Overall, the capability to offer qualified and rapid response even to non-chemical and non-industry emergencies is quite weak. Therefore, Gujarat state needs to build the overall fire department capability in the state on priority basis.

We recommend creating a department for fire services in the state. The state fire department can set up fire stations in areas currently not served by the municipalities and even assess adequacy of locations and numbers of fire stations in the state and take corrective action. While the ownership of the fire stations may remain with municipalities, the state fire department may act as a regulatory and resource agency to provide technical guidance, develop training academies and special courses for fire department, procure equipment, develop standard procedures for operations, and enforce fire safety rules for industry, commercial, and residential structures, and monitor the performance of fire stations in the state.

A recent report by Ministry of Home Affairs for State Wise Risk Assessment, Infrastructure and Institutional Assessment for Fire Hazard and Risk Analysis has also recommended that municipal fire and emergency services should come under State Fire and Emergency Services[5] Considering the state is preparing Gujarat Fire and Emergency Act, there may be an opportunity to create such state level department or agency.

[5]MHA (2012). Fire Hazard and Risk Analysis in the Country for Revamping the Fire Services in the Country. Final Report – State Wise Risk Assessment, Infrastructure and Institutional Assessment of Phase II States. Prepared by RMSI for the Directorate General NDRF and Civil Defence (Fire), Ministry of Home Affairs (MHA), New Delhi. November 2012.

4.4.4 INCIDENT RESPONSE SYSTEM

In Section 4.7, we describe the emergency response organization structure on basis of incident response system (IRS) recommended by NDMA, as well as by interpreting the US National Incident Management System (NIMS) within the Indian context. The IRS system allows for a qualified incident commander to direct the technical aspects of response under direction and authority from the district collector (at district level) or the chief secretary (at state level). The SDM, district collector and chief secretary are given a role of "responsible officer" in IRS. IRS involves creation of support departments for logistics, operations and administration and finance (called incident response team, IRT). The system can be scaled up effectively with more advanced response teams and incident commanders taking over command for technical, on-scene response. More details about IRS is provided in Section 4.7.

4.4.5 FORMATION OF STATE EMERGENCY RESPONSE TEAM (SERT)

A specialist State Emergency Response Team (SERT) for chemical disasters would be primarily responsible for responding to high-risk, high-volume, and thus, less frequent incidents that surpass capacity of local or regional response agencies. Such scenarios should be identified in district offsite plans. This local and regional response teams should be trained sufficiently to:

- Recognize events that may surpass local capacity to respond
- Rapidly collect information needed to define the situation and organize the appropriate response resources
- Support local incident command functions as the incident escalates.

SERT should be housed as a part of an agency or force where personnel are not transferred frequently because significant resources, training, and funds are invested in raising and building capacity of SERT and because SERT develops higher levels of skills through experience of working together as a team. Therefore, it will be prudent not to lose such investment and asset to staff transfers. In discussion with GSDMA we have identified that the proposed Gujarat SDRF would be most suitable for this purpose.

4.4.6 REGIONAL RESPONSE TEAM AT EMERGENCY RESPONSE CENTRES

The state has already planned 5 regional emergency response centres (ERC) and 4 mini ERC modelled on DPMC Ankleshwar in a PPP model. This is a crucial step towards greatly enhancing the preparedness, and should be completed on a priority basis. ERCs are multi hazard units that would be attached to local municipality's fire department. Subsequently, ERC may be housed under unified fire service at the state level if and when it is established because ERCs are state level assets and not restricted to only the city or district they are located in.

A specialist regional response team (RRT) for chemical emergencies should be developed in ERCs. The RRT may be established by building from a core of the most capable local fire departments. These teams will be a state level asset that can be officially mobilized by SEOC although the DEOC can directly contact them for fail-proof and speedier communication. These teams will respond to the higher-toxicity, higher-volume chemical release incidents, releases of unknown chemicals, and complex or long duration events that require more resources than local teams are able to support. The regional response teams will not replace but will augment local response capacity, and will be trained to identify events that necessitate the request for state-level (e.g., SERT) or national-level resources (e.g., NDRF). The regional teams will support the on-going development and training of other local responders and support the development of mutual aid agreements. As qualified and available private-sector responders are identified, they can be incorporated into the RRTs to serve in non-command roles. With respect to chemical emergencies, GSDMA should support ERC with the following:

- Formation of RRTs
- Policy support
- Development of safe work practices
- Procurement, calibration, and maintenance of equipment
- Procurement of PPE
- Advanced and regular training for technician and command staff.

4.4.7 LOCAL EMERGENCY RESPONSE TEAMS

Since responding to chemical emergencies is a specialist task, a local emergency response team (LERT) should be formed at local levels. LERTs will be the district or block level assets. Ideally LERTs should be available at each fire station. However, practically, the focus should be on establishing at least one LERT in an industrial pocket area. Districts where no LCG is present can form LERT at district level only. LERT may draw from the local fire department and other public agencies that can provide on-scene response. LERT can include members of the industry, provided these "private" resources are officially and bindingly committed and involved in planning, practice, and training. LERT should be well trained and well equipped to deal with small scale and frequent local emergencies (90% of chemical incidents). LERTs will also identify events beyond their capacity and intimate the district for state level support through RRT.

Other public or private response agencies may respond first to chemical emergencies involving chemical leaks, but they must remain at a safe distance and establish incident command post (ICP), as per IRS described in Section 4.7. The incident controller from the industry can be the first incident commander and may relieve the command to LERT chief as per the IRS as the emergency becomes offsite. A unified command can be formed by LERT with the unit's own responders if the industry is capable to provide qualified response.

The established IRS must be integrated, unified, comprehensive, scalable, and accountable. As the phase of the event evolves, incident command will change to reflect the new priorities and mission focus. All operational responders work for and are accountable to the RO (Collector at district, Chief Secretary at State) and through him the appointed incident commander, no matter what parent organization they work for. The incident commander leads and manages the entire response operation with support from logistics, operations and financial branches as discussed later.

4.5 PLAN FOR TRAINING, EQUIPMENT, AND RESOURCES FOR HAZMAT RESPONSE

In section 4.4.1 we provide summary of capacity assessment for qualified HAZMAT response in the state. We have recommended creation of LERT, RRT and SERT as well as a state level fire services department. In addition, Appendix F lists the available hospitals, fire stations, and supplier of emergency responder safety equipments as of now. More detailed information on the industrial experts, available NGOs, shelters is provided in SCG response plan 2008. It is clear that whatever chemical response capability is in Gujarat is with the industry and exceptions of fire services such as DPMC Ankleshwar. However, this CDMP requires that the Gujarat capability is in line with international standards which basically means that public authorities must have qualified and effective response assets under their control and this cannot be achieved by relying entirely on the industry. Industry will continue to remain an important partner but over time the CDMP envisions a more proactive and leadership role for the government authorities.

4.5.1 BACKGROUND AND BASIS FOR RESOURCE PLANNING

This plan is based on three basic rules:

1. All responders to a chemical emergency return home safely
2. Incident commanders will know what the outcome of an action will be before it is taken
3. All responders will take actions necessary to protect human health, the environment, and community stabilization.

Aside from the high value of human life, responders at all levels are important community investments. They are the resource that forms the basis of the community's response and resiliency to all chemical and industrial disasters. Their training and dedication make them an extremely valuable asset. Knowledge allows responders to demonstrate respect for the hazards they face and operate

safely. Knowledge allows responders to identify hazards and make decisions where the outcome is predicted with a high degree of certainty. The antithesis of knowledgeable decision making is that taking actions without sufficient knowledge will have negative consequences and likely cause further harm. Knowledge comes from four sources:

1. Sufficient training
2. Integrated planning and drills with industry partners
3. Continuous situational awareness and assessment during an incident
4. Adequate monitoring of equipment and sampling supplies.

This resource plan is written from the perspective of a HAZMAT Response Team leader, and is intended to provide a general level of guidance in identifying the resources needed to support local, regional, and state level response teams; and, more importantly, the reasons for acquiring a particular equipment or resource. This plan also assumes that the basic fire station capability will be built in all hazard context, but provide some guidelines for improving the fire services in the state.

The basic premise of this plan is the establishment of a three tier response system within the state of Gujarat for chemical disasters based on the 90/5/5 principle. The 90/5/5 principle is based on historic observations that 90% of chemical disasters pose relatively low risk to the public. Usually these incidents are comprised of low volume, low hazard chemicals such as fuel, paint, or pesticides/herbicides. A LERT is a basic level entry team that should be able to handle 90% events in their jurisdiction. These events, if left unresolved or if poorly handled, could escalate into more serious events, so it is imperative that a prompt response be afforded at the outset. A capable local fire department can also respond to such events through their in-house LERTs. Other local responders such as emergency medical services (EMS) personnel and police officers may also be called upon to respond to every incident. While they cannot be expected to provide a specialist chemical emergency response, they fill support roles that are essential to the overall response operation.

The next 5% of disasters involve more significant events with larger volumes, more complex chemicals or mixtures that may be resolved with fairly easily implemented response mitigation options (e.g., suit up and shut off a valve). These events would require the support of a RRT. These incidents could evolve into higher level situations if not promptly and properly handled.

The final 5% of events are both operationally and technically complex, characterized by large volumes of chemicals, highly toxic substances in uncontrolled circumstances, and may involve catastrophic consequences if left unresolved. These incidents include dumping or abandoning of unknown, large volume releases into populated areas or sensitive environments, toxic events with fatalities, or radiation events. Once any significant population is involved with exposures, contamination, or a significant water body or environmental receptor is involved, it is likely that a state or even national resource will be required. SERT is comprised of state-level resources that have the ability to work in complex, extremely dangerous situations by using a combination of extensive monitoring/ sampling equipment and PPE.

In general, the higher type teams bring increasing capacity to enter confined spaces and deal with increasingly higher concentrations of toxic chemicals, vapour hazard chemicals,Chemical-Biological-Radiological-Nuclear (CBRN) agents, more complex events, and unknown chemicals in unknown concentrations.

In following sections, a list of appropriate personnel, training, equipment, and supplies is provided for each team. Departments and agencies must make resource acquisition decisions based on many factors such as availability, cost, known hazards in the region, and simplicity of use in the field. Planning, training, and mock drills with local industry partners and local emergency responders should directly influence resource procurement decisions based on expected hazards in a community. Therefore, the procurement decisions must be made by local response agencies and teams as per “their own needs assessment,” while state level agencies can provide guidance and support to enable local agencies to make such determination. Another essential consideration is to

maintain equipment compatibility between teams at all levels, which will enable scaling up the use of equipment and resources for larger emergencies as well as ensure economies of scale in procurement and maintenance.

Training requirements listed for each team should also be considered the absolute minimum starting point for a particular position on any of these teams. It is highly recommended that all of these teams train continuously and cross-train all team members in every job so that the team is flexible and resilient. Training on procurement equipment is a must. Such training should be provided to local response agency staff directly instead of a top-down training approach. Finally, it is recommended that hazardous chemical response teams include members from industry and transportation agencies that are familiar with key facilities and transportation corridors/modes.

4.5.2 POLICE OFFICERS

The role of police during a chemical disaster is to initially provide an assessment of the situation to the dispatch and hazardous chemical response team prior to mobilization and to assist the incident commander with the implementation of public protective actions, site security, and traffic control as needed. Police are not expected to come into contact with hazardous chemicals and should remain at a safe distance from the event at all times. The most important piece of equipment for a police officer is a pair of binoculars to gather information from a safe distance.

4.5.2.1 TRAINING

- Hazardous material awareness, protective action, and site security training (8 hour awareness, 8 hour protective action and security = 16 hours) as per HAZWOPER training guidelines
- Training for traffic police in response to transport hazards and use of support tools such as TREMCARDS. In case police is assigned responsibility as IC in case of transportation emergencies, then designated officers as IC need such training (see training requirement for IC in LERT)
- Basic first aid and CPR

4.5.2.2 EQUIPMENT

- Binoculars and detailed maps of area
- Decontamination wipes
- Nitrile surgical gloves
- Escape self-contained breathing apparatus (10 minute bottle with hood) if working in an area with significant toxic inhalation hazard chemicals.

4.5.3 EMERGENCY MEDICAL SERVICES (GVK-EMRI 108 AND OTHER AMBULANCES)

Similar to police officers, EMS personnel are a critical community asset that should be protected from contamination and injury related to a chemical release. EMS must ensure all patients are adequately decontaminated before treatment and/or transportation. Under no circumstances should a contaminated patient be transported to an offsite medical facility. If a patient must be transported to a field treatment, decontamination, or collection area, they should be transported on trucks that can be easily decontaminated. It is the responsibility of the hazardous chemical response team to ensure decontamination of all persons involved in a chemical disaster, including casualties and fatalities.

4.5.3.1 TRAINING

- Awareness plus EMS Chemical Response training (8 hour awareness minimum, 16 hour EMS Chemical Response optional = 24 hours) as per HAZWOPER training guidelines
- Expecting paramedic or first responder training at appropriate levels

4.5.3.2 EQUIPMENT

- Decontamination wipes
- Nitrile surgical gloves
- Disposable chemical protective outer garments

4.5.3.3 SUPPLIES

- Antidotes and treatments as required in by emergency plans or protocols
- Absorbent pads
- Zip local bags for patient personal effects
- Tags for effects
- Pens or markers

4.5.4 FIRE DEPARTMENT

A qualified hazmat response by a local fire station assumes basic fire fighting capabilities, including industrial fires. NDMA has issued National Disaster Management Guidelines on "Scaling, Type of Equipment and Training of Fire Services" for standardization and revamping of the fire services in the country for effective, efficient and comprehensive management of fire incidents. We recommend that GSDMA follows these guidelines to build capacity of fire stations in Gujarat.

In addition, a recent report by Ministry of Home Affairs has conducted survey of fire stations in Gujarat and identified gaps in infrastructure, equipment, vehicle, manpower, training and others[6]. Table 9 summarizes the gap in number of fire stations. Currently, only 35% of the required number of fire stations is available in the state. In addition to lack of adequate number of fire stations, even the existing fire stations have limited manpower, equipment, vehicles and training. For example, currently Gujarat has manpower of 1447 people which is only 7.5%

Table 9. Gap in Number of Fire Station in the State

DISTRICT	EXISTING FIRE STATIONS	TOTAL RECOMMENDED FIRE STATIONS	ADDITIONAL URBAN FIRE STATIONS NEEDED	ADDITIONAL RURAL FIRE STATIONS NEEDED
Ahmedabad	19	48	19	10
Amreli	7	21	7	7
Anand	8	20	8	4
Basankantha	5	22	5	12
Bharuch	5	15	5	5
Bhavnagar	9	24	9	6
Dohad	3	13	3	7
Gandhinagar	4	18	4	10
Jamnagar	13	30	13	4
Junagadh	10	28	10	8
Kutch	6	18	6	6
Kheda	6	20	6	8
Mehsana	6	19	6	7
Narmada	1	5	1	3
Navsari	4	12	4	4
Panch Mahals	5	16	5	6
Patan	5	15	5	5
Porbandar	3	7	3	1
Rajkot	13	38	13	12
Sabar Kantha	8	23	8	7
Surat	15	40	15	10
Surendranagar	7	20	7	6
Tapi	2	5	0	3
The Dangs	0	2	0	2
Vadodara	12	25	5	8
Valsad	7	10	0	3
All State	183	514	167	164

[6]MHA (2012). Fire Hazard and Risk Analysis in the Country for Revamping the Fire Services in the Country. Final Report - State Wise Risk Assessment, Infrastructure and Institutional Assessment of Phase II States.

of the required strength of 19,222; the requirement will be higher if new fire stations are built. It will be important to build capacity of fire fighting and emergency service in Gujarat as a precursor to having chemical emergency response capability of international standard.

4.5.4.1 TRAINING

At present, fire services can deal with normal fires, though their knowledge base has yet to be upgraded with an understanding and capability to handle the various types of chemical fires. A comprehensive training programme for fire department personnel is needed including but not limited to the following:

i. Basic awareness of chemical emergency response (toxic, explosion, and fire hazards)
ii. Personal decontamination and mass decontamination
iii. Coordinated response with Police and EMS
iv. Search and Rescue in chemical emergencies
v. Preservation of evidence for criminal investigation
vi. First aid and CPR.

Fire stations should also build capability of their own internal and regular training. Availability and capacity building of trainers within fire stations can be included in the plan to strengthen fire services in Gujarat. Chemical fire fighting is a highly specialist subject matter, but a lot of reference material for chemical fire fighting is available[7].

4.5.4.2 NUMBER AND LOCATION OF FIRE STATIONS

The existing deficiency in the number of fire stations is 35% (see Table 9). The objective of adequate numbers and locations of fire stations is effective and quick response. The SFAC has laid down norms and considerations for setting up fire stations as follows:

- Response time (5 Minutes in Urban Areas and 20 Minutes in Rural Areas)
- The area to be covered (10 Sq. KMs in Urban Areas and 50 Sq. KMs for Rural Areas)
- The scale of population to be served
- The number of minimum standard equipment that may be needed and manpower required for its operation
- Location of the fire station in jurisdiction should be based on vulnerability analysis and set up strategically. These stations should be independently capable of responding to their specific fire hazard needs.

4.5.4.3 EQUIPMENT

Decisions regarding equipment requirements at fire stations entirely depend on the fire risk analysis and other hazard analysis in the jurisdiction area. These also depend on the area profile such as the road types, buildings, population density, etc. The local Fire Services Chief should assess the requirements and request equipment accordingly. It is not practical to determine needs of localfire stations at state level. However, we provide a general list of recommended equipment in this section.

Each fire station would ordinarily need the following typical / common equipment:

1. Water tender - As given in table below
2. Foam with CO2 and DCP Fire tender -1 No
3. Rescue tender with required equipment -1 No
4. Water browsers -2 No
5. Ambulance -1 No

Note – All vehicular equipment must have communication facilities.

Number of water tenders at a fire station can be determined on the basis of population served as:

1. 50000 - 1 No
2. 100000 - 2 No
3. 300000 - 6 No
4. Additional 1 Lakh

Apart from this basic equipment, the following PPEs need to be available with fire stations in sufficient quantity and

[7]National Fire Protection Association website at www.nfpa.org has a wealth of information ranging from basic to specialised. Online courses and documents are also available for review. Also, fire department officers or their trainers in Gujarat may want to refer to the following books: (1) Fire Officer's Handbook Of Tactics (3rd Edition) by John Norman; and (2) Firefighter's Handbook: Firefighting and Emergency Response by Cengage Learning Delmar.

meeting the specific size of the staff of that fire station; we identified close proximity fire suits lying unused because they did not fit in size to fire men on staff. The recommended PPE include:

1. Fire Suit
2. Fire Proximity Suit
3. Compressed Air Breathing Apparatus Sets with spare cylinder
4. Fresh air respirator with manual operation
5. Chemical Protective Suit
6. Hand Gloves for Chemical Resistant, Heat Resistant like Kevlar, Cut Resistant
7. Eye Protection
8. Ear plug & Muff
9. Safety Helmet
10. Safety Harness with life line & rope
11. Safety Shoes / Gum boots.

In addition, the following special equipment/appliances may be needed as per the hazards in the fire station jurisdiction:

1. Turn Table Ladder
2. Hydraulic Platform (54 Meters height)
3. Emergency Tender / Advanced Rescue Tender
4. Extra Heavy Water Tender
5. Hose laying Tender
6. Lighting Van
7. Control Post Van
8. Mobile Workshop for repair of Fire Appliances,
9. Mobile Workshop for Telecom and other rescue equipment etc.

4.5.4.4 WATER SUPPLY AND FOAM REQUIREMENTS

Based on worst case vulnerability assessment, we can plan for and identify need for water and foam requirements. While we plan for the worst, it should be noted that worst care are rarest of the rare possibilities and most frequent chemical emergencies will be much smaller in extent. On other hand, we should accept that the estimated quantities are only that and can differ in actual reality based on many factors.

To estimate water supply needs, we identified maximum unit storages in the districts for highly flammable substances that have potential for pool fire. We then estimate the total heat of combustion by multiplying the maximum storage quantity by the calorific value of the fuel. To neutralise this heat we estimate the quantity of water required by dividing by the latent heat of vaporization of water. We assume the efficiency of fire fighting at 25 percent so that we multiply the estimated quantity of water by 4 to get total water required. The actual amount of water can be even as high as 15 times if the fire fighting is not done in a technically efficient manner (angles, where to concentrate water jets, how many water jets at a time, is continuous supply possible, etc.) In case of chemical fires, different types of foams are also immensely useful. We estimate foam requirement as per NFPA guidelines.

Table 10 lists the amount of water and foam required by district in Gujarat. This table should not be used for procurement decisions; the foams can be of variety of types and best determined by the fire station personnel who plan to use them. District should identify sources that can provide the required amount of water or make plans to make such water available at short notice.

4.5.4.5 MAN POWER AND QUALIFICATION

The manpower requirements for fire stations will vary according to the types of fire fighting appliances to be manned, the number of fire engines at the station, the duty system (continuous or shift) , and other factors. Typically the following staff positions are required at a fire station:

- Firemen
- Leading Firemen
- Driver
- Telephone Operator
- Maintenance or Engineering staff
- Sub Officer
- Station Officer.

Table 10. Estimated Water Supply and Foam for Pool Fires

DISTRICT	WATER (M3)	FOAM (M3)
AHMEDABAD	2,994,000	39,800
AMRELI	121,000	9,800
ANAND	2,000	300
BANASKANTHA	1,000	200
BHARUCH	1,040,000	19,300
BHAVNAGAR	125,000	10,000
GANDHINAGAR	246,000	7,400
GODHRA	2,000	300
JAMNAGAR	7,153,000	71,400
JUNAGADH	2,000	400
KUTCH	3,235,000	41,100
MEHSANA	3,000	300
NADIAD	122,000	4,600
NAVSARI	46,000	2,500
PATAN	1,000	200
PORBANDAR	125,000	10,000
RAJKOT	286,000	8,200
SABARKANTHA	3,000	300
SURAT	6,729,000	66,900
SURENDRANAGAR	14,000	1,100
TAPI	3,000	400
VADODARA	1,348,000	22,900
VALSAD	41,000	3,200
All State	**7,153,000**	**71,400**

Note: These estimated quantities are only a guide. Actual quantities required can vary depending upon the chemical involved, fire fighting efficiency, and many other factors. Also, chemical industry fires should not be the only criteria in deciding water and foam requirements in the local area. The local fire departments should conduct a detailed fire profiling of their jurisdiction and estimate the quantities of resources needed.

4.5.5 LOCAL EMERGENCY RESPONSE TEAM

In chemical emergencies the LERT with help of other response agencies – fire services, police department or EMS – serve three functions.

- First, they secure the site.
- Second, they evaluate the situation and initiate public protective action measures or modify pre-planned actions.
- Third, they establish incident command.

All of these actions take place from a safe distance. No responders enter the site until a Site Safety Plan (SSP) has been completed and the team has all the appropriate PPE and equipment to operate safely in the expected environment. The key safety concern for this team is to be able to identify when an event exceeds their capacity and to request assistance from RRT. Usually each HAZMAT emergency response team is of 8 members at a given centre or fire station. If LERT cannot be formed in all fire stations, then there should be at least one LERT per industrial pocket or LCG or DCG, whichever results in higher number of LERT.

4.5.5.1 TRAINING

Minimum training for the eight member team as per

HAZWOPER training guidelines:

- Incident Commander – Technician and Specialist courses with Incident Command Course (40 hour hazmat chemistry, 24 hour specialist, 40 hour technician, 24 hour operations, 8 hour awareness, 16 hour incident command = 152 hours)
- Safety Officer – Technician and Specialist courses with Safety Officer Course (40 hour hazmat chemistry, 24 hour specialist, 40 hour technician, 24 hour operations, 8 hour awareness, 40 hour Safety Officer = 176 hours)
- Primary Entry (2 members) – Technician and Specialist courses (40 hour hazmat chemistry, 24 hour specialist, 40 hour technician, 24 hour operations, 8 hour awareness = 136 hours)
- Rescue and Backup (2 members) – Technician courses (40 hour technician, 24 hour operations, 8 hour awareness = 72 hours)
- Decontamination and Support (2 members) – Operations courses (24 hour operations, 8 hour awareness = 32 hours)
- All members should have basic training required of all fire station staff

4.5.5.2 EQUIPMENT

The equipment needed at the minimum level consists of PPE, monitoring equipment, tools, and supplies.

Personal Protective Equipment

- Level D Ensemble – basic fire structural PPE (coat and trousers) or work uniform, a hard hat, chemical work gloves, safety glasses, safety shoes/boots, and a Personal Alert Safety System (PASS) device.
- Level C Ensemble – basic liquid splash and minimum respiratory protection for known chemical hazards includes: chemical specific protective coverall or two-piece suit, chemical gloves, safety glasses, safety boots, and an Air-Purifying Respirator (APR) with appropriate cartridge or Self-Contained Breathing Apparatus (SCBA).
- Nitrile gloves both outer and inner
- Neoprene and butyl rubber outer gloves
- Chemical resistant boots and chemical resistant booties
- Assortment of cartridges if using APR
- Spare bottles if using SCBA
- First aid kit

Monitoring Equipment

- Electronic pulse and blood oxygen monitor
- Oral digital temperature thermometer
- Basic four gas monitor – includes cartridges for oxygen (O2), carbon monoxide (CO), Lower Explosive Limit (LEL), and choice of common toxic gas like hydrogen sulphide (H2S), sulphur dioxide (SO2), or chlorine (Cl2). This monitor measures the atmosphere to help ensure there is sufficient oxygen to use an APR and monitors for the presence of dangerous CO2 levels or explosive concentrations of flammable gas
- Test paper(s) – litmus, peroxide, M-8, M-9, ammonia, oxidizer, etc
- Photo Ionization Device (PID) – This monitor allows the direct measurement of airborne gasses, vapours, fumes, and dusts that are within the ionization potential of the bulb. It is useful for measuring concentrations of known chemicals, such as identifying soils contaminated with hydrocarbons. It is not very useful for measuring or identifying unknowns or complex mixtures
- Geiger counter and radiation film badge dosimeter – the film badge must be sent to a lab for dose reading. Use of a low-end digital personal radiation meter for real time readings and logbook to record exposures

Tools

- Binoculars
- Non-sparking tool set, socket set, drum wrench, pry bar, screw drivers, hammer(s)
- Shovels, picks, brooms
- Intrinsically safe radio (no cell phones in hot zone)

- Grounding wire and rod (for bonding flammable containers)
- Brushes, buckets, garden hose, five gallon sprayer for decontamination

4.5.5.3 SUPPLIES

- Absorbent pads, booms, and loose granular material (general and petroleum only)
- Containers - five gallon pails with lids, large heavy gauge plastic bags, gallon and quart zip-lock bags
- Chemical resistant, packing and duct tape
- Engineers tape for marking
- Pin flags
- Drum marker (paint marker)
- Markers, labels, and marking decals
- One gallon each of basic decontamination agents such as soap, tri-sodium phosphate (TSP), calcium hypochlorite solution (HTH), and super tropical bleach (STB)

4.5.5.4 VEHICLES

Basic vehicles include a fire engine or a small box van.

4.5.5.5 REFERENCE MATERIALS (PAPER ONLY)

- Field guides, reference books
- Onsite plans of the unit
- Material Safety Data Sheets (MSDS)
- ERG 2012 guidebook

4.5.6 REGIONAL RESPONSE TEAM

Regional response teams are state level assets located in the 5 ERCs across the state. They bring a higher level of chemical response capacity. No responders enter the site until the SSP has been reviewed and signed by all members of the team to ensure they have appropriate PPE, training, and equipment to safely operate in the expected environment. The key safety concern for this team is to be able to identify when disaster incident exceeds their capacity and request assistance from SERT.

4.5.6.1 TRAINING

Minimum training for the 24 member team as per HAZWOPER training guidelines:

- Team Commander - Technician, CBRNE and multiple specialist courses with Incident Command Course (40 hour hazmat chemistry, 40 hour CBRNE Training, 40 hour team leader course, 24 hour specialist, 40 hour technician, 24 hour operations, 8 hour awareness, 16 hour incident command = 232 hours)
- Incident Commander and alternate Team Leader (2 members) - Technician and specialist courses with Incident Command Course (40 hour team leader course, 40 hour hazmat chemistry, 24 hour specialist, 40 hour technician, 24 hour operations, 8 hour awareness, 16 hour incident command = 192 hours)
- Safety Officer (3 members) - CBRNE course, technician and specialist courses with safety officer course (40 hour CBRNE course, 40 hour hazmat chemistry, 24 hour specialist, 40 hour technician, 24 hour operations, 8 hour awareness, 40 hour Safety Officer = 216 hours)
- Primary Entry (6 members) - Technician and Specialist Courses (40 hour hazmat chemistry, 24 hour specialist, 40 hour technician, 24 hour operations, 8 hour awareness = 136 hours)
- Rescue and Backup (6 members) - Technician (40 hour technician, 24 hour operations, 8 hour awareness = 72 hours)
- Decontamination and Support (6 members) - Operations (24 hour operations, 8 hour awareness = 32 hours)

Note: All team members must have specific training on use and calibration of monitoring equipment beyond what is listed above.

4.5.6.2 EQUIPMENT

Personal Protective Equipment

- Level B Ensemble - enhanced liquid splash and maximum respiratory protection for known chemical hazards including chemical specific protective cover all with hood, integrated gloves, booties, and chemical inner gloves; SCBA; and taped seams at neck, gloves, and booties.

- Level A Ensemble – chemical specific vapour and gas tight protective over garment with internal SCBA and buddy system external support and safety bottle, integrated outer gloves and booties plus inner gloves and in-suit communications capability.
- Multi-chemical resistant high break through time gloves
- Insulated coveralls and insulated boots for working with liquefied gasses
- Flash protection suits (as needed or integrated into Level A suits)
- Chemical resistant boots and chemical resistant booties
- Assortment of cartridges for APR
- Three spare bottles for each SCBA or cascade system to refill bottles
- First aid kit

Monitoring Equipment

- Handheld digital infrared thermometer
- Enhanced gamma, beta, alpha radiation digital survey meter with pancake probe for alpha with data logging
- Digital dosimeters with data logging
- PID/Flame Ionization Device (FID) combination
- Mercury Vapour Analyser
- HazmatCAD Plus
- Radiological Survey Meter
- Colorimetric test kit (substance identification)
- Advanced HazCat Kit with Pump
- Multi-gas air monitor with data logging
- Dust and particular monitor with data logging

Tools

- Cutting tool
- Air tools
- Access to heavy equipment (backhoe, front end loader, dump truck, etc.)
- Meteorological station with data connection
- Generator
- Digital camera for documentation
- Voice recorder for documentation
- Water fog nozzle

4.5.6.3 SUPPLIES

- Neutralizing agents with immediate access to larger volumes (e.g., lime, soda ash, etc.)
- Plugging and patching materials
- Vapour leak repair kit
- Pipe for building bypass dikes or “French” drains
- Large rolls of plastic sheeting for soil storage piles or for covering large areas
- C Kit for chlorine tanks
- Ammonia tank kit
- Basic sampling assortment of jars and bottles with labels and sampling tubes

4.5.6.4 VEHICLES

- This team has a large amount of equipment that requires a dedicated box truck or tractor with trailer. A HAZMAT Van will be most suitable for RRT

4.5.6.5 REFERENCE MATERIALS (PAPER AND ELECTRONIC)

- Laptop computer with modelling software and chemical database
- Reference guides for Level of Concern (LOC) determination

4.5.7 STATE EMERGENCY RESPONSE TEAM

The state emergency response team is the most advanced hazardous chemical response team. No responders enter the site until the SSP has been reviewed and signed by all members of the team to ensure they have appropriate PPE, training, and equipment to safely operate in the expected environment. The key safety concern for this team is to be able to identify when an event exceeds their capacity and seek external (national / international) support as needed.

4.5.7.1 TRAINING

Minimum training for the 30 member team as per HAZWOPER training guidelines:

- Team Commander – Technician, CBRNE and

multiple Specialist courses with Incident Command Course (40 hour hazmat chemistry, 64 hour CBRNE Training, 40 hour team leader course, 24 hour specialist, 40 hour technician, 24 hour operations, 8 hour awareness, 16 hour incident command = 256 hours)

- Incident Commander and Alternate Team Leader (2 members) - Technician and Specialist courses with Incident Command Course (40 hour team leader course, 40 hour CBRNE course, hour hazmat chemistry, 24 hour specialist, 40 hour technician, 24 hour operations, 8 hour awareness, 16 hour incident command = 232 hours)
- Safety Officer (3 members) - CBRNE course, Technician and Specialist courses with safety officer course (40 hour CBRNE course, 40 hour hazmat chemistry, 24 hour specialist, 40 hour technician, 24 hour operations, 8 hour awareness, 40 hour Safety Officer = 216 hours)
- Primary Entry (6 members) - Technician, CBRNE, and Specialist Courses (40 hour hazmat chemistry, 24 hour specialist, 40 hour technician, 40 hour CBRNE, 24 hour operations, 8 hour awareness = 176 hours)
- Rescue and Backup (6 members) - Technician (40 hour technician, CBRNE 40 hour, 24 hour operations, 8 hour awareness =112 hours)
- Decontamination and Support (6 members) - Technician (40 hour technician, 24 hour operations, 8 hour awareness = 72 hours)
- Medical Support (3 members) - 40 hour medical hazmat course, 24 hour operations, 8 hour awareness = 72 hours
- Evidence Collection and Documentation Specialist (3 members) - 40 hour evidence collection and documentation course, 24 hour operations, 8 hour awareness = 72 hours

4.5.7.2 EQUIPMENT

Personal Protective Equipment

- Specialized cryogenic PPE for industrial refrigerated gasses
- Specialized Level A Ensemble - Chemical hazard specific vapour and gas tight chemical protective over garment with internal SCBA and buddy system external support and safety bottle, integrated outer gloves and booties plus inner gloves, and in-suit communications capability
- Twenty-five units of Air Purifying Supplied Air Hoods to support patient triage, decontamination, and treatment in warm zone. External personnel must work under supervision.

Monitoring Equipment

- High fidelity radiation meters with multiple probes and data logging
- Gas ID System
- RAZOR (PCR Biological Agent ID system)
- PID/FID combination
- Calibrated air sampling pumps with Tedlar® bags
- Vacuum air sampling boxes
- Dedicated data logging computer with radio telemetry support to collect data remotely
- Multi-gas radio telemetry capable monitors

Tools

- **Heavy lifting capability**
- **Hydraulic cutting, bending, pushing equipment**
- **Confined space rescue equipment**
- **Access to hazmat and flammable capable vacuum trucks**
- Large portable tents
- Small shelter tent for entry, backup, and support team
- 4 wheel all-terrain vehicle (ATV) to transport team to hot zone line from cold zone
- Hot tap drill and bit for venting or emptying a tank
- High pressure water pump with portable water tank and hose for decontamination
- Portable decontamination shower
- Water heater for decontamination shower
- VHF, UHF, Satellite and encrypted communication options

4.5.7.3 SUPPLIES

- Neutralizing agents with immediate access to larger volumes (e.g., lime, soda ash, etc.)
- Plugging and patching materials
- Vapour leak repair kit
- Pipe for building by pass dikes or "French" drains
- Large rolls of plastic sheeting for soil storage piles or covering large areas
- C Kit for chlorine tanks
- Ammonia tank kit
- Basic sampling assortment of jars and bottles with labels and sampling tubes
- Advanced specialty materials for plugging, sealing, and patching
- Inhibiting agents (as needed) to interrupt polymerization
- Antidote kits for CBRNE agents
- Advanced sampling lit with VOA bottles, and an assortment of sampling bottles, jars, and bags
- Metal Paint cans (un-used) for sealing CBRNE samples for transport
- Evidence collection and documentation kit

4.5.7.4 VEHICLES

- This team has a large amount of equipment that requires at least two dedicated box trucks or tractors with trailers and a mobile cascade air system for refilling air bottles used for SCBAs. A HAZMAT Van is appropriate for this team.

4.5.7.5 REFERENCE MATERIALS (PAPER AND ELECTRONIC)

- Laptop computer with modelling software and chemical database
- Reference guides for LOC determination
- Mobile hot spot to access internet

4.6 PUBLIC PRIVATE PARTNERSHIPS (PPP) FOR DISASTER RESPONSE

4.6.1 EXPAND MUTUAL AID BETWEEN LARGE INDUSTRIES

Mutual aid agreements to help each other in chemical emergencies exist in some industrial pockets among the larger units. Such partnerships should be encouraged elsewhere where the industries have own resources to respond to chemical emergencies.

4.6.2 REPLICATE SUCCESSFUL MODEL OF DPMC FOR MUTUAL AID AMONG INDUSTRIES

Currently, a critical gap in existing mutual aid between industries is that the small industries without own resources to respond to chemical emergencies are not the members of the mutual aid. The primary reason for this is that large industries in the mutual aid seek commensurate level of reciprocity from other member industries. Large industries do provide help to smaller units on request from them or district authorities, but as a benefactor and not under a formal or binding agreement. Considering this, we recommend a replication of the DPMC model in other industries' pockets in Gujarat to serve smaller industries. DPMC can also serve larger units in addition to mutual aid assistance from other large industries.

DPMC Ankleshwar is managed and supported by Ankleshwar Industries Association, GIDC Fire Stations, GIDC and GIDC Notified Area. It is well equipped with SCBA sets, fire fighting equipment, both FEAS, foam and water tenders, PPEs, breathing apparatus, air compressor and variety of Industries Association, GIDC Fire Stations, GIDC and GIDC Notified Area. It is well equipped with SCBA sets, fire fighting equipment, both FEAS, foam and water tenders, PPEs, breathing apparatus, air compressor and variety of monitoring instruments including lox meter and wind velocity and direction meter. DPMC helps in industries in the areas of:

- Strengthening of their preventive measures

- Emergency and industrial disaster management
- Data collection regarding hazardous chemicals and processes, MSDS, antidotes, toxic release, resources etc.
- Conducting safety awareness programmes and training programmes inclusive of industrial safety and fire fighting, safe handling of hazardous chemicals, first aid and community education
- The control room at DPMC also maintains list of fire services available in the area, hospitals, doctors and ambulances, technical experts, antidotes and their sources, emergency equipment etc.

4.6.3 PUBLIC PRIVATE PARTNERSHIP TO RESPOND TO ROAD EMERGENCIES

Currently, the response capability within public response agencies for HAZMAT response for on road emergencies involving tankers is nil. However, a special type of expertise required for different chemicals is available with the industry handling the transportation of the specific chemical. Therefore, it is necessary to use the existing expertise in the industry to handle HAZMAT emergency on the road.

We highly recommend adoption of the CHEMTREK system used in the US to track movement of hazardous goods and form a state-wide network of mutual aid to respond to road mishaps[8]. Gujarat already has a good example of such a successful network: Chlorine Transportation Emergency network by AMAI (Gujarat Chapter). Six Districts in Gujarat have Chlorine Manufacturing units and 20 Districts have only Chlorine Consuming Units. Five Chlorine Manufacturing units in adjacent States also supply chlorine to consumers in Gujarat. These Chlorine Manufacturing (in Gujarat and Adjacent States) and consuming units have created Chlorine Transportation Emergency network to deal with emergency situation due to chlorine leakages / spillage during transportation and to assist consumers to control chlorine leakages. This network is now expanded to western, eastern, northern, and southern regions for a national-level Network as of May 2012[9] .

Such a model can be expanded to transport other hazardous chemicals to develop a comprehensive system. Such a system has immense potential to develop in to a market based disaster response system. With clear mechanism for paying for the services provided by others in responding to emergencies, private players will start providing such services to consignor and consignee of hazardous goods as is a the case in the US now for CHEMTREK. Over time the plausibility of extending such a system to respond to emergencies in even fixed installation can be explored by learning from the experience in the road transport sector.

4.6.4 FORMING MUTUAL AID BETWEEN NEIGHBOURING DISTRICTS

State authorities can coordinate the response from agencies and resources from multiple districts. However, for an efficient and timely response, neighbouring districts or a cluster of districts in a region can form mutual aid agreements, especially districts served by the same ERC. These agreements recognize that an accident site in a district may in fact be closest to a response team in another district, that districts can pool resources to reduce the cost burden on each other, and that emergency in one district can affect another district(s). The mutual aid agreements can include standardization of notification procedures, standardization of equipment, joint trainings and mock drills, and procedures for sharing resources.

4.6.5 IMPROVING PREPAREDNESS OF PORTS AND FORMING MUTUAL AID WITH DCG

Onsite plans for major ports are prepared but they need to be incorporated in corresponding district offsite plans. Also subsequent onsite plans for the ports may be developed on basis of the onsite guidelines issued by DISH for industries to the extent feasible for the sake of standardization. Additionally, SCG/DCG, the Gujarat Maritime Board, and other private ports should sign a mutual aid agreement to help each other in responding to disasters. For minor ports functioning under GMB and private ports, GSDMA should encourage the development of comprehensive onsite emergency plans, given they are not yet prepared. These onsite plans should be

[8] http://www.chemtree.com/
[9] http://www.ama-india.org/

integrated with corresponding district plans and also be a part of the mutual aid between ports and district/state offsite agencies for response.

4.6.6 IMPROVING PREPAREDNESS OF AIRPORT AND FORMING MUTUAL AID WITH DCG

Onsite plans for airports are prepared by the Airport Authority of India. However, they need to be developed in the future as per DISH guidelines for the chemical hazards posed by the storage of aviation fuel on site and any other chemicals handled as cargo or for other purposes. Additionally, a mutual aid agreement should be developed between AAI and SCG/DCG for coordinated response to chemical disasters.

4.6.7 MPROVING PREPAREDNESS OF RAILWAYS AND FORMING MUTUAL AID WITH DCG

Western Railways have developed a comprehensive emergency management plan that includes a response to chemical disasters. They also have their own control room and resources. Considering that Railway HAZCHEM transport is a risk and that Railways have significant disaster response resources, their onsite plan should be integrated with the district offsite plans. This means the railways should develop some plan elements as per the guidance by DISH for onsite plans and provide information on vulnerability assessment and other such sections to DCG. Also, a mutual aid agreement between SCG and Railways should be developed for coordinated response to chemical emergencies.

4.7 STRENGTHENING OF RESPONSE MECHANISM

4.7.1 ESTABLISH EMERGENCY ORGANISATION AS PER INCIDENT RESPONSE SYSTEM

As stated in NDMA guidelines on IRS, the Incident Response System (IRS) is an effective mechanism for reducing the scope for ad-hoc measures in response. It incorporates all the tasks that may be performed during emergency response irrespective of their level of complexity. It envisages a composite team with various Sections to attend to all the possible response requirements. The IRS identifies and designates officers to perform various duties and get them trained in their respective roles. If IRS is put in place and stakeholders trained and made aware of their roles, it will greatly help in reducing chaos and confusion during the response phase. Everyone will know what needs to be done, who will do it and who is in command, etc. IRS is a flexible system and all the Sections, Branches and Units need not be activated at the same time; only as and when they are required.

The IRS organisation as depicted in Figure 13 functions through Incident Response Teams (IRTs) in the field. In line with DM Act 2005, Responsible Officer (RO) – the district collector at district level or the Chief Secretary at state level – is overall in charge of the incident response management. However, the RO may delegate responsibilities to the Incident Commander (IC), who can manage the incident through IRTs. Unlike natural disasters, the skill set to respond to chemical emergencies is more technical than administrative and managerial. Therefore, as discussed later, we recommend that a technically qualified person be designated as IC for chemical emergency by the RO. The IRTs will be pre-designated at State, District, Sub-Division and Taluka/Block levels. Because chemical emergencies may not provide early warning, the local IRT will respond and contact RO for further support, if required.

The IRS organization has two main components. First, the command staff consists of Incident Commander (IC), Information & Media Officer (IMO), Safety Officer (SO) and Liaison Officer (LO). They report directly to the IC and may have assistants. The Command Staff may or may not have supporting organisations under them. Second, the General Staff has three components. The Operations Section (OS) is responsible for directing the required tactical response actions. Expansion of the OS depends on the enormity of the situation. The Planning Section (PS) is responsible for collection, evaluation and display of incident information, maintaining and tracking resources, preparing the Incident Action Plan (IAP) and other necessary incident related documentation. The Logistics Section (LS) is responsible for providing facilities, services, materials, equipment and other resources in support of the incident response.

NDMA IRS guidelines are available at nidm.gov.in/PDF/guidelines/Incident_Response_System.pdf. We refer you for this much comprehensive report to understand the precise roles and responsibilities of different IRT members, and Annexure XI in above link provides suggestion for the departments and agencies that can fill various roles as per the IRS depicted in Figure 13. The information is too comprehensive to just copy in this report so we refer you to NDMA guidelines for more details. A more chemical emergency specific structure is provided in Figure 14. Note the minor changes and scaled down IRT for chemical emergencies. Specific IRTs with proper people or agencies should be predesigned as in the example of Figure 14.

The organization structure of SCG is much more specific as per CAEPPR Rules, and hence suitable for chemical emergencies. Therefore, the coordination of IRT and SCG structure is easily possible by linking the SCG members with specific roles under IRT. IRS is also not prescriptive and the state administration can assign the "best suited and/or interested" person or department to a specific role (including private industry resources provided the industry is committed for such a role). Below, we provide some chemical disaster specific recommendations and interpretation for IRS.

1. The chief secretary of the state is the chairman of SCG, member of GSDMA, and the "Responsible Officer" (RO) of the IRS at the state level. CEO of GSDMA is also a member of SCG. Therefore the coordination between SCG-DCG-LCG mechanism under CAEPPR Rules and GSDMA-DDMA structure under DM Acts is achieved at the state level and there is no conflict.
2. Chief Secretary or CEO GSDMA may be the IC for state level response (which may indeed be a right strategy for natural disasters), but for chemical emergencies the IC must have significant amount of training (see Section 4.5) and need to be present near the incident site, which such senior level officers are not most suited to. Therefore for chemical emergency, the RO will delegate responsibilities to a qualified Incident Commander (IC) to manage the incident through IRTs that are pre-designated. The IC is a person qualified in technical and managerial aspects of managing incidents at the incident site. We recommend that a senior officer from the proposed SERT be given this authority and responsibility. There can be multiple ICs at the state level depending on the type and scale of disasters. In case of combination of natural and chemical emergencies, the IC can indeed with a senior level administrative officer and the chemical response teams will be headed by a corresponding OSC. In case of catastrophic or major chemical emergencies also the IC can be an administrative officer because executive decisions about whose life and whose property should be saved have may have to be taken.
3. Until an IC is pre-assigned, the CS or CEO GSDMA will continue to fulfil the role. The RO can still head the SEOC while the IC is at the ICP near the accident site.
4. Considering that chemical emergencies would often happen without any early warning, first the local IRT will respond. The emergency will be escalated to the state level if the district capacity is inadequate and then RO will be also be at the state level.
5. The IC is located at the incident command post (ICP) which is located outside the hot zone of chemical incident and directs the response activities.
6. The IC is supported by a pre-designated Information and Media Officer (IMO), Safety Officer (SO) and Liaison Officer (LO) and any assistants or deputies. The IMOs main task is information exchange with media and general public. The LO is the focal point of contact for various line departments, representatives of NGOs, PRIs and others participating in the response. The IMO and LO can be located at the SEOC because they are not needed at the incident site. The function of the SO is to ensure the safety of responders and conduct any required situational awareness to assess and/or anticipate hazardous and unsafe situations. The SO should

be based at the ICP along with IC; this is usually a SERT team member. The IRS is flexible for IC to be from state level and IMO and LO from the district level but such organizational plans should be done as a part of preparedness measures.

7. The Operations Section (OS) is responsible for directing the required tactical actions to meet incident objectives. In case of chemical incidents the IC and the OS Chief (OSC) may both be the same or different persons. For large and complicated emergencies (for example, natural and chemical disasters together), the IC and OSC may have to be separate functionaries to deal with different aspects of emergency management. The OSC will typically be the head of the emergency HAZMAT response team at the local, district or state level and can be from the industry, fire department or any other agency as long as they are trained and sensitized.
8. The Planning Section (PS) is responsible for collection, evaluation and display of incident information, maintaining and tracking resources, preparing the Incident Action Plan (IAP) on the basis of a Site Safety Plan (SSP) as suggested in Section 4.5, and prepares the demobilization plan.
9. The Logistics Section (LS) is responsible for providing facilities, services, materials, equipment and other resources in support of the incident response. The Section Chief participates in the development and implementation of the IAP, and ensures prompt and smooth procurement and supply of resources as per financial rules.
10. A single supervisor may be put in-charge of multiple sections and branches within the sections. However, the functions identified in the IRS remain independent but only headed by a common manager.
11. Not all sections will need to be activated for all chemical emergencies. For example, for most medium scale emergencies, the LO or LS may not be needed, or the OCS and IC can be the same person, or the safety officer can also be the planning section chief, and other such arrangements. Overall, redundancy in the organization structure planned should be removed to ensure efficiency of operations and not an organizational quagmire.
12. When state level support is provided, the IRT structure at the district level will not be dismantled, but the state level IRT will support and take over operations if necessary. NDMA guidelines on IRS describe how the unity of command will be maintained and how the command can be transferred to higher levels.
13. Ideally, the state should build the capacity of the staff of public agencies (e.g. SDRF, SERT, State Fire Department, when established) to act as an IC with minimal reliance on the industry to provide such technical leadership. However, in the short term, considering the limited technical capacity for managing and directing a HAZMAT response in public agencies, the industry response personnel can be made the IC.

Figure 15 depicts the emergency response mechanism on the basis of the IRS. This figure attempts to draw the synergies between the response structures envisioned under MSIHC and DM Acts. The incident controller, site controller, and dotted shapes for LCG, DCG, and SCG is the mechanism under MSIHC. The ICP will be established as per IRS and the response will be by pre-designated IRT. The incident controller will become the part of ICP. We have depicted LERT, RRT and SERT as primary response agency. LERT, RRT or SERT head can be the OSC or the IC as per the plan of the district. SERT, RRT, LERT can also be considered as 'groups' in Figure 13 (bottom cell in left-most column). In short term, the incident controller from the industry may be the OSC (if district does not have qualified "public" response capability) and the DC is the IC but over time it is important that the district identifies a technically qualified IC and not rely on the industry alone. DEOC, SEOC and Local Control Rooms are established in Gujarat and will serve as control rooms. We have given example of police, fire and EMS teams providing support to the IC as per his directions. This simplified process can

indicate that the IRS is not something drastically different from what is being done under offsite plans.

4.7.2 ESTABLISH INCIDENT NOTIFICATION PROCESS

Currently, a system to notify district and local authorities exists in case the onsite emergency has the potential to become offsite under MSIHC Rules 1989. However, as discussed in Section 4.2.4, we are recommending a proactive (rather than reactive) approach to notifying possibility of offsite in a verifiable and quantitative manner. This system will require industries to report an incident as per the criteria in Section 4.2.4 and not wait for the onsite to have the potential to result in an offsite emergency. This state-level system would be responsible for the following activities

- Develop an incident reporting and notification matrix that pre-designates entities that will be included in the reporting or formal notification process, based on assigned disaster response roles, geographical area of responsibility, and event type.
- Provide official mandate of Government of Gujarat to state/district/local emergency operations centres or control rooms to receive and handle the notification and direct first responders accordingly.
- Receive an initial accident report, and follow-up/final accident report from responsible parties regarding any release that meets the following criteria as recommended in Section 4.2.4.
- Immediately direct the initial notifications to responding entities at appropriate levels (local, state, and national) based on the established reporting and notification matrix. Use appropriate technology to disseminate all available information as rapidly as possible. Notification forwarding should begin at the local level. Not all notifications should be escalated to SEOC.
- Immediately activate all pre-planned public alert and warning systems and support emergency public information systems by providing pre-planned messages for sheltering or evacuation orders. In case a siren by industry is one of the ways to alert the community in the vicinity of the accident site by the local / district authorities, then state government should establish a process to pre-authorize the industry for use of such siren, as per the terms of pre-authorization. For example, the process should advise on the type of siren (standardization across state) and the range of siren for the initial protective action distances (evacuation or shelter in place or both)
- A requirement to "formally and automatically" notify the district emergency authority (Collector) of the offsite emergency as per MSIHC Rules if the emergency becomes offsite during response.
- A requirement for a formal reporting within 48 hours that is based on debriefing after response resources are demobilized and a follow up report within 90 days as per existing MSIHC Rules.

4.7.3 IMPROVE CONTROL ROOM MANAGEMENT

- **Build timely alert and notification capability**
- **Resolve Roles of GVK 108 and SEOC:** GVK 108 is being promoted by the government of Gujarat as an all-emergency (fire, medical, and police) communication and dispatch centre. SEOC is also being promoted by the revenue department for disaster reporting. While GVK 108 is a public private partnership company, SEOC is a state owned asset who is authorized to receive chemical release notifications because revenue department is a member of SCG. Ideally, GVK 108 can play a role of "communication and dispatch centre" whereas SEOC is the "control room" that officially receives notification from industries and coordinates response to disasters. GVK 108 may forward reports of chemical emergencies to SEOC. However, their respective roles should be clarified by GSDMA and the Revenue Department in reporting of and responding to chemical emergencies. There should be "one" designated control room at state level.
- **Maintain Up to Date Contact Directory:**

Department of Revenue publishes contact directory for all state, district and taluka level government functionaries. MoEF published Red Book containing up to date contact information of national and state level functionaries for chemical response. Offsite plans prepared under MSIHC Rules have up to date information of even private assets at the district level. However, all such information must be available in easy to search and reliable platform while ensuring that all information is up to date.

SEOC should develop a system to monthly checking of all contact information and updating the same. For sake of reference, Appendix E includes the list of key contacts in the state. The individual district and local area CDMP should have more detailed information. However, the impulse to use CDMP or even offsite plan as a directory of contact information should be avoided and instead a proper database should be used.

- **Resolve Conflicting Agency-Specific Control Rooms:** We expect that SEOC will be manned and active 24 by 7. However, when a chemical emergency is notified, SEOC staff can initiate initial actions as per the pre-determined plan, but they will need support from other SCG members. For example, if an emergency is being scaled up to state level, the RRT may be asked to respond by the SEOC staff. However, the IC from the RRT will need logistics, technical, and media management support from SEOC. Therefore, pre-identified liaisons or representatives from relevant state agencies and department will need to report to the SEOC rather than activate their own agency-specific control rooms, if any. Also, the local or LCG control room (if any) and DEOC should mainly communicate with the SEOC during a major disaster and not multiple agencies directly. The role of a control room is to provide single location management of a disaster.
- **Adequate Equipment to Ensure the Self-Sufficiency of Control Rooms:** Conduct regular assessments of SEOC to ensure that backup electrical services and redundant communication systems are present. DEOC and SEOC must ensure a fail-proof and inter-operable communication system.
- **Procedures for Deactivation and Demobilization of the SEOC:**
  1. Develop deactivation criteria to include the following situations:
     a. "State of offsite emergency" is lifted
     b. Individual agencies or units are no longer required
     c. Coordination of response activities and resources is no longer required
     d. The incident has been contained and emergency response personnel have returned to regular duties
  2. Develop deactivation procedures, which should include the following
     a. The incident commander will determine when to initiate deactivation
     b. Liaison officer(s) will notify specific agencies when they are no longer required
     c. Liaison officer(s) will notify the appropriate agencies of the expected timeline for deactivation
     d. Copies will be made of all logs, reports, messages, and any other documents used (and received) in the SEOC
     e. All response agencies and other stakeholders should provide input for inclusion in an after action report (AAR). The AAR should be submitted within 90 days of incident as per MHISC Rules, and a copy should be marked to GSDMA.
  3. Develop a general deactivation checklist for SEOC staff to follow.

4.7.4 IMPROVEMENTS IN COMMUNICATIONS

- **Formal State Wide Communications Plan:** Develop a state-wide communications interoperability plan that governs internal and external communication during disaster situations. Ensure that the state wide communication interoperability plan addresses the continuity of operations to include consideration of critical components, networks, support systems, personnel, and an appropriate level of redundancy in communication systems. The end objective of this plan is to ensure a 100% fail-proof communication capability for all response agencies, control rooms and other resource agencies, as well communication with affected public.

  Conduct State wide communication exercise to validate the interoperability of DEOC with the SEOC (see Section 4.3.1)

4.7.5 SITUATIONAL AWARENESS

- A CAMEO software suit developed by USEPA and NOAA will be used for planning of response, database management of chemicals, identification of vulnerable zones for population and infrastructural resources, key contacts directories and route mapping. It is available for free use and can be used effectively within the Indian context without any modifications. As Gujarat starts using CAMEO, learning from the experience, and developing capability for planning and responding to chemical emergencies using DBMS and GIS, it can upgrade to other commercially available GIS software.
- Develop a programme and associate procedures to ensure that a GIS based database management and emergency response system is developed in the state. Recommendations for such a system are provided as a separate report.
- Develop a training programme for basic and advanced level of use of CAMEO software use by required control room and key response agency staff. Keep track of training and credentials of local staff.
- Emergency Response Guidebook (2012) can provide quick and adequate information to first responders and others while more detailed modelling and analysis is being conducted. ERG (2012) is available at http://phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/Hazmat/ERG2012.pdf and http://phmsa.dot.gov/hazmat/library/erg
- Mobile Apps for ERG (2012) are also available for free or at low price at http://www.androidzoom.com/android_applications/emergency+response+guidebook
- Basic training of first responders and users of ERG (2012) is necessary, even though the guide is organized for easy understanding. First responders will need a hard copy of the same translated into Gujarati.
- Live monitoring at the peripheral areas of vulnerable zones should be done for toxicity and concentration of the hazardous chemicals such that the responders can quickly plan their tactics for response. Well-trained members of the HAZMAT response team can monitor the situation using on-field sampling equipment. The live monitoring data can be shared with DEOC and SEOC to aid decision making. Live monitoring is different from post-emergency atmospheric sampling and pollution surveillance conducted by GPCB.

4.7.6 HIERARCHICAL HAZMAT RESPONSE SYSTEM

Develop a hierarchal response system within the state that provides for a basic Hazardous Material response capacity within each district. Districts with the greatest hazards should be prioritized. The following levels of HAZMAT teams will respond hierarchically.

1. Local Emergency Response Team
2. Regional Response Teams (RRT) at Emergency Response Centres (ERC)
3. State Emergency Response Team

4.7.7 EMERGENCY PUBLIC INFORMATION

Establish formal procedure for coordinating with local and district entities to issue coordinated emergency public messages. Require a single state-level Information and Media Officer to serve as the point of contact for district-level officers. When an incident involves multiple districts, identify a state-level procedure for controlling and coordinating all emergency public information. An important element of chemical emergency work with the media is to keep them out of the danger zone so they don't become a part of the problem. This can be achieved by proactively providing media video, photographs, and complete information. Considering the media can also be a part of response efforts by informing the public, they should be involved in developing local, district, and state planning efforts related to public information. Often politicians and other VIPs visit the area for sake of information and getting first-hand knowledge. They should be kept away from the danger zone and be provided with required information, photographs etc.

4.7.8 MANAGEMENT OF DEAD

Develop the capacity of all districts to manage a large number of fatalities in order to appropriately enhance the state's management of dead capability. To support district-level capabilities, develop a plans and procedures to locate, activate, mobilize, and provide additional personnel, transportation, last rites, and temporary cold storage for a mass fatality incident as per guidelines issued by NDMA.

4.7.9 MASS CARE

Ensure that each district has identified appropriate structures or buildings to be used as emergency shelters following a chemical or industrial incident. Appropriateness of structure to protect against chemical leaks will be verified regularly. Develop each district's ability to manage distribution of bulk commodities to support emergency shelter(s). Ensure self-sufficiency of district shelters (e.g., access to water and restrooms) and the shelter staff's ability to communicate effectively with DEOC. Develop each district's capacity to provide personnel to manage and operate emergency shelter(s).

4.8 MEDICAL PREPAREDNESS FOR CHEMICAL EMERGENCIES

Medical preparedness is aimed to prepare medical and other authorities to develop the capacity of first responders and upgrade infrastructure so that they can handle a mass casualty event. Emergency medical units should collaborate with stakeholders to develop, implement and maintain a comprehensive strategy to prepare for, respond to, and recover from health emergencies of known and unknown origins. While this DMP includes a plan for an emergency medical response, the Department of Health must prepare comprehensive state and district level medical emergency management plans with a focus on preparedness and resource planning to deal with all types of hazards including chemical hazards. Such plans, when developed, will be referred to in this DMP. The following is only a stop gap arrangement and does not undermine the acute need for comprehensive medical preparedness and response plans by the Department of Health.

4.8.1 GUJARAT MEDICAL EMERGENCY SERVICES ACT

Gujarat Medical Emergency Services Act (2007) is one of the earliest efforts in the country to regulate EMS in the country. The act provides for identification of, partnering with and regulating the performance and accountability of EMS hospitals and ambulance services. The act allows makes provisions for: (a) technical and financial assistance for EMS; (b) planning, accreditation, certification and licensing; and (c) training of EMS responders and doctors. This act will be useful in context of CDMP and should be read in conjunction with applicable NDMA guidelines time to time. Particularly this act can be used to integrate the role of 108 as MFR for chemical emergencies, their training, and coordination of 108 with other EMS resources.

4.8.2 ESTABLISH A PUBLIC PRIVATE PARTNERSHIP TO AUGMENT MEDICAL RESOURCES

Public private partnership models should be developed as a part of the medical preparedness plan, as 70% of medical resources in the country lie within the private sector. It should include the following activities:

- Identification of private resources

- Classification as per their level-of care and response capability
- Pre-disaster agreements regarding management of mass casualty events
- Inclusion of a corporate social responsibility clause to assist in disaster response while allotting the land for hospitals
- Linkage of other public sector hospitals like railways, ESI, and others in defence sector should be part of planning strategy.

4.8.3 ESTABLISH A CHEMICAL-SPECIFIC MEDICAL MANAGEMENT PROCESS

A chemical-specific medical management process for the treatment of exposed/contaminated patients requires a description of impact inclusive of synonyms, appearance, routes of exposure, potential for secondary contamination, physical properties table, sources and uses, and its health effects (organ systems affected by acute exposure, potential sequel, effects of chronic exposure).

It defines the need of pre-hospital management organized by hot/warm zone, decontamination zone, and support zone (personal protection, decontamination, support, triage, transportation) at the incident site within the golden hour. An organized decontamination area and Critical Care Area (specific medical procedures to treat the exposed patient, patient disposition) should be defined. Evacuation of patients should be based on incident site triage having Patient Information Sheet (the exposure and its potential effects, follow-up instructions) is essential.

Chemicals can be differentiated on the basis of toxic, moderately toxic, or least toxic. The management of any chemical at incident site should be done as per the information given in Material Safety Data Sheet (MSDS). International Chemical Safety Cards are also available for most of the hazardous substances and include information on first aid measures.

4.8.4 CREATION OF TRAINED MEDICAL FIRST RESPONDER (MFR)

Trained MFR should be available at the incident site as well as at the reception area of the hospital to carryout triage, medical decontamination, resuscitation, etc. This needs to match the district's vulnerability to chemical emergencies and other natural risks in the area. A training programme and participation of private industry are key in these efforts.

4.8.5 FORMATION OF QUICK RESPONSE MEDICAL TEAM (QRMT)

QRMT is a designated group of healthcare clinicians who can be assembled quickly to deliver critical care expertise in response to grave clinical deterioration of a victim at chemical incident site itself, if the site can be safely accessed. QRMTs may consist of the following staff positions: a) Physician – senior resident or hospitalist; b) Physician's assistant; c) Critical care unit Specialists; d) Clinical nurse specialist and; e) Respiratory therapist. They all need to be trained in managing victims of chemical incidence. The QRMT has several key roles:

- Assessing and stabilizing the victim's condition through effective resuscitation measures
- Performing incident site medical decontamination
- Organizing information to be communicated to the hospital care settings
- Educating and supporting the ambulance staff while transferring a victim
- If circumstances warrant, assisting with victim's transfer to a higher level of care.

4.8.6 ELECTRONIC SYSTEM FOR TRACKING EMS UNITS DURING MAJOR DISASTERS

Work with EMS partner agencies to assess the possibility of tracking ambulances on a real-time basis. GVK-EMRI has developed these capabilities for 108 ambulances. Such a capability should be extended to all ambulances that will respond to chemical disasters. Explore the possibility of procuring new equipment or technology upgrades to ensure such a capability exists for large-scale or complex disasters.

4.8.7 CREATION OF STATIONARY AND MOBILE DECONTAMINATION FACILITIES

The medical posts within the factory should have a station decontamination facility for the incident site decontamination/primary treatment to safeguard the

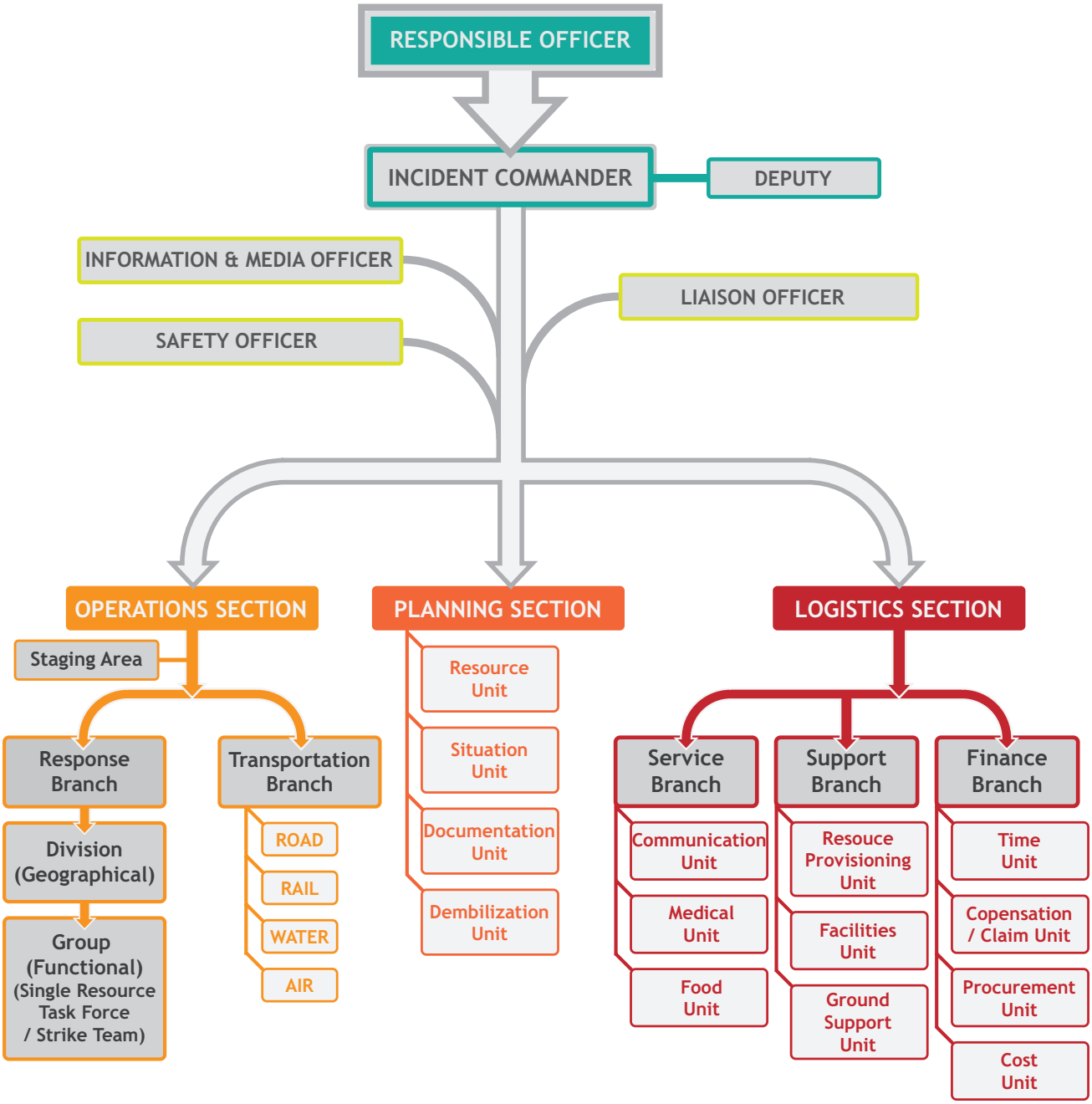

Figure 13. Incident Response Team Structure according to the IRS Recommended by the NDMA

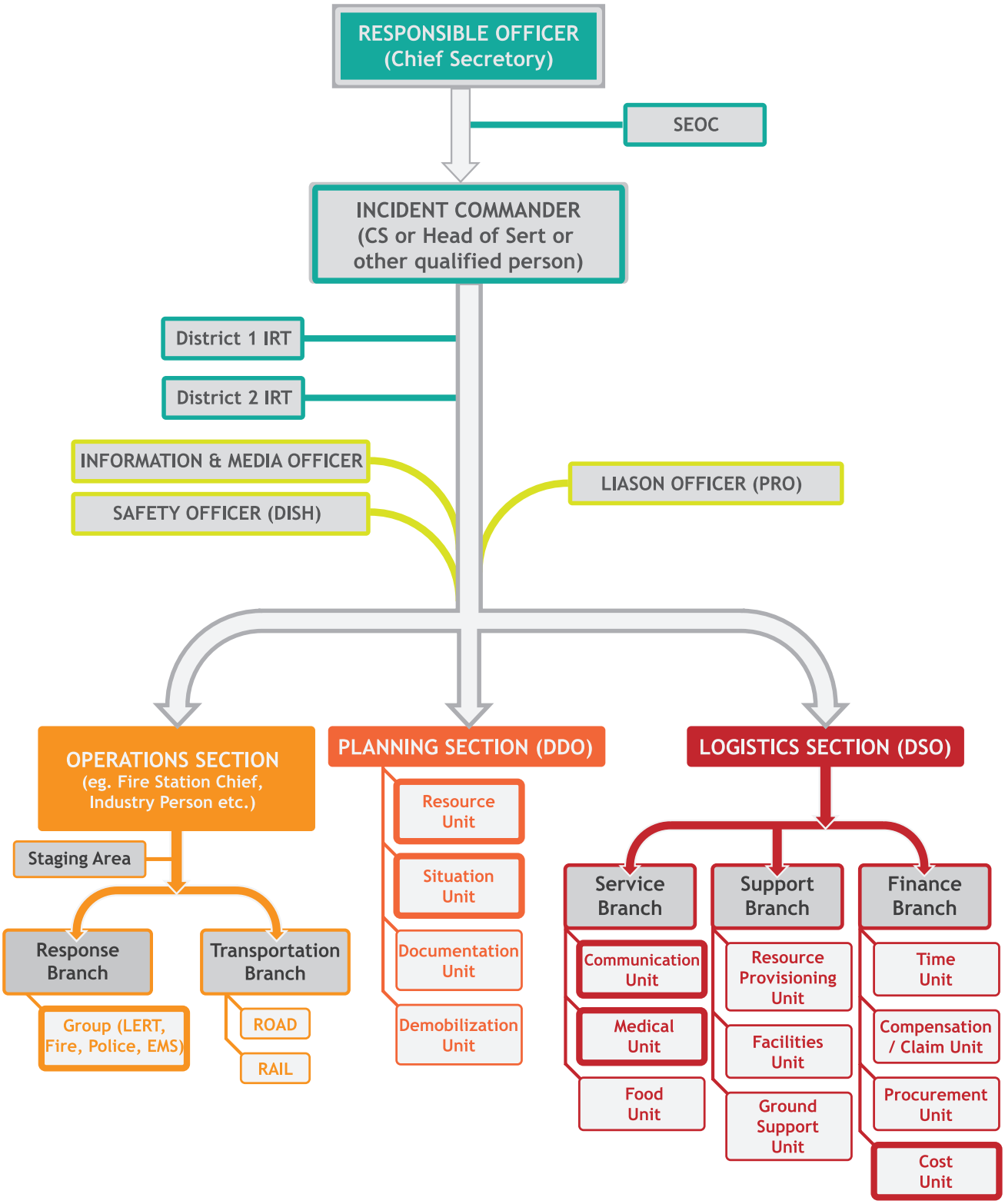

Figure 14. Example of Incident Response Team Structure for Chemical Emergencies at State Level

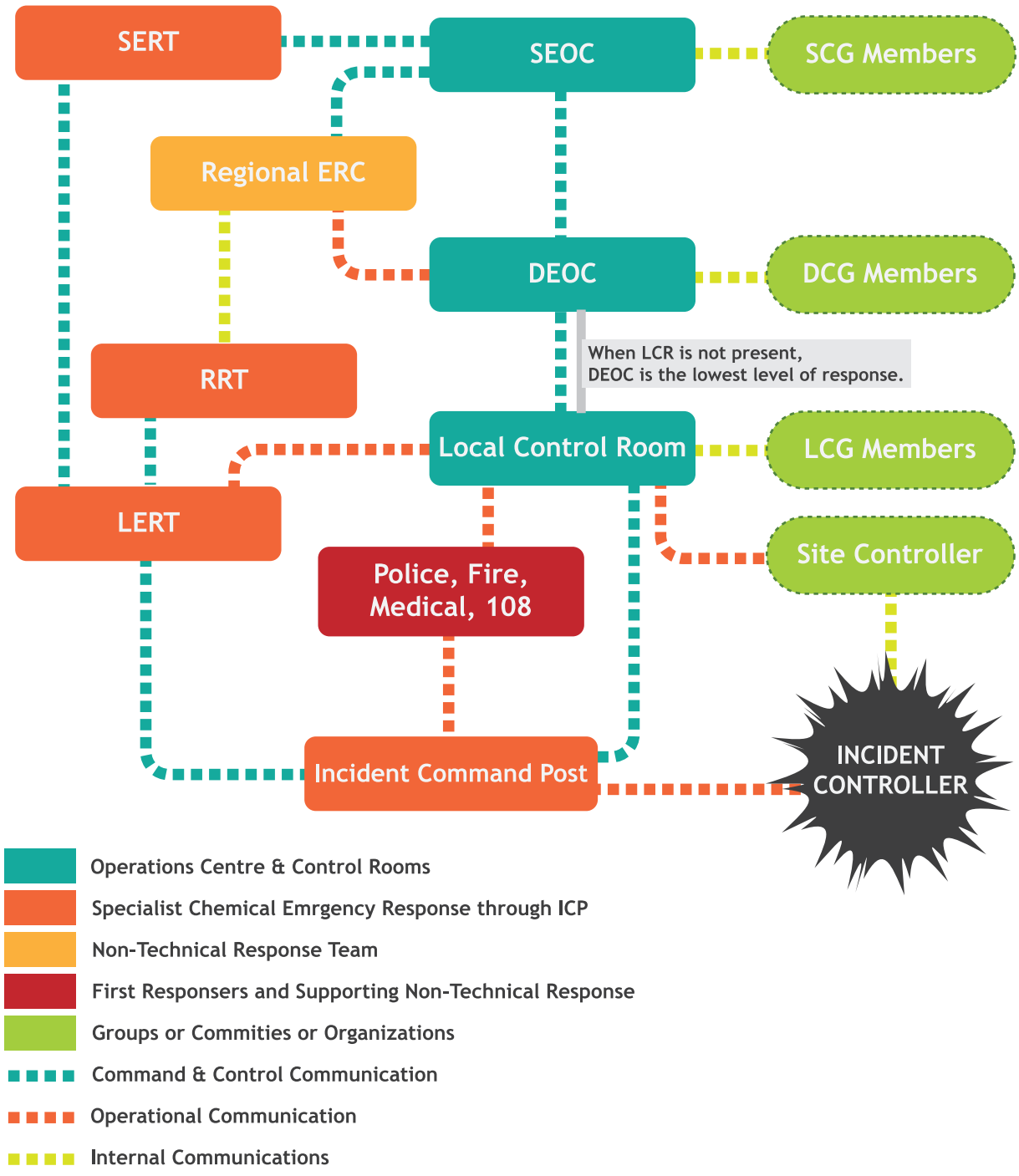

Figure 15. Schematic of Emergency Response Mechanism (Structure and Process)

victim. There should be at least two medical posts perpendicular to each other with an appropriate evacuation route and assembly point to ensure that wind flows in the opposite direction of the leak. DISH may encourage the industry to take appropriate action in this regard.

Mobile Decontamination Facility should also be planned either through mutual aid or by District Administration. There should be stationary decontamination units at hospitals to ensure that hospitals are safe for use.

Under no circumstances shall a person be allowed to even enter a medical facility without decontamination. Improper or no decontamination can potentially cripple the medical response capacity so that all local hospitals will be sensitized for decontamination and procedures for the same.

4.8.8 UNIFORM CASUALTY PROFILE AND CLASSIFICATION OF CASUALTIES

Medical officers will develop a prototype of casualty profiles and their antidotes, based on the type of toxicants. A uniform profile will also be made for secondary injuries so that the treatment can be standardized.

4.8.9 UPGRADING POISON CENTRES / TOXICOLOGICAL LABORATORY

It is essential to upgrade Poison Centres at the regional level with a network of toxicological laboratories located in closer vicinity to determine the nature of chemicals using advanced analytical technologies. It is essential to have such facilities at the local level to ensure that chemical identification is fast and accurate, especially in case of transition species. The recommendation for live monitoring in the previous section has identified the need for field sampling. However, often the equipment for on-field detection of toxic gases is limited to a few chemicals and it can also be very expensive. Therefore, quick collection on-field and immediate testing in a local laboratory is important to identify the type and effect of the chemical. The national poison information centre at AIIMS should be continuously linked up to undertake first-hand information based on symptomology.

4.8.10 PLAN FOR ONSITE MEDICAL RESOURCE INVENTORY

The MAH units should develop their own Medical Risk and Resource Inventory. GSDMA may develop guidelines for the same and cause the industry to maintain these as a part of their onsite plans required under MSIHC rules. Medical resource inventory should be established based on onsite risk assessment including:

- Ambulances, medical post, basic life support, trauma support, initial management of burn/toxic care, resuscitation equipment, and ventilators should be made available
- Personal Protection Equipment are essential to be stocked
- Trained QRTs and stationed medical doctor/ paramedical staff
- Special stocks of antidotes as needed.

4.8.11 PROVISION FOR MOBILE HOSPITAL / MOBILE TEAM

The mobile hospital/medical teams are essential to relieve the pressure from the earmarked hospital, especially in the case of combined disaster emergencies. The capacity of a mobile hospital depends on the magnitude of the disaster and population to be treated. Such cases are applicable to chemical leaks as secondary disasters, as observed in the case of the Bhuj Earthquake. The state can support the district develop this capacity with appropriate funding and training.

District preparedness capabilities should ensure that four triage categories of victims and affected population receive sufficient vehicles for evacuation to assembly areas, temporary shelters, or to designated hospitals. Procedure and systems should be developed so that under no circumstances does a victim enter a medical facility—especially a hospital) -prior to decontamination.

4.8.12 STOCKING FOR ANTIDOTES AND CHEMICAL CASUALTY TREATMENT KIT

A proper chemical casualty treatment kit has a composition of burn care, first aid for ABC and advance support care, trauma care, and specialised antidotes

and essential medicines, etc. It is essential to develop mitigation reserves at the district level to ensure the availability of required materials at right time. The antidotes required for chemical incidences along with the essential medicines need to be stocked at locations to ensure their availability in the least possible amount of time to site where it is required. In addition, direct stocking at the responder level ensures their safety and victim's safety too. The primary sites for stocking are MAH units- medical posts, ambulances, and earmarked health facilities for both public and private sector.

4.8.13 DEVELOP CRISIS MANAGEMENT PLAN AT HOSPITALS

A crisis management plan will be prepared by all earmarked hospitals. The responsibility for preparation and implementation of the plan should lie with the medical superintendent of the hospital. The crisis management plan or hospital disaster management plan should cater for surge capacity, continuous information exchange with other hospitals, temporary makeshift arrangements for mass casualties, etc. The hospital disaster management plan should cater for the development of facilities to conduct a set of minimal tests and follow ups to ensure the toxicological impact of chemical. A hospital disaster management plan has the following components:

- Specify the roles and responsibilities identified for managing chemical disasters. This should include identification of a hospital incident command system, the command nucleus, the quick response teams, etc.
- The contact details of the members of the command nucleus and quick response teams
- Plan for and participate in offsite drills
- Regular updating of hospital disaster management plans
- Develop capacities to handle large number of casualties, a contingency plan for bed expansion, and decontamination facilities
- Training of medical personnel
- Antidote stocking and procurement plan
- Plan for availability of sufficient quantity of other medical stores such as antibiotics, other drugs and life- support equipment, oxygen, continuous positive air pressure (CPAP) ventilators, dialysis facilities, blood and IV fluid for transfusion, and others
- Procedures for accurate accounting of morbidity and mortality data.

4.9 STAKEHOLDER ROLES AND RESPONSIBILITIES IN PREPAREDNESS

The table below summarizes the key activities required for prevention and mitigation and the responsible agencies.

Table 11. Stakeholder Roles in Preparedness at State Level

	PREPAREDNESS ACTIVITY / ACTIONS	PRIMARY STAKEHOLDER / RESPONSIBILITY AT THE STATE LEVEL	SECONDARY RESPONSIBILITY/
1	Development of preparedness work plans	Off-site response agencies -SERT, State level fire department, ERC, RRT, Emergency Medical Services, State Police department , etc.	SCG, GSDMA
2	Overall disaster management planning	GSDMA SCG	LCG, DCG, DDMA
3	Strengthening the synchronization of onsite and district /local offsite Plans	DISH	GSDMA, SCG
4	Develop emergency responder safety guidelines	DISH	GSDMA, SCG

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	PREPAREDNESS ACTIVITY / ACTIONS	PRIMARY STAKEHOLDER / RESPONSIBILITY AT THE STATE LEVEL	SECONDARY RESPONSIBILITY/
5	Develop guidelines for reporting and immediate intimation of hazardous chemical leakage	DISH, GPCB	GSDMA, SCG
6	Developing and Implementing a formal after action reporting system	DISH	GSDMA, SCG
7	Development of GIS based database for planning information	GSDMA	DC
8	Guidelines for off-site mock drills and Support and Training for Improving the Capability for and Effectiveness of Offsite Mock Drills	GSDMA, DISH, SCG,	LCG, DCG, DDMA All other agencies with role in CDMP
9	Developing of Specialized Training Course on an Integrated and Coordinated Emergency Response System	GIDM	DISH, PESO, GPCB
10	Development and Implementation of a Chemical Emergency Community Awareness and Preparedness Strategy	GSDMA, SCG	DDMA, DCG ,LCG Industry
11	Enhance chemical Disaster Response Capacity through establishment of unified state level fire services, IRS, SERT, RRT, LERT	State Fire Department (proposed), Urban Development Department, GSDMA	SCG, local fire department, DCG, DDMA, Other off-site response agencies
12	Plan for Training, Equipment and Resources for HAZMAT Response	State Fire Department, SERT, RRT, LERT, Police , EMS, DMPC	GSDMA,SCG
13	Public Private Partnerships (PPP) for Disaster Response through expansion of Mutual Aid between industries, replication of DPMC model, PPP to respond to road emergencies, mutual aid between districts, mutual aid with Port Authorities, Airport Authority of India and Western Railways HAZCHEM	GSDMA, SCG	ERC, Ports Authority, DoT, AAI, Western Railways
14	Strengthening of the Response Mechanism through establishment of the Incident response system, incident intimation process, improved control room management , communications, hierarchical HAZMAT response system, Emergency public information, mass care and management of dead	GSDMA, SCG, SEOC	DDMA, DEOC,DCG

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	PREPAREDNESS ACTIVITY / ACTIONS	PRIMARY STAKEHOLDER / RESPONSIBILITY AT THE STATE LEVEL	SECONDARY RESPONSIBILITY/
15	Medical Preparedness for Chemical Emergencies- including PPP, formation of trained medical first responder, QRMT, stationary and mobile decontamination facilities, identification of poison centres, mobile hospital, antidotes planning and crisis management planning at hospitals	Department of Health	Chief district medical officer, Chief district Health officer

5 RESPONSE

5.1 SITUATION OVERVIEW

1. All the hazardous process industries listed in the first schedule of the Factories Act, 1948 must draw up an onsite emergency plan and establish disaster control measures in consultation with DISH. The responsibility for the activation of the onsite emergency plan lies with the management. In Gujarat, all MAH units have prepared their onsite emergency plans. Many of these industries in Vadodara, Ankleshwar, and Surat have developed chemical safety programmes based on mutual aid. A number of initiatives in chemical and industrial safety have been taken up by the industries themselves. All factories have shown due diligence in instituting safety management mechanisms in their premises, in accordance with the provisions of the Factories Act.
2. Districts having Major Accident Hazard (MAH) installations have prepared Offsite Emergency Plans for chemical and hazardous substances. These offsite plans are updated every year. LCG wise pockets plan are required to be prepared as per CAEPPR Rules but currently the district offsite plan includes information about each LCG without separate LCG level pocket plans.
3. All the participating agencies in chemical and industrial disaster response such as the police, fire services, and medical services have participated in mock exercises. According to CAEPPR Rules, a full-scale mock drill of each district offsite emergency plan is an annual requirement. A full scale mock drill at LCG level needs to be conducted twice in an year.
4. Limited technical capability to respond to chemical emergencies is available with chemical industries, especially the larger units. Most units have the basic capability to deal with common and small intensity emergencies. Some large chemical units have automated and active control measures, adequate response equipment, and a well-trained response staff. Larger chemical industries also help local authorities in responding to chemical emergencies elsewhere on request but not as obligation.
5. Technical ability of public response agencies to respond to chemical emergencies in terms of qualified man power and adequate equipment is negligible except in a few larger fire stations for fires caused by chemicals (but not toxic leaks or toxic by product of fire). The public agencies such as police, fire and medical play a supporting role such as site security, evacuation, search and rescue whereas the industry is expected to provide response to control and then eliminate the hazard posed during emergency.

5.2 PLANNING ASSUMPTIONS

1. It is assumed that all MAH industries will revise onsite plans as per the guidelines referred in Section 4.2.2 so that the onsite plans are easily coordinated with offsite plans and provide actionable information for response in a case of emergency. Further, we assume that smaller Type A and Type B units have also prepared onsite plans. Overall, we assume that information on the chemical unit where the incident happens is completely and accurately available to public response agencies.
2. It is the responsibility of agencies and their officials listed under this plan to prepare a preparedness action plan to discharge their assigned role as per Section 4.1. It is assumed that the preparedness levels of the response agencies such as fire brigade, police, medical care, and other agencies have reached the desired levels.
3. It is assumed that this state CDMP is annexed by emergency response plan for isolated storages, sea (major and minor) ports, airports, railways, road transport, pipelines that respective departments have prepared as recommended in Section 4.6.

4. Wherever applicable, mutual aid agreements to conduct joint mock drills, share resources and provide coordinated response exist between industries, between industries in local authorities, between different public agencies (hospitals, police, railway, fire etc.), between local authorities and private resources (e.g., hospitals, antidote vendors, etc.), and between neighbouring districts exist as per recommendations in Section 4.6.
5. The chemical industry will report accidents as soon as the quantity threshold recommended in Section 4.2.4 is exceeded without waiting for the emergency to have potential for or actually result in offsite consequence. Local authorities will initiate actions to save lives and protect property. State and national disaster assistance, when provided, will support and supplement, not substitute the response provided by districts.
6. Emergency response actions by all response agencies are well planned, coordinated, and regularly exercised / drilled by local and district authorities as per Section 4.3.1
7. Respective agencies who have a role in the response have been given proper orientation or sensitization and training, as per their roles as recommended in Section 4.3.2. All responders are provided with proper PPE and equipment as per Section 4.5. Further, first responders are provided with emergency response guidebook 2012 as recommended in Section 4.7.5, so they can immediately assess the danger and initial isolation and protection zones.
8. It is assumed that response to chemical emergencies will be provided as per incident response system (IRS) recommended in Section 4.7.1. It is assumed that all local/district/state authorities have identified and trained incident commanders, and formed SERT, RRT and LERT.
9. There is a state-level fire department established, as recommended in Section 4.4.3, that can direct fire-fighting resources from other fire brigades, as per the need of LERT, RRT or SERT.
10. All LERT, RRT, SERT and fire stations in supporting roles are well equipped with specialist manpower and equipment resources to deal with chemical emergencies along with a regular training at different levels of response functions, as recommended in Section 4.5.
11. All local, district and state-level control rooms are well staffed and equipped to coordinate response to chemical emergencies, as recommended in Section 4.7.3. State-wide communication plan is implemented and interoperability exercises are regularly conducted, as recommended in Section 4.7.4.
12. Hazardous substances involved in an incident can be identified within a reasonable period of time. It is possible to quickly assess the potential damage, identify protective actions, and plan the response using GIS based decision support database and software, and live monitoring using field equipment, as recommended in Section 4.2.6 and Section 4.7.5. Responders (support functions) have a copy of ERG 2012 guidebook as recommended in Section 4.7.5.
13. The population most likely to be affected by emergencies are regularly trained on what protective measures may be used, expected response actions, and preparations needed to implement these actions as per Section 4.3.3. It is assumed that most of the citizens potentially affected (including evacuees) will cooperate with local officials and follow recommended protective actions. Such measures could include evacuation instructions for relocation to designated reception or shelter areas.

5.3 EMERGENCY RESPONSE ORGANIZATION STRUCTURE AND PROCESS

Section 4.7.1 describes the IRS recommended as Emergence Response structure and system. Figure 13 and 14depicts the emergency response structure as per IRT. Figure 15 provides a simplified notation of the process of emergency response as per the IRS for decision making,

communication and response during emergency. This process is common irrespective of the type of hazard or where it happens. The first responder on site may be different, the qualified IC may be different, the type of response needed may be different, the members of pre-designated IRT maybe different as per emergency type, but the process at all time is scalable, flexible, with unified command, and provides hierarchal response. Figure 16 is simplified step-by-step response mechanism.

5.4 CONCEPT OF EMERGENCY OPERATIONS

5.4.1 TRIGGER MECHANISM

1. The occupier / manager of the establishment responsible for releasing or discharging a hazardous chemical will notify incident the appropriate LCR (if available) and DEOC (whether or not LCR exists, DEOC should be notified) as per the guidelines in Section 4.2.4. Industry can additionally report to local control rooms of

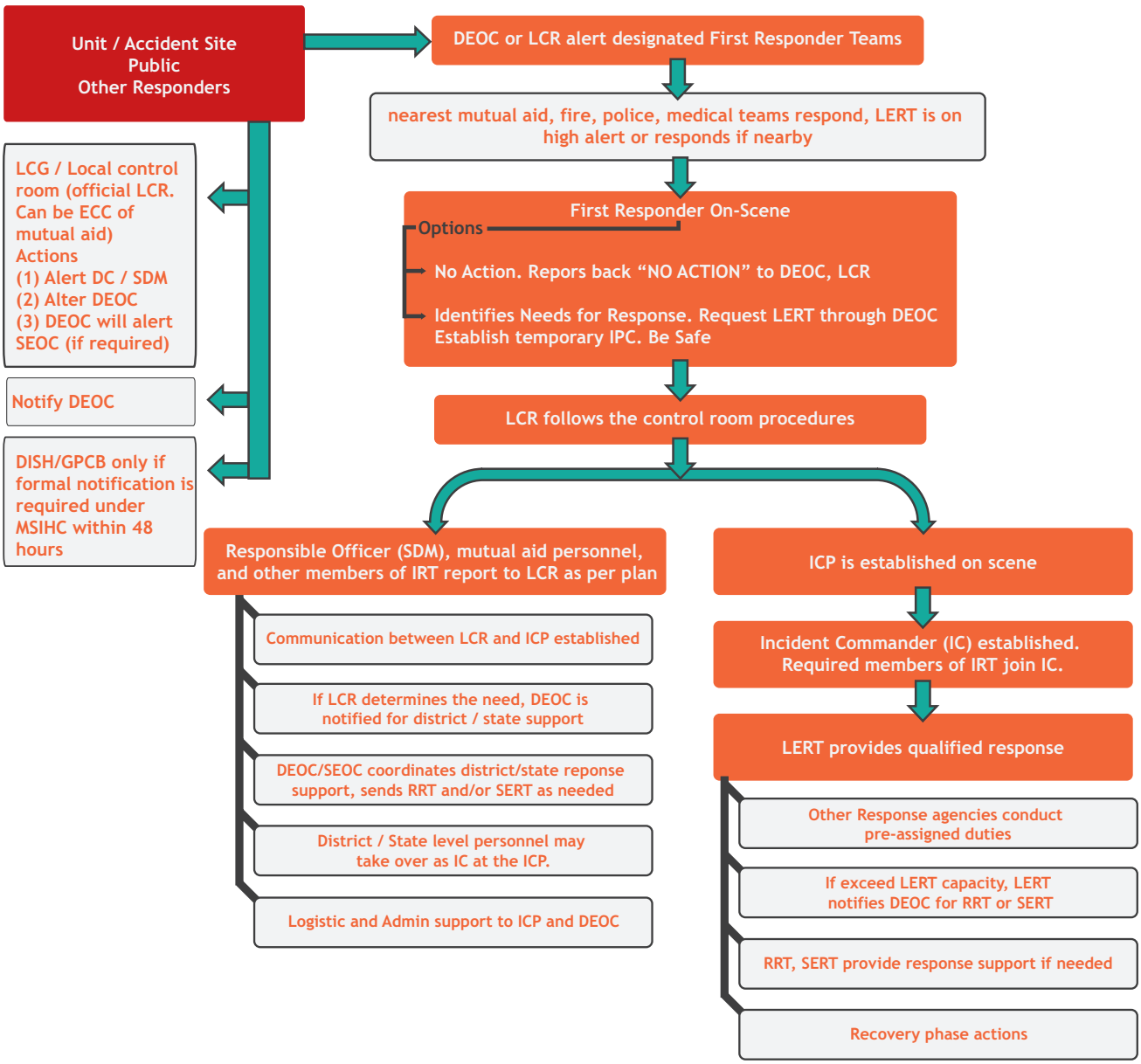

Figure 16. Emergency Response Process as per IRS (for locations without local control room)

mutual aid partners, GVK 108, and local fire and police departments, as per the local emergency response plans, but these agencies are not authorized to receive the official notification of offsite emergency; DEOC and LCR of LCG are.

a. Gujarat State Control Room is located on the ground floor of Block No. 2, New Sachivalaya, Gandhinagar. The telephone numbers are 079- 23251900/ 23251902/23251908/ 23251914 and Fax is 079-23251916. SEOC toll free number is 1070.

b. DEOC can be reached by toll free number 1077 by the occupier.

c. It is recommended that there be "one" emergency contact number 108 for general public. 108 can handle high volume of calls, has well secured central communication center, stable computer assisted dispatch, and coordinated police, medical, and fire dispatch capability. However, 108 does not have the statutory authority to receive notification of offsite emergency from the chemical industry. If 108 receives such call, they should forward the same to the DEOC to coordinate qualified response. 108 must train its responders to recognize chemical emergencies and remain safe and follow the directions of the IC

d. The trigger mechanism is purposively redundant with respect to report and alerts to both DEOC and LCR of the LCG even if LCR can report to DEOC

e. If response by offsite agencies is indeed necessary, then DEOC will notify the district collector and declare offsite emergency under his direction. DISH and GPCB regional officers are required to be notified by the occupier in the case of offsite emergencies within 48 hours, as per MSIHC Rules

2. The occupier should provide the following information to LCR / DEOC.

a. Name and telephone number of contact person.

b. Name of the chemical(s) released.

c. An indication of whether the substance is extremely hazardous.

d. An estimate of the quantity released into the environment.

e. Estimated time and duration of the release.

f. Whether the release occurred into air, water, and/or land.

g. Any known or anticipated acute or chronic health risks associated with the emergency, and where necessary, advice regarding medical attention for exposed individuals.

h. Suggested protective actions such as evacuation or sheltering in place.

3. A written accident report should be submitted by the occupier to the Local Crisis Group (LCG), District Crisis Group (DCG) as per MSIHC Rules within 48 hours on basis of debriefing post emergency. A more detailed follow-up report should be submitted within 90 days. DCG should submit such report to SCG and GSDMA, the SCG or DCG should report these in CAIRS developed by MOEF or State's own accident reporting system. The follow-up report must update information included in the initial notice and provide information on actual response actions taken and advice regarding medical attention necessary for citizens exposed.

4. Warning the public in immediate vicinity: leaks of highly toxic chemicals can result in very high concentration in the immediate vicinity of the leak for a few hundred meters within few minutes. In this zone, no external response is possible to save lives. Therefore, the best strategy is to ensure no residential population or other sensitive receptors in such a zone around the unit. Unfortunately, such buffering is often not available in reality. Therefore, if the onsite plan of the industry has identified that community in the immediate vicinity will be affected within a short period time – too short a period of time

to inform district/local authorities, properly assess the situation to determine what protective actions are needed, and then inform community as per the instruction of the IC – then there should be provisions for sounding alarms for immediate evacuations. It must be recognized that in this zone there can be fatalities even if an alarm is sounded within a few minutes of a leak depending upon the nature of the leak and chemical properties. Also, the success of alarm depends on the preparedness of the community through regular training and awareness activities. There are two options as per the discretion of DCG:

a. One, the DCG may have installed public alarms at critical locations throughout the district and sound those alarms through DEOC or LCR. DEOC/LCR and DEOC/LCR may sound alarm after seeking immediate approval from the RO or as per pre-authorization from the RO as the case may be

b. Second, the DCG and the RO has assigned the responsibility of sounding alarm to the industry and industry has installed such alarms. Industry can sound alarms as per direction of DEOC.

5. Course of Action Following the Trigger (described in more detail in subsequent sections):

a. Formal Notification Process is initiated as per MSIHC Rules if the response by offsite agencies is required

b. Protective Actions are identified and implemented based on scenario unfolding

c. Emergency Alerts are disseminated to the public

d. Local emergency response teams are activated.

5.4.2 SET UP OF THE INCIDENT COMMAND POST

1. Responding police officers, GVK-EMRI 108, local medical department and/or fire departments will receive the report of incident from DEOC officially or from the public or the occupier directly.

2. Ideally the fire department will be the first on-scene response agency, but police, EMRI ambulances, or other public agencies may also reach the site first. Irrespective, the agency who reaches first should determine a safe location for the Incident Command Post (ICP), gather all essential information, and report situation details to the DEOC. The DEOC will disseminate this information to LERT and others as required.

3. The first responders will immediately determine protective action recommendations as per their actions as per ERG (2012) unless instructed otherwise by the RO or IC.

5.4.3 ASSESS THE SITUATION

1. DEOC (or LCR) will obtain MSDS for the leaked chemical from onsite plan of the industry or other sources to understand potential hazards, control measures, medical treatment, and other details. CAMEOfm has MSDS information for hundreds of chemicals. DEOC will also use CAMEO suit (ALOHA, MARPLOT) to the extent information about the incident is available. SEOC will support in these activities if help is needed by DEOC.

2. LERT will conduct further monitoring and assess the situation whenever they arrive at the ICP. RRT and SERT may conduct more rigorous situational analysis if the need arises.

3. Situational assessment will continue throughout the response through modelling software and live monitoring.

5.4.4 STAFFING AND ACTIVITIES OF SEOC

1. SEOC staff in as per existing procedures will decide whether and which members of SCGs and GSDMA or other personnel as a part of state IRT need to be convened at SEOC to deal with the emergency situation.

2. State Chief Secretary, Secretary of Labour and Employment Department, Secretary Revenue Department and Relief Commissioner, and CEO GSDMA or their designated representatives form

the core of SCG and form the command, with Chief Secretary as the head.

3. All communication channels with responders, technical experts, regulatory bodies, DEOC, other local control rooms if any will be established by SEOC as per the need to coordinate support from out of the district. DEOC (or LCR) will continue to coordinate the response activities at the incident site along with ICP. It is expected that SEOC, DEOC, and LCR have fail-proof communication systems and up-to-date contact information.
4. SEOC will gather all required onsite plans, offsite plans, action plans, GIS based CAMEO suit (ALOHA + MARPLOT + CAMEOfm), database of resource available within the district, neighbouring districts, ERC (RRT), SERT, private industry, etc.
5. Disaster information is managed by the SEOC through the IMO as per IRT. This representative(s) will collect information, analyse information, and disseminate information to state- and local-level counterparts as needed.
6. SEOC will assess the overall situation and determine whether the CCG at MoEF should be notified. The Ministry of Environment and Forests has set up a Control Room in Room No.705, 7th Floor, B-Block, Paryavaran Bhavan, CGO Complex, Lodi Road, New Delhi-110003. The contact information is as follows: During Office Hours: 011 24360734 (Phone), 011 24360678 (Fax), 011 24363577 (Fax). Off-hours and Holidays: 011 24360734 (Phone), 31-66185 DOE-In (TELEX), 31-63015 WILD-IN (TELEX).
7. If required, SEOC will seek national level support from NDMA and NDRF as well.
    a. 6th NDRF Battalion at Gandhinagar: 079-23202540 (tel), 079-23201551 (fax), 09428826445 (cell)
    b. NDRF Head Quarter Control Room: 011-26107953 (tel), 011-26105912 (fax), 09711448595 (cell)
    c. NDMA Control Room: 011-26701728 (tel), 9868891803 (cell)

5.4.5 SELECT PROTECTIVE ACTION(S)

1. Post intimation of emergency/ incident, the LERT will rush to the scene and assess if response by offsite agencies is required in discussion with site controller and/or incident controller. If yes, protective actions will be determined on basis of situational awareness. If not, the LERT will stay on scene until the onsite personnel can effectively control the leak and LERT will leave after ascertaining that emergency is tackled. Next steps assume that offsite response is needed.
2. The DEOC will notify all the response agencies on the salient aspects of the hazard identification, required PPE, and possible ways to control it. This could be on the basis of the MSDS of chemicals, CAMEO chemicals or discussion with experts. Note, this activity may have to be supported by the SEOC in case the information is not available at the DEOC.
3. Use of CAMEO suite software and ERG (2012) will provide estimates of potential damage and help in determining the protective actions to the responders rushing to the site.
4. The DEOC will consult with the IC to determine appropriate protective actions to ensure the health and safety of local citizens as per pre-determined criteria. Protective actions may include evacuation and/or shelter in place orders.

5.4.6 CONTROL THE HAZARD

1. Establish Incident Command Post
2. Declare emergency
    a. The district collector (for DCG) or SDM (for LCG) should formally declare a chemical emergency is taking place if indeed this is the case. In case of chemical emergencies, the ICP is established first and then DC / SDM will be reached as soon as possible for official notification and declaration of offsite emergency. A declaration is useful for confirming that a chemical emergency has originated, for accessing local, regional or

state level resources, and to establish legal authority for all responders to manage the emergency as per the plan.

3. Activate Emergency Response Team(s) through IRS
    a. Response to a chemical release will be immediately and initially conducted by local ordinary responders—medical/GVK-EMRI, fire fighters and police officers—that have been trained to assess a hazardous situation, request appropriate assistance, and coordinate with the DEOC (basic awareness training).
    b. LERT will respond first.
    c. If LERT capacity is not sufficient, RRT and/or the SERT will supplement local response capacity.
    d. The following triggers would necessitate the activation of an RRT:
        i. Presence of a highly toxic chemical;
        ii. Presence of an highly hazardous substance in an uncontrolled release situation;
        iii. Fires or situations involving unknown hazardous substances;
        iv. Presence of a combination of chemicals or compounds that create complex mixtures with unknown public health or environmental consequences; or
        v. Large volume release of any hazardous chemical that has or is likely to impact the general public or the environment.
    e. The following triggers would necessitate the deployment of the SERT:
        i. Presence of a toxic and hazardous chemical where control of the source will require extended resources beyond the capacity of an RRT
        ii. Release of highly hazardous chemical in an uncontrolled situation where the monitoring equipment or personal protective equipment (PPE) needed for safe operations is not available with the RRT
        iii. Fires or releases involving unknown chemicals where the documentation, monitoring or sampling capabilities are beyond the capacity of the RRT
        iv. Presence of a combination of chemicals or compounds that create complex mixtures with unknown public health or environmental consequences where the documentation, monitoring, or sampling requirements are beyond the capacity of RRT
        v. Large volume release of any hazardous chemical that has or is likely to impact the general public or the environment that are beyond the capacity of a RRT.
4. Implement Protective Action(s)
    a. Warn the public as per advice of IC, and DCG/LCG members.
        i. The appropriate public warning messages and the system(s) to deliver the message will be selected based on pre-scripted messages and media
        ii. DEOC may establish and manage a phone bank or toll-free hotline to provide emergency information to the public.
        iii. For major emergencies, SEOC will also support in information dissemination, media management, and providing logistic and administrative support to the district administration.
    b. Secure the site
        i. Local police officers are responsible for traffic management, control of the impacted area, verification of responder credentials, and daily security
        ii. In the case of a complex, widespread, or long-term chemical disaster, local police departments may request assistance from home guards,

civil defence groups, neighbouring districts force, or the state force by coordinating through the DEOC.

5. Ensure Site Safety
    a. The IC will ensure that a Site Safety Plan (SSP) is available prior to establishing control zones and conducting initial reconnaissance. SSP can be prepared on basis of information provided by the industry in their onsite plan as well as any incident specific information. All response team members will be briefed on the SSP. When a command is handed over to state level IC, the state level personnel at ICP should be briefed on SSP as well. A SSP template is provided as Appendix B.
    b. Control zones, established by IC, will be communicated to all response team members, emergency medical services (EMS) agencies, and other field personnel.
    c. The other member of IRT at ICP (the safety officer to be specific) will support the evaluation of personal protective equipment (PPE) and review the SSP requirements for initial reconnaissance.
    d. All entry team, rescue team, and decontamination team members will undergo initial medical monitoring prior to entering the site.
    e. The IC will identify an appropriate decontamination process for response team members, and local fire fighters/EMS personnel will establish a decontamination station and contamination controls.
    f. Additional resources may be requested from SEOC in the form of licensed medical professionals, trained fire fighters, decontamination equipment, or consumable decontamination supplies.
6. Conduct Initial Reconnaissance
    a. The appropriate response team will verify PPE requirements, conduct site monitoring to establish levels of concern, and assess community exposure pathways.
    b. The DEOC will support the modelling of the chemical release scenario (if applicable) to assist the emergency response teams.
    c. RRT and SERT (state level response) are expected to have onsite modelling capabilities (the list of equipment in Section 4.5 includes laptops). However, SEOC may have to provide specialist modelling support as well.
7. Conduct Site Entry and Exit
    a. Once specific response actions are identified, the relevant response team will don the appropriate PPE and execute the required mitigation tasks under the leadership of IC or OSC.
    b. If multiple entries are required, each entry and exit will be followed by decontamination, medical evaluation, and rotation through primary response stations.
    c. When the situation is stabilized, the response team will exit the hot zone, undergo decontamination, be assessed by medical personnel, rehabilitated as needed, and participate in a post-response debriefing with incident command staff.

5.4.7 PROVIDE SHORT-TERM RELIEF TO THE PUBLIC

The DEOC will logistically support relief efforts and/or deploy specialized personnel to provide medical screening, emergency medical care, documentation of medical treatment, temporary shelter, and basic necessities (i.e., water and food) to citizens that were directly affected by the chemical release. Immediate relief funds can also be released as per existing norms and procedures. SEOC will support DEOC in these functions if required. The IRT has a special logistics branch to coordinate such efforts.

5.5 EMERGENCY MEDICAL RESPONSE

Emergency medical units should collaborate with stakeholders to develop, implement and maintain a

comprehensive strategy to prepare for, respond to, and recover from health emergencies of known and unknown origins. While this CDMP includes a plan for an emergency medical response, the Department of Health will prepare a comprehensive state level medical emergency management plan as discussed earlier. The following is only a stop gap arrangement and does not undermine the acute need for a comprehensive medical response plan by the Department of Health.

5.5.1 RESPONSE CAPACITY ASSESSMENT AND PLANNING DURING RESPONSE

The response capacity of health services should be assessed with particular attention to determine the following: a) Availability of first-line and backup emergency medical services (including health personnel and facilities); b) Availability of protective equipment; c) Use of clear diagnostic criteria, standard treatment regimens, and compliance with them; d) Availability of specific medication (e.g. antidotes); e) Availability of facilities for decontaminating exposed individuals (including health workers); and f) Vulnerability of the health facilities to the chemicals.

The Department of Health will assess the deployment needs of resources from outside, based on preliminary findings (e.g. qualified technical personnel, drugs, logistics, and communications support). The Department of Health will make take decisions on following issues:

- Appropriate triage and case management
- Appropriate care for those evacuated to temporary shelters
- Collection, identification, and management of dead victims
- Advise SCG on possibility of evacuation versus shelter-in-place.

5.5.2 RESPONSE BY QUICK RESPONSE MEDICAL TEAM (QRMT)

1. QRMT is a self-sufficient unit that provides a staging and triage base for evaluation and management at chemical incident site prior to transporting a victim to a hospital. QRMTs should be activated immediately with the following considerations:
   a. Additional QRMT teams should be activated as soon as the need has been assessed
   b. Proper communication must be established between DEOCs/ ERCs, designated health care units, district level health care response units, and concerned tertiary care health facilities
   c. Rapid Diagnostic kits must be available to diagnose the chemical agent and thereby provide proper treatment
   d. Psychosocial support should be given to the worried well category of affected community
   e. Specialized ambulances, various medical kits for pre-hospital care, and a special vehicle must be available at the incident site so as to provide adequate diagnostic and specialized treatment support for all the contaminated victims.
2. The chemical incident victim requires immediate resuscitation measures at incident site and evacuation in specialized vehicles. An emergency medical service exists to fulfil the basic principles of first aid in contaminated zones, which are to Preserve Life, Prevent Further Injury, and Promote Recovery. Following six stages / actions should be followed by medical responders as per their training on the same.
   a. Early detection of chemical agent and design of medical response strategy accordingly.
   b. Early reporting: The police force at the incident site will call the emergency medical services and provide details to enable a specialized response.
   c. Early response: QRMTs will arrive at the site as quickly as possible, enabling pre-hospital care to begin.
   d. Good on-scene care: The emergency medical service provides appropriate and timely interventions to treat the victims and incident site decontamination at pre-established medical post itself.

e. Care in transit: The emergency medical service loads the patient into a suitable, specialized transport vehicle and continues to provide appropriate medical care throughout the journey to reduce mortality and morbidity in the golden hour.

f. Transfer to definitive care: The patient is handed over to an appropriate care setting, wherein hospital level decontamination and necessary treatment including antidotes etc., will follow.

3. The definition of key concepts of medical response are as follows

a. Triage: Triage is the process of determining the priority of patients' treatments based on the severity of their condition. Triage may result in determining the order and priority of emergency treatment, the order and priority of emergency transport, or the transport destination for the patient. Those who have been very close to the leak site are highly intoxicated and should be given higher priority.

b. Resuscitation: Resuscitation is a series of actions taken to establish normal breathing, heart rate, and response in a victim with abnormal vital signs. It uses a systematic approach, based on airway, breathing, and circulation to assess and treat a victim intoxicated by gases.

c. Decontamination: Decontamination is the reduction or removal of chemical agents from body. Three basic methods of decontamination are physical removal, chemical deactivation, and biological deactivation of the agent.

5.5.3 SEARCH AND RESCUE

In the case of a leak of chemicals, sheltering-in-place and/or evaluation need to be done as per the planning and specifics of the incident that is unfolding. However, once the chemical incident is in a phase where the first responder can enter an affected area either using personal protective equipment or when the chemical cloud is of low enough concentration, search and rescue of an affected population is a key task. Each local area and district should decide which agency or agencies will conduct the search and rescue. Search and rescue can be done by police, /or fire first responders onsite. However, such activities must happen only as per direction of the response commander. Proper coordination between all response agencies tasked with search and rescue is a must and requires thorough joint planning and joint practice in non-emergency time.

5..5.4 EVACUATION OF CASUALTIES FROM INCIDENT SITE

The most basic emergency medical services are provided as a transport operation only to take patients from their location to the nearest medical treatment. Generally speaking, the levels of service available will fall into one of three categories; Basic Life Support (BLS), Advanced Life Support (ALS) and an Intermediate Life Support (ILS). Transportation of casualties should occur in ambulances fitted with state of art equipment and trained MFRs. The system should work in coherence with EMS system of district.

5.5.5 ACTIVATION OF CRISIS MANAGEMENT AT HOSPITALS

1. In the case of chemical disasters, the crisis management at hospital shall be immediately activated by triggering inbuilt mechanisms for prompt emergency medical response. The steps taken in the first few minutes will determine the effectiveness of disaster mitigation. Quick Reaction Medical Teams (QRMTs) with PPE will reach the accident site immediately along with resuscitation, protection, detection, and decontamination equipment and materials. Resuscitation, triage, and evacuation work must be done as per SOPs.

2. In hospitals, the disaster victims shall be decontaminated and kept in a clean, special ward. Initially, based on early symptoms, the type of chemical is assumed, symptomatic treatment initiated, and an antidote administered. Blood is then analysed to find out the exact chemical

agents and further course of treatment is decided. All supportive treatment must be given in the hospital immediately.

3. The hospital casualty room should be well-equipped with resuscitation equipment such as oxygen cylinders, suction apparatus, airways, laryngoscopes, ventilators, pulse oxymeters, defibrillators, life-saving drugs, antidotes, auto injectors, and dressing material. Medical treatment includes treatment with antidotes, medical first aid kits, trauma care kits, burn case measures, decontamination kits, and drugs.
4. People with life-threatening injuries and illnesses need critical care. Critical care involves close, constant attention by a team of specially-trained health professionals. It usually takes place in an intensive care unit (ICU) or trauma centre. Problems that might need critical care treatment include complications from surgery, accidents, infections, and severe breathing problems. Monitors, intravenous (IV) tubes, feeding tubes, catheters, ventilators, and other equipment are common in critical care units.
5. Administration of specific antidotes and other treatments should be initiated as per pre-determined treatment protocol for given chemical exposure and symptoms.

5.5.6 PROTOCOL FOR MEDICAL MANAGEMENT

The Department of Health should develop chemical-specific medical management protocols for treating exposed patients. The protocol will provide information on the following issues:

1. Description (synonyms, appearance, routes of exposure, potential for secondary contamination, physical properties table, sources, and uses)
2. Health effects (organ systems affected by acute exposure, potential sequel, effects of chronic exposure)
3. Pre-hospital management organized by hot zone, decontamination zone, and support zone (personal protection, decontamination, support, triage, transportation)
4. Emergency Department Management organized by the decontamination area and critical care area (specific medical procedures to treat the exposed patient, patient disposition)
5. Patient information sheet (the exposure and its potential effects, follow-up instructions)
6. Administration of specific antidotes and other treatment profile.

5.5.7 RAPID ASSESSMENT OF HEALTH CONSEQUENCES

A chemical emergency should be first assessed within 24 hours following the incident. A more comprehensive assessment should be carried out later. The Department of Health will contact the nearest designated hospital for chemical emergencies and direct it to perform the rapid assessment. The rapid assessment consists of:

1. Confirming the occurrence of a chemical emergency
2. Determining the source, site, type, size, and distribution of the release
3. Identifying the specific types of chemicals and their reaction by-products
4. Determining the population at risk and the health impact
5. Assessing existing health response capacity.

The Department of Health, in collaboration with GPCB, will compile the following information on the basis of rapid health assessment:

1. Determine the population at risk. Gather information on the proximity and size of residential neighbourhoods, the location and numbers of high-risk populations (e.g. individuals with chronic illnesses, pregnant women, and infants).
2. Evaluate toxicological risks and human exposure pathways. Environmental exposure and body burden assessments are usually not feasible during the acute phase of the accident. These require complex sampling and labour-intensive analytical procedures.
3. Describe morbidity and mortality. For this to be

done systematically, it is essential that a working case definition is developed, and consistently applied. During the actual emergency, it is not feasible to conduct a survey. However, it is important to collect information on whether there has been increased morbidity or mortality caused by the release.

5.5.8 PLAN FOR ANTIDOTES FOR CHEMICAL AGENT EXPOSURES

Approximately 10 % of victims would need immediate treatment on-scene as soon as the emergency responders arrive. These responders must have antidotes, proper training on administration and protective gear to save these patients. 70 – 80 % of the victims would arrive at hospitals directly, most of them using alternate modes of transport such as taxis or private vehicles.

While not all chemical exposures need antidotes to treat them, some do. It is assumed that antidotes are stocked at the local and regional levels in adequate quantity, as per the antidotes plan. It is assumed that hospitals have a sufficient stock of appropriate antidotes that is immediately available.

5.5.9 REQUISITION OF PHARMACEUTICAL STOCKPILE

It is assumed that a pharmaceutical stockpile is available in the state, as per the antidotes plan provided to GSDMA. This stockpile is a state resource of a large cache of drugs and medical supplies that can be distributed to the site of possible incidents. The plan is to deliver critical medical resources to the site of a state emergency when local public health resources would likely be or have already been overwhelmed by the magnitude of the medical emergency. The stockpile is stored strategically in locations around the state in such a way that the supply will reach the incident site(s) at the earliest possible time, the average acceptable time being 12-24 hours. The stockpile is controlled by the SEOC and can be authorized for release by the appropriate authority.

SEOC will coordinate with DEOC so that stockpile assets can be efficiently received and distributed upon arrival at the site. The state officials will transfer responsibility for the materials to the appropriate district or local authorities once it arrives at the location. District and local authorities must be prepared to repackage and label bulk medicines and other stockpile materials according to established SOPs.

5.5.10 VENDOR MANAGED INVENTORY

It is assumed that an appropriate Vendor Managed Inventory (VMI) programme is established in the state. If the incident requires additional pharmaceuticals or medical supplies, follow-up Vendor Managed Inventory supplies will be shipped to arrive within 24 to 36hours. The VMI packages can be tailored to provide pharmaceuticals, supplies, and/or products specific to the suspected or confirmed agent or combination of agents. The vendors/ manufacturers under the VMI program are contracted by the state Central Medical Store to provide the requested quantities of drugs/supplies at short notice. These inventories may be transported directly to the location(s) specified in the request by the Central Medical Store.

5.5.11 PSYCHOSOCIAL CARE

In chemical emergencies, the psychological shocks and actual exposure related complications pose a challenge. The medical teams and hospitals should be trained and prepared to provide psychosocial care to patients during emergency. Even in the recovery and rehabilitation phase, psychological care is an essential component.

5.5.12 PUBLIC HEALTH RESPONSE

During a chemical disaster, there are subsequent damages incurred that require special attention from the Department of Public Health:

- Contaminated water supply
- Lack of food and safety of food is a major concern
- Displacement of community from its natural habitat.

The Department of Health will provide the response to ensure public health by preventative approaches, as per their departmental action plan to manage above-mentioned conditions.

5.5.13 MEDICAL RESPONSE TO LONG TERM EFFECTS

In the post-disaster scenario, some of the casualties will develop sequels due to chemical injuries. These cases

may need regular follow-up, medical care, reconstructive surgery, and rehabilitation. Close monitoring is required to identify and treat long term health effects such as blindness, interstitial lung fibrosis, genetic disorders, neurological deficiencies, etc. Psychosocial care is also a key component of long term care. It is valuable to create a database of long term effects of chemicals and their management as a knowledge resource.

5.6 RESPONSE TO HAZCHEM TRANSPORTATION EMERGENCIES

In cases of emergencies involving transportation of hazardous chemicals, the organizational structure for response, concept of emergency operations, and roles and responsibility of key stakeholders remains almost the same as those in Section 5.3 and 5.4. Following are special considerations while responding to transportation emergencies.

5.6.1 PIPELINE TRANSPORTATION

As a part of a separate report on improving response mechanism, PRESTLES has suggested that Emergency Response and Disaster Management Plan as per the regulations of the Petroleum and Natural Gas Regulatory Board should be developed. GSDMA already has conducted GIS mapping of pipelines in the state which can be useful in this regard . As discussed in previous sections, pipelines are usually underground and pose less risk than road transportation. The main source of pipeline related accidents is the accidental rupturing of a pipeline during construction and digging earth. Usually large pipelines are carried through areas with sparse population and have good protection on either side along with control measures such as automatic shut off valve that limit the amount of leak. In case of a chemical leak from a pipeline, the following apply:

1. The initial notification may be done by the occupier/owner of the pipeline or by local community or by contractor who caused the damage to the pipeline. Therefore, it is important that all pipeline nodes and routes clearly display the emergency contact information in case of any accident with the pipeline.
2. Once initial notification of accident is obtained, the response operations are similar to that in Section 5.3

5.6.2 ROAD TRANSPORTATION

As a part of a separate report on improving response mechanism, PRESTLES has suggested that a highway chemical disaster management plan be developed. This plan will be based on survey of vulnerable population along the route and vulnerability scenario of all chemicals being transported. The following special actions are taken during an emergency involving a road tanker carrying hazardous chemical.

5.6.2.1 TRIGGER MECHANISM

1. The driver of the tanker is expected to be trained to handle an emergency situation and have up to date contact information. He will contact the consignor and consignee of the cargo he is carrying and the local police station (the number should be available with the driver) on priority basis.
2. The driver will also notify DEOC (1077).
3. The information driver should provide include
    a. Exact location of the tanker
    b. Identification of any critical or sensitive structures nearby (schools, hospitals, etc.)
    c. Name and telephone number of contact per consignor and consignee
    d. Name of the chemical(s) released
    e. An indication of whether the substance is extremely hazardous
    f. An estimate of the quantity released into the environment
    g. Estimated time and duration of the release
    h. Whether the release occurred into air, water, and/or land
    i. Any known or anticipated acute or chronic health risks associated with the emergency, and where necessary, advice regarding medical attention for exposed individuals

j. Suggested protective actions such as evacuation or sheltering in place.

4. The subsequent actions will be similar to those in Section 5.3 and 5.4. In case of road emergencies, police may be first on site ahead of fire brigade. Irrespective of who arrives on the site first, all first responders should have basic training to identify safe isolation distance and initial protective actions, and identify situations where they must wait for a qualified emergency response to control the situation.

5.6.2.2 INFORMATION AVAILABLE WITH DRIVER

Under the Motor Vehicle Act 1988, every motor vehicle carrying hazardous substances should have the following:

1. Emergency Information Panel with information on: (a) Correct, technical name of the substances being transported; (b) UN-number, HAZCHEM code, and UN hazard class label; (c) Emergency contact telephone; and (d) Any specialist advice
2. The driver of the vehicles should possess the TRANSPORT EMERGENCY CARD or TREMCARD as per Central Motor Vehicles Rules 132 (2). TREMCARD carries detailed instructions on response actions for fire, spillage, or leakage. It also includes instruction to driver on his actions.

5.6.2.3 PROTECTIVE ACTIONS BY THE DRIVER

1. As per his training and hazard posed by the chemical, stop traffic and general citizens from approaching the accident site until police arrive for help.
2. The driver of the tanker must be given appropriate level of protective clothing if he is expected to assist in response. He needs to protect himself before attempting response. If appropriate PPE is not available, then he should move to a safe distance and await response from offsite agencies.

5.6.2.4 ROLE OF CONSIGNOR AND CONSIGNEE IN RESPONSE

1. Consignor must ensure that the driver of the tanker is well trained, carries valid license, has TREMCARD, and the emergency information panel is clearly visible as per the rules on the tanker.
2. The driver should be provided with up-to-date contact information of police stations and DEOC on route through Gujarat.
3. The driver should have contact information (phones and mobiles) of contracted external experts, and in-house experts at consignor and consignee.
4. The driver should be provided with appropriate protective equipment if he is expected to assist in response.
5. The driver should be instructed to report at Department of Transportation check posts at entry points to Gujarat and register themselves.
6. Driver should handover TREMCARD to responding agencies.
7. Consignor and consignee should coordinate with DEOC / SEOC to make arrangement for containment, transfer of content to other vehicles, and other response actions.
8. Consignor and consignee should be encouraged to identify experts enroute to assist in emergency situations and include their contact information on TREMCARD.
9. If consignor and consignee are a part of mutual aid group such as the one existing for Chlorine transport in Gujarat, they should include contact information of the mutual aid groups on TREMCARD and train driver accordingly.

5.6.2.5 INITIAL ACTIONS BY POLICE

1. Police should immediate notify DEOC
2. The most important action by police is to cordon of the site of accident, regulate traffic, and evacuate/shelter in place citizens in close proximity on priory basis.
3. In case of flammable gas leak, the source of ignition is often a passing vehicle or an electrical transmission tower or substation. Depending on the location of the site of accident and the

chemical involved, not only traffic but electricity supply to the area may have to be stopped by police who may reach the accident spot before other agencies.

5.6.2.6 INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCE

Cordoning off and evacuation decisions are based on the safe distance for isolation and protective actions. ERG (2012) provide guidance on protective actions such as the effect of the chemicals, response information, isolation distance, protection distance, and other useful information for first responders such as the police.

5.7 ROLES AND RESPONSIBILITIES AS PER SCG 2008 RESPONSE PLAN

The following roles are responsibilities are assigned as per the SCG 2008 Response Plan. However, as recommended in Section 4.1, it is imperative that all response agencies and state departments develop their own preparedness action plan to fulfil the duties assigned to them in this plan.

5.7.1 FIRE SERVICES

1. Fire services are provided by three agencies within the state: municipal corporations and municipalities, public and private sector industries, and Gujarat Industrial Development Corporations (GIDCs).
2. The role of fire brigades during a chemical accident is to assess the situation, request additional support if local capabilities are inadequate, secure the scene in coordination with police officers, and send status updates to the district control room.
3. All local fire departments are expected to have developed the capacity to respond to minor and localized chemical leaks and other incidents and certainly to typically expected fire hazards in their jurisdiction. A strong and capable fire department is a precursor and a building block to a chemical response capability.
4. Normally, the GIDC industrial estate and municipal corporation, in whose jurisdiction the accident has taken place, will rush the available fire brigades to the scene.
5. If more fire fighting resources are needed by the IC, they will be sent from the other municipal corporations and GIDC estates as per coordination from DEOC and SEOC. The SCG, with help from the State Fire Department, (we recommend Gujarat establish a state-level fire department) must create a state-wide protocol of mutual aid in providing fire services. Secretary, Urban Development will coordinate the deployment of fire tenders from other places until there is a special State Fire Department. Secretary, Industries will coordinate redeployment of GIDC fire tenders and help from private and public sector industries from other places.
6. Anup-to-date database of contact information and resources available with GIDC fire brigades and private/public industries should be maintained regularly. A list should be made available to SEOC and DEOC.
7. A equipment maintenance program will be established to assess resource needs and their maintenance
8. Regular training or the staff though specialist courses and mock drill will be conducted as recommended in this CDMP.

5.7.2 HOME DEPARTMENT AND POLICE

1. The Director General of Police (DG) (or the representative) will report to SEOC when required. The DG is responsible for establishing contact with the District Police Control Room immediately to receive a situation report and assess the operational requirements for police officers.
2. The DG will issue an alert to the DIG and the surrounding districts. He will direct all the police officials and forces in adjacent districts to be deployed if necessary. The DG will also contact the Central / Gujarat Industrial Security Forces and other paramilitary forces to seek their deployment in case SDRF and NDRF resources

fall inadequate.

3. The DG will ensure that the police forces required for traffic management, law and order, evacuation, site security, and wireless communications are available to the district authority.
4. The DG will ensure that police forces will not enter the contaminated area without the permission of IC.
5. The DG will ensure that police officers have basic chemical awareness training and use of ERG 2012 guidebook as recommended in this CDMP. Police will be trained to cordon off the initial isolation area, evacuate or shelter in place, and access control at the accident site.
6. The DG will review the traffic management in the area. The primary aim would be to ensure transport of the injured to the hospital, easy access for emergency responders, and safe evacuation of people from the danger zone.
7. The DG will coordinate with transport to issue directives that all private and public trains and buses be diverted from the disaster area.
8. The DG will coordinate with the district SP to ensure that public order is maintained, and no one takes undue advantage of the situation.
9. In case of inadequate communication infrastructure at the local level, police wireless sets and operators will help IC and first responders to communicate with DEOC.
10. DG will coordinate with district SP to immediately assess the cause of the accident and direct investigations and other immediate actions commensurate with suspicion of cause of accident. In case of terrorism or sabotage suspicion, DG will mobilize anti-terrorism and forensic squad immediately to obtain as much evidence as possible even with help of national security agencies.

5.7.3 DEPARTMENT OF HEALTH

1. The Secretary, Health Department and the Commissioner of Health will provide necessary and emergency medical experts to SEOC.
2. State experts will refer to the Medical Management Plan for specific details regarding diagnostic support services such as blood banks, radiology, pathology, pharmacy, paramedics, Red Cross, NGOs, and volunteer personnel. While operational concepts of medical responses are provided as a section of this plan, a detailed state medical emergency management plan should be annexed to this plan.
3. Health department will make required antidotes available in adequate quantities and sufficient locations as well as make a provision for a bulk supply of antidotes as and when required. Antidotes availability will be ensured at ambulance and hospital levels as well.
4. The health department will ensure that medical responders have basic chemical awareness training to recognize safe actions during a chemical emergency, to keep them safe, and not to make the situation worse. Health department may identify specialist training requirements and conduct the same for some of their personnel as per the medical DMP.
5. A database of contact information and key resources (beds, burn units, antidote availability, etc.) will be maintained at the state level for all public hospitals and for private (industry and other) hospitals with whom a mutual aid agreement for sharing resources is made.
6. Health experts will consider the intrinsic toxic potential of the released chemical(s), potential concentration(s), estimated duration of exposure, and public health impacts based on situational details from DEOC.
7. Health experts will provide advice and guidance

for protective actions, public warning, triage, and emergency medical transportation.

8. The SEOC will contact the Civil Surgeon/CMO and the District Health Officer of the concerned district and discuss the deployment of necessary medical resources including decontamination equipment and supplies, ambulance units, and other specialized assets requested by the incident commander.
9. The SEOC will work closely with DEOC to alert major hospitals near the impacted area and coordinate GVK-EMRI 108 and other ambulance units.
10. Health personnel at SEOC will collect information on the number of deaths and injuries, the nature of the injuries, and likely long-term medical treatment requirements from DEOC.
11. In case the nature of contamination requires national level support, medical experts will coordinate with national bodies to ask for the necessary medical assistance of experts, doctors, and equipment. The relevant agency for emergency medicine in the Government of India is the Directorate General of the Health Services (DGHS) in the Ministry of Health and Family Welfare. The DGHS has set up the Emergency Medical Relief Cell for dealing with these contingencies.
12. The health department will assess the medical needs of the area region on the basis of likely long-term consequences and take steps to equip local medical facilities for treating people on a long-term basis. The SCG will make preparations for the provision of financial assistance for long-term medical treatment.

5.7.4 GUJARAT STATE DISASTER MANAGEMENT AUTHORITY

1. GSDMA will act as a part of SCG in coordinating the response and deploy required officers to SEOC.
2. GSDMA will partner with Revenue department to maintain, improve and manage SEOC.
3. Upon activation for a chemical disaster, GSDMA will help SEOC ensure the activation of all relevant state agencies to staff the SEOC as required.
4. GSDMA will support creation of LERT, RRT and SERT and ensure deployment of RRT and SERT through SEOC. GSDMA will also coordinate with NDMA, NDRF, and CCG to seek national support if required.
5. GSDMA will help LCG and DCG in community preparedness for chemical emergencies through funds and technical knowledge.
6. GSDMA will promote appropriate level of training for first responders, specialist responders, regulatory agencies, LCG and DCG members, and industry on topics related to chemical emergency management through GIDM and monitor the outcome and credentials post training.
7. GSDMA will strengthen SCG, DCG and LCG functioning in terms of regular meetings, updating of plans, review of preparedness status, identifying needs, and actions plans of individual department and agencies playing a role in disaster management. GSDMA may provide required financial and technical support.
8. Maintain a list of suppliers and vendors that can provide essential chemical disaster response supplies on an urgent basis if needed. Make provisions for and ensure appropriate emergency procurement processes are followed during disaster response operations.
9. Make provisions for assessing the cost of disaster response by tracking and documenting all disaster-related procurements, contracts, rental agreements, labour hours, and equipment hours. Make policies and procedures for recovery of these costs from the occupier if applicable.

5.7.5 DEPARTMENT OF REVENUE / RELIEF COMMISSIONER

1. The Relief Commissioner, through the Department of Revenue, will provide immediate relief to all affected citizens and will most likely be chosen by the chief secretary (state level RO) to head

the logistics branch under IRT.

2. Relief may consist of ex-gratia financial assistance, temporary shelter, water, food, and transportation back to homes when the disaster area is safe.
3. The Relief Commissioner may provide assistance for reconstruction depending upon the nature of damages to the private property and assets.
4. The revenue department has established and operates SEOC. They should coordinate with GSDMA to upgrade, maintain and operate SEOC.

5.7.6 DEPARTMENT OF LABOUR AND EMPLOYMENT / DIRECTOR INDUSTRIAL SAFETY AND HEALTH (DISH)

1. Conduct regular review and planning meetings with chairman of SCG, DCG and LCG as member secretary of these committees.
2. Review onsite emergency plans from MAH installations during the preparedness phase and ensure that information is up-to-date and usable in time of disaster.
3. Promote onsite emergency planning at non-MAH units.
4. Promote industrial safety programs in industry to reduce the risk to the workers as well as the public and environment by preventing or minimizing the effects of chemical emergencies.
5. Conduct accident investigation and suggest improvement to the unit as well as update DMP as required from the lessons learned.
6. Help coordinate mock drills in industries and offsite drills with help of DPO and other members of SCG, DCG and LCG.
7. Coordinate with GSDMA in maintenance and updating of state, district and local CDMP.
8. Provide experts to SEOC during a chemical disaster.
9. Provide inspectors to train, drill, and deploy with the SERT if required.
10. Assist the Relief Commissioner in providing vocational guidance, labour training, and other employment services to citizens affected by a chemical disaster.

5.7.7 STATE FORESTS AND ENVIRONMENT DEPARTMENT AND GUJARAT POLLUTION CONTROL BOARD

1. SFED or GPCB will send appropriate officer to SEOC as required to guide the emergency response. GPCB will guide SEOC and DEOC on the environmental and health consequences of a chemical release. GPCB will provide expertise to assess resource requirements and determine potential damage to environmental assets in the state (forests, water bodies,) as well as public health effects of chemical emergency. GPCB will coordinate with health department to determine human health impacts.
2. GPCB will guide and monitor the efforts for site remediation and restoration by the occupier of the industry. In case, occupier is not available (shut down factories) or not capable (too small a factory), the GPCB may lead the efforts as well and recover the cost from the responsible party (if any).
3. GPCB will ensure proper and safe disposal hazardous wastes from operational and shut down industries, isolated storages and other producers. GPCB with help of DISH (and powers of DISH under the Factories Rules) will require hazardous waste TSDF facilities to prepare process safety plan, conduct safety audits, and prepare onsite emergency plans.
4. GPCB will assess vulnerability of critical environmental assets such as biodiversity hotspots, forests, and water bodies and make a mitigation plan to protect against posed hazards.
5. GPCB will coordinate with DISH to share information on quantity of hazardous chemicals stored and ensure that proper pollution control measures are established for such storages.
6. GPCB will provide laboratory support the testing hazardous substances sent from the disaster scene.

7. GPCB will monitor air and water pollution after chemical emergencies to assess whether it is safe to return to the area and consume usual activities.
8. GPCB will investigate chemical emergencies that flout ambient environmental quality and point source quality related rules and norms as and if requested.
9. Under the Public Liability Insurance (PLI) Act, 1991, MoEF has published the list of chemicals and threshold qualities beyond which the occupier or owner must take third-party PLI for providing relief to accident victims and also contribute amount equal to the premium to the Environment Relief Fund (ERF) which is held by the insurer on behalf of the government. A notification under the PLI Act in 1993, has appointed the chairman and member secretary of SPCB to ascertain the compliance with this Act or of any rule or of any direction given under this Act, and require any owner to submit information as necessary. GPCB should ascertain the compliance under this Act and provide annual summary of the compliance, the funds received and used. This is a critical financial resources or disaster management and should be reviewed in SCG meetings.

5.7.8 DEPARTMENT OF TRANSPORT

1. Secretary, Home (Transport), and the Managing Director, Gujarat State Road Transport Corporation (GSRTC) will work as part of the State Crisis Group for the implementation of the hazardous materials transport emergency management plan as well as provide transport coordination during other types of chemical disasters as well. He will make officers available to SEOC as per the need.
2. In case of major offsite emergencies, the Managing Director will contact the Gujarat State Road Transport Corporation (GSRTC) and private transport operators for requisition of vehicles for mass evacuation of the public. Support of railways can be taken for evacuations, as well, and this is identified in the responsibilities of the railways.
3. In case of major offsite emergencies, the Managing Director will contact the Gujarat State Road Transport Corporation (GSRTC) and private transport operators for requisition of vehicles for mass evacuation of the public. Support of railways can be taken for evacuations, as well, and this is identified in the responsibilities of the railways.
4. Considering that prevention of chemical emergencies on road is achieved through enforcement of Motor Vehicle Act and Rules therein, DOT needs to provide more support for the enforcement. DOT should consider check of TREMCARD, driver license, EIP on tanker and general road worthiness of tanker on road at the five check points in the state. Within the state the traffic police may be sensitized towards safety of HAZMAT tankers, and thus motivated to check TREMCARD, driver license and overall safety of the vehicle. DOT may be considering RFID based number plates for ease of tracking the vehicles in the state. If so, a special number plate for HAZMAT tankers may be considered for tracking the movement in the state.
5. Considering that prevention of chemical emergencies on road is achieved through enforcement of Motor Vehicle Act and Rules therein, DoT needs to provide more support for the enforcement. DoT should consider check of TREMCARD, driver license, EIP on tanker and general road worthiness of tanker on road at least the five check points in the state. Within the state the traffic police may be sensitized towards safety of MAZMAT tankers, trained in basic chemical awareness, and thus motivated to check TREMCARD, driver license and overall safety of the vehicle. DoT may be considering RFID based number plates for ease of tracking the vehicles in the state. If so, a special number plate for HAZMAT tankers may be considered for

tracking the movement in the state.

5.7.9 GUJARAT MARITIME BOARD (GMB)

1. An Emergency Management plan for all ports must be prepared and shared with corresponding DCG as well as SCG to be annexed to district and state CDMPs.
2. In the event of a major chemical disaster, the GMB is responsible for protecting port employees and tenants, regulating the movement of vessels, and monitoring clean-up efforts for GMB operated ports.
3. GMB will initiate steps to provide minimum disruption of port commercial fishing and recreation. The department will notify department of fisheries for any potential contamination of fish.
4. Considering ports have substantial emergency resources, GMB will coordinate with public and private ports to provide necessary support to nearby DEOC/DCG as per pre-existing mutual aid agreements.

5.7.10 INDIAN RAILWAYS

1. Western Railway Emergency Management Plan should include vulnerability assessment for chemical emergencies. This plan should be annexed to the respective district CDMP with a copy to state CDMP as annex. The plan should identify the incident commander and qualified chemical emergency response team available with railways and/or it may include provisions to transfer incident command to LERT, RRT or SERT if required. The plan should identify the available at railways and establish procedure to share resources with district administration if required.
2. The Accident Relief Medical Vans (ARMVs) of the Ministry of Railways are stabled at stations every 100 kilometres and should be made available to state and district authorities as per the pre-agreed terms, conditions and procedures.
3. If feasible, provide rapid evacuation through trains and provide safe sheltering against chemical emergencies in discussion with local and district administration and when such assistance from railways is planned in the CDMP as per mutual agreements.
4. Follow the directions by the incident commander for protective actions in case any railway property will be vulnerable to chemical emergencies.
5. Respond to chemical and industrial disasters at the railway station, along railway lines and in property owned by railways to protect life, property, and the environment.
6. Repair infrastructure and restore operations following a chemical disaster.

5.7.11 AIRPORT AUTHORITY OF INDIA

1. An Airport Emergency Management Plan should be annexed to the respective district CDMP with a copy to state CDMP as annex. The airport plans must dovetail with state and district CDMP, and include provisions to transfer incident command to RRT or SERT when required, and make provisions for a controlled access to airport premises of emergency responders. Airport Authority, Airport Managers' Officers, Airfield Operations, Airport Police, Construction and Maintenance and Public Relations Officers should coordinate with DEOC.
2. Respond to chemical and industrial disasters at the national/international airport to protect life, property, and the environment.
3. Request additional assistance from the DEOC and SEOC when the Airport Authority's aircraft rescue and fire-fighting personnel are overwhelmed.
4. Repair airport infrastructure and restore operations following a chemical disaster.

5.7.12 DEPARTMENT OF ANIMAL HUSBANDRY

1. Provide safe facilities for animals in need of relocation and/or confinement due to a chemical disaster.
2. Maintain service for the care and treatment of sick and injured animals that are relocated, and reunite owners with impounded animals.
3. Arrange for the safe disposal of

animal carcasses.

4. Reunite owners with impounded animals and coordinate relief to owners who lose cattle in disasters.

5.7.13 DEPARTMENT OF AGRICULTURE

1. Take immediate actions to reduce crop damage and economic losses following a chemical spill.
2. Assess agricultural damage following a chemical disaster and provide expertise for remediation efforts.
3. Coordinate relief efforts.

5.7.14 DEPARTMENT OF INDUSTRIES AND MINES

1. Provide a liaison to SEOC during a chemical disaster.
2. Coordinate resources of GIDC and private/public industries during disasters as needed and as per pre-existing mutual aid policy and procedures.

5.7.15 STATE INFORMATION BUREAU

1. Coordinate the delivery of public warning and emergency information that relates to chemical disaster situations with SEOC. Manage media for rumours and spreading panic while ensuring that relevant, accurate, and necessary information is disseminated.

5.7.16 DEPARTMENT OF LAW

1. Provide legal advice to the SEOC as required. Serve as a liaison with other legal and judicial entities.

5.7.17 PUBLIC WORKS DEPARTMENT /ROADS AND BUILDINGS DEPARTMENT

1. Assist with traffic management and debris removal for mandatory evacuations.
2. Inspect public roads and buildings for return to normal operations and occupancy.
3. Oversee the repair and reconstruction of public buildings, roads, and other infrastructure if necessary after a chemical disaster.
4. Enforce applicable building codes.
5. Evaluate main roads for case of emergency vehicle movement and address any problems (e.g., Building emergency lane/shoulder)

5.7.18 CHIEF ELECTRICAL INSPECTOR

1. CEI is responsible for safety of electrical installation among other statutory functions. CEI inspects industries, commercial complexes, residential high rises, and others as per the criteria laid in Electricity Act and rules (http://ceiced.gujarat.gov.in/act_rules.htm). The quantum of work is such that not all premises can be thoroughly inspected. Juxtaposing this with the fact that majority of industrial accidents are blamed on electrical system failure, strengthening CEI activities become key as detailed in a report on Performance Improvement of DISH, PESO and CEI.
2. CEI regulates the power distribution companies and require them to investigate all electrocution accidents. CEI may also sensitize power distribution companies on their role during disaster management for temporary power supply provision, stopping power supply to an area on instruction of a IC, and conducting regular checks of electrical systems within the industries.

5.7.19 KEY SUPPORT FUNCTIONS

1. Public and private transport, railways, and other transport resources may be required for a large scale chemical emergency requiring evacuation over several hours. However, evacuation within the first 1-2 hours after the incident cannot rely on such external and non-immediate transport resources. The transport resources should be included in regular discussions and trainings on the state CDMP, as well as in mock drills and other capacity building exercises.
2. Private hospitals, businesses, and industries within Gujarat may assist with a wide variety of response, relief, or rehabilitation tasks based on their capabilities. Memorandums of understanding may be enacted with such entities for assistance. Also, they should be included in regular discussions and trainings on the state CDMP as well as in mock drills and other capacity building exercises.

3. Volunteer agencies, such as the Red Cross and local religious organizations, may be available to provide shelter, food, management of donations, and other short-term relief functions. Memorandums of understanding may be enacted with such entities for assistance. Also, they should be included in regular discussions and trainings on the state CDMP as well as in mock drills and other capacity building exercises.
4. All such external support function agencies that are not in direct control of SCG, GSDMA or the state of Gujarat, or those agencies that have not been assigned an explicit role under this plan but may be required to provide any support should be requested to prepare a "support function action plan," and these plans should be annexed to state and district CDMPs.

5.7.20 SUPPORT FROM CENTRAL GOVERNMENT IF REQUIRED

For emergencies that are beyond the response capability of the state, additional help can be requested from the central authorities. The following two authorities are available at the national levels.

The Central Crisis Group, constituted by the Ministry of Environment and Forests, shall be the apex body in the country to deal with and provide expert guidance for planning and handling of major chemical accidents in the country. The CCG shall continuously monitor the post-accident situation and suggest measures for prevention of recurrence of such accidents.

Along with MOEF, NDMA is also a national body to provide coordination, technical, and logistical support to the state. NDMA, through the Home Ministry, can help the state seek formal support from NDRF. A NDRF company is stationed in Ahmedabad. This company is developing its capability in chemical emergency management to be a resource for the state in the case of emergencies needing national level assistance. GSDMA may consider including NDRF in coordination meetings, plan preparation, and mock drills to ensure a coordinated response whenever needed. Considering the role NDRF battalion at Ahmedabad may play, it may be well suited to invite NDRF commandant as a member of SCG.

5.8 SUMMARY OF RESPONSE ACTIONS AND STAKEHOLDERS RESPONSIBILITIES

The tables below summarises the key response activities and the respective primary and support stakeholders responsible for chemical emergency response. In addition, a comprehensive listing of responder responsibilities is listed in Appendix A for ready reference as per the MOEF off-site emergency guidelines, 2010.

5.9 INFORMATION AND COMMUNICATIONS

1. Communication protocol and coordination procedures employed by the SEOC and DEOC will be annexed to this CDMP. Communication protocol for all responding agencies will be developed and standardized and annexed to this CDMP.
2. Communications for the RRT and SERT will have a dedicated channel monitored by SEOC.
3. GSDMA will update the plans and procedure for the following if and when available:
    a. Information Management Portal System (IMPS): The web based system should be menu driven and with role-based access control for various stakeholders as per requirements to access information regarding the status of disaster(s).
    b. Incident Management System (IMS): A robust portal-based solution for public safety and emergency management that should have four core capabilities: (a) Dynamic team management(collaboration, communication and control); (b) Disaster planning (before); (c) Emergency operations (during); and (d) Disaster recovery (after). We recommend that GSDMA gives a different name to this system so that it is not confused with IRS and IRT and similar sounding yet different terminologies are not coined.
    c. Universal communication interface based

on common (e.g. VoIP) switching for voice call connectivity across various technology based equipment such as VHF radio, VSAT, VoIP calls on MPLS-VPN etc. Whichever technology used, redundancy and 100% fail proof communication should be key criteria.

Table 12. Stakeholder Roles in HAZMAT Response

	RESPONSE ACTIVITY	PRIMARY RESPONSIBILITY AT DISTRICT/STATE LEVEL	SUPPORT/ SECONDARY RESPONSIBILITY
1	Trigger Mechanism - Intimation of accident/ hazard	Occupier / manager of the establishment	DEOC/LCR
2	Pre-designate and train Incident Commander at district and State level for different types and scales of chemical emergencies	GSDMA, SCG, DCG	LERT, RRT, SERT, SDRF, Police, Fire Services
3	Establish Incident Command Post	First Response Agency - ideally Fire Services, LERT	DC, SDM
4	Situation Assessment	DEOC, LCR, LERT, RRT, SERT	SEOC
5	Staffing and Activities at SEOC	SEOC	SCG, GSDMA
6	Selection of Protective Actions	IC, DC	DEOC, SEOC
7	Control of Hazard - Establish Incident Command Post Declare Emergency Warn the public Secure the site Ensure Safety through a Site Safety Plan Control Zones will be established by the IC Conduct Initial Reconnaissance Site entry and exit	IC at district level, IC at State level (if required) LERT, RRT, SERT	EMS, Fire Services, Police, SCG, DCG
8	Provide short term relief to public	DC	Department of Revenue, GSDMA

Table 13. Stakeholder Roles in Emergency Medical Management

	RESPONSE ACTIVITY	PRIMARY RESPONSIBILITY	SUPPORT/ SECONDARY RESPONSIBILITY
1	Intimation to MFR, 108, Local Medical Department	DEOC, Industry	GVK-EMR 108
2	Response by QRMT	QRMT	Local MFR, DOH
3	Response Capacity Assessment and planning during Response	DOH	
4	Search and Rescue	Police /MFR/Fire Services	
5	Evacuation of Casualties for Incident Site	MFR, EMS	DOH
6	Activation of Crisis Management at hospitals	Earmarked hospitals	DOH
7	Rapid Assessment of Health consequences	Medical Staff and Earmarked hospitals	DOH, GPCB
8	Administration of Antidotes	QRMT, MFR	DOH, Earmarked hospitals
9	Requisition of Pharmaceutical stockpiles	Earmarked Hospital	DOH
10	Supply of drugs from Vendor Managed Inventory	State Central Medical Store	
11	Psychosocial care	Earmarked hospitals	
12	Public Health Response	Department of Public Health	

Table 14. Response Protocol for Hazards in Road Transportation of HAZCHEM

	RESPONSE ACTIVITY	PRIMARY RESPONSIBILITY	SUPPORT/ SECONDARY RESPONSIBILITY
1	Trigger - Intimation to DEOC, Police, 108, Consignor and Consignee	Driver	Consignor and Consignee
2	Initial Protective Actions as specified in TREMCARD	Driver	Helper
3	Co-ordination of Consignor and Consignee with DEOC	Consignor and Consignee	Mutual Aid Group
4	Cordoning off site, notification to DEOC, Fire Services , EMS and LERT	Police	108
5	Establish incident command post	Police	Other First Responders
6	Isolation and Establishing protective action distance	Police	Other First Responders
7	Control of Hazard	LERT, RRT, SERT	Police, Consignor and Consignee Fire Services, First Responder

5.10 REFERRED AND ANNEXED DOCUMENTS

1. In this section, a reference to legal and administrative requirements or procedures that are applicable to disaster operations (e.g., emergency procurement procedures, mutual aid agreements, etc.) will be made as and when these documents are available. These documents will not be annexed to the CDMP but need to be available at the SEOC for easy reference. Examples of documents that may be referenced here include:
    a. Administration of insurance claims
    b. Consumer protection
    c. Duplication of benefits
    d. Non-discrimination
    e. Relief assistance
    f. Recovery of response costs from the responsible party (i.e., entity that caused the spill or release).
2. Annex Action Plans developed by offsite agencies and state departments to this state CDMP as and when available.
3. CDMP or response plans for pipelines, ports, hospital, railways should be annexed to this CDMP whenever available.
4. The state directory of contact developed by revenue department should be annexed to this CDMP.
5. The national directory developed by CCG (the Red Book) should be annexed to this CDMP.

6 RECOVERY, RECONSTRUCTION AND REHABILITATION

The recovery and reconstruction phase of disaster management involves disaster relief: a) immediate shelter, life support, and human needs to persons affected by, or responding to, a disaster; b) the broader disaster recovery; c) the coordinated process of supporting affected communities in the reconstruction of the physical infrastructure, restoration of the economy and of the environment; and d) support for the emotional, social, and physical wellbeing of those affected. Section 5.4.7 discusses immediate relief operations as a part of the response plan for chemical emergencies. In this chapter, we focus on longer term recovery and reconstruction efforts needed in case of major or catastrophic chemical disaster. State Relief Commissioner, Revenue department, and the district collector are in charge of such recovery operations.

6.1 FUNCTIONS OF RECOVERY

For the purpose of effective coordination, aspects of recovery are conceptually grouped into four functions. It is important to acknowledge that the four functions of recovery overlap and recovery arrangements must reflect the inter-relationship between each of these functions.

6.1.1 INFRASTRUCTURE

Infrastructure, or built environment, recovery includes repair and reconstruction of residential and public buildings, commercial, industrial and rural buildings and structures, government structures, utility structures, systems and services (transport, water, sewage, energy, communications), and other essential services.

6.1.2 HUMAN-SOCIAL

Human-social recovery includes personal support and information, physical health and emotional, psychological, spiritual, cultural and social well-being, public safety and education, temporary accommodation, and financial assistance to meet immediate individual needs.

6.1.3 ECONOMIC AND LIVELIHOOD

Economic recovery includes renewal and growth of the micro economy (within the affected area) and the macro economy (overall economic activity of the state). Economic recovery includes individual and household entities (e.g. employment, income, insurance claims), private and government business enterprises and industry. It includes assets, production and flow of goods and services, export of goods and services from the affected region, and securing confidence of overseas markets.

6.1.4 ENVIRONMENT

Environment, or natural environment, recovery includes restoration and regeneration of biodiversity (species and plants) and ecosystems, natural resources, environmental infrastructure, amenity/aesthetics (e.g. scenic lookouts), culturally significant sites and heritage structures. It includes management of environmental health, waste, contamination, pollution and hazardous materials.

6.2 TRANSITION FROM RESPONSE TO RECOVERY

The after-stage of response is defined as the period when there is no further requirement for the coordination of response activities. As recovery activities bgin within the response phase, it also signals the transition from response to recovery mode. In this transition the emergency is declared over and the IRT hands over the planning and operations to the relief commissioner or others as appointed by the chief secretary. Careful planning and handover is essential with proper documentation for a successful transition. The major steps taken during transition are as follows:

1. Preliminary Damage Assessment: State should deploy multidisciplinary team to determine the extent of damage to communities.
2. Aids & Assistance: Identification of the type of public or individual assistance necessary in an emergency declaration. These can be housing, grants, low-interest loans, relocation, unemployment assistance, food commodities, or legal services. Also includes assistance for community such as debris removal, emergency protective measures, roads and bridges, drinking water, buildings and equipment, and other utilities.

3. Mobilization of essential resources: Coordinate and ensure mobilization of essential resources to a temporary location of emergency mass care where impacted survivors of disasters go for limited services and information within 24-96 hours following the disaster. Such temporary locations could be termed as "Disaster Recovery Centre". Their responsibility can be shared by the affected district, state and central authorities.
4. Community Groups: Community groups should be deployed in the affected community areas to disseminate information. They will identify and report local unmet human needs and assist survivors.
5. Expenditure: Estimation of cost to be incurred by the agencies responsible for relief and recovery should be made.

6.3 COUNSELLING AND REHABILITATION OF VICTIMS

The psychological impact of a chemical disaster manifests as psychosocial trauma including psychological reactions, post-traumatic stress disorder, and other psychological ailments in displaced disaster victims which needs to be addressed. Counselling by psychologists and psychiatrists for those suffering from mental trauma is an essential element of medical rehabilitation.

6.4 IMMEDIATE FINANCIAL RELIEF TO VICTIMS

Under the Public Liability Insurance Act, 1991, MOEF has published the list of chemicals and threshold qualities beyond which the occupier or owner must take third-party PLI for providing relief to accident victims as per the direction of the collector. The Act also provides for an Environment Relief Fund (ERF) and enables payment of relief over and above the insured amount. The occupier or owner should pay an amount equal to the PLI premium to the ERF and deposit the same with the insurer. At state level GPCB is responsible to ensure compliance with PLI Act and at district level the collector and regional officer of GPCB are responsible. This act provides for immediate access to relief funds so that the compliance with Act should be verified and strengthened. We have already recommended that the maximum liability under the Act (currently Rs 5 cores) should be substantially enhanced.

6.5 PENALTIES AND COMPENSATION

Beyond the immediate relief through provisions of PLI Act, the major compensation for disaster victims comes from the Prime Minister's Relief Fund and National Disaster Response Fund. State Government also provides compensation for disaster victims through the State Disaster Response Fund. According to a strict concept of liability, the industries responsible for the accident are liable to pay compensation to victims. Therefore, legal actions can be initiated against the occupier for additional compensation.

6.6 RESTORATION AND REGENERATION OF ECOSYSTEM

The potential of chemical accidents to cause severe environmental damage has been realised on a number of occasions such as at Seveso, Bhopal, Mexico City (LPG disaster), Chernobyl, and Alaska (Exxon Valdez). For the remediation of the affected environment, it is essential to assess the environmental impacts, which includes determining the quantitative and qualitative nature of impact, and ascertaining the components of the environment most at risk from chemical accidents. This assessment is dependent on certain factors such as the chemicals involved, pollutant concentrations in the environment, environment media polluted by the accident, topography, and meteorology. After assessing the impact, the government can choose the appropriate recovery strategy.

6.7 RECONSTRUCTION OF DAMAGED STRUCTURES AND SERVICES

Major and catastrophic fires and explosions can result in significant damage to structures although less in extent compared to natural disasters. Reconstruction offers us a chance to build back better and safer. Reconstruction and restoration of infrastructure shall be achieved at the earliest as per the following guiding principles laid out in the national policy on disaster management.

1. Consideration should be given in planning to open spaces, water and sanitation infrastructure,

health care facilities, education infrastructure and roads.

2. Reconstruction plans should be a participatory process involving the government, affected community, NGOs and the corporate sector. After the planning process is over, owner driven construction is a preferred option but as per the guidelines and specifications in the plan.
3. Essential services and intermediate shelters/ camps should be established in the shortest possible time. The restoration of normalcy and day-to-day functioning is an important factor for consideration. For permanent reconstruction, the relocation option should be considered in case the affected community was in the highly vulnerable zone (e.g. squatters or developments within buffer zone around a company). In case of large chemical facility, the community may be persuaded to shift to a distance further away from the unit. The structure and electrical safety audit of all damaged building should be done and they should be repaired accordingly. New construction should ideally be completed within 2-3 years.

7 AUTHORIZATION AND PLAN MAINTENANCE

7.1 PLAN AUTHORIZATION

The Chemical and Industrial Disaster Management Plan for the state of Gujarat supersedes and rescinds all previous versions of the same or similar documents, and it is effective from the date of affixing the signature of the Chairman of State Crisis Group (Chief Secretary, Government of Gujarat), Member Secretary of State Crisis Group (Principal Secretary, Labour and Employment Department), and Chief Executive officer of Gujarat State Disaster Management Authority.

The plan and recommendations herein have been developed in discussion with and in agreement with the stakeholders listed in this plan. This plan is/will be annexed with action plans developed by the various response agencies and line departments identified in this plan to achieve an integrated and coordinated management of chemical and industrial disasters. These action plans will be discussed, improved upon, and accepted in a participatory manner through periodic meetings of SCG or another such forum. These action plans will be attached as annexes to this plan in a time bound manner.

Continuous review and improvement of this plan is essential to ensure that it is not only updated, but also implemented in its true spirit. Therefore, this CDMP shall be reviewed and updated regularly and in participatory manner by SCG, GSDMA or an agency designated by them.

We hereby affix our signature to declare that the Gujarat State Chemical and Industrial Disaster Management Plan is authorized on this XX Day of MMM, 2013.

Signatures

7.2 AUTHORITY AND RESPONSIBILITY FOR THE MAINTENANCE OF THE PLAN

The Chairman of SCG and CEO of GSDMA appoint XXX as an overall responsible agency for maintenance and upkeep of this plan. The following representatives are appointed for this purpose. [insert a table of names, position and department]. It is the duty of these appointed representatives to:

1. Possess a master copy of the plan and ensure at all times that it is up-to-date
2. Ensure distribution of the latest plan copy to SEOC, all response agencies and line departments, and obtain documentary evidence of their acceptance and agreement (for example, signature) of the plan document
3. Keep detailed and up-to-date records of revisions or changes to the plan document and communicate such revisions to all the possessors of the plan
4. Initiate revision of plan whenever it is due
5. Ensure review during periodic meetings of the state crisis group.

7.3 PLAN DEVELOPMENT AND MAINTENANCE

1. GSDMA will maintain, distribute, and update this CDMP with assistance from SCG members.
2. State departments and agencies provided responsibility under the plan should nominate an officer responsible to recommend changes and provide updated information periodically (e.g., changes of personnel, available resources, and preparedness action plan). Head of stakeholder departments and agencies have the ultimate responsibility of preparing, maintaining, and updating internal action plans and resources to fulfil their roles on basis of the state CDMP.
3. The action plans from departments, all district CDMP, all LCG or industrial pocket CDMPs should be available at SEOC. The state CDMP needs to be reviewed annually by SCG and GSDMA and updated as per the findings from annual exercises and mock drills in the districts and LCG areas as well as implementation lessons learns by individual departments as per their own action plans.
4. Changes to this plan may be needed even before

annual review when any of the following happens.

a. When hazard consequences or risk areas change.

b. When the concept of operations for chemical disasters change.

c. When departments, agencies, or groups that perform disaster functions are reorganized and can no longer perform the emergency tasks laid out in this plan.

d. When alert/warning or communication systems change.

e. When additional disaster resources are obtained through acquisition or agreement.

f. When the anticipated disaster resources are no longer available.

g. When a mock drill or actual disaster reveals significant deficiencies in existing plan.

h. When state or national planning standards or regulations are revised.

7.4 RECORD OF ACCEPTANCE

All the undersigned accept and agree to the following:
"This plan document is prepared in discussion with our department/agency/organization. We understand and accept the roles and responsibilities assigned to us for effective implementation of this plan."

Table 15. Record of Acceptance

SN	DEPARTMENT / AGENCY / ORGANIZATION	NAME OF AUTHORIZED REPRESENTATIVE	POSITION	SIGNATURE AND DATE

7.5 RECORD OF CHANGES

Table 16. Record of Changes

DATE	DESCRIPTION OF CHANGE	PAGE OR SECTION	DATE WHEN THE ACKNOWLEDGEMENT OF CHANGE FROM POSSESSORS OF THE PLAN IS OBTAINED

7.6 STAKEHOLDERS AND POSSESSORS OF THE PLAN

The authorities and agencies whose participation is vital in any phase of disaster management as per the CDMP are collectively referred to as the Stakeholders and/or possessors of this CDMP. These include:

1. State representative of MoEF
2. NDMA
3. Ministry of Home Affairs
4. All Members of State Crisis Groups
5. GSDMA
6. Chairman and member secretary of all DCGs
7. DPO of all DDMAs
8. Chairman and member secretary of all LCGs
9. SEOC and DEOCs
10. State emergency response team
11. Regional emergency response centres
12. Others as identified by SCG and GSDMA.

APPENDIX A: ROLES AND RESPONSIBILITIES OF RESPONDERS IN THE NATIONAL GUIDELINES FOR OFF-SITE EMERGENCY PLAN BY MOEF

This appendix can be used to link the roles of different authorities, departments, agencies and people with appropriate role as per IRT.

DISTRICT EMERGENCY AUTHORITY (DEA - DISTRICT COLLECTOR)

1) Take overall responsibility for combating the off site emergency.
2) Ensure the Police and Fire, personnel combat the emergency.
3) Arrange, if necessary, for warning and evacuating the public, through the Depart¬ment of Police.
4) Communicate with Media to disseminate vital information to public
5) Arrange for dispensing vital information to public using arrangements like mass-sms, public announcement using pre-recorded tapes
6) Direct the team of Doctors headed by the Medical Officer
7) Direct the local chief of State Transport Corporation to arrange for transport of victims and evacuation of people trapped within the hazard zone, if necessary.
8) Direct the Electricity Board officials to give uninterrupted power supply.
9) Direct the official in-charge to provide uninterrupted water supply as required.
10) If evacuation of population is necessary direct the Revenue officer and the Supply officer to provide safe shelters, food and other life sustaining requirements for the evacuees, if required.
11) Co-ordinate with the media
12) Arrange for, release and provide necessary funds at various stages of disaster mitigation
13) Direct railways to stop train, if required

POLICE

1) Communicate and co-ordinate with
   i. MAH unit
   ii. DEA
   iii. Fire Services.
   iv. Transport authorities.
   v. Medical Department
   vi. Media
   vii. Civil Defence and Home Guards.
   viii. Local Army establishment as required.
2) Warn and advice the people in the affected area.
3) Regulate and divert traffic.
4) Arrange for evacuation
5) Maintain law and order in the area.
6) Ensure protection of life and property of evacuees
7) Deal sternly with people exploiting opportunism in wake of a disaster

FIRE SERVICE DEPARTMENT

1) Perform fire fighting operations by deploying men and appliances.
2) Perform rescue operation in the affected area.
3) Communicate and co-ordinate with Police, Medical Department of necessary information
4) Keep knowledge on appropriate response to different chemical emergency scenarios
5) Keep adequate stock and resource information on necessary means, material, appliances required to deal with particular emergency situations with updated details of suppliers and stockists.

MEDICAL DEPARTMENT

1) Arrange for preparing casualties to be sent to government/private hospitals.

2) Set up temporary medical camp and ensure medical facilities at affected location and neighbourhood
3) Keep knowledge on appropriate response to different cases of toxic consumption and injuries
4) Set up temporary mortuary, identification of dead bodies and post mortem.

FACTORY INSPECTORATE DEPARTMENT

1) Provide necessary direction to MAH unit and assistance to DEA, Fire Department, and Medical Department among others.
2) Seek help from and involve assistance of Technical Experts of relevant and appropriate expertise and specialization.
3) Initiate, facilitate and provide for investigation into the accident.

OCCUPIER OF MAH UNIT

1) Possess up-to-date copy of off-site emergency plan.
2) Communicate promptly, any foreseeable disaster, to the DEA, Police, Fire Service and Inspector of Factories in-charge of the District.
3) Communicate changes within the factory that may require inclusion or suitable modification in the off-site plan to the DEA (Maintenance Officer) of the Plan.

TECHNICAL EXPERTS

1) Promptly respond to provide the necessary technical advice to MAH unit, DEA, Factory Inspectors, Fire Department, Medical Department among others.
2) Provide on-phone help after properly understanding and assessing the situation.
3) Make visit to the site in co-ordination with DEA, Factory Inspector(s) to provide for appropriate technical assistance.

MUTUAL AID GROUPS

1) To quickly mobilize the resources required to emergency mitigation at the site or wherever required

POLLUTION CONTROL BOARD

1) Project likely areas to be polluted.
2) Carry out pollution assessment at suspected locations including soil, river and air assessment.
3) Ensure controlling of long-term pollution damage.
4) Identify unidentified substances, chemical releases, if any.

TRANSPORT FLEET OWNERS INCLUDING STATE TRANSPORT

1) Act on the direction of DEA or Police
2) Ascertain the extent of transport required with pick-points, routes and destinations to transport people.
3) Promptly arrange for dispatch of vehicles with sufficient fuel for evacuation purposes.
4) Arrange vehicles to transport water and other provision to camps set up

MEDIA

1) Disseminate vital information to public on direction of DEA, Police and other Authorities
2) Act responsibly in disseminating vital information and dispel rumours, if any.

RAILWAYS

1) Act as per the direction of DEA to stop incoming trains, if required
2) Arrange for evacuation, if required

TRANSPORTER OF HAZARDOUS CHEMICAL

1) Possess up-to-date copy of off-site emergency plan.
2) Communicate promptly, any foreseeable disaster during transportation to the DEA, Police, Fire Service and Inspector of Factories in-charge of the District.
3) Communicate new assignments, newly added routes or other changes that may require inclusion or suitable modification in the off-site plan to the DEA (Maintenance Officer) of the Plan.

ELECTRICITY BOARD

1) Arrange for uninterrupted power supply to the plant, as required.
2) Arrange for lighting; at temporary medical camps etc.
3) Arrange for switching off power supply on request from District Authorities
4) Take care of electrical equipment within the damaged zone.

TELECOMMUNICATION DEPARTMENT

1) Ensure working of communication lines to enable effective communication between various responder agencies

AVIATION DEPARTMENT

1) Mobilise resources such as helicopters for knocking down vapour clouds etc.

CIVIL DEFENCE

1) Co ordinate with Police authorities.
2) Extend help in evacuation.
3) Arrange for round the clock security arrangements in the affected and evacuation areas.
4) Safeguard the properties and belongings of evacuees.

HOME GUARDS

1. Co ordinate with Police authorities.
2. Extend help in evacuation.
3. Arrange for round the clock security arrangements in the affected and evacuation areas.
4. Safeguard the properties and belongings of evacuees.

NATIONAL DISASTER RESPONSE FORCE

1. Carry out tasks for disaster mitigation as required

LOCAL GOVERNMENT BODIES

1. Mobilise necessary resources in emergency mitigation
2. Provide for community halls, town halls for evacuees

NGOs

1. Act as per the direction of DEA, Police and other District Authorities
2. Aid and assist the district authorities in emergency mitigation.

PUBLIC WORKS DEPARTMENT

1. Ensure adequate water supply for fire fighting.
2. Arrange for drinking water for evacuated persons at rallying posts, parking yards and evacuation centres.
3. Arrange water for cattle.

WATER SUPPLY BOARD

1. Arrange for supply of water to evacuees and all others involved in emergency control operations

CIVIL SUPPLIES DEPARTMENT

1. Arrangement to provide food and clothing as necessary, to the evacuees and all others involved in emergency controlling operations.

ANIMAL HUSBANDRY DEPARTMENT

1. Arrange for taking care of cattle especially dairy animals living in affected zone.
2. If evacuation of cattle is required, identify the evacuation area and shelter.
3. Transport arrangements for evacuation.
4. Fodder, drinking water arrangements for cattle.
5. Arrange for veterinary doctor.

AGRICULTURE DEPARTMENT

1. Arrange for protection of food grains and standing crops in the vulnerable zone.
2. Give instructions, to farmers, if any.

REGIONAL TRANSPORT AUTHORITY

1. To investigate into the cause of road accident involving hazardous goods carrier and take necessary action

OTHER MEMBERS OF DCG

1. Assist and act as per directions of the District Collector

COASTS GUARDS AND PORT TRUSTS (in case of emergency situation in coastal areas)

1. Co ordinate with Police authorities.
2. Provide necessary help in emergency mitigation

APPENDIX B: SITE SAFETY PLAN TEMPLATE

- The Site Safety Plan below is a critical requirement and significantly meets the requirement for Incident Action Plan recommended by NDMA under IRS.
- This SSP is involved and time consuming to complete. Therefore, it is prudent that this form be made a part of onsite submission by industry with as much information as possible prefilled.
- Even if a prefilled SSP is available, the RC must ensure accuracy of the same. Often in case of units that don't submit onsite plans, road accidents or even domestic cases involving chemicals will not have pore-filled SSP
- SSP is an incident specific form so it has to be filled for each incident
- SSP can be filled in phases as more information becomes available over time during an incident.
- SSP should be submitted as a part action taken report.

Site Name:	**Site Contact:**	**Telephone:**
Location:	**Responsible Party Contact:**	**Telephone:**
DSO Contact:	**Prepared By:**	**Date Prepared:**
Project #:	**Dates of Activities:** (SSP is not valid for periods longer than 12 months)	**Emergency Response** ☐ **Yes** ☐ **No**
Objectives:	**Site Type:** *Check as many as applicable.* ☐ Active ☐ Landfill ☐ Inner-City ☐ Inactive ☐ Railroad ☐ Rural ☐ Secured ☐ Residential ☐ Remote ☐ Unsecured ☐ Industrial ☐ Other *(specify)* _____	
Project Scope of Work and Site Background:		
Site Safety Approver Comments or Additional Instructions:		
Site Safety Plan Approver Signature:		**Date:**

Note: A minimum of two persons with appropriate training and medical surveillance must be on site for any fieldwork subject to SSP requirements.
Note: A detailed site sketch or figure may be included

Initial Isolation and Protective Action Distances (for emergency response operations only): Day time / Large Spills
NOTE: Distance can be found in US DOT Emergency Response Guidebook
Initial Isolation Distance:
NOTE: Keep a maximum distance away for unknown sites until the identity of the materials is determined.
Subsequent Isolation and Protection Action Zones Based on Air Monitoring Results:
NOTE: Distance at sites with unknown hazards should be increased, if necessary, based on air monitoring results and site reconnaissance.

Wind Speed and Direction (Approach from upwind)		Temperature (ºC)	Relative Humidity (%)	Probability of Precipitation (%)	Weather Forecast (like partly cloudy, snow, etc.)
Speed (mph):	**From Direction:**				

On-Site Supplies: ☐ **First Aid Kit** ☐ **Fire Extinguisher** ☐ **Air Horn** ☐ **Oral Thermometer** ☐ **Noise Dosimeter**

Known or Anticipated Site Hazards or Concerns: (Hazards covered by existing Safe Work Practices are listed on the next page)

- ☐ Work on active roadway
- ☐ Onsite laboratory
- ☐ Explosion or fire hazard
- ☐ Oxygen deficiency
- ☐ Unknown or poorly characterized chemical hazards
- ☐ Inorganic chemicals
- ☐ Organic chemicals\
- ☐ Chemical warfare materiel
- ☐ Compressed Gas Cylinders
- ☐ Asbestos
- ☐ Respirable particulates
- ☐ Respirable silica
- ☐ Blasting and explosives
- ☐ Non-ionizing radiation (lasers, radiofrequencies, UV)
- ☐ Ionizing radiation (alpha, beta, gamma, etc.)
- ☐ Heat stress
- ☐ Cold stress
- ☐ Overhead utilities
- ☐ Buried Utilities
- ☐ Surface or underground storage tanks
- ☐ General slips, trips, falls
- ☐ Uneven, muddy, rugged terrain
- ☐ Lift (man lift, cherry picker) use
- ☐ Industrial truck (forklift) use
- ☐ Wood or metal ladder use
- ☐ Dangerous goods shipped by air
- ☐ Elevated work (over 2 m high)
- ☐ Heavy equipment use or operation
- ☐ Construction work
- ☐ Excavation or trenching
- ☐ Benching, shoring, bracing
- ☐ Scaffold use
- ☐ High noise
- ☐ Grinding operations
- ☐ Energized electrical systems
- ☐ Portable hand tool use
- ☐ Portable electrical tool use
- ☐ Machine guarding
- ☐ Portable fire extinguisher use
- ☐ Driving commercial vehicles
- ☐ Driving personal vehicles
- ☐ Diving underwater operations
- ☐ Work in strip or shaft mines
- ☐ Off-road vehicle use
- ☐ Clandestine drug lab
- ☐ Working over or near water
- ☐ Mould
- ☐ District-specific safety requirements (attach to SSP)
- ☐ Other *(insert)*
- ☐ Other *(insert)*
- ☐ Other *(insert)*

Explosion or Fire Potential: ☐ High ☐ Medium ☐ Low ☐ Unknown

Chemical Products Response Will Use or Store On Site: (Attach a Material Safety Data Sheet [MSDS] **for each item.)**

- ☐ Alconox or Liquinox
- ☐ Hydrochloric acid (HCl)
- ☐ Nitric acid (HNO3)
- ☐ Sodium hydroxide (NaOH)
- ☐ Calibration gas (Methane)
- ☐ Calibration gas (Isobutylene)
- ☐ Calibration gas (Pentane)
- ☐ Calibration gas (4-gas mixture)
- ☐ Hydrogen gas
- ☐ Household bleach (NaOCl)
- ☐ Sulfuric acid (H2SO4)
- ☐ Hexane
- ☐ Isopropyl alcohol
- ☐ HazCat Kit
- ☐ Mark I Kits (number?) _____
- ☐ Other (specify) _____

WARNING: Eyewash solution shall be readily available on ALL projects where corrosives (acids or bases) are used.

Applicable Safety Programs and Safe Work Practices (SWP). Attach to SSP:

- ☐ Demolition and Decontamination
- ☐ Trenching and Excavation Safety
- ☐ Asbestos Protection Program
- ☐ Haulage and Earth Moving
- ☐ Lead Protection Program
- ☐ General Safe Work Practices
- ☐ General Safe Work Practices HAZWOPER
- ☐ Safe Work Practices for Office Responders
- ☐ Safe Drilling Practices
- ☐ Safe Direct Push (GeoProbe) Practices
- ☐ Working Over or Near Water
- ☐ Use of Heavy Equipment
- ☐ Special Site Hazards (Firearms, Remote Sites, Mines, aircraft, etc.)
- ☐ Safe Electrical Work Practices
- ☐ Fall Protection Practices
- ☐ Portable Ladder Safety
- ☐ Drum and Container Handling Practices
- ☐ Flammable Hazards and Ignition Sources
- ☐ Spill and Discharge Control Practices
- ☐ Heat Stress / Cold Stress / Prevention of Sun Exposure
- ☐ Biohazards
- ☐ Underground Storage Tank Removal Practices
- ☐ Safe Lifting Procedures
- ☐ Hydrographic Data Collection
- ☐ Permit-Required Confined Space Entry Practices
- ☐ Non-Permit-Required Confined Space Entry Practices
- ☐ Respirator Cleaning Practices
- ☐ Safe Use Practices for Use of Respirators
- ☐ Respirator Qualitative Fit Testing Procedures
- ☐ Laboratory Soil Testing Safe Work Practices

Employee Training and Medical Requirements:

Basic Training and Medical

- ☐ Initial 40 Hour Training
- ☐ 8-Hour Supervisor Training (one-time)
- ☐ Current 8-Hour Refresher Training
- ☐ Current Medical Monitoring Clearance (including respirator use)
- ☐ Current First Aid Training
- ☐ Current CPR Training
- ☐ Current 8-Hour Refresher Training
- ☐ Current Respirator Fit-Test

Other Specific Training and Medical Surveillance Requirements

- ☐ Confined Space Training
- ☐ Level A Training
- ☐ Radiation Training
- ☐ Industry Specific Specialist _____
- ☐ Asbestos Awareness Training
- ☐ Other _____
- ☐ Other _____

MATERIALS PRESENT OR SUSPECTED AT SITE	HIGHEST OBSERVED CONCENTRATION (SPECIFY UNITS AND SAMPLE MEDIUM)	EXPOSURE LIMIT (SPECIFY PPM OR MG/M3)	IDLH LEVEL (SPECIFY PPM OR MG/M3)	PRIMARY HAZARDS OF THE MATERIAL (EXPLOSIVE, FLAMMABLE, CORROSIVE, TOXIC, VOLATILE, RADIOACTIVE, BIOHAZARD, OXIDIZER, OR OTHER)	SYMPTOMS AND EFFECTS OF ACUTE EXPOSURE	PHOTOIONIZATION POTENTIAL (EV)
		PEL = ppm, REL = ppm TLV = [Skin] Hazard ☐	ppm			eV
		PEL = n/a, REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
Specify Information Sources: NIOSH Pocket Guide to Hazardous Chemicals, September 2005 and American Conference of Governmental Industrial Hygienists (ACGIH). "Threshold Limit Values and Biological Exposure Indices for 2009."						

Note: In the Exposure Limit column, include Ceiling (C) and Short-Term Exposure Limits (STEL) if they are available. Also, use the following short forms and abbreviations to complete the table above.

A = Air
CARC = Carcinogenic
eV = Electron volt
U = Unknown

IDLH = Immediately dangerous to life or health
mg/m3 = Milligram per cubic meter
NA = Not available
NE = None established

PEL = Permissible exposure limit
ppm = Part per million
REL = Recommended exposure limit
S = Soil
TLV = Threshold limit value

Note: If no contingency level of protection is selected, all Responders covered under this plan must evacuate the immediate site area if air contaminant levels require upgrading PPE.			
Field Activities Covered Under this SSP:			
Task Description	**Level of Protection**		**Date of Activities**
	Primary	**Contingency**	
1	☐ A ☐ B ☐ C ☐ D	☐ A ☐ B ☐ C ☐ D	
2	☐ A ☐ B ☐ C ☐ D	☐ A ☐ B ☐ C ☐ D	
3	☐ A ☐ B ☐ C ☐ D	☐ A ☐ B ☐ C ☐ D	
4	☐ A ☐ B ☐ C ☐ D	☐ A ☐ B ☐ C ☐ D	
5	☐ A ☐ B ☐ C ☐ D	☐ A ☐ B ☐ C ☐ D	
Site Personnel and Responsibilities (Include Responders from the Responsible Party):			
Responder Name and Location	**Task(s)**	**Responsibilities**	
	IC SSO OPS Officer Entry Team Decon Team	• • • • • •	

Note: See next page for details on levels of protection

NOTE: Contingency level of protection section should be completed only if the upgraded level of protection is immediately available at the job site. If no contingency level of protection is denoted, all responders covered under this SSP must evacuate the immediate site area if air contaminant levels would require an upgrade of PPE.

Protective Equipment: (Indicate type or material as necessary for each task.)

Task #	**Primary Level of Protection (A,B,C,D)**	PPE Component Description (Primary)	Contingency Level of Protection (A, B, C, D)	PPE Component Description (Contingency)
		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other:		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other:
		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other:		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other:
		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other:		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other:
		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other:		Respirator type: Cartridge type (if applicable): CPC material: Glove material(s): Boot material: Other:

Respirator Notes:Respirator cartridges may only be used for a maximum time of 8 hours or one work shift, whichever is less, and must be discarded at that time. For job sites with organic vapours, respirator cartridges may be used as described in this note as long as the concentration is less than 200 parts per million (ppm), the boiling point is greater than 70 °Celsius, and the relative humidity is less than 85 percent. If any of these levels are exceeded, a site-specific respirator cartridge change-out schedule must be developed and included in the SSP.

Notes:
All levels of protection must include eye, head, and foot protection. CPC = Chemical protective clothing
Thermoluminescent Dosimeter (TLD) Badges must be worn during all field activities on sites with radiation hazards. TLDs must be worn under CPC.

Monitoring Equipment: All monitoring equipment on site must be calibrated before and after each use and results recorded in the site logbook				
Instrument (Check all required)	**Task**	**Instrument Reading**	**Action Guideline**	**Comments**
☐ Combustible gas indicator model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	0 to 10% LEL	Monitor; evacuate if confined space	
		10 to 25% LEL	Potential explosion hazard; notify SSC	
		>25% LEL	Explosion hazard; interrupt task; evacuate site; notify SSO & DSO	
☐ Oxygen meter model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	>23.5% Oxygen	Potential fire hazard; evacuate site	
		23.5 to 19.5% Oxygen	Oxygen level normal	
		<19.5% Oxygen	Oxygen deficiency; interrupt task; evacuate site; notify SSO& DSO	
☐ Radiation survey meter model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Normal background	Proceed	Annual exposure not to exceed 1,250 mrem per quarter Background reading must be taken in an area known to be free of radiation sources.
		Two to three times background	Notify SSC	
		>Three times background	Radiological hazard; interrupt task; evacuate site; notify SSO & DSO	
☐ Photoionization detector model: ☐ 11.7 eV ☒ 10.6 eV ☐ 10.2 eV ☐ 9.8 eV ☐ Other (specify): _____	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Any response above background to 5 ppm above background	Level B is recommended Level Ca may be acceptable	These action levels are for unknown gases or vapours. After the contaminants are identified, action levels should be based on the specific contaminants involved.
		> 5 to 500 ppm above background	Level B	
		> 500 ppm above background	Level A	
☐ Flame ionization detector model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Any response above background to 5 ppm above background	Level B is recommended Level Ca may be acceptable	These action levels are for unknown gases or vapours. After the contaminants are identified, action levels should be based on the specific contaminants involved.
		>5 to 500 ppm above background	Level B	
		>500 above background	Level A	
☐ Detector tube models:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Specify: < 1/2 the PEL > 1/2 the PEL	Specify:	The action level for upgrading the level of protection is one-half of the contaminant's PEL. If the PEL is reached, evacuate the site and notify the SSO & DSO.
☐ Other (specify):	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Specify:	Specify:	

Notes: eV= electron volt LEL=Lower explosive limit mrem=Millirem PEL=Permissible exposure limit ppm=Part per million

Project-Specific Industrial Hygiene Requirements	Emergency Contacts: Telephone No.
Chemical Regulated by OSHA in USA: *Check any present on the job site in any medium (air, water, soil)* ☐ No chemicals below are located on the job site ☐ Friable Asbestos ☐ Silica, crystalline ☐ alpha-Napthylamine ☐ Methyl chloromethyl ether ☐ 3,3'-Dichlorobenzidine (and its salts) ☐ bis-Chloromethyl ether ☐ beta-Napthylamine ☐ Benzidine ☐ 4-Aminodiphenyl ☐ Ethyleneimine ☐ beta-Propiolactone ☐ 2-Acetylaminoflourene ☐ 4-Dimethylaminoazobenzene ☐ N-nitrosomethylamine ☐ Vinyl chloride ☐ Inorganic arsenic ☐ Lead ☐ Chromium (VI) ☐ Cadmium ☐ Benzene ☐ Coke oven emissions ☐ 1,2-Dibromo-3-chloropropane ☐ Acrylonitrile ☐ Ethylene oxide ☐ Formaldehyde ☐ Methylenedianiline ☐ 1,3-Butadiene ☐ Methylene chloride	Medical Monitoring Physician: 24-hour Anonymous Hazard Reporting Line: National Ministry of Forestry & Environment: District Control Room: Poison Control: Fire department: Police department: Personnel Call-Down List: **Job Title or Position:** **Name** **Mobile Phone:** District Safety Officer: Incident Commander: Site Safety Officer (SSO): Responsible Party SSO: Other: _____ **Medical and Site Emergencies:** **Telephone No.** Signal a site or medical emergency with three blasts of a loud horn (car horn, fog horn, or similar device). Responders should evacuate to the rally points as designated on the site map. Hospital Name: Address: General Phone: Emergency Phone: Ambulance Phone: Hospital called to verify emergency services are offered? YES ☐ NO ☐ Detailed Route to Hospital: (see Page 11 of 12 for route map)

Note: This page must be posted on site.

Decontamination Procedures

The Site Safety Sfficer (SSO) overseas implementation of response decontamination procedures and is responsible for ensuring they are effective.

Personnel Decontamination

Level D Decon - ☐ Wet ☐ Dry
Level C Decon - ☐ Wet ☐ Dry
Level A or B Decon – Briefly outline the level A or B decontamination methods to be used on a separate page attached to this SSP.

Equipment Decontamination

All tools, equipment, and machinery from the Exclusion Zone (hot) or Contamination Reduction Zone (warm) are decontaminated in the CRZ before they are removed to the Support Zone (cold). Equipment decontamination procedures are designed to minimize the potential for hazardous skin or inhalation exposure, cross-contamination, and chemical incompatibilities.

Respirator Decontamination

Respirators are decontaminated, disinfected, and stored in clean bags.
Waste Handling for Decontamination
Procedures for decontamination waste - all waste must be fully characterized and disposal must meet all applicable local, state, and national regulations prior to any disposal action.

Decontamination Equipment

- ☐ Washtubs
- ☐ Buckets
- ☐ Scrub brushes
- ☐ Pressurized sprayer
- ☐ Detergent [Type]
- ☐ Solvent [Type]
- ☐ Household bleach solution
  Concentration/Dilution: _____
- ☐ Deionized water
- ☐ Disposable sanitizer wipes
- ☐ Facemask sanitizer powder
- ☐ Wire brush
- ☐ Spray bottle
- ☐ Tubs / pools
- ☐ Banner/barrier tape
- ☐ Plastic sheeting
- ☐ Tarps and poles
- ☐ Trash bags
- ☐ Trash cans
- ☐ Duct tape
- ☐ Paper towels
- ☐ Folding chairs
- ☐ Other

Emergency Response Planning

During the pre-work briefing and daily tailgate safety meetings, all responders will be trained in the provisions this SSP, site communication systems, site evacuation routes and rally points, and location of the hospital.

In the event of an emergency that necessitates evacuation of a work task area or the site, the following procedures will take place.

- The SSOwill advise all responders of the emergency using the on-site communications and notify the DSO.
- The personnel will proceed along site roads to a safe distance upwind from the hazard source.
- The responders will collect at the primary or alternate rally point at (provide locations):
  Primary _____
  Alternate _____
- The responders will remain in the rally point until the SSO or an authorized individual provides further instructions.

In the event of a severe spill or a leak, site personnel will follow the procedures listed below.

- Evacuate the affected area and relocate responders to an upwind location.
- Inform the SSO and the District Safety Officer immediately.
- Locate the source of the spill or leak, and stop the flow if it is safe to do so.
- Begin containment and recovery of spilled or leaked materials.
- Notify appropriate local, state, and national agencies.

In the event of severe weather, site personnel will follow the procedures listed below.

- Site work shall not be conducted during severe weather, including high winds and lightning.
- In the event of severe weather, stop work, lower any equipment (drill rigs) and evacuate the affected area.
- Severe weather may cause heat or cold stress.

All work-related incidents must be reported; you should:

- Notify Medical Monitoring Physician at _____
- Notify your Site Safety Officer (SSO) or District Safety Officer (DSO) via phone immediately.

Site Map:

Hospital Route Map:

Note: A test drive should be conducted to establish a good route to the hospital location. Verbal verification from the hospital emergency room should also be obtained to ensure that the hospital will accept chemically contaminated patients.

APPROVAL AND SIGN-OFF FORM

Project #: _____

I have read, understood, and agree with the information set forth in this Site Safety Plan and will follow the direction of the Site Safety Officer (SSO) as well as procedures and guidelines established in the Safety Policy Manual. I understand the training and medical requirements for conducting field work and have met these requirements.

Name	Company / Agency / Organization	Signature	Date

I have read, understood, and agree with the information set forth in this Site Safety Plan and will comply with and enforce this SSP, as well as procedures and guidelines established in the Safety Policy Manual.

Name	Site-Specific Position	Signature	Date
	Incident Commander		
	Site Safety Officer		

ILLUSTRATION PURPOSE ONLY

Emergency Scenario Description: 10T Chlorine Bullet leak at Naamwala Chemicals, Gram, District (0261)

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
1	Incident Controller (Rahul Pawar)	(Anand Saxena)	a. Attend to leakage with maintenance team.	a. Team of trained workers, equipment for repairs, emergency kit, local exhaust, SCBAs, special quick setting cement.	Site Controller	INT: 202, O: 232432, M: 9823243534	Chlorine leak from pipe of bulk storage tank, flow being stopped temporarily by using cement, transfer being started, Help of Fire Brigade for fog and water curtain needed, Assessed quantity spilled about 300 kg and that leak may start again if cement gives way.
			b. Start transfer activity.	b. Permanent piping arrangement for transfer to other storage vessel.			
			c. Use neutralizing medium for spilled liquid, fog and water curtain to prevent spread.	c. Neutralizing medium, gas scrubbing arrangement, water for creating fog and water curtain.			

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
2	Site Controller	(Kunjan Parsi)	a. Assess consequences of the emergency, the area likely to be affected presently and if escalated - including zone of isolation, additional help required from responding agencies and mutual aid partners.	a. Templates, windsock, plant and area map	a. District Collector	a. O: 252483, R: 254218, M:9881367074 b. O: 243454, R: 235434, M:9324834956 c. O: 223241, R: 212324, M:9786568899 d. O: 237548, R: 224844, M:9921237527 e. O: 269874, R: 263254, M:9766303009 f. O: 234353, R: 253453, M:9834323453 g. O: 271258, R: 254514, M:9823548759	a-f. The nature of emergency, consequences, area likely to be affected presently and if emergency is escalated, what help is required
	(Neeraj Patel)		b. Coordinate actions with Incident Controller for staff, material, equipment, experts advice and arrange for help.	b. Internal telephone	b. Police		g. Nature of emergency, area likely to be affected and precautions to be taken by public at large
			c. Identify if all workers are safe and arrange for rescue where necessary.	c. Transport for injured	c. Fire Brigade		
			d. Arrange communication centre for media, families.	d. Communication centre	d. Medical Officer		
					e. Factory Inspector		
					f. Mutual Aid representative		
					g. Media		

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
3	District Collector	Asst. District Collector (Shyam Mittal)	a. Confirm that Police, Fire Brigade and Medical Officer have received information and activated their Plan. Direct them suitably.	a-d. Area map, vulnerability templates, telephones	a. Police	a. O: 243454, R: 235434, M:9324834956 b. O: 223241, R: 212324, M:9786568899 c. O: 237548, R: 224844, M:9921237527 d. O: 242587, R: 284522, M:9865842135 e. Electricity board officials f. O: 265489, R: 254824, M:9881568748 g. O: 271548, R: 254621, M:9921578468 h. O: 269387, R: 242154, M:9922458789 i. O: 271258, R: 254514, M:9823548759 j. O: 265398, R: 274682, M:9368754125	a. Inform Police about nature of emergency, persisting wind direction, affected areas, isolation area, arrangement for warning and preparation for evacuation.
	(Asim Sheikh)		b. Direct concerned Revenue official for evacuation, sheltering arrangement wherever necessary.	e. Communication centre	b. Fire Brigade		b. Inform Fire Brigade about nature of emergency, wind direction, casualties in the factory, rescue requirement, mitigation requirements.
			c. Monitor situation at factory continuously and in the affected area and issues directions to responders		c. Medical officer		c. Inform medical officer about nature of emergency, casualties in the factory, area likely to be affected. Direct medical officer to alert hospitals in the area.
			d. Requisition from Authorities and Agencies (both Government and Private) such as Transportation, Water, Electricity Providers as necessary.		d. State Transport depot manager		d. Inform State Transport depot manager about nature of emergency, likely affected area. Direct him to keep buses ready with drivers, full with fuel and await instructions from DC/police.
			e.Arrange Media Centre to give information to media, public, families.		e. Electricity board officials		e. Direct electricity board officials to ensure constant electric supply to the area.

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
3					f. Water supply officer (Mr. Arun Iyer)		f. Direct water supply officer to ensure continuous water supply with proper pressure.
					g. Supply officer (Revenue Dept.) (Mr.S.G.Kulkarni)		g. Alert supply officer (revenue dept.) and instruct him to be ready to arrange to evacuate people in coordination with police and to arrange for providing safe shelters, food.
					h. Station Master, Anandnagar		h. Direct station master, Anandnagar to stop the traffic on the railway line passing through the area likely to be affected.
					i. Media		i. Arrange for informing public through local cable TV, SMS, local FM Radio, PA system.
					j. Outside District Authorities (neighbouring districts, State authority)		j. Request for all additional help required to mitigate the emergency
4	Fire Brigade Chief	Deputy Fire Chief (Purshottam Agarwal)	a. Arrange for water curtains and fog around the spilled liquid chlorine in association with the factory fire team.	a. Water, nozzles for fog and curtain, fire tenders, SCBAs.	a. Fire Brigade (neighbouring District)	a. O: 223241, R: 212324, M:9786568899 b. O: 237548, R: 224844, M:9921237527 c. O: 252483, R: 254218, M:9881367074	a. Request for fire tenders.

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
4	(Dhanajay Tambe)		b. Rescue the affected persons. Evacuate them and other casualties and hand over to medical team.	b. Fire tender with extendible ladders, SCBAs, stretchers, arrangement to lower the stretchers from height.	b. Medical Officer		b. Inform location of affected, rescued persons.
					c. District Collector		c. Request for additional assistance from Fire Brigade of neighbouring cities, districts if required.
5.	Police Superintendent	Deputy Police Superintendent (Sheela Sagar)	a. Cordon off area, stop traffic going towards affected area.	a. Barricades	a. Commandant Home Guards	a. O: 274521, R: 265628, M:9326587418	a. Inform where they are needed and about action to be taken.
	(Bhupinder Singh)		b. Arrange for warning public.	b. PA system fixed on a jeep	b. Commandant Civil Defence	b. O: 271258, R: 265874, M:9823587458	b. Inform where they are needed and about action to be taken.
			c. Arrange for personnel at various spots to maintain law and order.	c-e. Police Personnel, vehicles	c. State Transport Manager	c. O: 274485, R: 266582, M:9921587485	c. Request to arrange buses to evacuate people from public congregation and hutments.
			d. Send Police to public congregation to ask them to stay confined.	f. Telephone	d. District Collector	d. O: 252483, R: 254218, M:9881367074 e. O: 275624, R: 254824, M:9890254781	d. Inform ground-status and request for additional arrangements or measures to be taken.

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
5			e. Make arrangements to evacuate dwellers from neighbouring hutments, which are likely to be affected. Hand over charge of evacuees to revenue officer.		e. Neighbouring District Headquarters		e. Inform emergency and ask for additional staff and resources
			f. Interact continuously with site controller and District Collector.				
6.	Medical Officer	Asst. Medical Officer (Leela Jain)	a. Arrange for ambulances, doctors and staff.	a. Ambulances, Doctors, Nursing staff	Identified hospitals and doctors	a. O: 254287, R: 256428, M:9960254713	a. Inform about nature of emergency, and ask them to be ready for treatment. Inform about likely number of casualties and ask them to make beds available promptly, dispatch ambulances and pick up casualties in coordination with Police and other authorities.
	(Smriti Jain)		b. Arrange for oxygen and other requirements for emergency treatment.	b. Oxygen Cylinders			
7	State Transport Manager (Prabha Rao)	Asst. State Transport Manager (Punit Malhotra)	a. Keep vehicles ready with drivers and with sufficient fuel. Ascertain number of buses, pick points, routes and destinations from District Collector and Police. Dispatch vehicles with necessary instructions to drivers as directed by Police / District Collector for evacuation, or for transportation of provisions.	a. Buses, water tankers, Drivers.	a. Police/District Collector	a. O: 243454, R: 235434, M:9324834956 / O: 252483, R: 254218, M:9881367074 b. O: 254872, R: 274215, M:9766245842	a. Details of requirements of buses, pickup points, routes, destinations

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
7			b. Arrange for more vehicles from other depots if required.	b. Telephone	b. Other depots for additional vehicles		b. Requirement for additional vehicles
8.	Factory Inspector in-charge of District (Akash Satpute)	Deputy Factory Inspector (Manish Giri)	a. Visit site in coordination with technical experts.	a. Transport arrangement.	a. Experts	a. O: 264489, R: 272548, M:9326548713 b. O: 254687, R: 269824, M:9422875414	a. Inform about emergency and seek their technical advice.
			b. Investigate accident in due course.	b. Investigation form	b. Mutual Aid Members		b. Direct to provide assistance in handling emergency.
9	Technical Expert (Kamal Menon)	(Taslim Shetty), (Pritam Kaur)	a. Respond with appropriate technical advice to the factory, District Collector, Police, Fire Brigade, medical officer, factory inspector.	a. Own expertise, technical reference library, internet facility, telephone	a. Factory	a. O: 271254, R: 271486, M:9881574825 b. O: 269874, R: 263254, M:9766303009 c. O: 252483, R: 254218, M:9881367074 d. O: 223241, R: 212324, M:9786568899 e. O: 237548, R: 224844, M:9921237527	a-e. Technical advice for handling emergency
			b. Visit site in coordination with District Collector, Factory Inspector to provide necessary advice.	b. Vehicle	b. Factory inspector		
10.	Pollution Control Board Member (Girija Gavasane)	Asst. Member, PCB (Tejas Thankur)	Project areas to be affected and monitor chlorine concentration levels at various spots	Monitoring equipment	-	-	-

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
11	Electricity Board (Prabhu D Silva)	(Neelam Muni)	Ensure uninterrupted electric supply to the factory and at shelters	-	-	-	-
12	Animal Husbandry (Jeevan Ganesh)	(Helen Kejwal)	Provide necessary care for cattle of the dairies, arrange for veterinary doctor.	-	Veterinary doctor	O: 343543, L: 345654, M: 9567545679	Look after the cattle
13	Agriculture Department (Anish Jadhav)	(Mandeep Kishor)	-	-	-	-	-
14	Civil Defence and Home Guards (Rita Kapoor)	(Raj Raisoni)	a. Co-ordinate with Police and arrange to control traffic, assist in evacuation. b. Assist Police for security of evacuated property.	Monitoring equipment	-	-	-
15	PWD/Water Supply (Reshami Sood)	(Deepak Katti)	a. Ensure continuous water supply with adequate pressure for Fire Brigade.	a. Water	-	-	-
			b. Arrange drinking water at shelters.	b. Drinking water			
			c. Ensure water for the cattle.	c. Water for cattle			
16	Civil Supplies Department (Ramesh Mehendale)	(Dilip Sahani)	Arrange for food, water and other basic amenities as necessary for evacuees	Food, water and other basic amenities	-	-	-

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
17	Mutual Aid Group co-ordinator (Kishor Gupta)	(Meenal Dev)	a. Ascertain what equipment, material, personal protective equipment are required and arrange to deliver it as fast as possible where that may be of use.	a. Emergency response equipments, PPEs, SCBAs, Trained personnel, Ambulances, Fire Tenders.	a. Affected factory	a. O: 265842, R: 235684, M:9535842456 b. O: 254875, R: 265248, M:9966548725 c. O: 223241, R: 212324, M:9786568899 d. O: 237548, R: 224844, M:9921237527	a. Find out what is needed (equipment, material, PPEs).
			b. Render technical assistance.	b. Technical expertise.	b. Members of the Mutual Aid Group.		b. Inform and request to deliver resources to the affected factory.
					c. Fire Brigade		c,d. Technical assistance for handling emergency, ascertain what is needed (equipment, material, PPEs).
					d. Medical Officer		
18	Railway Station Master (Sorab Mishra)	Asst. Station Master (Preeti Hubbe)	a. Stop trains passing through the affected area as advised by District Collector. b. Coordinate with Police if evacuation is necessitated.	a, b) -	District Collector	O: 252483, R: 254218, M:9881367074	Ground status reporting
19	Head of Local Government Body (Gajanan Rathod)	(Seema Munim)	Mobilise resources required under the control of the body like buses, shelters (community halls, town hall, schools), food and water supply	Emergency Shelters, Food and Water supply	District Collector	O: 252483, R: 254218, M:9881367074	Find out resources, personnel help required

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
20	Telecommunication Department (Dolly Daniels)	(Rima Reddy)	Ensure that communication lines are efficiently working	-	-	-	-
21	NGO (Green City - Jyoti Kumar, Save Planet - Nitu Pandey)		a) Assist emergency responders. b) Help families of casualties, counsel victims.	a, b) -	-	-	-
22	Media (Radio Anandnagar - Manu Mitra, Cable Anandnagar - Lavish Jacob)		Disseminate vital information to public in a responsible manner	-	Public at large	Media channels	Precautions and actions to be taken by public

Source: *MoEF Guidelines for Off-site Emergency Plans, 2010*

ILLUSTRATION PURPOSE ONLY

Emergency Scenario Description: Naphtha 15 kl tanker leak on NH 00 near Some Road at Milestone 00 km

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
1	Incident Controller (Rahul Pawar)	(Anand Saxena)	a. Attend to leakage with maintenance team.	a. Team of trained workers, equipment for repairs, emergency kit, local exhaust, SCBAs, special quick setting cement.	Site Controller	INT: 202, O: 232432, M: 9823243534	Chlorine leak from pipe of bulk storage tank, flow being stopped temporarily by using cement, transfer being started, Help of Fire Brigade for fog and water curtain needed, Assessed quantity spilled about 300 kg and that leak may start again if cement gives way.
			b. Start transfer activity.	b. Permanent piping arrangement for transfer to other storage vessel.			
			c. Use neutralizing medium for spilled liquid, fog and water curtain to prevent spread.	c. Neutralizing medium, gas scrubbing arrangement, water for creating fog and water curtain.			

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
1	Driver, (Deepak Naik)	Co-driver (Arjun Yadav)	a. Call the Police. Request passing vehicles to inform the police, if phone out of range.	a. Phone	a. Police Control Room	a. O: 243454, R: 235434, M:9324834956 b. O: 274451, R: 254624, M:9823658422	a. The tanker carrying highly flammable Naphtha has overturned, there is leakage from the valve and there is a danger of fire and possible explosion. Details of location. Traffic has to be stopped. Repairs needed and spare tanker for transfer of material required. Crowd is gathering and needs quick control.
			b. Stop vehicles and divert traffic away from leaking tank.	b. Road blocking arrangement	b.Employer		
			c. Warn people by putting up display board stating 'Danger'.	c. Display board of 'Danger'			b. The details of the incident and details of exact location.
2	Police Control Room (Pooja Madhavan)	Police Control Room (Suman Dev)	-	-	a. Nearest Police Station b. District Collector c. Fire Brigade d. Medical Officer e. Mutual Aid Group co-ordinator	a. O: 243454, R: 235434, M:9324834956 b. O: 252483, R: 254218, M:9881367074 c. O: 223241, R: 212324, M:9786568899 d. O: 237548, R: 224844, M:9921237527 e. O: 234353, R: 253453, M:9834323453	a-e. The details of the incident and details of exact location.

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
4	Leader of Police team at the spot (Vipul D Souza)	(Mohan Patel)	a. Stop traffic from both directions.	a-d. Staff, road blocking equipment, cautionary boards.	Police control room	O: 243454, R: 235434, M:9324834956	Request for reinforcements, if needed, Update on status at site.
				b) Cordon off area to ensure that people are at safe distance.			
				b) Cordon off area to ensure that people are at safe distance.			
				c) Ensure that there is no source of ignition like a smoking bidi/ cigarette.			
				d) Ensure that there is no blockage of smooth arrival of emergency responders.			

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
5	District Collector (Ashok Mitra)	Assistant District Collector (Meenal Gujar)	Ascertain type of accident and possible consequences	-	a. Fire Brigade	a. O: 223241, R: 212324, M:9786568899	a-c. Inform about the incident etc., if they have not received it earlier, monitor progress of actions taken.
					b. Medical Officer	b. O: 237548, R: 224844, M:9921237527	d. Inform about the incident and location, and direct him to arrange for a crane and a spare tanker. Direct him further to reach the spot.
					c. Mutual Aid Group	c. O: 254687, R: 269824, M:9422875414 d. O: 275424, R: 256524, M:9922548732 e. O: 245248, R: 265624, M:9822487588	e. Requisition for resources such as crane, spare tanker with pumping arrangement, if required
					d. Road transport Authority		f. Inform about incident and direct to seek appropriate technical advice
					e. Provider of crane, spare tanker with pumping arrangement		
					f. Factory inspector		
6	Fire Brigade Chief (Manu Tandon)	Deputy in charge-Fire Brigade (Shyam Mittal)	Send a fire tender to the spot.	Fire tender	-	-	-

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
7	Medical Officer (Kiran Joshi)	Assistant Medical Officer (Naresh Sachdev)	Arrange to send an ambulance from a source nearest to the spot.	Ambulance	Hospitals (Sanjeevani Hospital)	O: 245256, R: 256524, M:9921545874	Inform about the incident. Request them to be in state of readiness if there are fire/ explosive casualties.
8	Road Transport Authority Chief (Manish Katgiri)	Deputy officer, RTA (Pritam Holgi)	a. Arrange for resources required such as crane, spare tanker with pumping arrangement	a. Resource directory	Nearest provider of crane, spare tanker with pumping arrangements	O: 266354, R: 254521, M:9822548785	Requisition for crane, spare tanker with pumping arrangement.
			b. Proceed to the spot for rendering assistance	b. Vehicle			
			c. Initiate accident investigation	c. Accident investigation report format			
9	Factory Inspector (Mallikarjun Rao)	Deputy Factory Inspector (Krishna Pandit)	a. Arrange for technical assistance from technical experts	a. Resource directory	-	-	-
			b. Direct Mutual Aid Group to render assistance	b. Telephone			

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
10	Mutual Aid Group Co-ordinator (Ashok Anand)	(Seema Roy)	a. Arrange for resources required such as crane, spare tanker with pumping arrangement	a. Available resources	a. District Collector	a. O: 252483, R: 254218, M:9881367074 b. O: 243454, R: 235434, M:9324834956 c. O: 223241, R: 212324, M:9786568899 d. O: 271254, R: 265254, M:9890245587	a-d. Inform and offer available resources to mitigate the emergency
			b. Proceed to the spot with technical experts for rendering assistance	b. Vehicles, Transport arrangement	b. Police		
			c. Initiate accident investigation	c. Accident investigation report format	c. Fire Brigade		
			b. Direct Mutual Aid Group to render assistance	b. Telephone	d. RTA		
11	Owner of vehicle involved in above accident (Harsh Irani)	Manager at Owner's facility (Gautam Firangpani)	a. Arrange for resources required such as crane, spare tanker with pumping arrangement	a. Available resources	a. District Collector	a. O: 252483, R: 254218, M:9881367074 b. O: 243454, R: 235434, M:9324834956 c. O: 223241, R: 212324, M:9786568899 d. O: 271254, R: 265254, M:9890245587	a-d. Inform and offer available resources to mitigate the emergency

SN	PERSON		ACTION		COMMUNICATION		
	PRIMARY	ALTERNATE	ACT	RESOURCE	WHOM	HOW	WHAT
11			b. Proceed to the spot for rendering assistance	b. Vehicles, Transport arrangement	b. Police	e. O: 254485, R: 274532, M:9921587421	e. Inform about incident details and seek assistance
					c. Fire Brigade		
					d. RTA		
					e. Neighbouring owners of such transportation companies		

Source: MoEF Guidelines for Off-site Emergency Plans, 2010

The following is the directory of key contacts provided only for reference. The SEOC and DEOC is required to maintain an up to date contact information database. Department of Revenue publishes contact information of Gujarat government functionaries. MoEF also published "Red Book" with key contact information for chemical emergency management. The following information is as per SCG 2008 plan

Table 17. Contact Directory for SCG Members

SN	POSITION	DEPARTMENT	PHONE (OFFICE)
1	Chair Person	Chief Secretary,	23220372
2	Member Secretary	Principal Secretary, Labour & Employment Department,	23220044
3	Member	Add. Chief Secretary, Forest & Environment Deptt.	23220140
4	Member	Secretary, Health & Family Welfare Deptt.	23220069
5	Member	Principal Secretary , Industries & Mines Deptt.	23221814
6	Member	Secretary (Transport) Home Department.	23251512
7	Member	Secretary , (Water Supply,) Narmada, Water Resources and Water Supply Deptt.	23250812
8	Member	Director General and Inspector General of police, Police Bhavan, Gandhinagar.	23246333
9	Member	Chairman, Gujarat Pollution Control Board, Gandhinagar.	23232401
10	Member	Director, Industrial Safety & Health.	22684249
11	Member	Chief Fire Officer, Ahmedabad Municipal Corporation	22148466
12	Member	Additional Chief Executive Officer, Gujarat State Disaster Management Authority, Gandhinagar.	23259502
13	Member	4 Experts (Industrial Safety & Health) to be nomineted by the State Government.	
14	Member	One representative from industry to be nominated by the State Government.	

SN	POSITION	DEPARTMENT	PHONE (OFFICE)
15	Shalimar Talkies	1000	No
16	Ikra Islamic High School, Dehgam Chokdi	1500	No
17	High School, Palej	1000	No
18	Sarvajanik High School, Nabipur	1000	No
19	Lallubhai G High School, Haldar	500	No
20	Primary School, Rozatankaria	500	No
21	Maharaj K G M Vidhyamandir, Zadeshwar	1500	No
22	Shri M P Patel School, Samlod	1000	No
23	Sarvajanik High School, Chanchvel	1000	No

Table 18. State and District Satellite Phone Directory

SN	PERSON	SATELLITE PHONE NO	ALLOTTED ID BY AVAILABLE SERVICE			
			Voice (Sat No.)	Fax	Data	Voice (Ext. No.)
1	Hon'ble Chief Minister	76 EB 5102 BE BE	762483273	762483274	762483275	762483276
2	Chief Secretary	76 EB 51021 00D	762483269	762483270	762483271	762483272
3	Principal Secretary (Revenue)	76 EB 51E 88AIE	762483390	762483391	762483392	762483393
4	Commissioner of Relief	76 EB 51BD8C7E	762483394	762483395	762483396	762483397
5	Secretary, I.T.	76 EB 518AD 122	762483334	762483335	762483336	762483337
6	Collector, Ahmedabad	76 EB 51504BA8	762483295	762483296	762483297	762483298
7	Collector, Amreli	76 EB 51CA02D1	762483330	762483331	762483332	762483333
			Voice (Sat No.)	Fax	Data	Voice (Ext. No.)
8	Collector, Anand	76 EB 5118 F062	762483299	762483310	762483311	762483312
9	Collector, Baroda	76 EB 51S80F4F	762483342	762483343	762483344	762483345
10	Collector, Bharuch	76 EB 5133B81D	762483420	762483421	762483422	762483423
11	Collector, Bhavnagar	76 EB 517BA494	762483338	762483339	762483340	762483341
12	Collector, Dahod	76 EB 51COA339	762483366	762483367	762483368	762483369

SN	PERSON	SATELLITE PHONE NO	ALLOTTED ID BY AVAILABLE SERVICE			
13	Collector, Dangs	76 EB 515D88C4	762483346	762483347	762483348	762483349
14	Collector, Gandhinagar	76 EB 5177C999	762483362	762483363	762483364	762483365
15	Collector, Jamnagar	76 EB 5194EF03	762483374	762483375	762483376	762483377
16	Collector, Junagadh	76 EB 51AO1AEB	762483412	762483413	762483414	762483415
17	Collector, Kheda	76 EB 51FOBD54	762483313	762483314	762483315	762483316
18	Collector, Kutch	76 EB 51D62127	762483354	762483355	762483356	762483357
19	Collector, Mehsana	76 EB 51C6395B	762483350	762483351	762483352	762483353
20	Collector, Navsari	76 EB 51EE2609	762483358	762483359	762483360	762483361
21	Collector, Banaskantha	76 EB 51C4FB7C	762483317	762483318	762483319	762483320
22	Collector, Panchmahals	76 EB 51D6217C	762483324	762483325	762483326	762483327
23	Collector, Patan	76 EB 510999FC	762483292	762483293	762483294	762483321
24	Collector, Porbandar	76 EB 5132A643	762483378	762483379	762483380	762483381
25	Collector, Rajkot	76 EB 519CE394	762483382	762483383	762483384	762483385
26	Collector, Narmada	76 EB 51F31DE9	762483398	762483399	762483410	762483411
27	Collector, Sabarkantha	76 EB 51570936	762483370	762483371	762483372	762483373
28	Collector, Surat	76 EB 5113266E	762483428	762483429	762483430	762483431
29	Collector, Surendranagar	76 EB 5116A163	762483386	762483387	762483388	762483389
30	Collector, Valsad	76 EB 51FD60B4	762483416	762483417	762483418	762483419

Table 19. Contact Information for District Collectors and Municipal Commissioners

SN	DISTRICT	STD CODE	OFFICE	FAX
District Collector of the State				
1	Ahmedabad	79	27551681	27552144
2	Amreli	2792	222307	222710
3	Anand	2692	242871	241575
4	Banaskantha	2742	257171	252740
5	Bharuch	2642	240600	240602 51900
6	Bhavnagar	278	2428822	2427941
7	Dahod	2673	221999	222005
8	Dang	2631	220201	220294
9	Gandhinagar	79	23220630	23259040
10	Jamnagar	288	2555869	2555899
11	Junagadh	285	2650201 / 2650202	2651332
12	Kheda	268	2550856	2565348
13	Kutch	2832	250020	250430
14	Mehsana	2762	222200	222202
15	Narmda	2640	222161	222171
16	Navsari	2637	244999	281540
17	Panchmahal	2672	242800	242899
18	Patan	2766	233301	233055
19	Porbandar	286	2243800	2242527
20	Rajkot	281	2473900 2479351	2453621
21	Sabarkantha	2772	241001	241611
22	Surat	261	2471121	2472419
23	Surendranagar	2752	282200	283862
24	Vadodara	265	2434301	2431093
25	Valsad	2632	253613	243417
Municipal Commissioners				
1	Ahmedabad	70	25352828, 25321115	25354638
2	Vadodara	265	2433344	2433060
3	Rajkot	281	2224133, 2239973	2224258
4	Surat	261	2422244	2422110
5	Jamnagar	288	2552321	2554454
6	Bhavnagar	278	2427332	2428628
7	Junagadh	285	2650450	2651510

APPENDIX F: RESPONSE RESOURCES IN GUJARAT

Table 20. Fire Stations and Facilities in the State of Gujarat

FIRE STATION ZONE	TYPE	NAME	CONTACT	FACILITIES AVAILABLE
AHMEDABAD				
Danapith	Municipal	Fire Station Danapith	079- 22148465-67	2- FireTender
Gomtipur	Municipal	Fire Station Gomtipur	079- 22161896	1- Fire Tender
Jamalpur	Municipal	Fire Station	079- 2539759	2- Fire Tender
Memnagar	Municipal	Fire Station	079- 27417203	2- Fire Tender
Maninagar	Municipal	Fire Station	079- 25470221	1- Fire Tender
Naroda	Municipal	Fire Station	079- 22167715	1-Fire Tender
Odhav	Municipal	Fire Station	079- 22875434	1- Fire Tender
Panchkuva	Municipal	Fire Station	079- 22120388	2-Fire Tender
Sabarmati	Municipal	Fire Station	079- 27506795	1- Fire Tender
Shahpur	Municipal	Fire Station	079- 25621969	2- Fire Tender
AMRELI				
Fire Station Municipality Amreli	Municipal	Fire Officer, Municipality Amreli	02792 - 220917	Fire Tender
L & T Ltd. Kovaya	Public industry	Fire Officer, L & T Ltd., Kovaya	02794 - 283061	Fire Tender
Bharat Shell Ltd. Pipavav	Pvt Industry	Fire Officer, Bharat Shall Ltd. Pipavav	02794 - 286063	Fire Tender
ANAND				
Anand	Municipal	Anand Municipality, Anand	02692 - 243944	5 Fire Tender
Khambhat	Municipal	Khambhat Nagarpalika	928, 101 , 20222	4 Fire Tender
Dhuvaran	Public industry	Thermal Power Station , Dhuvaran	42625 , 42815 , 42623	2 Fire Tender
ONGC	Public industry	ONGC	21105	2 Fire Tender
Borsad	Municipal	Borsad Nagarpalika	20101	1 Fire Tender
Petlad	Municipal	Petlad Nagarpalika	0927 - 24101	1 Fire Tender
BANASKANTHA				
Palanpur	Municipal	Fire Brigade, Palanpur.		Fire Tender
Deesa	Municipal	Fire Brigade, Deesa	222333	Fire Tender
Sidhpur	Municipal	Fire Bridge, Sidhpur	20086	Fire Tender
BHARUCH				

FIRE STATION ZONE	TYPE	NAME	CONTACT	FACILITIES AVAILABLE
Bharuch	Municipal	Nagar Palika	(O) 02642- 101- 240008- 243468	2- Fire Tender
Bharuch	Public industry	G.N.F.C.	(O) 02642- 237300 247001- 15	
Bharuch	Public industry	NCPL	(O) 02642- 247289	
Bharuch	Public industry	G.P.E.C.	(O) 02642- 288501- 08	
Bharuch	Pvt Industry	Vedeocon Narmada Glass	(O) 02642- 240803	
Bharuch	Public industry	NTPC, Zanor (Bharuch)	(O) 02642- 287555, 287488	
Ankleshwar	GIDC	GIDC Fire Station,	(O) 02646- 220229	3- Fire Tender
Ankleshwar	Municipal	Nagar Palika,	(O) 02646- 101- 245101, 247201	1- Fire Tender
Ankleshwar	Pvt Industry	Glenmark Pharma	(O) 02646- 222265- 69-78	
Ankleshwar	Public industry	ONGC	(O) 02646- 237546	
Panoli	GIDC	GIDC Fire Station	(O) 02646- 272747,	
Kharach	Pvt Industry	Birla Cellulose	(O) 02646- 270001- 05	
Jhagadia	GIDC	GIDC Fire Statioon	(O) 02645- 226108	
Jhagadia	Pvt Industry	Shree Ram Alkali	(O) 02645- 226031	
Jhagadia	Pvt Industry	UPL - 5	(O) 02645- 226011- 14	
Jhagadia	Pvt Industry	Swill Ltd.	(O) 02645- 226054- 60	
Jhagadia	Pvt Industry	Rajeshri Profilies, Umalla	234436- 43	
Dahej- Vagra	Public industry	IPCL	(O) 02641- 256272	
Dahej- Vagra	Pvt Industry	Birla copper	(O) 02641- 256004- 09	
Dahej- Vagra	Public industry	GCPTCL	(O) 02641- 256064,	
Dahej- Vagra	Public industry	Gail, Amod	(O) 02641- 231030, 231001- 15	
Kosamba	Public industry	GIPCL	02629- 261063	
Kosamba	Pvt Industry	Gujarat Glass Ltd.	(O) 02641- 231701- 04, Ext. - 1606	

FIRE STATION ZONE	TYPE	NAME	CONTACT	FACILITIES AVAILABLE
Jambusar	Municipal	Jambusher Nagar Palika	(O) 02644- 101-221196, 220360	
BHAVNAGAR				
Subhasnagar	Municipal	Chief Fire Officer, Nagar Palica, Bhavnagar	Chief Fire Officer, (O) 101, (O) 2424814 / 15/78	1 Fire Tender
Nirmal Nagar	Municipal	Nirmal Nagar	Chief Fire Officer, (O) 101, (O) 2424814 / 15/78	1 Fire Tender
Gujarat Meriline Board, Alang	Municipal	Chief Fire Officer, Alang	(O) 02842 / 235147	3 Fire Tender
Airport Bhavnagar	Public industry	Airport Manager, Bhavnagar		3 Fire Tender
GANDHINAGAR				
Kalol	Public industry	G. N. R.FireBrigade	3222742	Fire Tender
Kalol	Public industry	G. E.B.- G. N. R.Fire	3215964	Fire Tender
Kalol	Public industry	IFFCO - Kalol	223272,	Fire Tender
Kalol	Public industry	O. N. G. C.- Kalol	223461	Fire Tender
Kalol	Municipal	Kalol Nagar Palika	921-233333	Fire Tender
Gandhinagar	Municipal	Fire Station GEB Gandhinagar	23215285	Fire Tender
Gandhinagar	Municipal	Fire Station Sector-17 Gandhinagar	23222742	Fire Tender
GODHRA PANCHMAHAL				
Godhra	Municipal	Chief Officer, Nagar Palika, Godhra	(O) 02672 - 101 , 02672 - 240596 , 02672 - 243185	2 Fire Tender
Halol	Pvt Industry	General Motor India Pvt. Ltd. , Halol	(O) 02676- 221000	2 Fire Tender & 1 ambulance
Santarampur	Municipal	Nagar Panchayat	02675 - 220055	2 Fire Tender
Lunavada	Municipal	Nagar Panchayat	02674 - 220006	2 Fire Tender
Kalol	Municipal	Fire Brigade	02676 - 235101 , 235605 , 235566	
JAMNAGAR				
1	Municipal	Fire Station, Municipal Corporation, Jamnagar	2662690	
2	Public industry	I.O.C., Sikka		

FIRE STATION ZONE	TYPE	NAME	CONTACT	FACILITIES AVAILABLE
3	Pvt Industry	K.I.L. Sikka		
4	Public industry	G.E.B., Sikka	2344106	
5	Public industry	G.A.O.C., Sikka		
6	Public industry	Jetty Fire Station, Sikka		
7	Public industry	G.S.F.C. Sikka Unit	2432200	
8	Pvt Industry	Tata Chemicals, Mithapur	223439	
9	Pvt Industry	Reliance Industries Ltd., Meghpar, Padana	2310000	
JUNAGADH				
Junagadh	Municipal	Junagadh Fire Brigade	101 / 102 (0285) 2620841 / 2624965	Fire Tanker - 03 Nos. Capacity: (1) 4500 ltrs. (2) 3500 ltrs. (3) 2000 ltrs One Ambulance Ph.No.-102
Una	Municipal	Una Fire Brigade	(02875) 222220	One 4500 ltrs capacity of water tanker
Veraval	Municipal	Veraval Fire Brigade	(02876) 220101	Two nos. of water tenker One Ambulance
Manavadar	Municipal	Manavadar Fire Station		One Fire Tender
Keshod	Public industry	Keshod Air Port		One Fire Tender
Veraval	Pvt Industry	Indian Rayon & Industries Ltd.		Two Fire Tenders
KHEDA	Municipal			
Nadiad	Municipal	Fire Brigades, Nadiad	0268 - 2550106, 2560101, 2551376, 2551377, 2551378	Fire Tender 1
Kapadvanj	Municipal	Kapadvanj Nagar Palika, Kapadvanj	02691- 252365	Fire Tender 1
Thasara	Municipal	Municipal Burro Dakor Thasara	02699 - 2446638	Fire Tender 1
Thasara	Public industry	Vanakbori Thermal Power Station, Thasara	02699- 235604 , 235680	Fire Tender 1
Balasinor	Municipal	Nagar Palika , Balasinor	02690- 266188 , 267939	Fire Tender 1
KUTCH				

FIRE STATION ZONE	TYPE	NAME	CONTACT	FACILITIES AVAILABLE
1	Public industry	Fire Station, Old Kandla Port (Oil Jetty Area)		
2	Public industry	Fire Station, Booster Pumping Station		
3	Public industry	Fire Station, New Port (Central Fire Station)		
4	Public industry	Fire Station, Old Kandla		
MEHSANA				
Mehsana	Municipal	District Panchayat	02762-21217	Fire Tender
Kalol	Public industry	ONGC, Kalol,Saij.	02764-23416	Fire Tender
kalol	Public industry	IFFCO, KALOL	02764-23271	Fire Tender
Palvasana	Public industry	CISF, ONGC, Palvasana	02762- 54599	Fire Tender
NAVSARI				
Navsari	Municipal	Nagarpalika,	(O) 02632- 250253	2- Fire Tenders
PATAN				
Patan	Municipal	Fire Brigade, Patan	(O) 02766-101	Fire Tender
Patan	Municipal	FireWaterWorks, Nagar Palika,	02766-33232	Fire Tender
Sidhpur	Municipal	Fire Station, Sidhpur.	02767-20086	Fire Tender
Radhanpur	Municipal	Fire Station, Nagar Palika,	02746-77148, 77183	Fire Tender
Sidhpur	Municipal	Nagarpalika	02767-20479, 20618	Fire Tender
PORBANDAR				
Fire Station Porbandar	Municipal	Fire Station Porbandar	Fire Station Incharge	Fire Tender
Fire Station Airport Porbandar	Public industry	Airport Porbandar	Fire Station Incharge	Fire Tender
SHV Energy LPG Infrastructure Pvt Ltd. Porbandar	Pvt Industry	Terminal Manager, SHV Energy LPG Infrastructure Pvt Ltd. Porbandar	0286- 2211906 , 2243034	Fire Tender
Saurashtra Chemicals, Porbandar	Pvt Industry	General Manager , Saurashtra Chemicals, Porbandar	0286 - 2242478 , 2242479	Fire Tender
Saurashtra Cements, Ranavav	Pvt Industry	General Manager , Saurashtra Cements, Ranavav	02801 - 230826 / 230827 / 230828 / 230829	Fire Tender

FIRE STATION ZONE	TYPE	NAME	CONTACT	FACILITIES AVAILABLE
RAJKOT				
Chief Fire Station	Municipal	Kanak Road Fire Station, Nr. S.T. Bus Station, Kanak Road, Rajkot	0281 - 2227222 , 101	1 Mini Water Tender, 1 Foam Tender, 1 Snokal, 3 Resque Tanker, 5 Water Tanker
Sub Fire Station	Municipal	Bedipara Fire Station, Nr. Rajmoti Oil Mill, Bhavnagar Road, Rajkot	101	4 Water Tanker, 1 Air Boat
Sub Fire Station	Municipal	Kalavad Road Fire Station, Nr. Kotecha Chawk, Kalavad Road, Rajkot	101	2 Water Tanker
Sub Fire Station	Municipal	Mavadi Road Fire Station, Mavadi Plot, Main Road, Rajkot	101	1 Dewatering Pump, 1 Foam Tender, 2 Water Tanker
SABARKANTHA				
Himatnagar	Municipal	Nagarpalika	46720	Fire Tender
Modasa	Municipal	Nagarpalika	46450	Fire Tender
SURAT				
Central Zone	Municipal	C.F.O.	(O) 2422285 / 86	1 Fire Fighter
Wireless Control Room	Municipal	Wireless Control Room	101, 102, Ext- 450, 324, 24141-39- 95/ 96	
Navsari Bazar	Municipal	Navsari Bazar	(O) 3952830-	1 Fire Fighter 1 Water Tanker
Kapodra, East Zone	Municipal	Kapodra, East Zone	(O) 3952824	2 Fire Fighter 2 Water Tanker
Adajan, West Zone	Municipal	Adajan, West Zone	(O) 3952827	1 Fire Fighter 2 Water Tanker
Katargam, North Zone	Municipal	Katargam, North Zone	(O) 3952825	2 Fire Fighter 1 Foam Tender 2 Water Tanker
Mandarwaja, South East Zone	Municipal	Mandarwaja, South East Zone	(O) 3952823	1 Fire Fighter 1 Foam Tender 2 Water Tanker
Pandesara, South Zone	Municipal	Pandesara, South Zone	(O) 3952826	2Fire Fighter 2 Water Tanker
Majura, South West Zone	Municipal	Majura, South West Zone	(O) 3952822	1 Fire Fighter 1 Foam Tender 1 Water Tanker
SUREDRANAGAR				

FIRE STATION ZONE	TYPE	NAME	CONTACT	FACILITIES AVAILABLE
Surendranagar	Municipal	Fire Station Surendranagar	(O) 02752- 101, 102, 282250, 550310	Fire Tender 2
Vadhwan	Municipal	Fire Station Vadhwan	(O) 02752- 241196 ,	Fire Tender 1
Limdi	Municipal	Fire Station Limdi	(O) 02753-260101	Fire Tender 1
Dhrangadhra	Municipal	Fire Station Dhrangadhra	(O) 02754-261629	Fire Tender 1
Limdi	Public industry	GEB Choraniya		Fire Tender 1
Surendranagar	Pvt Industry	Neminath Jinning Factory Surendranagar Rajkot Road,		Fire Tender 1
		VADODARA		
Vadodara	Municipal	Dandia Bazar, Vadodara	0265 - 2426313	5 Fire Tender
Vadodara	Municipal	Panigate, Vadodara	0265 - 2513014	5 Fire Tender
Vadodara	Municipal	Gajarwadi, Vadodara	0265 - 2420882	1 Fire Tender
Vadodara	Municipal	Makarpura, Vadodara	0265 - 2642444	3 Fire Tender
Vadodara	Municipal	Wadi, Vadodara	0265 - 2343545	4 Fire Tender
Vadodara	GIDC	GIDC , Nandesari	0265 - 2840363	1 Fire Tender
Vadodara	Public industry	Gas Authority of India Ltd. Vadodara	02668 - 262316	2 Fire Tender
Vadodara	Pvt Industry	Gujarat Dye Stuff Industries, Vadodara	0265 - 2840492 , 2840352	2 Fire Tender
Vadodara	Public industry	Gujarat Industries Power Company Ltd. Vadodara	0265 - 2230186 , 2232152	2 Fire Tender
Vadodara	Public industry	Gujarat Refinery Ltd, Vadodara	0265 - 2233301-21	11 Fire Tender
Vadodara	Public industry	Gujarat State Fertilizer & Chemicals Ltd., Vadodara	0265 - 2272855 , 2273955	7 Fire Tender
Vadodara	Pvt Industry	Nirma Ltd, Vadodara	02667 - 251461 , 251462	2 Fire Tender
Vadodara	Public industry	Indian Petro Chemicals Corporation Ltd.	0265 - 2230359 , 2232011	9 Fire Tender
		VALSAD		
Sarigam	Municipal	Fire Station Sarigam	0260- 2780222	1 Fire Tender
Vapi	GIDC	Fire Station Vapi GIDC- No. 1	0260- 2430101	2 Fire Tender

FIRE STATION ZONE	TYPE	NAME	CONTACT	FACILITIES AVAILABLE
Vapi	GIDC	Fire Station Vapi GIDC No. 2	0260- 2431300	1 Fire Tender
Vapi	Municipal	Fire Station Vapi Nagar Palika	0260- 2460100	2 Fire Tender
Valsad	Municipal	Fire Station Valsad	02632- 242702	3 Fire Tender
Sarigam	Pvt Industry	Aarti Drugs Ltd.	Ph. 0260- 2782269	90 m^3 water 1 Fire Entry Suits
Vapi	Pvt Industry	Aarti Ind. Ltd.	. 0260- 2431366, 2429059	2250 m^3 water 2 Fire Proximity Suits
Vapi	Pvt Industry	Acra Pack (I) Pvt. Ltd.	0260- 2421236, 2422856	90 m^3 water 1 Fire Entry Suits 1 Fire Proximity Suits
Vapi	Pvt Industry	Aero Industries.	Ph. 0260- 2425436,	200 m^3 water Fire Proximity Suits
Vapi	Pvt Industry	Alok Ind. Ltd.	022- 24996200,	800 m^3 water 2 Fire Proximity Suits
Dharampur	Pvt Industry	Anchor Electronics & Ele. P.l.	02633- 242422, 248412	75 m^3 water 2 Fire Proximity Suits
Atul	Pvt Industry	Atul Ltd.	02632- 233261, 233262	45000 m^3 water 4 Fire Entry Suits 2 Fire Tender
Vapi	Pvt Industry	Bhageria Dye Chem. Ltd.	0260- 2424147, 2427147	150 m^3 water
Vapi	Pvt Industry	Bilag Ind. Pvt. Ltd.	2432443, 2432444	11 m^3 water 2 Fire Entry Suits 5 Fire Proximity Suits 4 Fire Tender
Vapi	Pvt Industry	Brighton Inorganics Pvt. Ltd.	0260- 2426630	12 m^3 water
Vapi	Pvt Industry	Chirag Organics Pvt. Ltd.	0260- 2426836, 5542391	20 m^3 water
Gundlav	Pvt Industry	Demosha Chemicals Pvt. Ltd.	02632- 237271, 237272	22 m^3 water 1 Fire Entry Suits
Vapi	Pvt Industry	Jaysinth Dyestuff Ind. Ltd.	0260- 2431263, 2431542	350 m^3 water
Vapi	Pvt Industry	K. V. Aero Chem .Pvt. Ltd.	0260- 2430699,	500 m^3 water 1 Fire Proximity Suits
Vapi	Pvt Industry	Mack-Well Plasticizers	0260- 2423495, 2423496	200 m^3 water

FIRE STATION ZONE	TYPE	NAME	CONTACT	FACILITIES AVAILABLE
Vapi	Pvt Industry	Maglam Drugs & Organics Ltd.	0260-2430598,	70 m^3 water 1 Fire Entry Suits
Vapi	Pvt Industry	Mazda Colour Ltd.	0260- 2432993, 2453137	350 m^3 water 1 Fire Proximity Suits
Vapi	Pvt Industry	Mitsu Ltd.	0260- 2432443, 2432444	5.5 m^3 water
Vapi	Pvt Industry	Nascent Chemical	0260- 2430196	100 m^3 water
Vapi	Pvt Industry	Nath Industrial chem Ltd.	0260- 2424830, 2420881	250 m^3 water
Vapi	Pvt Industry	Nirmala Dye Chem. Pvt. Ltd.	0260- 243281	120 m^3 water
Vapi	Pvt Industry	Numet Chemicals Pvt. Ltd.	0260- 2432489	5 m^3 water
Vapi	Pvt Industry	Pidilite Industries Ltd.	0260- 2430521,	348 m^3 water 1 Fire Proximity Suits 1 Fire Tender
Vapi	Pvt Industry	Rishi- Roop Organics	0260- 2423941, 2400152	100 m^3 water
Vapi	Pvt Industry	Rupani Chemicals Ind.	022- 25038231, 25032571	20 m^3 water
Sarigam	Pvt Industry	S.H.V. Energy (N-W)	0260- 2783228, 2783230	600 m^3 water
Sarigam	Pvt Industry	Sabero Org. (G) Ltd.	0260- 2782395, 2782396	870.24 m^3 water 2 Fire Proximity Suits
Sarigam	Pvt Industry	Sandhya Dyes & Chemicals	0260- 2781049, 2782149	4 m^3 water
Sarigam	Pvt Industry	Sandhya Industrial Chemicals	0260- 2530875, 2400235	10 m^3 water
Vapi	Pvt Industry	Savi Chemical Pvt. Ltd.	0260- 2422816, 2426690	27 m^3 water
Vapi	Pvt Industry	Shanti Intermediates	0260- 2430702, 2421262	10 m^3 water
Sarigam	Pvt Industry	Tristar Intermediates	0260- 2783378	70 m^3 water
Vapi	Pvt Industry	United Phosphorus. P. Ltd.	0260- 2432716, 2432717	150 m^3 water 2 Fire Proximity Suits 1 Fire Tender
Sarigam	Pvt Industry	Valiant Chemical Corporation.	0260- 2780139, 2780605	20 m^3 water

FIRE STATION ZONE	TYPE	NAME	CONTACT	FACILITIES AVAILABLE
Vapi	Pvt Industry	U. P. Ltd. (Unit- 6)	9824396941	40 m^3 water
Vapi	Pvt Industry	Dhiraj Intermediates	0260- 2432241, 2429085	80 m^3 water
Vapi	Public industry	Gujarat Krishi Chem.	0260- 2432796, 2428660	10 m^3 water

Table 21. List of Government Municipal, and Other Hospitals

SN	NAME	PHONE NO.
AHMEDABAD		
1	Civil Hospital	
2	V.S. General Hospital	
3	Shardaben Hospital	
4	Police Hospital	
5	Railway Hospital	
6	Sal Hospital	
7	Sterling Hospital	
8	Kesar Sal Hospital	
9	Appolo Hospital	
10	Krishna Heart Hospital	
AMRELI		
1	Civil Hospital, Amreli	02792- 222587 - 113
2	Pipavav Dispensary	02794 - 286001
3	Mahuva Municipal Medical Unit, Mahuva	
4	Mahuva Vinay Heart Hospital, Mahuva.	
ANAND		
1	Local Hospital, Anand	02692-244656
2	Shree Krishna Hospital, Anand	02692-222130, 233247, 223479
3	Local Hospital, Khambhat	02698-276001
4	Civil Hospital, Khambhat	02698-276001
5	Cambay General Hospital, Khambhat	
6	Candy Hospital, Khambhat	0298-276001
7	Local Hospital, Karamsad	02692-231388
8	Local Hospital, Sojitra,	
9	Local Hospital, Tarapur	

SN	NAME	PHONE NO.
10	Local Hospital, Umreth	02692-276055 , 276697
11	Local Hospital, Petlad	02697-224645, 224745
12	S.S. Hospital, Petlad	02697-224645, 224745
13	Civil Hospital, Petlad	02697-224645, 224745
14	Thermal Power Station, G.E.B., Dhuvaran	0298-242815
BANASKANTHA		
1	Civil Hospital,Palanpur	02742 - 253758
2	District Health Centre,Palanpur	
3	Mother Phc, Malan	
BHARUCH		
1	New Civil Hospital : Bharuch	
2	Brijlal Rungata Hospital : Bharuch	
3	Sevashram Hospital : Panch Batti, Bharuch	
4	Patel Welfare Hospital, Bharuch.	
5	NTPC Hospital : Zanor : Dist. Bharuch	
6	Samuhik Arogya Kentra, Jambusar, Dist.Bharuch,	
7	Patel Surgical Hospital, Ankleshwar Town. Dist.Bharuch	
8	Jayaben Modi Hospital, GIDC, Ankleshwar.	
BHAVNAGAR		
1	Sir T. General Hospital,	
2	Bajarangdas Hospital, Panvadi,	
3	Shantilal Shah Hopital, Near Mahila Colledge,	
GANDHINAGAR		
1	Civil Hospital, Gandhinagar	
2	CRP Hospital, Gandhinagar	
3	Sheth N.N.Sarvajanik Hospital Randheja	
4	Kanoria Hospital, Bhat	
5	IFFCO Hospital, Kasturinagar, Kalol	
6	New Sachivalya Dispensary	
7	Old Sachivalya Dispensary	
8	GEB Dispensary	
GODHRA PANCHMAHAL		
1	Civil Hospital, Godhra	02672- 240950, 242205
2	General Hospital, Kalol	02676 - 235937
3	Referral Hospital, Halol	02676 - 22011, 220297

SN	NAME	PHONE NO.
4	Referral Hospital, Jarod	
5	ESIC Dispensary, Godhra.	02672 - 235390
6	Ayurvedic Hospital, Popatpura, Godhra	
7	State Hospital, Santarampur, Godhra	02675 - 220046
8	Cottage Hospital, Lunawada	02674 - 220008
9	Samuhik Arogya Kendra, Halol,	02676 - 220111
10	Samuhik Arogya Kendra, Kalol	02676 - 235937
JAMNAGAR		
1	Irwin Hospital, Jamnagar	2554629
2	Samarpan Hospital, Jamnagar	2712728
3	Mithapur Hospital, Mithapur	222813
4	Dwarka Hospital, Dwarka	234262
JUNAGADH		
1	General Hospital, Junagadh	0285- 2651436
2	Hospital, Vanthli	02872- 222192-93
3	Hospital, Manavadar	02874- 221244
4	Hospital, Keshod	02871- 236359
5	Hospital, Malia-Hatina	02870- 222278
6	Hospital, Veraval	02876 - 244298
7	Hospital, Prabhas Patan	02876- 231752
8	Hospital, Kodinar	02795- 221529
9	Hospital, Una	02875- 222044
10	Hospital, Mangrol	
11	Hospital, Talala	02877- 222502
12	Hospital, Mendarda	02872- 241351
13	Hospital, Visavadar	02873- 222221
14	Hospital, Bhesan	
15	Hospital, Sutrapada	
16	Hospital, Gir Gadhda	
KHEDA (NADIAD)		
1	Civil Hospital, Nadiad	0268- 2529074, 2521386
2	Maha Gujarat Hospital, Nadiad	0268- 2523361, 2523362
3	Methodist Hospital, Nadiad	0268- 2550973
4	General Hospital, Kheda.	02694- 224932
KUTCH		

SN	NAME	PHONE NO.
1	Civil Hospital, Bhuj	
2	Rambaug Hospital, Bhuj	
MEHSANA		
1	Civil Hospital Mehsana	02762 - 221109
2	District Health Centre Mehsana	
3	T. B. Hospital Vijapur	
4	Lions Hospital Mehsana	02762 - 251130
NAVSARI		
1	Civil Hospital, Navsari City	02637 - 250389
2	Babu Hospital, Navsari	
3	K.G.General Hospital, Shartedevi Road Navsari	256115 , 261351
4	Parsi General Hospital, Luncikul, Navsari	258021
5	Bhagwan Mahavir Jain Hospital, Ashanagar, Navsari	
6	Amuta Hospital, Navsari	
7	Anukur Hospital, Navsari	
8	Aaradlana Hospital, Navsari	
9	Gayati Hospital, Navsari	
10	KDM Gohil Hospital, Dudhiya Taluka, Navsari	259225 , 259229
11	Kejal Hospital, Kaliyawadi Road, NH No.8, Navsari	236207
12	Kamdar Umiya Hospital, Navsari	
13	Lions Hospital, Navsari	250390
14	Jaykishan Hospital, Navsari	02634 - 262649
15	Yashfin Hospital, Navsari	235725
PATAN		
1	Civil Hospital, Patan	02766-33311
2	Civil Hospital, Sidhpur	02767-20086 / 10
3	Malik Hospital, Sidhpur	
4	Ajani Hospital, Sidhpur	
5	Ami Hospital, Sidhpur	
6	Main District Health Center, Patan	
7	Janata Hospital, Patan	
8	Ayurvedik Hospital, Patan	
9	Bhartiya Arogya Nidhi,Patan	
PORBANDAR		

SN	NAME	PHONE NO.
1	Sahyog Hospital, Porbandar	0286- 2245525
2	Bhavsinghji Hospital, Porbandar	0286- 2240923
3	Rupariba Ladies Hospital, Porbandar	0286- 2246817
4	Asha Children Hospital, Porbandar	0286- 2246911
5	Siddhi Hospital, Porbandar	0286- 2246099
6	Royal Maternity Hospital, Porbandar	0286- 2246269
7	Lion's Medical Centre, Porbandar	0286- 2246906
8	Lohana Mahajan Hospital, Porbandar	0286- 2245248
9	V.V. Hospital, Porbandar	0286- 2241098
RAJKOT		
1	Civil Hospital, Rajkot	0281 - 2440298
2	Doshi Hospital, Rajkot	
3	Zanana Civil Hospital, Rajkot	
4	Gondiya Hospital, Rajkot	
5	Civil Hospital, Jetpur	220111 , 221772
6	Civil Hospital, Gondal	02825- 220031
7	Civil Hospital, Padadhari	233440
8	Padm Kunvarba Hospital , Rajkot	0281- 2227136 , 2571930
9	Govt. Hospital , Dhoraji	220139
10	General Hospital Morbi	230238
11	General Hospital Upleta	221462 , 221401
SABARKANTHA		
1	General Hospital, Himatnagar	
2	District Health Centre, Himatnagar	
3	General Hospital, Bhiloda	
4	Aryuvedik Hospital, Himatnagar	
5	Aryuvedik Hospital, Idar	
6	Aryuvedik Hospital, Prantij	
7	Aryuvedik Hospital, Modasa	
8	Aryuvedik Hospital	
SURAT		
1	Civil Hospital (New), Surat	
2	Civil Hospital (Old), Surat	
3	ESIC Hospital, Majura Gate, Surat	

SN	NAME	PHONE NO.
4	Shree Mahavir Hospital, Surat	
5	Sheth P.T. General Hospital, Surat	
6	Seventh Day Hospital, Nanpura, Surat	
7	Sanjeevani Hospital, Chalthan	
8	Kribhco Township Hospital, Kawas	
9	Ashaktashram Hospital, Rampura, Surat	
10	Maskati Charitable Hospital, Surat	
SURENDRANAGAR		
1	Gandhi Hospital, Surendranagar	02752 - 222050
2	C.J.Hospital, Surendranagar	02752 - 220299
3	T.B.Hospital (C.U. Shah), Surendranagar	02752 - 256001
4	Shri Ram Hospital, Surendranagar	02752 - 225512
5	Govt. Hospital, Wadhwan	02752 - 243961
6	Govt. Hospital, Than	02751 - 220277
7	Govt. Hospital, Dhrandhra	02754 - 262637
8	Govt. Hospital, Chotila	02751 - 280422
9	Govt. Hospital, Bamanbore	02751 - 240383
10	Govt. Hospital, Sayla	02755 - 280642
11	E.S.I. Hospital	
VADODARA		
1	SSG Hospital, Vadodara	2424848
2	Bhailal Amin General Hospital, Vadodara	2285555
3	Shree Narhari Arogya Kentra, Vadodara	2794413
4	Railway Hospital, Vadodara	2641385
5	ESIC Hospital, Vadodara	2336421
6	Pramukhswami Hospital, Vadodara	2680313
7	Jalaram Hospital, Vadodara	2564785
8	Gujarat Refinery Medical Centre, Vadodara	2236154
9	IPCL Refinery, Vadodara	3067221
10	GSFL Refinery, Vadodara	2231342
11	Jamnabai Hospital, Vadodara	2517400
VALSAD		
1	Civil Hospital, Valsad	242911
2	Municipality Hospital, Valsad	244286 , 244296 , ® 243583
3	Kasturba Hospital, Valsad	222481 , 244168

SN	NAME	PHONE NO.
4	Govt. Staff Quarter Dispensary, Valsad	223846
5	Referral Hospital, Bhilad,	
6	Mohanlal Daya Prasutigrah and General Hospital, Kila Pardi	
7	Panchyat Dispensary, Umbargam	
8	L. G. Haria Hospital, GIDC, Vapi	2430654 , 2430206 , 2426153
9	Haria Nursing Home, Daman Road, Near Jayshree Cinema, Vapi.	2430654 , 2430206 , 2426153
10	Vapi General Hospital, Near Apasana Market, Vapi	2460003
11	ESIC Hospital, Chanod Naka, Vapi	2421802

Table 22. List of Community Health Centres in Gujarat

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Ahmedabad	Ahmadabad City	Sarkhej Okaf	Ahmedabad	Bavla	Bavla	Ahmedabad	Daskroi	Singarva
Ahmedabad	Detroj-Rampura	Detroj	Ahmedabad	Dhandhuka	Dhandhuka	Ahmedabad	Dholka	Dholka
Ahmedabad	Ranpur	Ranpur	Ahmedabad	Sanand	Sanand	Ahmedabad	Viramgam	Viramgam
Amreli	Babra	Babra	Amreli	Bagasara	Bagasara	Amreli	Dhari	Chalala
Amreli	Dhari	Dhari	Amreli	Jafrabad	Jafrabad	Amreli	Khambha	Khambha
Amreli	Kunkavav Vadia	Vadia	Amreli	Kunkavav Vadia	Kunkavav Moti	Amreli	Lathi	Lathi
Amreli	Lathi	Damnagar	Amreli	Lilia	Lilia	Amreli	Rajula	Rajula
Amreli	Savar Kundla	Savarkundla	Anand	Anand	Ode	Anand	Anand	Sarsa
Anand	Anklav	Anklav	Anand	Borsad	Ras	Anand	Khambhat	Khambhat
Anand	Petlad	Mahelav	Anand	Petlad	Dharmaj	Anand	Sojitra	Sojitra
Anand	Tarapur	Tarapur	Anand	Umreth	Umreth	Banaskantha	Amirgadh	Amirgadh
Banaskantha	Bhabhar	Bhabhar Juna	Banaskantha	Danta	Danta	Banaskantha	Deesa	Deesa
Banaskantha	Deodar	Deodar	Banaskantha	Dhanera	Dhanera	Banaskantha	Kankrej	Shihori
Banaskantha	Kankrej	Thara	Banaskantha	Palanpur	Chandisar	Banaskantha	Tharad	Tharad
Banaskantha	Vadgam	Vadgam	Banaskantha	Vadgam	Memadpur	Banaskantha	Vav	Vav
Bharuch	Amod	Amod	Bharuch	Bharuch	Palej	Bharuch	Hansot	Hansot
Bharuch	Jambusar	Jambusar	Bharuch	Jhagadia	Umalla	Bharuch	Jhagadia	Jhagadia
Bharuch	Vagra	Vagra	Bharuch	Valia	Valia	Bhavnagar	Bhavnagar	Vartej
Bhavnagar	Bhavnagar	Koliyak	Bhavnagar	Botad	Paliyad	Bhavnagar	Botad	Botad
Bhavnagar	Gadhada	Gadhada	Bhavnagar	Gariadhar	Gariadhar	Bhavnagar	Ghogha	Ghogha
Bhavnagar	Mahuva	Jesar	Bhavnagar	Mahuva	Mota Khuntavada	Bhavnagar	Sihor	Sihor
Bhavnagar	Talaja	Talaja	Bhavnagar	Talaja	Datha	Bhavnagar	Umrala	Umrala
Bhavnagar	Vallabhipur	Vallabhipur	Dohad	Devgadh Baria	Piplod	Dohad	Devgadh Baria	Devgadhbaria

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Dohad	Dhanpur	Dhanpur (To)	Dohad	Dohad	Katwara	Dohad	Fatepura	Fatepura Alias Val
Dohad	Garbada	Gangarda	Dohad	Limkheda	Singvad	Dohad	Limkheda	Limkheda
Dohad	Zalod	Jhalod	Dohad	Zalod	Limdi	Dohad	Zalod	Parthampur
Gandhinagar	Dehgam	Dehgam	Gandhinagar	Gandhinagar	Sadra	Gandhinagar	Gandhinagar	Chandkheda
Gandhinagar	Kalol	Nardipur	Gandhinagar	Mansa	Charada	Gandhinagar	Mansa	Mansa
Jamnagar	Bhanvad	Bhanvad	Jamnagar	Dhrol	Dhrol	Jamnagar	Jamjodhpur	Jamjodhpur
Jamnagar	Jamnagar	Sikka	Jamnagar	Jodiya	Jodiya	Jamnagar	Kalavad	Kalavad
Jamnagar	Kalyanpur	Kalyanpur	Jamnagar	Kalyanpur	Jamraval	Jamnagar	Khambhalia	Salaya
Jamnagar	Lalpur	Lalpur	Jamnagar	Okhamandal	Dwarka	Junagadh	Bhesana	Bhesan
Junagadh	Junagadh	Bilkha	Junagadh	Keshod	Keshod	Junagadh	Kodinar	Kodinar
Junagadh	Malia	Malia	Junagadh	Manavadar	Manavadar	Junagadh	Mangrol	Mangrol
Junagadh	Mendarda	Mendarda	Junagadh	Patan-Veraval	Patan (Rural Area	Junagadh	Sutrapada	Sutrapada
Junagadh	Talala	Talala	Junagadh	Una	Una	Junagadh	Una	Gir Gadhada
Junagadh	Vanthali	Vanthali	Junagadh	Visavadar	Visavadar	Kachchh	Abdasa	Naliya
Kachchh	Anjar	Anjar	Kachchh	Bhachau	Janan	Kachchh	Bhachau	Lakadiya
Kachchh	Bhachau	Bhachau	Kachchh	Bhuj	Khavda	Kachchh	Bhuj	Bharapar
Kachchh	Gandhidham	Gandhidham	Kachchh	Mandvi	Mandvi	Kachchh	Mundra	Mundra
Kachchh	Nakhatrana	Nakhatrana	Kachchh	Rapar	Rapar	Kheda (Nadiad)	Balasinor	Balasinor
Kheda (Nadiad)	Kapadvanj	Atarsumba	Kheda (Nadiad)	Kathlal	Kathlal	Kheda (Nadiad)	Kheda	Kheda
Kheda (Nadiad)	Mahudha	Mahudha	Kheda (Nadiad)	Matar	Matar	Kheda (Nadiad)	Mehmedabad	Haldarvas
Kheda (Nadiad)	Nadiad	Alindra	Kheda (Nadiad)	Thasra	Thasra	Kheda (Nadiad)	Thasra	Dakor
Kheda (Nadiad)	Virpur	Virpur	Mahesana	Bechraji	Bechraji	Mahesana	Kadi	Kadi
Mahesana	Kadi	Thol	Mahesana	Kheralu	Kheralu	Mahesana	Mahesana	Langhnaj
Mahesana	Satlasana	Satlasana	Mahesana	Unjha	Unjha	Mahesana	Vadnagar	Vadnagar

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Mahesana	Vijapur	Kolavda	Mahesana	Vijapur	Vijapur	Mahesana	Visnagar	Visnagar
Mahesana	Visnagar	Udalpur	Narmada	Dediapada	Dediapada	Narmada	Nandod	Garudeshwar
Narmada	Sagbara	Sagbara	Narmada	Tilakwada	Tilakwada	Navsari	Bansda	Bansda
Navsari	Bansda	Limzar	Navsari	Chikhli	Chikhli	Navsari	Chikhli	Rumla
Navsari	Chikhli	Khergam	Navsari	Gandevi	Gandevi	Navsari	Jalalpore	Maroli
Navsari	Jalalpore	Mandir	Navsari	Navsari	Ambada	Navsari	Navsari	Khadsupa
Panchmahal	Ghoghamba	Ghoghamba	Panchmahal	Godhra	Kankanpur	Panchmahal	Godhra	Timba
Panchmahal	Halol	Halol	Panchmahal	Jambughoda	Jambughoda	Panchmahal	Kadana	Kadana
Panchmahal	Kalol	Kalol	Panchmahal	Kalol	Malav	Panchmahal	Lunawada	Lunawada
Panchmahal	Lunawada	Kothamba Palla	Panchmahal	Morwa Hadaf	Mora	Panchmahal	Santrampur	Santrampur
Panchmahal	Santrampur	Sukhsar	Panchmahal	Shehera	Shehera	Patan	Chanasma	Lanva
Patan	Harij	Harij	Patan	Patan	Sander	Patan	Radhanpur	Radhanpur
Patan	Sami	Sami	Patan	Santalpur	Santalpur	Patan	Sidhpur	Sidhpur
Patan	Sidhpur	Kahoda	Porbandar	Kutiyana	Kutiyana	Porbandar	Porbandar	Advana
Porbandar	Ranavav	Ranavav	Rajkot	Dhoraji	Dhoraji	Rajkot	Dhoraji	Moti Marad
Rajkot	Gondal	Kolithad	Rajkot	Gondal	Gondal	Rajkot	Jamkandorna	Jam Kandorna
Rajkot	Jasdan	Vinchhiya	Rajkot	Jasdan	Jasdan	Rajkot	Jetpur	Virpur
Rajkot	Jetpur	Jetpur	Rajkot	Kotada Sangani	Kotda Sangani	Rajkot	Lodhika	Lodhika
Rajkot	Maliya	Maliya	Rajkot	Paddhari	Paddhari	Rajkot	Tankara	Tankara
Rajkot	Upleta	Bhayavadar	Rajkot	Upleta	Upleta	Rajkot	Wankaner	Wankaner
Sabarkantha	Bayad	Bayad	Sabarkantha	Bayad	Amodara	Sabarkantha	Bhiloda	Bhiloda
Sabarkantha	Bhiloda	Shamlaji	Sabarkantha	Dhansura	Dhansura	Sabarkantha	Himatnagar	Gambhoi
Sabarkantha	Himatnagar	Rupal	Sabarkantha	Idar	Idar	Sabarkantha	Idar	Chorivad
Sabarkantha	Khedbrahma	Poshina (Ratanpur)	Sabarkantha	Khedbrahma	Khedbrahma	Sabarkantha	Malpur	Malpur
Sabarkantha	Meghraj	Meghraj	Sabarkantha	Modasa	Madasana	Sabarkantha	Prantij	Takhatgadh

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Sabarkantha	Prantij	Prantij	Sabarkantha	Talod	Talod	Sabarkantha	Vijaynagar	Vijaynagar
Surat	Bardoli	Bardoli	Surat	Kamrej	Kamrej	Surat	Mahuva	Mahuva
Surat	Mahuva	Anaval	Surat	Mandvi	Areth	Surat	Mandvi	Mandvi
Surat	Mangrol	Mangrol	Surat	Mangrol	Jhankhvav	Surat	Nizar	Nizar
Surat	Olpad	Olpad	Surat	Olpad	Sayan	Surat	Palsana	Palsana
Surat	Songadh	Songadh	Surat	Uchchhal	Uchchhal	Surat	Valod	Valod
Surat	Vyara	Vyara	Surat	Vyara	Gadat	Surendranagar	Chotila	Chotila
Surendranagar	Chuda	Chuda	Surendranagar	Dasada	Patdi	Surendranagar	Dhrangadhra	Dhrangadhra
Surendranagar	Dhrangadhra	Rajsitapur	Surendranagar	Halvad	Halvad	Surendranagar	Lakhtar	Lakhtar
Surendranagar	Muli	Muli	Surendranagar	Sayla	Sayla	Surendranagar	Wadhwan	Wadhwan
Tapi	Nizar	Nizar	Tapi	Songadh	Songadh	Tapi	Uchchhal	Uchchhal
Tapi	Valod	Valod	Tapi	Vyara	Vyara	The Dang	The Dangs	Waghai
Vadodara	Chhota Udaipur	Zoz	Vadodara	Chhota Udaipur	Chhota Udaipur	Vadodara	Dabhoi	Dabhoi
Vadodara	Jetpur Pavi	Jetpur	Vadodara	Jetpur Pavi	Jabugam	Vadodara	Karjan	Karjan
Vadodara	Kavant	Kavant	Vadodara	Nasvadi	Nasvadi	Vadodara	Padra	Padra
Vadodara	Sankheda	Gola Gamdi	Vadodara	Sankheda	Sankheda	Vadodara	Savli	Savli
Vadodara	Sinor	Mota Fofaliya	Vadodara	Vadodara	Chhani	Vadodara	Vadodara	Por
Vadodara	Vaghodia	Jarod	Valsad	Dharampur	Dharampur	Valsad	Dharampur	Pindval
Valsad	Dharampur	Pondha Jungle	Valsad	Kaprada	Kaprada	Valsad	Pardi	Pardi
Valsad	Pardi	Rohina	Valsad	Pardi	Vapi	Valsad	Umbergaon	Bhilad
Valsad	Umbergaon	Umbergaon	Valsad	Valsad	Dungri			

Table 23. List of Primary Health Centres in Gujarat

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Ahmedabad	Ahmadabad City	Chandlodiya	Ahmedabad	Ahmadabad City	Memnagar	Ahmedabad	Ahmadabad City	Ranip
Ahmedabad	Ahmadabad City	Vejalpur	Ahmedabad	Barwala	Barwala	Ahmedabad	Bavla	Bagodara
Ahmedabad	Bavla	Gangad	Ahmedabad	Bavla	Kavitha	Ahmedabad	Bavla	Nanodara
Ahmedabad	Daskroi	Aslali	Ahmedabad	Daskroi	Jetalpur	Ahmedabad	Daskroi	Kanbha
Ahmedabad	Daskroi	Kasindara	Ahmedabad	Daskroi	Kuha	Ahmedabad	Daskroi	Nandej
Ahmedabad	Daskroi	Oganaj	Ahmedabad	Daskroi	Ramol	Ahmedabad	Daskroi	Singarva
Ahmedabad	Detroj-Rampura	Rampura	Ahmedabad	Dhandhuka	Bhadiyad	Ahmedabad	Dhandhuka	Dholera
Ahmedabad	Dhandhuka	Pipli	Ahmedabad	Dholka	Ambaliyara	Ahmedabad	Dholka	Chaloda
Ahmedabad	Dholka	Koth	Ahmedabad	Dholka	Transad	Ahmedabad	Dholka	Vataman
Ahmedabad	Mandal	Mandal	Ahmedabad	Mandal	Sitapur	Ahmedabad	Mandal	Trent
Ahmedabad	Ranpur	Jalila	Ahmedabad	Sanand	Modasar	Ahmedabad	Sanand	Sanathal
Ahmedabad	Sanand	Upardal	Ahmedabad	Sanand	Zolapur	Ahmedabad	Viramgam	Karkathal
Ahmedabad	Viramgam	Kumarkhan	Amreli	Amreli	Ankadiya Mota	Amreli	Amreli	Chital
Amreli	Amreli	Jaliya	Amreli	Amreli	Vankiya	Amreli	Babra	Devaliya Mota
Amreli	Babra	Khambhala	Amreli	Babra	Kotda Pitha	Amreli	Bagasara	Haliyad Juni
Amreli	Bagasara	Mavjinjva	Amreli	Dhari	Dalkhaniya	Amreli	Kunkavav Vadia	Anida
Amreli	Kunkavav Vadia	Devgam	Amreli	Kunkavav Vadia	Luni-Dhar	Amreli	Lathi	Ansodar
Amreli	Lathi	Chavand	Amreli	Lathi	Matirala	Amreli	Lilia	Gundran
Amreli	Lilia	Krankach	Anand	Anand	Ajarpura	Anand	Anand	Bakrol
Anand	Anand	Boriavi	Anand	Anand	Chikhodra	Anand	Anand	Kunjrao
Anand	Anand	Navli	Anand	Anand	Rasnol	Anand	Anand	Vadod
Anand	Anand	Vaherakhadi	Anand	Anand	Vasad	Anand	Anklav	Anklav
Anand	Anklav	Bamangam	Anand	Anklav	Khadol (Haldari)	Anand	Borsad	Alarsa

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Anand	Borsad	Badalpur	Anand	Borsad	Bhadran	Anand	Borsad	Davol
Anand	Borsad	Jharola	Anand	Borsad	Kathana	Anand	Borsad	Napa Talpad
Anand	Borsad	Sisva	Anand	Borsad	Virsad	Anand	Khambhat	Bamanva
Anand	Khambhat	Dhuvaran	Anand	Khambhat	Rohni	Anand	Khambhat	Sayama
Anand	Khambhat	Undel	Anand	Khambhat	Vadgam	Anand	Khambhat	Vatadra
Anand	Petlad	Bandhni	Anand	Petlad	Changa	Anand	Petlad	Morad
Anand	Petlad	Nar	Anand	Petlad	Simarada	Anand	Petlad	Vadadala
Anand	Sojitra	Dabhou (Virsadpura	Anand	Sojitra	Deva Talpad	Anand	Tarapur	Budhej
Anand	Umreth	Bhalej	Anand	Umreth	Bharoda	Anand	Umreth	Pansora
Anand	Umreth	Shili	Anand	Umreth	Sundalpura	Banaskantha	Amirgadh	Dhanpura
Banaskantha	Amirgadh	Iqbalgadh	Banaskantha	Amirgadh	Surela	Banaskantha	Amirgadh	Virampur
Banaskantha	Bhabhar	Balodhan	Banaskantha	Bhabhar	Kuvala	Banaskantha	Bhabhar	Runi
Banaskantha	Danta	Ghorad	Banaskantha	Danta	Hadad	Banaskantha	Danta	Jitpur
Banaskantha	Danta	Kunvarsi	Banaskantha	Danta	Navavas (Danta)	Banaskantha	Danta	Sembalpani
Banaskantha	Dantiwada	Jegol	Banaskantha	Dantiwada	Panthawada	Banaskantha	Deesa	Bhildi
Banaskantha	Deesa	Davas	Banaskantha	Deesa	Jherda	Banaskantha	Deesa	Juna Deesa
Banaskantha	Deesa	Kuchavada	Banaskantha	Deesa	Lakhani	Banaskantha	Deesa	Mota Kapra
Banaskantha	Deesa	Ramsan	Banaskantha	Deesa	Samau Motavas	Banaskantha	Deesa	Varnoda
Banaskantha	Deodar	Forna	Banaskantha	Deodar	Paldi	Banaskantha	Deodar	Raiya
Banaskantha	Dhanera	Bapla	Banaskantha	Dhanera	Jadiya	Banaskantha	Dhanera	Khimat
Banaskantha	Dhanera	Kunwarla	Banaskantha	Kankrej	Anganwada	Banaskantha	Kankrej	Kamboi
Banaskantha	Kankrej		Banaskantha	Kankrej	Shihori	Banaskantha	Kankrej	Tervada
Banaskantha	Kankrej	Totana	Banaskantha	Kankrej	Un	Banaskantha	Palanpur	Bhutedi
Banaskantha	Palanpur	Chandisar	Banaskantha	Palanpur	Gola	Banaskantha	Palanpur	Malan

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Banaskantha	Palanpur	Samdhi (Motavas)	Banaskantha	Palanpur	Vedancha	Banaskantha	Tharad	Bhordu
Banaskantha	Tharad	Bhorol	Banaskantha	Tharad	Duva	Banaskantha	Tharad	Madal
Banaskantha	Tharad	Moti Pavad	Banaskantha	Tharad	Piluda	Banaskantha	Vadgam	Chhapi
Banaskantha	Vadgam	Jalotra	Banaskantha	Vadgam	Kodaram	Banaskantha	Vadgam	Meta
Banaskantha	Vadgam	Pilucha	Banaskantha	Vadgam	Vadgam	Banaskantha	Vav	Asaravas
Banaskantha	Vav	Dhima	Banaskantha	Vav	Mavsari	Banaskantha	Vav	Morwada
Banaskantha	Vav	Suigam	Banaskantha	Vav	Tadav	Bharuch	Amod	Achhod
Bharuch	Amod	Samani	Bharuch	Anklesvar	Jitali	Bharuch	Anklesvar	Kharod
Bharuch	Anklesvar	Mandvabuzarg	Bharuch	Anklesvar	Sajod	Bharuch	Anklesvar	Sisodara
Bharuch	Bharuch	Derol	Bharuch	Bharuch	Haldarwa	Bharuch	Bharuch	Jhanor
Bharuch	Bharuch	Palej	Bharuch	Bharuch	Shuklatirth	Bharuch	Hansot	Ilav
Bharuch	Hansot	Kudadara	Bharuch	Jambusar	Chhidra	Bharuch	Jambusar	Gajera
Bharuch	Jambusar	Kavi	Bharuch	Jambusar	Kora	Bharuch	Jambusar	Tankari
Bharuch	Jhagadia	Avidha	Bharuch	Jhagadia	Bhalod	Bharuch	Jhagadia	Dharoli
Bharuch	Jhagadia	Govali	Bharuch	Jhagadia	Jespore	Bharuch	Jhagadia	Moriyana
Bharuch	Jhagadia	Panetha	Bharuch	Jhagadia	Uchedia	Bharuch	Vagra	Dahej
Bharuch	Vagra	Keshwan	Bharuch	Vagra	Pakhajan	Bharuch	Valia	Chasvad
Bharuch	Valia	Daheli	Bharuch	Valia	Gundia	Bharuch	Valia	Kara
Bharuch	Valia	Netrang	Bharuch	Valia	Thava	Bhavnagar	Bhavnagar	Bhandariya
Bhavnagar	Bhavnagar	Bhumbhali	Bhavnagar	Bhavnagar	Nari	Bhavnagar	Bhavnagar	Undevi
Bhavnagar	Botad	Bhadravadi	Bhavnagar	Botad	Lakheni	Bhavnagar	Botad	Lathidad
Bhavnagar	Gadhada	Gadhali	Bhavnagar	Gadhada	Khopala	Bhavnagar	Gadhada	Tatam
Bhavnagar	Gariadhar	Mangadh	Bhavnagar	Gariadhar	Moti Vavdi	Bhavnagar	Gariadhar	Velavadar
Bhavnagar	Ghogha	Tanasa	Bhavnagar	Ghogha	Valukad	Bhavnagar	Mahuva	Bagdana
Bhavnagar	Mahuva	Boda	Bhavnagar	Mahuva	Gundarana	Bhavnagar	Mahuva	Kalsar

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Bhavnagar	Mahuva	Kumbhan	Bhavnagar	Mahuva	Madhiya	Bhavnagar	Mahuva	Mota Asrana
Bhavnagar	Mahuva	Moti Jagdhar	Bhavnagar	Mahuva	Sedarda	Bhavnagar	Palitana	Gheti
Bhavnagar	Palitana	Nani Rajasthali	Bhavnagar	Palitana	Nondhanvadar	Bhavnagar	Palitana	Valukad
Bhavnagar	Sihor	Sanosara	Bhavnagar	Sihor	Songadh	Bhavnagar	Sihor	Tana
Bhavnagar	Sihor	Usrad	Bhavnagar	Talaja	Pithalpur	Bhavnagar	Talaja	Talli
Bhavnagar	Talaja	Trapaj	Bhavnagar	Talaja	Unchdi	Bhavnagar	Umrala	Dadva (Randalna)
Bhavnagar	Vallabhipur	Kala Talav	Bhavnagar	Vallabhipur	Patana	Dohad	Devgadh Baria	Antela
Dohad	Devgadh Baria	Bhathwada	Dohad	Devgadh Baria	Bhuval	Dohad	Devgadh Baria	Dabhva (Sagtala)
Dohad	Devgadh Baria	Degavada	Dohad	Devgadh Baria	Dudhiya	Dohad	Devgadh Baria	Guna
Dohad	Devgadh Baria	Kuva	Dohad	Devgadh Baria	Sevaniya	Dohad	Dhanpur	Agasvani
Dohad	Dhanpur	Kanjeta	Dohad	Dhanpur	Mandor	Dohad	Dhanpur	Rachhava
Dohad	Dhanpur	Ved	Dohad	Dohad	Bhathiwada	Dohad	Dohad	Bordi Inami
Dohad	Dohad	Borwani	Dohad	Dohad	Jekot	Dohad	Dohad	Kathla
Dohad	Dohad	Katwara	Dohad	Dohad	Kharoda	Dohad	Dohad	Moti Kharaj
Dohad	Dohad	Naghrala	Dohad	Dohad	Timarda	Dohad	Fatepura	Balaiya
Dohad	Fatepura	Ghughas	Dohad	Fatepura	Madhva	Dohad	Fatepura	Margala
Dohad	Fatepura	Moti Dhadheli	Dohad	Garbada	Abhlod	Dohad	Garbada	Gangardi
Dohad	Garbada	Jambua	Dohad	Garbada	Jesawada	Dohad	Garbada	Panchwada
Dohad	Garbada	Patiya	Dohad	Limkheda	Chhaparvad	Dohad	Limkheda	Chilakota
Dohad	Limkheda	Dhadhela	Dohad	Limkheda	Dudhiya	Dohad	Limkheda	Handi
Dohad	Limkheda	Ninamana Khakhariy	Dohad	Limkheda	Rai	Dohad	Limkheda	Sudiya
Dohad	Zalod	Bilwani	Dohad	Zalod	Chakaliya	Dohad	Zalod	Gamdi
Dohad	Zalod	Garadu	Dohad	Zalod	Gultora	Dohad	Zalod	Kadval

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Dohad	Zalod	Karamba	Dohad	Zalod	Lilva Thakor	Dohad	Zalod	Mahudi
Dohad	Zalod	Mandli	Dohad	Zalod	Mirakhedi	Dohad	Zalod	Rupakheda
Dohad	Zalod	Sanjeli	Dohad	Zalod	Vansiya	Gandhinagar	Dehgam	Bahiyel
Gandhinagar	Dehgam	Kadadara	Gandhinagar	Dehgam	Kadjodra	Gandhinagar	Dehgam	Rakhiyal
Gandhinagar	Dehgam	Sanoda	Gandhinagar	Gandhinagar	Adalaj	Gandhinagar	Gandhinagar	Adraj Moti
Gandhinagar	Gandhinagar	Dabhoda	Gandhinagar	Gandhinagar	Rupal	Gandhinagar	Gandhinagar	Sugad
Gandhinagar	Gandhinagar	Unava	Gandhinagar	Gandhinagar	Unvarsad	Gandhinagar	Gandhinagar	Vadodara
Gandhinagar	Kalol	Hajipur	Gandhinagar	Kalol	Mokhasan	Gandhinagar	Kalol	Pansar
Gandhinagar	Kalol	Rancharada	Gandhinagar	Kalol	Saij	Gandhinagar	Mansa	Bilodra
Gandhinagar	Mansa	Itadara	Gandhinagar	Mansa	Mahudi	Gandhinagar	Mansa	Pundhara
Gandhinagar	Mansa	Varsoda	Jamnagar	Bhanvad	Bhanvad	Jamnagar	Bhanvad	Gunda
Jamnagar	Bhanvad	Pachhatar	Jamnagar	Dhrol	Jaliya Devani	Jamnagar	Dhrol	Latipur
Jamnagar	Jamjodhpur	Ghunda	Jamnagar	Jamjodhpur	Jamvali	Jamnagar	Jamjodhpur	Samana
Jamnagar	Jamjodhpur	Vansjaliya	Jamnagar	Jamnagar	Alia	Jamnagar	Jamnagar	Bedi
Jamnagar	Jamnagar	Dhutarpar	Jamnagar	Jamnagar	Jamvanathali	Jamnagar	Jamnagar	Lakha Baval
Jamnagar	Jamnagar	Moti Banugar	Jamnagar	Jamnagar	Vasai	Jamnagar	Jodiya	Amran
Jamnagar	Jodiya	Balambha	Jamnagar	Jodiya	Hadiyana	Jamnagar	Kalavad	Beraja
Jamnagar	Kalavad	Kalavad	Jamnagar	Kalavad	Kharedi	Jamnagar	Kalavad	Navagam
Jamnagar	Kalavad	Nikava	Jamnagar	Kalyanpur	Bhatiya	Jamnagar	Kalyanpur	Lamba
Jamnagar	Kalyanpur	Ran	Jamnagar	Khambhalia	Bhadthar	Jamnagar	Khambhalia	Movan
Jamnagar	Khambhalia	Vachlabara	Jamnagar	Khambhalia	Vadtra	Jamnagar	Lalpur	Dabasang
Jamnagar	Lalpur	Padana	Jamnagar	Lalpur	Pipartoda	Jamnagar	Okhamandal	Okhamadhi
Jamnagar	Okhamandal	Surajkaradi	Jamnagar	Okhamandal	Varavala	Junagadh	Junagadh	Bagdu
Junagadh	Junagadh	Dungarpur	Junagadh	Junagadh	Khadiya	Junagadh	Junagadh	Majevdi
Junagadh	Junagadh	Vadal	Junagadh	Keshod	Ajab	Junagadh	Keshod	Balagam
Junagadh	Keshod	Kevadra	Junagadh	Keshod	Mesvan	Junagadh	Kodinar	Dolasa

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Junagadh	Kodinar	Ghantvad	Junagadh	Kodinar	Harmadiya	Junagadh	Kodinar	Velan
Junagadh	Malia	Amrapur Gir	Junagadh	Malia	Bhanduri	Junagadh	Malia	Khorasa Gir
Junagadh	Malia	Kukasvada	Junagadh	Manavadar	Bantwa	Junagadh	Manavadar	Limbuda
Junagadh	Manavadar	Nakra	Junagadh	Manavadar	Sardargadh	Junagadh	Mangrol	Bagasra-Ghed
Junagadh	Mangrol	Juthal	Junagadh	Mangrol	Mekhadi	Junagadh	Mangrol	Shil
Junagadh	Mendarda	Datrana	Junagadh	Mendarda	Dedakiyal	Junagadh	Patan-Veraval	Adri
Junagadh	Patan-Veraval	Ajotha	Junagadh	Patan-Veraval	Govindpara	Junagadh	Sutrapada	Dhamlej
Junagadh	Sutrapada	Pransli	Junagadh	Sutrapada	Prashnavda	Junagadh	Sutrapada	Thareli
Junagadh	Talala	Ankolvadi	Junagadh	Talala	Dhava	Junagadh	Una	Delwada
Junagadh	Una	Dhokadva	Junagadh	Una	Jamvala	Junagadh	Una	Samter
Junagadh	Una	Simar	Junagadh	Una	Tad	Junagadh	Vanthali	Kanjha
Junagadh	Vanthali	Shapur	Junagadh	Vanthali	Thanapipli	Junagadh	Visavadar	Bhalgam
Junagadh	Visavadar	Kotda Mota	Junagadh	Visavadar	Monpari Moti	Kachchh	Abdasa	Kothara
Kachchh	Abdasa	Mothala	Kachchh	Abdasa	Tera	Kachchh	Abdasa	Vayor
Kachchh	Anjar	Bhimasar	Kachchh	Anjar	Dudhai	Kachchh	Anjar	Khedoi
Kachchh	Bhachau	Adhol (Pasakayara)	Kachchh	Bhachau	Dholavira	Kachchh	Bhachau	Katariya Juna
Kachchh	Bhachau	Manfara	Kachchh	Bhuj	Dhaneti	Kachchh	Bhuj	Dhori
Kachchh	Bhuj	Gorewali	Kachchh	Bhuj	Kera	Kachchh	Bhuj	Kodki
Kachchh	Bhuj	Kukma	Kachchh	Lakhpat	Dayapar	Kachchh	Lakhpat	Ghaduli
Kachchh	Lakhpat	Matana Madh	Kachchh	Mandvi	Darashadi	Kachchh	Mandvi	Gadhsisa
Kachchh	Mandvi	Godhra	Kachchh	Mandvi	Talvana	Kachchh	Mundra	Vanki
Kachchh	Nakhatrana	Deshalpar	Kachchh	Nakhatrana	Mangvana	Kachchh	Nakhatrana	Netra
Kachchh	Nakhatrana	Nirona	Kachchh	Nakhatrana	Vithon	Kheda	Balasinor	Janod
Kheda	Balasinor	Othvad	Kheda	Balasinor	Pandva	Kheda	Kapadvanj	Antisar
Kheda	Kapadvanj	Antroli	Kheda	Kapadvanj	Moti Zer	Kheda	Kapadvanj	Nirmali

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Kheda	Kapadvanj	Torna	Kheda	Kapadvanj	Vaghas	Kheda	Kathlal	Anara
Kheda	Kathlal	Bharkunda	Kheda	Kathlal	Chared	Kheda	Kathlal	Lasundra
Kheda	Kheda	Naika	Kheda	Kheda	Radhu	Kheda	Kheda	Vasna Margiya
Kheda	Mahudha	Alina	Kheda	Mahudha	Chunel	Kheda	Mahudha	Nani Khadoli
Kheda	Mahudha	Sanali	Kheda	Matar	Alindra	Kheda	Matar	Daloli
Kheda	Matar	Khandhli	Kheda	Matar	Limbasi	Kheda	Matar	Traj
Kheda	Mehmedabad	Ghodasar	Kheda	Mehmedabad	Kanij	Kheda	Mehmedabad	Modaj
Kheda	Mehmedabad	Sihunj	Kheda	Mehmedabad	Varsola	Kheda	Nadiad	Akhdol
Kheda	Nadiad	Chaklashi	Kheda	Nadiad	Maholel	Kheda	Nadiad	Narsanda
Kheda	Nadiad	Palana	Kheda	Nadiad	Pij	Kheda	Thasra	Chetarsumba
Kheda	Thasra	Dhunadara	Kheda	Thasra	Menpura	Kheda	Thasra	Nes
Kheda	Thasra	Pipalvada	Kheda	Thasra	Wanghroli	Kheda	Virpur	Debhari
Mahesana	Becharaji	Modhera	Mahesana	Becharaji	Rantej	Mahesana	Kadi	Dangarva
Mahesana	Kadi	Kalyanpura	Mahesana	Kadi	Khavad	Mahesana	Kadi	Medha
Mahesana	Kadi	Nandasan	Mahesana	Kadi	Rajpur	Mahesana	Kadi	Suraj
Mahesana	Kheralu	Chansol	Mahesana	Kheralu	Dabhoda	Mahesana	Kheralu	Panchha
Mahesana	Mahesana	Akhaj	Mahesana	Mahesana	Ambaliyasan	Mahesana	Mahesana	Balol
Mahesana	Mahesana	Bamosana	Mahesana	Mahesana	Chhathiyarda	Mahesana	Mahesana	Jagudan
Mahesana	Mahesana	Jotana	Mahesana	Mahesana	Kherva	Mahesana	Mahesana	Linch
Mahesana	Mahesana	Mitha	Mahesana	Satlasana	Satlasana	Mahesana	Satlasana	Sudasana
Mahesana	Unjha	Bhunav	Mahesana	Unjha	Kamli	Mahesana	Unjha	Kanthravi
Mahesana	Unjha	Unava	Mahesana	Unjha	Upera	Mahesana	Vadnagar	Karbatiya
Mahesana	Vadnagar	Shahpur (Vad)	Mahesana	Vadnagar	Sipor	Mahesana	Vadnagar	Sundhiya
Mahesana	Vadnagar	Valasana	Mahesana	Vijapur	Falu	Mahesana	Vijapur	Kharod
Mahesana	Vijapur	Kukarvada	Mahesana	Vijapur	Ladol	Mahesana	Vijapur	Pilvai

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Mahesana	Vijapur	Sardarpur	Mahesana	Vijapur	Vasai	Mahesana	Visnagar	Denap
Mahesana	Visnagar	Gothva	Mahesana	Visnagar	Kansarakui	Mahesana	Visnagar	Kharvada
Mahesana	Visnagar	Magroda	Mahesana	Visnagar	Umta	Mahesana	Visnagar	Valam
Narmada	Dediapada	Gangapur	Narmada	Dediapada	Gopaliya	Narmada	Dediapada	Khaidipada
Narmada	Dediapada	Mandala	Narmada	Dediapada	Soliya	Narmada	Nandod	Boria
Narmada	Nandod	Garudeshwar	Narmada	Nandod	Jesalpor	Narmada	Nandod	Jetpor (Vaghrali)
Narmada	Nandod	Khunta Amba	Narmada	Nandod	Lachhras	Narmada	Nandod	Rajuvadia
Narmada	Nandod	Sisodara	Narmada	Nandod	Taropa	Narmada	Nandod	Zaria
Narmada	Sagbara	Devmogra	Narmada	Sagbara	Kolvan	Narmada	Sagbara	Patanamau
Narmada	Sagbara	Selamba	Narmada	Tilakwada	Agar	Narmada	Tilakwada	Bujetha
Narmada	Tilakwada	Vajiriya	Navsari	Bansda	Anklachh	Navsari	Bansda	Ghodmal
Navsari	Bansda	Kandolpada	Navsari	Bansda	Mahuvas	Navsari	Bansda	Mankunia
Navsari	Bansda	Sara	Navsari	Bansda	Unai	Navsari	Bansda	Vandarvela
Navsari	Chikhli	Achhavani	Navsari	Chikhli	Alipor	Navsari	Chikhli	Bhervi
Navsari	Chikhli	Fadvel	Navsari	Chikhli	Ghej	Navsari	Chikhli	Kangvai
Navsari	Chikhli	Ranverikalla	Navsari	Chikhli	Ranverikalla	Navsari	Chikhli	Sadakpor
Navsari	Chikhli	Tankal	Navsari	Chikhli	Toranvera	Navsari	Chikhli	Velanpor
Navsari	Gandevi	Amalsad	Navsari	Gandevi	Bigri	Navsari	Gandevi	Dhanori
Navsari	Gandevi	Gadat	Navsari	Gandevi	Kesali	Navsari	Gandevi	Mendhar
Navsari	Jalalpore	Abrama	Navsari	Jalalpore	Dipla	Navsari	Jalalpore	Krushnapur
Navsari	Jalalpore	Matwad	Navsari	Jalalpore	Sagra	Navsari	Jalalpore	Vesma
Navsari	Navsari	Adada	Navsari	Navsari	Munsad	Navsari	Navsari	Nagdhara
Panchmahal	Ghoghamba	Bakrol	Panchmahal	Ghoghamba	Farod	Panchmahal	Ghoghamba	Gamani
Panchmahal	Ghoghamba	Kanpur	Panchmahal	Ghoghamba	Ranjitnagar	Panchmahal	Ghoghamba	Rinchhwani
Panchmahal	Ghoghamba	Simaliya	Panchmahal	Ghoghamba	Vav Kulli	Panchmahal	Godhra	Bhamaiya

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Panchmahal	Godhra	Chhariya	Panchmahal	Godhra	Kalyana	Panchmahal	Godhra	Kevadiya
Panchmahal	Godhra	Mahelol	Panchmahal	Godhra	Mirap	Panchmahal	Godhra	Nadisar
Panchmahal	Godhra	Sampa	Panchmahal	Godhra	Timba	Panchmahal	Halol	Arad
Panchmahal	Halol	Kanjari	Panchmahal	Halol	Kathola	Panchmahal	Halol	Rameshra
Panchmahal	Halol	Shivrajpur	Panchmahal	Jambughoda	Chalvad	Panchmahal	Jambughoda	Duma
Panchmahal	Kadana	Amthani	Panchmahal	Kadana	Ditvas	Panchmahal	Kadana	Malvan
Panchmahal	Kadana	Munpur	Panchmahal	Kadana	Sanghri	Panchmahal	Kalol	Delol
Panchmahal	Kalol	Jantral	Panchmahal	Kalol	Sansoli	Panchmahal	Kalol	Vejalpur
Panchmahal	Khanpur	Pandarwada	Panchmahal	Khanpur	Vadagam	Panchmahal	Lunawada	Hathivan
Panchmahal	Lunawada	Kharol	Panchmahal	Lunawada	Malekpur	Panchmahal	Lunawada	Undra
Panchmahal	Lunawada	Vardhari	Panchmahal	Lunawada	Viraniya	Panchmahal	Morwa Hadaf	Morwa (Hadaf)
Panchmahal	Morwa Hadaf	Rajayata	Panchmahal	Morwa Hadaf	Vadodar	Panchmahal	Morwa Hadaf	Vandeli
Panchmahal	Santrampur	Batakwada	Panchmahal	Santrampur	Chitva	Panchmahal	Santrampur	Chunthana Muvada
Panchmahal	Santrampur	Doli	Panchmahal	Santrampur	Gothib	Panchmahal	Santrampur	Vankdi
Panchmahal	Shehera	Bahi	Panchmahal	Shehera	Boriya	Panchmahal	Shehera	Dharapur
Panchmahal	Shehera	Morva	Panchmahal	Shehera	Nandarva	Panchmahal	Shehera	Waghjipur
Patan	Chanasma	Brahmanvada	Patan	Chanasma	Chanasma	Patan	Chanasma	Dhinoj
Patan	Chanasma	Palasar	Patan	Chanasma	Pimpal	Patan	Harij	Dunavada
Patan	Harij	Nana	Patan	Patan	Der	Patan	Patan	Kuder
Patan	Patan	Ranunj	Patan	Patan	Sariyad	Patan	Radhanpur	Bandhwad
Patan	Radhanpur	Gotarka	Patan	Radhanpur	Nanapura	Patan	Sami	Baspa
Patan	Sami	Lolada	Patan	Sami	Mujpur	Patan	Sami	Rafu
Patan	Sami	Shankheshvar	Patan	Santalpur	Abiyana	Patan	Santalpur	Madhutra
Patan	Santalpur	Varahi	Patan	Santalpur	Zazam	Patan	Sidhpur	Chandalaj
Patan	Sidhpur	Kakoshi	Patan	Sidhpur	Kunvara	Patan	Vagdod	Jangral

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Patan	Vagdod	Kansa	Patan	Vagdod	Vagdod	Porbandar	Kutiyana	Devda
Porbandar	Kutiyana	Mahiyari	Porbandar	Porbandar	Bakharla	Porbandar	Porbandar	Garej
Porbandar	Porbandar	Madhavpur	Porbandar	Porbandar	Simar	Porbandar	Porbandar	Visavada
Porbandar	Ranavav	Adityana	Porbandar	Ranavav	Bileshwar	Porbandar	Ranavav	Kandorna-Rana
Rajkot	Dhoraji	Patanvav	Rajkot	Dhoraji	Supedi	Rajkot	Gondal	Derdi
Rajkot	Gondal	Gomta	Rajkot	Gondal	Moviya	Rajkot	Gondal	Shivrajgadh
Rajkot	Gondal	Sultanpur	Rajkot	Jamkandorna	Chitravad	Rajkot	Jamkandorna	Raydi
Rajkot	Jasdan	Atkot	Rajkot	Jasdan	Bhadla	Rajkot	Jasdan	Bhadli
Rajkot	Jasdan	Pipardi	Rajkot	Jasdan	Sanathali	Rajkot	Jetpur	Amarnagar
Rajkot	Jetpur	Bordi Samadhiyala	Rajkot	Jetpur	Jetalsar	Rajkot	Jetpur	Mevasa
Rajkot	Kotada Sangani	Navi Mengani	Rajkot	Kotada Sangani	Ramod	Rajkot	Lodhika	Khirsara (Ranmalji
Rajkot	Maliya	Khakhrechi	Rajkot	Maliya	Sarvad	Rajkot	Maliya	Vavaniya
Rajkot	Morvi	Bagathala	Rajkot	Morvi	Jetpar	Rajkot	Morvi	Khareda
Rajkot	Morvi	Rajpar	Rajkot	Paddhari	Khodapipar	Rajkot	Paddhari	Sarapdad
Rajkot	Rajkot	Gadhka	Rajkot	Rajkot	Kuvadva	Rajkot	Rajkot	Sanosara
Rajkot	Rajkot	Sardhar	Rajkot	Tankara	Neknam	Rajkot	Upleta	Bhimora
Rajkot	Upleta	Dhank	Rajkot	Upleta	Kolki	Rajkot	Upleta	Paneli Moti
Rajkot	Wankaner	Lunasar	Rajkot	Wankaner	Mesariya	Rajkot	Wankaner	Sindhavadar
Rajkot	Wankaner	Tithava	Sabarkantha	Bayad	Ambliyara	Sabarkantha	Bayad	Choila
Sabarkantha	Bayad	Demai	Sabarkantha	Bayad	Gabat	Sabarkantha	Bayad	Sathamba
Sabarkantha	Bhiloda	Chitariya	Sabarkantha	Bhiloda	Chorimala	Sabarkantha	Bhiloda	Kishangadh
Sabarkantha	Bhiloda	Lusadiya	Sabarkantha	Bhiloda	Munai	Sabarkantha	Bhiloda	Torda (Jetpur)
Sabarkantha	Bhiloda	Vankaner	Sabarkantha	Dhansura	Akarund	Sabarkantha	Dhansura	Vadagam
Sabarkantha	Himatnagar	Chandarni	Sabarkantha	Himatnagar	Desasan	Sabarkantha	Himatnagar	Hadiyol

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Sabarkantha	Himatnagar	Ilol	Sabarkantha	Himatnagar	Jamla	Sabarkantha	Himatnagar	Viravada
Sabarkantha	Idar	Chitroda	Sabarkantha	Idar	Davad	Sabarkantha	Idar	Jashvantgadh
Sabarkantha	Idar	Kadiyadara	Sabarkantha	Idar	Mudeti	Sabarkantha	Idar	Revas
Sabarkantha	Idar	Verabar	Sabarkantha	Khedbrahma	Dantral	Sabarkantha	Khedbrahma	Delvada
Sabarkantha	Khedbrahma	Derol	Sabarkantha	Khedbrahma	Kheroj	Sabarkantha	Khedbrahma	Lambadiya
Sabarkantha	Khedbrahma	Matoda	Sabarkantha	Khedbrahma	Unchi Dhanal	Sabarkantha	Malpur	Jitpur
Sabarkantha	Malpur	Satarda	Sabarkantha	Meghraj	Isari	Sabarkantha	Meghraj	Kasana
Sabarkantha	Meghraj	Patelna Dhundha	Sabarkantha	Meghraj	Ramgadhi	Sabarkantha	Meghraj	Sangal
Sabarkantha	Modasa	Limbhoi	Sabarkantha	Modasa	Modasa	Sabarkantha	Modasa	Sardoi
Sabarkantha	Modasa	Sinavad	Sabarkantha	Modasa	Tintoi	Sabarkantha	Prantij	Majra
Sabarkantha	Prantij	Moyad	Sabarkantha	Prantij	Poglu	Sabarkantha	Talod	Aniod
Sabarkantha	Talod	Antrolivas Dolji	Sabarkantha	Talod	Kherol	Sabarkantha	Talod	Punsri
Sabarkantha	Vadali	Dobhada	Sabarkantha	Vadali	Vadali	Sabarkantha	Vijaynagar	Atarsumba
Sabarkantha	Vijaynagar	Kodiyavada	Surat	Bardoli	Kadod	Surat	Bardoli	Sarbhon
Surat	Bardoli	Uva	Surat	Bardoli	Vankaner	Surat	Bardoli	Vanskui
Surat	Bardoli	Varad	Surat	Chorasi	Dumas	Surat	Chorasi	Kharvasa
Surat	Chorasi	Sachin	Surat	Chorasi	Sunvali	Surat	Chorasi	Utran
Surat	Kamrej	Kathor	Surat	Kamrej	Kosmada	Surat	Kamrej	Orna
Surat	Kamrej	Sevni	Surat	Kamrej	Valan	Surat	Kamrej	Vav
Surat	Mahuva	Anaval	Surat	Mahuva	Dungari	Surat	Mahuva	Karcheliya
Surat	Mahuva	Kharvan	Surat	Mahuva	Vaheval	Surat	Mahuva	Valvada
Surat	Mandvi	Baudhan	Surat	Mandvi	Dadhvada	Surat	Mandvi	Kamlapor
Surat	Mandvi	Patal	Surat	Mandvi	Sathvav	Surat	Mandvi	Tadkeshvar
Surat	Mangrol	Kosamba	Surat	Mangrol	Lavet	Surat	Mangrol	Nani Naroli
Surat	Mangrol	Vankal	Surat	Mangrol	Velachha	Surat	Olpad	Dihen

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Surat	Olpad	Erthan	Surat	Olpad	Karanj	Surat	Olpad	Mor
Surat	Olpad	Sayan	Surat	Palsana	Kadodara	Surat	Palsana	Kanav
Surat	Palsana	Vanesa	Surat	Umarpada	Kevdi (Sharda)	Surat	Umarpada	Vadi
Surat	Umarpada	Vadpada	Surndranagar	Chotila	Anandpur (Bhadla)	Surndranagar	Chotila	Bamanbore
Surndranagar	Chotila	Thangadh	Surndranagar	Chuda	Chokdi	Surndranagar	Chuda	Mojidad
Surndranagar	Dasada	Bajana	Surndranagar	Dasada	Dasada	Surndranagar	Dasada	Kharaghoda
Surndranagar	Dasada	Kherva	Surndranagar	Dasada	Zinzuwada	Surndranagar	Dhrangadhra	Kankavati
Surndranagar	Dhrangadhra	Kondh	Surndranagar	Dhrangadhra	Methan	Surndranagar	Halvad	Mathak
Surndranagar	Halvad	Mayurnagar	Surndranagar	Halvad	Tikar	Surndranagar	Lakhtar	Dhanki
Surndranagar	Lakhtar	Talsana	Surndranagar	Lakhtar	Vana	Surndranagar	Limbdi	Hadala
Surndranagar	Limbdi	Panshina	Surndranagar	Limbdi	Ranagadh	Surndranagar	Limbdi	Shiyani
Surndranagar	Muli	Sara	Surndranagar	Muli	Tikar	Surndranagar	Muli	Vagadiya
Surndranagar	Sayla	Doliya	Surndranagar	Sayla	Sudamda	Surndranagar	Wadhwan	Dedadara
Surndranagar	Wadhwan	Khodu	Surndranagar	Wadhwan	Rampara	Tapi	Nizar	Gangtha
Tapi	Nizar	Kukarmunda	Tapi	Nizar	Raygadh	Tapi	Nizar	Vanka
Tapi	Songadh	Agasvan	Tapi	Songadh	Bandharpada	Tapi	Songadh	Borda
Tapi	Songadh	Jamkhadi	Tapi	Songadh	Ukai	Tapi	Songadh	Ukhalda
Tapi	Songadh	Virthava	Tapi	Uchchhal	Bhad Bhunja	Tapi	Uchchhal	Karod
Tapi	Valod	Algat	Tapi	Valod	Buhari	Tapi	Valod	Degama
Tapi	Valod	Kalamkui	Tapi	Vyara	Balpur	Tapi	Vyara	Borkhadi
Tapi	Vyara	Champavadi	Tapi	Vyara	Dolvan	Tapi	Vyara	Gadat
Tapi	Vyara	Karanjkhed	Tapi	Vyara	Lakhali	Tapi	Vyara	Panchol
The Dang	The Dangs	Garkhadi	The Dang	The Dangs	Kalibel	The Dang	The Dangs	Pimpri
The Dang	The Dangs	Sakarpatal	The Dang	The Dangs	Samgahan	The Dang	The Dangs	Saputara
The Dang	The Dangs	Subir	Vadodara	Chhota Udaipur	Malaja	Vadodara	Chhota Udaipur	Padharvant

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Vadodara	Chhota Udaipur	Rangpur (Zoz)	Vadodara	Chhota Udaipur	Tejgadh	Vadodara	Chhota Udaipur	Zoz
Vadodara	Dabhoi	Bhilodiya	Vadodara	Dabhoi	Kayavarohan	Vadodara	Dabhoi	Sathod
Vadodara	Dabhoi	Thuvavi	Vadodara	Jetpur Pavi	Chalamali	Vadodara	Jetpur Pavi	Dungarvant
Vadodara	Jetpur Pavi	Kadval	Vadodara	Jetpur Pavi	Kalarani	Vadodara	Jetpur Pavi	Karali
Vadodara	Jetpur Pavi	Moti Amrol	Vadodara	Jetpur Pavi	Pandhara	Vadodara	Jetpur Pavi	Suskal
Vadodara	Jetpur Pavi	Uchapan	Vadodara	Karjan	Choranda	Vadodara	Karjan	Handod
Vadodara	Karjan	Methi	Vadodara	Karjan	Rarod	Vadodara	Karjan	Valan
Vadodara	Kavant	Kadipani	Vadodara	Kavant	Karajvant	Vadodara	Kavant	Navalja
Vadodara	Kavant	Saidivasan	Vadodara	Nasvadi	Amroli	Vadodara	Nasvadi	Dughdha
Vadodara	Nasvadi	Palasani	Vadodara	Nasvadi	Tankhala	Vadodara	Padra	Chansad
Vadodara	Padra	Kanzat	Vadodara	Padra	Karkhadi	Vadodara	Padra	Mobha
Vadodara	Padra	Mujpur	Vadodara	Padra	Sadhi	Vadodara	Padra	Vadu
Vadodara	Sankheda	Ali Kherva	Vadodara	Sankheda	Bahadarpur	Vadodara	Sankheda	Bhatpur
Vadodara	Sankheda	Vasana	Vadodara	Savli	Bhadarva	Vadodara	Savli	Desar
Vadodara	Savli	Pandu	Vadodara	Savli	Samlaya	Vadodara	Savli	Sandhasal
Vadodara	Savli	Tundav	Vadodara	Savli	Vejpur	Vadodara	Sinor	Sadhli
Vadodara	Sinor	Simli	Vadodara	Sinor	Sinor	Vadodara	Vadodara	Asoj
Vadodara	Vadodara	Bajwa	Vadodara	Vadodara	Bhayli	Vadodara	Vadodara	Kelanpur
Vadodara	Vadodara	Koyli	Vadodara	Vadodara	Ranoli	Vadodara	Vadodara	Sankarda
Vadodara	Vadodara	Sokhda	Vadodara	Vadodara	Varnama	Vadodara	Vaghodia	Asoj
Vadodara	Vaghodia	Goraj	Vadodara	Vaghodia	Rustampura	Vadodara	Vaghodia	Vaghodia
Valsad	Dharampur	Dhamni	Valsad	Dharampur	Hanmatmal	Valsad	Dharampur	Jamaliya
Valsad	Dharampur	Kakadkuva	Valsad	Dharampur	Nani Dhol Dungari	Valsad	Dharampur	Sidhumbar
Valsad	Dharampur	Tutarkhed	Valsad	Kaprada	Dabkhal	Valsad	Kaprada	Dahikhed
Valsad	Kaprada	Lavkar	Valsad	Kaprada	Manala	Valsad	Kaprada	Mota Pondha

DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE	DISTRICT	TALUKA	VILLAGE
Valsad	Kaprada	Rohiyal Jungle	Valsad	Kaprada	Sildha	Valsad	Kaprada	Sukhala
Valsad	Kaprada	Sutharpada	Valsad	Pardi	Chala	Valsad	Pardi	Koparli
Valsad	Pardi	Mota Waghchhipa	Valsad	Pardi	Nani Tambadi	Valsad	Pardi	Orvad
Valsad	Pardi	Paria	Valsad	Pardi	Sonwada	Valsad	Pardi	Udwada
Valsad	Pardi	Umarsadi	Valsad	Umbergaon	Anklas	Valsad	Umbergaon	Daheli
Valsad	Umbergaon	Fansa	Valsad	Umbergaon	Khattalwada	Valsad	Umbergaon	Maroli
Valsad	Umbergaon	Sanjan	Valsad	Umbergaon	Solsumba	Valsad	Umbergaon	Valwada
Valsad	Valsad	Atgam	Valsad	Valsad	Bhadeli Desai Part	Valsad	Valsad	Chanvai
Valsad	Valsad	Dharasna	Valsad	Valsad	Gorgam	Valsad	Valsad	Hariya
Valsad	Valsad	Kanjan Ranchhod	Valsad	Valsad	Magod	Valsad	Valsad	Vankal

Table 24. Contact Information of Civil Hospitals in Municipal Corporations

SN	NAME	STD CODE	OFFICE	HOSPITAL
1. Ahmedabad Zone				
1	Sola	79	27474355	27474359
2	M.H. Ahmedabad	79	25624583	25622485
3	Kheda	2684	224932	224838
4	Nadiad	268	2529074	2521386
5	Petlad	2697	224645	224422
6	Limbadi	2753	260164	260065
7	Surendranagar	2752	222052	222553
8	Dhrangadhra	2754	262637	222637
2. Gandhinagar Zone				
9	Gandhinagar	79	23322733	23221913
10	Mahesana	2762	221784	221217
11	Visnagar	2765	221364	231283
12	Patan	2766	233311	232660
13	Unjha	2767	254029	
14	Palanpur	2742	253083	251709
15	Deesa	2744	222500	222500
16	Himatnagar	2772	246618	241892
17	Bhiloda	2771	232027	232027
3. Vadodara Zone				
18	Jamana, Vadodara	265	2517400	2518134
19	I.D. Vaodara	265	2460800	2465739
20	M.H. Vadodara	265	2461493	
21	Lunavada	2674	250008	250008
22	Godhra	2672	242559	143192
23	Dahod	2673	246548	220029
24	Devgadh Baria	2678	220435	220220
25	Santrampur	2675	220046	
26	Bharuch	2642	243515	241759
27	Rajpipla	2640	220030	224230
4. Surat Zone				
28	Surat	261	2749311	2479610
29	Ahwa	2631	220205	220204
30	Valsad	2632	251744	251911

SN	NAME	STD CODE	OFFICE	HOSPITAL
31	Dharampur	2633	242044	242043
32	Navsari	2637	257001	257265
33	Vansda	2630	222248	
5. Bhavnagar Zone				
34	Sir T. Bhavnagar	278	427524	423250
35	Palitana	2848	252175	243075
36	Amreli	2792	222587	222113
37	Savarkundla	2845	242604	235011
38	Lathi	2793	240566	
39	Junagadh	285	2620090	2651436
40	Porbandar	286	2242910	2240923
6. Rajkot Zone				
41	P.K. Rajkot	281	2227136	2231460
42	G.T. Sheth, Rajkot			
43	Morbi	2822	230203	230138
44	Jetpur	2823	220111	220111
45	Dhoraji	2824	220139	
46	Gondal	2825	221762	220031
47	Upleta	2826	221482	
48	Bhuj	2832	225054	
49	M.H. Bhuj	2832	225054	
50	Gandhidham	2836	220263	
51	Mandvi Kutch	2834	223207	232232
52	Jamkhambhalia	2833	234704	255170
53	M.H. Jamnagar	288	2750218	
7. Jamnagar Zone				
54	Guru Govindsinh Hospital (Emergency)	288	2661087	
55	Samarpan Hospital	288	25566423	
56	Mental Hospital	288	2712728	
57	Dental Hospital	288	2750218	
58	Ayurvedic Hospital	288	2550368	
59	City Dispensary - Ranjit Road	288	2676456	
60	Oswal Hospital	288	2676521	

SN	NAME	STD CODE	OFFICE	HOSPITAL
8. Junagadh Zone				
61	Urban Health Centre - Ambedkar Nagar	285	2651671	97277 02832
62	Urban Health Centre - Dolatpara	285	2660874	97277 79137
63	Urban Health Centre - Ganesh Nagar	285	2651231	97277 79138
64	Urban Health Centre - Shanteshwar	285	610877	97277 02833
65	Urban Health Centre - Timbavadi	285	2670104	97277 79139

Table 25. Supplier of PPE and Other Safety and Response Related Equipments

SN	EQUIPMENT	NAME OF SUPPLIER	ADDRESS	PHONE	FAX	LOCAL OFFICE
1	Sealf Contained Breathing Apparatus	M/S Vijay Sabre	35, Chandivali Village, Off Sakivihar Road, Mumbai-400072	022- 28518785	022- 28518773 & 28528614	0265-3236515
2	Industrial Gas Mask	M/S Vijay Sabre	35, Chandivali Village, Off Sakivihar Road, Mumbai-400072	022- 28518785	022- 28518773 & 28528614	0265-3236515
3	D type Suit (Pressure Suit)	Creative Engg. Bombay	Bhandup Ind. Estate, Unit No. 8m, 3rd Floor, Pannalal Silk Mill Compound, L. B. S. Marg Bhandup(West). Mumbai - 400078	022 - 25900780	022- 26247286	
4	Resuscitator	MSA India Ltd.	p.25, Transport Depot Road, Kolkata - 700088	033- 24494334	033- 24491368	
5	Spare air Cylinder	M/S Vijay Sabre	35, Chandivali Village, Off Sakivihar Road, Mumbai-400072	022- 28518785	022- 28518773 & 28528614	0265-3236515

SN	EQUIPMENT	NAME OF SUPPLIER	ADDRESS	PHONE	FAX	LOCAL OFFICE
6	Canister Mask & Spare Canistaer	MSA India Ltd.	p.25, Transport Depot Road, Kolkata - 700088	033- 24494334	033- 24491368	
7	PVC Suit	Creative Engg. Bombay	Bhandup Ind. Estate, Unit No. 8m, 3rd Floor, Pannalal Silk Mill Compound, L. B. S. Marg Bhandup(West). Mumbai - 400078	022 - 25900780	022- 26247286	
8	PVC Hand Gloves	Creative Engg. Bombay	Bhandup Ind. Estate, Unit No. 8m, 3rd Floor, Pannalal Silk Mill Compound, L. B. S. Marg Bhandup(West). Mumbai - 400078	022 - 25900780	022- 26247286	
9	Asbestos Hand Gloves	Creative Engg. Bombay	Bhandup Ind. Estate, Unit No. 8m, 3rd Floor, Pannalal Silk Mill Compound, L. B. S. Marg Bhandup(West). Mumbai - 400078	022 - 25900780	022- 26247286	
10	Safety Goggles	MSA India Ltd.	p.25, Transport Depot Road, Kolkata - 700088	033- 24494334	033- 24491368	
11	Safety Helmet	Concard aria pvt. Ltd.	3/373, Old Mahabalipuram Road, Mettukuppam, Chennai - 600096	044-24961717	044- 24961919	
12	Safety Belts	Sure Safety Services	407/408, Saffron Complex, Fategang, Baroda	0265- 2750680	0265 - 2786329	
13	Safety PVC Gumboots	MSA India Ltd.	p.25, Transport Depot Road, Kolkata - 700088	033- 24494334	033- 24491368	

SN	EQUIPMENT	NAME OF SUPPLIER	ADDRESS	PHONE	FAX	LOCAL OFFICE
14	Explosive meter	MSA India Ltd.	p.25, Transport Depot Road, Kolkata - 700088	033- 24494334	033- 24491368	
15	Oxygen meter	MSA India Ltd.	p.25, Transport Depot Road, Kolkata - 700088	033- 24494334	033- 24491368	
16	Detector Tubes	MSA India Ltd.	p.25, Transport Depot Road, Kolkata - 700088	033- 24494334	033- 24491368	
17	Chlorine / Ammonia / H2S/COH/ Hydrocarbons Pocket monitors	MSA India Ltd.	p.25, Transport Depot Road, Kolkata - 700088	033- 24494334	033- 24491368	
18	Emergency Lamps	Sure Safety Services	407/408, Saffron Complex, Fategang, Baroda	0265- 2750680	0265 - 2786329	
19	Portable Flame proof torches	Sure Safety Services	407/408, Saffron Complex, Fategang, Baroda	0265- 2750680	0265 - 2786329	
20	Sound Level meter	Quality Services Baroda	28, Welcome Shopping Center. Opp. Punitnagar , Boroda-390015	0265- 2333597	0265- 2330640	
21	Vibration Monitoring meter	Quality Services Baroda	28, Welcome Shopping Center. Opp. Punitnagar , Boroda-390015	0265- 2333597	0265- 2330640	

APPENDIX G: OSHA STANDARD FOR HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

We have referenced OSHA standard 1910.120 for Hazardous waste operations and emergency response (HAZWOPER) as a resource to determine the requirements of the emergency response personnel for personal protective equipment criteria, training, equipments, and teaming arrangements. Although the proposed standard is US based it can be suitably adopted in Indian context. A web-link for HAZWOPER standard is provided in the main text whereas this appendix includes the PDF text from US Federal Register for easy reference. **HAZWOPER is included here only for ease of reference for those not having ease of internet access.**

Notice of Intention to Appear. In instances where the information contained in the submission dues not justify the amount of time requested, a more appropriate amount of time will be allocated and the participant will be notified of that fact prior to the informal public hearings.

Any party who has not substantially complied with the above requirement may be limited to a ten-minute presentation and may be requested to return for questioning at a later time.

Any party who has not filed a notice of intention to appear may be allowed to testify, as time permits, at the discretion of the Administrative Law judge, but will not be allowed to question witnesses.

Notices of intention to appear, testimony and evidence will be available for inspection and copying at the Docket Office, Docket S-760A, U.S. Department of Labor, Occupational Safety and Health Administration, Room N-3670, 200 Constitution Avenue, NW., Washington, DC 20210. (202) 523-7894.

Conduct of Hearings

The informal public hearings will commence at 9:30 a.m. at the scheduled locations with the resolution of any procedural matters relating to the proceeding. The informal public hearing will be presided over by an Administrative Law Judge who will have the power necessary and appropriate to conduct a full and fair informal public hearing as provided in 29 CFR Part 1911, include the power to:

1. Regulate the course of the proceedings;

2. To dispose of procedural requests, objections and comparable matters;

3. To confine the presentation to the matters pertinent to the issues raised;

4. To regulate the conduct of those present at the informal public hearing by appropriate means;

5. In the Judge's discretion, to question and permit questioning of any witness; and

6. In the Judge's discretion to keep the record open for a reasonable time to receive written information and additional data, views, and arguments from any person who has participated in the oral proceedings.

Following the close of the informal public hearing, the presiding Administrative Law judge will certify the record of the informal public hearing to the Assistant Secretary of Labor for Occupational Safety and Health. The notice of proposed rulemaking will be reviewed in light of all testimony and written submissions received as part of the record, and the proposed standard will be modified or a determination will be made not to modify the proposed standard based on the entire record of the proceeding.

List of Subjects in 29 CFR Part 1910

Containers, Drums, Emergency response, Flammable and combustible liquids, Hazardous materials, Hazardous substances, Hazardous wastes, Incorporation by reference, Materials handling and storage, Personal protective equipment, Storage areas, Training, Waste disposal.

Authority

This document has been prepared under the direction of John A. Pendergrass, Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Avenue NW., Washington, DC 20210. Pursuant to section 126 of the Superfund Amendments and Reauthorization Act of 1986 (Pub. L. 99-499), sections 6 and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 655, 657), section 4 of the Administrative Procedures Act (5 U.S.C. 553), 29 CFR Part 1911 and Secretary of Labor's Order 9-83 (48 FR 35736), it is proposed to amend 29 CFR Part 1910 by revising § 1910.120, Hazardous Waste Operations, as set forth below.

Signed at Washington, DC this 5th day of August 1987.

John A. Pendergrass,
Assistant Secretary of Labor.

For the reasons set out in the preamble, Title 29, Part 1910, of the Code of Federal Regulations is amended as follows:

PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

1. The authority citation for Subpart H of Part 1910 is proposed to be amended by adding the following citation:

Authority:

***** ***** ***** ***** *****

Section 1910.120 is issued under the authority of Section 126 of the Superfund Amendments and Reauthorization Act of 1986 (Pub. L. 99-499), Sections 6 and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 655, 657), sections 3 and 4 of the Administrative Procedure Act (5 U.S.C. 552(a), 553), 29 CFR Part 1911 and Secretary of Labor's Order 9-83 (48 FR 35736).

2. Section 1910.120 of Title 29 of the Code of Federal Regulations is proposed to be revised to read as follows:

§ 1910.120 Hazardous waste operations and emergency response.

(a) Scope, application, and definitions—(1) Scope for operations other than emergency response. This section covers employers and employees engaged in the following operations:

(i) Operations involving hazardous substances that are conducted under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended (42 U.S.C. 9601 *et seq.*) (CERCLA), including initial investigations at CERCLA sites before the presence or absence of hazardous substances has been ascertained;

(ii) Clean-up operations involving major corrective actions conducted under the Resource Conservation and Recovery Act of 1978 as amended (42 U.S.C. 6901 *et seq.*) (RCRA);

(iii) Operations at hazardous waste sites that have been designated for clean-up by state or local governmental authorities: and

(iv) Storage, treatment, and disposal facilities involving hazardous wastes regulated under 40 CFR Parts 264 and 265 pursuant to RCRA; and

(2) *Scope for emergency response operations*. This section also covers employers whose employees have a reasonable possibility of engaging in emergency response operations for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.

(3) *Application.* (i) All requirements of Part 1910 and Part 1926 of Title 29 of the Code of Federal Regulations apply pursuant to their terms to hazardous waste operations whether covered by this section or not. In addition, the provisions of this section apply to operations covered by this section. If there is a conflict or overlap, the provision more protective of employee safety and health shall apply without regard to 29 CFR 1910.5(c)(1).

(ii) All paragraphs of this section except paragraph (o) apply to operations involving hazardous substances conducted under CERCLA, major corrective actions taken in clean-up operations under RCRA, and hazardous waste operations that have been designated for clean-up by state or local governmental authorities.

(iii) Only the requirements of paragraphs (1) and (o) of this section apply to those operations involving hazardous waste treatment, storage, and

disposal facilities regulated under 40 CFR Parts 264 and 265.

Exceptions: For small quantity generators and generators with less than 90 days accumulation of hazardous wastes who have emergency response teams that respond to releases of, or substantial threats of releases of, hazardous substances, only paragraph (l) is applicable. Small quantity generators and generators with less than 90 days accumulation of hazardous wastes who do not have emergency response teams that respond to releases of, or substantial threats of releases of, hazardous substances are exempt from the regulations of this section.

(iv) Paragraph (l) of this section applies to all emergency response operations for releases of, or substantial threats of releases of, hazardous substances including those releases of or substantial threats of releases that occur at worksites other than those sites identified in paragraphs (a)(2)(i) through (a)(2)(iii) of this section.

(4) *Definitions. "Buddy system"* means a system of organizing employees into work groups in such a manner that each employee of the work group is designated to observe the activities of at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to those other employees in the event of an emergency.

"Decontamination" means the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health affects.

"Emergency response" means a coordinated response effort by employees from outside the immediate release area or by outside responders (i.e., mutual-aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area are not considered to be emergency responses within the scope of this standard. Responses to releases of hazardous substances where the concentration of a hazardous substance is below the established permissible exposure limits established in this standard are not considered to be emergency responses.

"Established exposure levels" means the inhalation or dermal permissible exposure limit specified in 29 CFR Part 1910, Subpart Z; or if none is specified, the exposure limits in "NIOSH Recommendations for Occupational Health Standards" dated 1986 incorporated by reference, or if neither of the above is specified, the standards specified by the American Conference of Governmental Industrial Hygienists in their publication "Threshold Limit Values and Biological Exposure Indices for 1986-87" dated 1986 incorporated by reference. The two documents incorporated by reference are available for purchase from the following:

NIOSH, Publications Dissemination, Division of Standards Development and Technology Transfer, National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, OH 45226, (513) 841-4287.

American Conference of Governmental Industrial Hygienists, 6500 Glenway Ave., Building D-7, Cincinnati, OH 45211-4438, (513) 661-7881

and are available for inspection and copying at the OSHA Docket Office, Docket No. S-760, Room N-3671, 200 Constitution Ave., NW., Washington, DC 20210.

"Facility" means (A) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft, or (B) any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any vessel.

"Hazardous materials (HAZMAT) team" means an organized group of employees, designated by the employer, who are knowledgeable and specifically trained and skilled to handle and control leaking containers or vessels, use and select special chemical protective clothing and perform other duties associated with accidental releases of hazardous substances. The team members perform responses to releases of hazardous substances for the purpose of control or stabilization of the release. A HAZMAT team is not a fire brigade nor is a typical fire brigade a HAZMAT team. A HAZMAT team, however, may be a separate component of a fire brigade.

"Hazardous substance" means any substance designated or listed under (A) through (D) below, exposure to which results or may result in adverse affects on the health or safety of employees:

(A) Any substance defined under section 101(14) of CERCLA;

(B) Any biological agent and other disease-causing agent as defined in section 104 (33) of CERCLA;

(C) Any substance listed by the U.S. Department of Transportation as hazardous materials under 49 CFR 172.101 and appendices; and

(D) Hazardous waste.

"Hazardous waste" means (A) a waste or combination of wastes as defined in 40 CFR 261.3, or (B) those substances defined in 49 CFR 171.8.

"Hazardous-waste operation" means any operation conducted within the scope of this standard involving employee exposure to hazardous wastes, hazardous substances, or any combination of hazardous wastes and hazardous substances.

"Hazardous waste site" or "site" means any facility or location within the scope of this standard at which hazardous waste operations take place.

"Health hazard" means a chemical, mixture of chemicals or a pathogen for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. Further definition of the terms used above can be found in Appendix A to 29 CFR 1910.1200.

"IDLH" or "Immediately dangerous to life or health" means an atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere.

"Oxygen deficiency" means that concentration of oxygen by volume below which air supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent oxygen.

"Permissible exposure limit" means the inhalation or dermal permissible exposure limit specified in 29 CFR Part 1910, Subpart Z.

"Post emergency response" means that portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the site has begun. If post emergency response is performed by

an employer's own employees as a continuation of initial emergency response, it is considered to be part of the initial response and not post emergency response.

"Qualified person" means a person with specific training, knowledge and experience in the area for which the person has responsibility.

"Site safety and health supervisor (or official)" means the individual located on a hazardous waste site who is responsible to the employer and has the authority and knowledge necessary to implement the site safety and health plan and verify compliance with applicable safety and health requirements.

"Small quantity generator" means a generator of hazardous wastes who in any calendar month generates no more than 1000 kilograms (2210 pounds) of hazardous waste in that month.

(b) *General requirements—(1) Safety and health program—(i) General.* Employers shall develop and implement a written safety and health program for their employees involved in hazardous waste operations. The program shall be designed to identify, evaluate, and control safety and health hazards and provide for emergency response for hazardous waste operations. The program shall incorporate as separate chapter the following:

(A) Organizational structure chapter;

(B) A comprehensive workplan chapter; and

(C) A site-specific safety and health plan chapter.

(ii) *Organizational structure chapter.*

(A) The organizational structure chapter shall establish the specific chain of command and specify the overall responsibilities of supervisors and employees. It shall include at a minimum, the following elements:

(*1*) A general supervisor who has the responsibility and authority to direct all hazardous waste operations.

(*2*) A site safety and health supervisor who has the responsibility and authority to develop and implement the site safety and health plan and verify compliance.

(*3*) All other personnel needed for hazardous waste site operations and emergency response and their general functions and responsibilities.

(*4*) The lines of authority, responsibility, and communication.

(B) The organizational structure shall be reviewed and updated as necessary to reflect the current status of waste site operations.

(C) The original organizational structure plan and any changes to the overall organizational structure shall be made available to all affected employees.

(iii) *Comprehensive workplan chapter.* The comprehensive workplan chapter shall address the tasks and objectives of site operations and the logistics and resources required to reach those tasks and objectives.

(A) The comprehensive workplan shall address anticipated clean-up activities as well as normal operating procedures.

(B) The comprehensive workplan shall define work tasks and objectives and identify the methods for accomplishing those tasks and objectives.

(C) The comprehensive workplan shall establish personnel requirements for implementing the plan.

(D) The comprehensive workplan shall provide for the implementation of the training required in paragraph (e) of this section.

(E) The comprehensive workplan shall provide for the implementation of the required informational programs required in paragraph (i) of this section.

(F) The comprehensive workplan shall provide for the implementation of the medical surveillance program described in paragraph (f) of this section.

(iv) *Site-specific safety and health plan chapter.* The site safety and health plan, which is part of the overall safety and health program shall be available on the site for inspection by employees, their designated representatives, and OSHA personnel, shall address the safety and health hazards of each phase of site operation; and include the requirements and procedures for employee protection.

(A) The site safety and health plan, as a minimum, shall address the following:

(*1*) Names of key personnel and alternates responsible for site safety and health, including a site safety and health supervisor.

(*2*) A safety and health risk or hazard analysis for each site task and operation found in the workplan.

(*3*) Employee training assignments to assure compliance with paragraph (e) of this section.

(*4*) Personal protective equipment to be used by employees for each of the site tasks and operations being conducted as required by the personal protective equipment program in paragraph (g)(5) of this section.

(*5*) Medical surveillance requirements in accordance with the program in paragraph (f) of this section.

(*6*) Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used including methods of maintenance and calibration of monitoring and sampling equipment to be used.

(*7*) Site control measures in accordance with the site control program required in paragraph (d) of this section.

(*8*) Decontamination procedures in accordance with paragraph (k) of this section.

(*9*) An emergency response plan meeting the requirements of paragraphs (l)(1)(i) and (l)(1)(ii) of this section for safe and effective responses to emergencies, including the necessary PPE and other equipment.

(*10*) Confined space entry procedures.

(B) Pre-entry briefings shall be held prior to initiating any site activity and at such other times as necessary to ensure that employees are apprised of the site safety and health plan and that this plan is being followed.

(C) Inspections shall be conducted by the site safety and health supervisor or, in the absence of that individual, another individual acting on behalf of the employer as necessary to determine the effectiveness of the site safety and health plan. Any deficiencies in the effectiveness of the site safety and health plan shall be corrected by the employer.

(*11*) When major spills may be anticipated due to the type of work involved, a spill containment program meeting the requirements of paragraph (j)(1) of this section shall be included.

(2) *Site excavation.* Site excavations created during initial site preparation or during hazardous waste operations shall be shored or sloped as appropriate to prevent accidental collapse in accordance with Subpart P of 29 CFR Part 1926.

(3) *Contractors and sub-contractors.* (i) An employer who retains contractor or sub-contractor services for work in hazardous waste operations shall inform those contractors, sub-contractors, or their representatives of any potential fire, explosion, health, safety or other hazards of the hazardous waste operation that have been identified by the employer including the employer's information program.

(ii) The safety and health program required in paragraph (b)(1) of this

section shall be made available to any subcontractor or its representative who will be involved with the hazardous waste operation and employees, their designated representatives, and OSHA personnel.

(c) *Site characterization and analysis.* Hazardous waste sites shall be evaluated in accordance with this paragraph to identify specific site hazards and to determine the appropriate safety and health control procedures needed to protect employees from the identified hazards.

(1) A preliminary evaluation of a site's characteristics shall be performed prior to site entry by a qualified person in order to aid in the selection of appropriate employee protection methods prior to site entry. Immediately after initial site entry, a more detailed evaluation of the site's specific characteristics shall be performed by a qualified person in order to further identify existing site hazards and to further aid in the selection of the appropriate engineering controls and personal protective equipment for the tasks to be performed.

(2) All suspected conditions that may pose inhalation or skin absorption hazards that are immediately dangerous to life or health (IDLH) or other conditions that may cause death or serious harm, shall be identified during the preliminary survey and evaluated during the detailed survey. Examples of such hazards include, but are not limited to, confined space entry, potentially explosive or flammable situations, visible vapor clouds, or areas where biological indicators such as dead animals or vegetation are located.

(3) The following information to the extent available shall be obtained by the employer prior to allowing employees to enter a site:

(i) Location and approximate size of the site.

(ii) Description of the response activity and/or the job task to be performed.

(iii) Duration of the planned employee activity.

(iv) Site topography.

(v) Site accessibility by air and roads.

(vi) Pathways for hazardous substance dispersion.

(vii) Present status and capabilities of emergency response teams that would provide assistance to hazardous waste clean-up site employees at the time of an emergency.

(viii) Hazardous substances and health hazards involved or expected at the site and their chemical and physical properties.

(4) Personal protective equipment (PPE) shall be provided and used during initial site entry in accordance with the following requirements:

(i) Based upon the results of the preliminary site evaluation, an ensemble of PPE shall be selected and used during initial site entry which will provide protection to a level of exposure below established permissible exposure limits for known or suspected hazardous substances and health hazards, and which will provide protection against other known and suspected hazards identified during the preliminary site evaluation.

(ii) During initial site entry an escape self-contained breathing apparatus of at least five minutes' duration shall be carried by employees or kept available at their immediate work station if positive-pressure self-contained breathing apparatus is not used as part of the entry ensemble.

(iii) If the preliminary site evaluation does not produce sufficient information to identify the hazards or suspected hazards of the site, an ensemble providing protection equivalent to Level B PPE shall be provided as minimum protection, and direct reading instruments shall be used as appropriate for identifying IDLH conditions. (See Appendix B for a description of Level B hazards and the requirements for Level B protective equipment.)

(iv) Once the hazards of the site have been identified, the appropriate PPE shall be selected and used in accordance with paragraph (g) of this section.

(5) The following monitoring shall be conducted during initial site entry when the site evaluation produces information that shows the potential for ionizing radiation or IDLH conditions, or when the site information is not sufficient to reasonably eliminate these possible conditions:

(i) Monitoring for hazardous levels of ionizing radiation.

(ii) Monitoring the air with appropriate test equipment for IDLH and other conditions that may cause death or serious harm (combustible or explosive atmospheres, oxygen deficiency, toxic substances).

(iii) Visually observing for signs of actual or potential IDLH or other dangerous conditions.

(6) Once the presence and concentrations of specific hazardous substances and health hazards have been established, the risks associated with these substances shall be identified. Employees who will be working on the site shall be informed of any risks that have been identified. In situations covered by the Hazard Communication Standard, 29 CFR 1910.1200, training required by that standard need not be duplicated.

Note.—Risks to consider include, but are not limited to:

a. Exposures exceeding the appropriate established Permissible Exposure Limits (PELs), Threshold Limit Values (TLVs), or Recommended Exposure Limits (RELs), etc.

b. IDLH Concentrations.

c. Potential Skin Absorption and Irritation Sources.

d. Potential Eye Irritation Sources.

e. Explosion Sensitivity and Flammability Ranges.

(7) Any information concerning the chemical, physical, and toxicologic properties of each substance known or expected to be present on site that is available to the employer and relevant to the duties an employee is expected to perform shall be made available to the affected employees prior to the commencement of their work activities.

(8) An ongoing air monitoring program in accordance with paragraph (h) of this section shall be implemented after site characterization has determined the site is safe for the start-up of operations.

(d) *Site control.* Appropriate site control procedures shall be implemented before clean-up work begins to control employee exposure to hazardous substances.

(1) A site control program for protecting employees which is part of the employer's safety and health program required in paragraph (b) of this section shall be developed during the planning stages of a hazardous waste operation clean-up and modified as necessary as new information becomes available.

(2) The site control program shall, as a minimum, include: A site map; site work zones: the use of a "buddy system"; site communications; the standard operating procedures or safe work practices; and identification of the nearest medical assistance.

(e) *Training.* Initial or review training meeting the requirements of this paragraph shall be provided to employees before they are permitted to engage in hazardous waste operations that could expose them to hazardous substances, safety, or health hazards.

(1) All employees (such as but not limited to equipment operators and general laborers) exposed to hazardous substances, health hazards, or safety hazards shall be thoroughly trained in the following:

(i) Names of personnel and alternates responsible for site safety and health;

(ii) Safety, health and other hazards present on the site;

(iii) Use of personal protective equipment:

(iv) Work practices by which the employee can minimize risks from hazards;

(v) Safe use of engineering controls and equipment on the site;

(vi) Medical surveillance requirements including recognition of symptoms and signs which might indicate overexposure to hazards; and

(vii) The contents of paragraphs (7) through (10) of the site safety and health plan set forth in paragraph (b)(1)(iv)(A) of this section.

(2) All employees shall at the time of job assignment receive a minimum of 40 hours of initial instruction off the site, and a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. Workers who may be exposed to unique or special hazards shall be provided additional training. The level of training provided shall be consistent with the employee's job function and responsibilities.

(3) On-site management and supervisors directly responsible for, or who supervise employees engaged in, hazardous waste operations shall receive training as provided in paragraph (e)(1) and (e)(2) of this section, and at least eight additional hours of specialized training at the time of job assignment on such topics as, but not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring techniques.

(4) Trainers shall be qualified to instruct employees about the subject matter that is being presented in training.

Note.—Trainers can show their qualifications by having the knowledge or training equivalent to a level of training higher than the level they are presenting. This may be shown by academic degrees, training courses completed and/or work experience.

(5) Employees shall not be permitted to participate in field activities until they have been trained to a level required by their job function and responsibility.

(6) Employees and supervisors that have received and successfully completed the training and field experience specified in paragraphs (e)(1), (e)(2) and (e)(3) of this section shall be certified by their instructor as having completed the necessary training. A written certificate shall be given to each person so certified. Any person who has not been so certified nor meets the requirements of paragraph (e)(9) of this section shall be prohibited from engaging in hazardous waste operations.

(7) Employees who are engaged in responding to hazardous emergency situations at hazardous waste clean-up sites that may expose them to hazardous substances shall be trained in how to respond to expected emergencies.

(8) Employees specified in paragraph (e)(1), and managers and supervisors specified in paragraph (e)(3) of this section, shall receive eight hours of refresher training annually on the items specified in paragraph (e)(1) and/or (e)(3) of this section and other relevant topics.

(9) Employers who can show that an employee's work experience and/or training has resulted in initial training equivalent to that training required in paragraphs (e)(1), (e)(2), and (e)(3) of this section shall not be required to provide the initial training requirements of those paragraphs. Equivalent training includes the training that existing employees might have already received from actual site work experience.

(f) *Medical surveillance.* Medical surveillance shall be provided in accordance with this paragraph for employees exposed or potentially exposed to hazardous substances or health hazards or who wear respirators.

(1) *Employees covered.* A medical surveillance program which is part of the employer's safety and health program required in paragraph (b) of this section or required in paragraphs (l)(4) or (o)(3) of this section, shall be instituted by the employer for:

(i) All employees who are or may be exposed to hazardous substances or health hazards at or above the established exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year.

(ii) All employees who wear a respirator for 30 days or more a year or as required by § 1910.134.

(iii) All employees who are injured due to overexposure from an emergency incident involving hazardous substances or health hazards.

(2) *Frequency of medical examinations and consultations.* Medical examinations and consultations shall be made available by the employer to each employee covered under paragraph (f)(1) of this section on the following schedules:

(i) For employees covered under paragraphs (f)(1)(i) and (f)(1)(ii):

(A) Prior to assignment;

(B) At least once every twelve months for each employee covered;

(C) At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last six months;

(D) As soon as possible upon notification by an employee that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards or that the employee has been exposed above the established exposure levels in an emergency situation;

(E) At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary.

(ii) For employees covered under paragraph (f)(1)(iii) and for all employees who may have been exposed during an emergency incident to hazardous substances at concentrations above the established exposure levels without the necessary personal protective equipment being used:

(A) As soon as possible following the emergency incident;

(B) Additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary.

(3) *Content of medical examinations and consultations.* (i) Medical examinations required by paragraph (f)(2) of this section shall include a medical and work history (or updated history if one is in the employee's file with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site.

(ii) The content of medical examinations or consultations made available to employees pursuant to paragraph (f) shall be determined by the examining physician.

(4) *Examination by a physician and costs.* All medical examinations and procedures shall be performed by or under the supervision of a licensed physician, and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

(5) *Information provided to the physician.* The employer shall provide one copy of this standard and its appendices to the examining physician, and in addition the following for each employee:

(i) A description of the employee's duties as they relate to the employee's exposures.

(ii) The employee's exposure levels or anticipated exposure levels.

(iii) A description of any personal protective equipment used or to be used.

(iv) Information from previous medical examinations of the employee which is not readily available to the examining physician.

(v) Information required by § 1910.134.

(6) *Physician's written opinion.* (i) The employer shall obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following:

(A) The results of the medical examination and tests if requested by the employee.

(B) The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirators used as required by § 1910.134.

(C) The physician's recommended limitations upon the employee's assigned work.

(D) A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

(ii) The written opinion obtained by the employer shall not reveal specific findings or diagnoses unrelated to occupational exposure.

(7) *Recordkeeping.* (i) An accurate record of the medical surveillance required by paragraph (f) of this section shall be retained. This record shall be retained for the period specified and meet the criteria of 29 CFR 1910.20.

(ii) The record required in paragraph (f)(7)(i) of this section shall include at least the following information:

(A) The name and social security number of the employee;

(B) Physicians' written opinions, recommended limitations, and results of examinations and tests;

(C) Any employee medical complaints related to exposure to hazardous substances;

(D) A copy of the information provided to the examining physician by the employer, with the exception of the standard and its appendices.

(g) *Engineering controls, work practices, and personal protective equipment for employee protection.* Engineering controls, work practices, personal protective equipment, or a combination of these shall be implemented in accordance with this paragraph to protect employees from exposure to hazardous substances and health hazards.

(1) *Engineering controls, work practices and PPE for substance regulated in Subpart Z.* (i) Engineering controls and work practices shall be instituted to reduce and maintain employee exposure to or below the permissible exposure limits for substances regulated by 29 CFR Part 1910, Subpart Z, except to the extent that such controls and practices are not feasible.

Note.—Engineering controls which may be feasible include the use of pressurized cabs or control booths on equipment, and/or the use of remotely operated material handling equipment. Work practices which may be feasible are removing all non-essential employees from potential exposure during opening of drums, wetting down dusty operations and locating employees upwind of possible hazards.

(ii) Whenever engineering controls and work practices are not feasible, PPE shall be used to reduce and maintain employee exposures to or below the permissible exposure limits or dose limits for substances regulated by *29* CFR Part 1910, Subparts G and Z.

(iii) The employer shall not implement a schedule of employee rotation as a means of compliance with permissible dose limits except when there is no other feasible way of complying with the airborne or dermal dose limits for ionizing radiation.

(2) Engineering controls, work practices, and personal protective equipment for substances not regulated in Subpart Z. An appropriate combination of engineering controls, work practices, and personal protective equipment shall be established to reduce and maintain employee exposure to or below appropriate exposure levels for hazardous substances and health hazards not regulated by 29 CFR Part 1910, Subparts G and Z taking into account the established exposure levels.

(3) *Personal protective equipment selection.* (i) Personal protective equipment (PPE) shall be selected and used which will protect employees from the hazards and potential hazards they are likely to encounter as identified during the site characterization and analysis.

(ii) Personal protective equipment selection shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site.

(iii) Positive pressure self-contained breathing apparatus or positive pressure air-line respirators equipped with an escape air supply, shall be used in IDLH conditions.

(iv) Totally-encapsulating chemical protective suits (Protection equivalent to Level A protection as specified in Appendix B) shall be used in conditions where skin absorption of a hazardous substance may result in an IDLH situation.

(v) The level of protection provided by PPE selection shall be increased when additional information on site conditions show that increased protection is necessary to reduce employee exposures below established permissible exposure limits for hazardous substances and health hazards. (See Appendix B for guidance on selecting PPE ensembles.)

Note.—The level of employee protection provided may be decreased when additional information or site conditions show that decreased protection will not result in increased hazardous exposures to employees.

(vi) Personal protective equipment shall be selected and used to meet the requirements of 29 CFR Part 1910, Subpart I, and additional requirements specified in this section.

(4) *Totally-encapsulating chemical protective suits.* (i) Totally-encapsulating suit materials used for Level A protection shall protect employees from the particular hazards which are identified during site characterization and analysis.

(ii) Totally-encapsulating suits shall be capable of maintaining positive air pressure. (See Appendix A.)

(iii) Totally-encapsulating suits shall be capable of preventing inward test gas leakage of more than 0.5 percent. (See Appendix A.)

(5) *Personal protective equipment (PPE) program.* A written personal protective equipment program, which is part of the employer's safety and health program required in paragraph (b) of this section or required in paragraph (1)(4) of this section, shall be established for hazardous waste operations which shall be part of the site-specific safety and health plan. The PPE program shall address the following elements:

(i) Site hazards,

(ii) PPE selection,

(iii) PPE use,

(iv) Work mission duration,

(v) PPE maintenance and storage,

(vi) PPE decontamination,

(vii) PPE training and proper fitting,

(viii) PPE donning and doffing procedures,

(ix) PPE inspection,

(x) PPE in-use monitoring,

(xi) Evaluation of the effectiveness of the PPE program, and

(xii) Limitations during temperature extremes, and other appropriate medical considerations.

(h) *Monitoring.* Monitoring shall be performed in accordance with this paragraph to assure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels which exceed established permissible exposure limits for hazardous substances.

(1) Air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection needed on site.

(2) Upon initial entry, representative air monitoring shall be conducted to identify any IDLH condition, exposure over established exposure levels, exposure over a radioactive material's dose limits or other dangerous condition such as the presence of flammable atmospheres or oxygen-deficient environments.

(3) Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that exposures may have risen since prior monitoring. Situations where it shall be considered whether the possibility that exposures have risen are when:

(i) Work begins on a different portion of the site.

(ii) Contaminants other than those previously identified are being handled.

(iii) A different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling).

(iv) Employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon).

(v) A sufficient reasonable interval has passed so that exposures may have significantly increased.

(4) After hazardous waste clean-up operations commence, the employer shall monitor those employees likely to have the highest exposures to hazardous substances and health hazards likely to be present above established permissible exposure limits by using personal sampling frequently enough to characterize employee exposures. The employer may utilize a representative sampling approach by documenting that the employees and chemicals chosen for monitoring are based on the criteria stated above.

Note.— it is not required to monitor employees engaged in site characterization operations covered by paragraph (c) of this section.

(i) *Informational programs.* Employers shall develop and implement a program, which is part of the employer's safety and health program required in paragraph (b) of this section, to inform employees, contractors, and subcontractors (or their representative) actually engaged in hazardous waste operations of the nature, level and degree of exposure likely as a result of participation in such hazardous waste operations. Employees, contractors and subcontractors working outside of the operations part of a site are not covered by this standard.

(j) *Handling drums and containers.* Hazardous substances and contaminated soils, liquids, and other residues shall be handled, transported, labeled, and disposed of in accordance with this paragraph.

(1) *General.* (i) Drums and containers used during the clean-up shall meet the appropriate DOT, OSHA, and EPA regulations for the wastes that they contain.

(ii) When practical, drums and containers shall be inspected and their integrity shall be assured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions (i.e., buried beneath the earth, stacked behind other drums, stacked several tiers high in a pile, etc.) shall be moved to an accessible location and inspected prior to further handling.

(iii) Unlabelled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled.

(iv) Site operations shall be organized to minimize the amount of drum or container movement.

(v) Prior to movement of drums or containers, all employees exposed to the transfer operation shall be warned of the potential hazards associated with the contents of the drums or containers.

(vi) U.S. Department of Transportation specified salvage drums or containers and suitable quantities of proper absorbent shall be kept available and used in areas where spills, leaks, or ruptures may occur.

(vii) Where major spills may occur, a spill containment program, which is part of the employer's safety and health program required in paragraph (b) of this section, shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred.

(viii) Drums and containers that cannot be moved without rupture, leakage, or spillage shall be emptied into a sound container using a device classified for the material being transferred.

(ix) A ground-penetrating system or other type of detection system or device shall be used to estimate the location and depth of buried drums or containers.

(x) Soil or covering material shall be removed with caution to prevent drum or container rupture.

(xi) Fire extinguishing equipment meeting the requirements of 29 CFR Part 1910, Subpart L, shall be on hand and ready for use to control incipient fires.

(2) *Opening drums and containers.* The following procedures shall be followed in areas where drums or containers are being opened:

(i) Where an airline respirator system is used, connections to the bank of air cylinders shall be protected from contamination and the entire system shall be protected from physical damage.

(ii) Employees not actually involved in opening drums or containers shall be kept a safe distance from the drums or containers being opened.

(iii) If employees must work near or adjacent to drums or containers being opened, a suitable shield that does not interfere with the work operation shall be placed between the employee and the drums or containers being opened to protect the employee in case of accidental explosion.

(iv) Controls for drum or container opening equipment, monitoring equipment, and fire suppression equipment shall be located behind the explosion-resistant barrier.

(v) When there is a reasonable possibility of flammable atmospheres being present, material handling equipment and hand tools shall be on the type to prevent sources of ignition.

(vi) Drums and containers shall be opened in such a manner that excess interior pressure cannot be relieved from a remote location, appropriate shielding shall be placed between the employee and the drums or containers to reduce the risk of employee injury.

(vii) Employees shall not stand upon or work from drums or containers.

(3) *Material handling equipment.* Material handling equipment used to transfer drums and containers shall be selected, positioned and operated to minimize sources of ignition related to the equipment from igniting vapors released from ruptured drums or containers.

(4) *Radioactive wastes.* Drums and containers containing radioactive wastes shall not be handled until such time as their hazard to employees is properly assessed.

(5) *Shock sensitive wastes.*

Caution.—Shipping of shock sensitive wastes may be prohibited under U.S. Department of Transportation regulations. Employers and their shippers should refer to 49 CFR 173.21 and 173.50.

As a minimum, the following special precautions shall be taken when drums and containers containing or suspected of containing shock-sensitive wastes are handled:

(i) All non-essential employees shall be evacuated from the area of transfer.

(ii) Material handling equipment shall be provided with explosive containment devices or protective shields to protect equipment operators from exploding containers.

(iii) An employee alarm system capable of being perceived above surrounding light and noise conditions shall be used to signal the commencement and completion of explosive waste handling activities.

(iv) Continuous communications (i.e., portable radios, hand signals, telephones, as appropriate) shall be maintained between the employee-in-charge of the immediate handling area and the site safety and health supervisor or command post until such time as the handling operation is completed. Communication equipment or methods that could cause shock sensitive materials to explode shall not be used.

(v) Drums and containers under pressure, as evidenced by bulging or swelling, shall not be moved until such time as the cause for excess pressure is determined and appropriate containment procedures have been implemented to protect employees from explosive relief of the drum.

(vii) Drums and containers containing packaged laboratory wastes shall be considered to contain shock-sensitive or explosive materials until they have been characterized.

(6) *Laboratory waste packs.* In addition to the requirements of paragraph (j)(5) of this section, the following precautions shall be taken, as a minimum, in handling laboratory waste packs (lab packs):

(i) Lab packs shall be opened only when necessary and then only by an individual knowledgeable in the inspection, classification, and segregation of the containers within the pack according to the hazards of the wastes.

(ii) If crystalline material is noted on any container, the contents shall be handled as a shock-sensitive waste until the contents are identified.

(7) *Sampling drums and containers.* Sampling of containers and drums shall be done in accordance with a sampling procedure which is part of the site safety and health plan developed for and available to employees and others at the specific worksite.

(8) *Shipping and transport.* (i) Drums and containers shall be identified and classified prior to packaging for shipment.

(ii) Drum or container staging areas shall be kept to the minimum number necessary to identify and classify materials safely and prepare them for transport.

(iii) Staging areas shall be provided with adequate access and egress routes.

(iv) Bulking of hazardous wastes shall be permitted only after a thorough characterization of the materials has been completed.

(9) *Tank and vault procedures.* (i) Tanks and vaults containing hazardous substances shall be handled in a manner similar to that for drums and containers, taking into consideration the size of the tank or vault.

(ii) Appropriate tank or vault entry procedures meeting paragraph (b)(1)(iv)(A)(*10*) of this section shall be followed whenever employees must enter a tank or vault.

(k) *Decontamination.* Procedures for all phases of decontamination shall be developed and implemented in accordance with this paragraph.

(1) A decontamination procedure shall be developed, communicated to employees and implemented before any employees or equipment may enter areas on site where potential for exposure to hazardous substances exists.

(2) Standard operating procedures shall be developed to minimize employee contact with hazardous substances or with equipment that has contacted hazardous substances.

(3) Decontamination shall be performed in geographical areas that will minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment.

(4) All employees leaving a contaminated area shall be appropriately decontaminated; all clothing and equipment leaving a contaminated area shall be appropriately disposed of or decontaminated.

(5) Decontamination procedures shall be monitored by the site safety and health supervisor to determine their effectiveness. When such procedures are found to be ineffective, appropriate steps shall be taken to correct any deficiencies.

(6) All equipment and solvents used for decontamination shall be decontaminated or disposed of properly.

(7) Protective clothing and equipment shall be decontaminated, cleaned, laundered, maintained or replaced as needed to maintain their effectiveness.

(8) Employees whose non-impermeable clothing becomes wetted with hazardous substances shall immediately remove that clothing and proceed to shower. The clothing shall be disposed of or decontaminated before it is removed from the work zone.

(9) Unauthorized employees shall not remove protective clothing or equipment from change rooms.

(10) Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the potentially harmful effects of exposures to hazardous substances.

(11) Where the decontamination procedure indicates a need for regular showers and change rooms outside of a contaminated area, they shall be provided and meet the requirements of 29 CFR 1910.141. If temperature conditions prevent the effective use of water then other effective means for cleansing shall be provided and used.

(l) *Emergency response.* Emergency response at hazardous waste operation incidents shall be conducted in accordance with this paragraph.

(1) *General*—(i) *Emergency response plan.* An emergency response plan shall be developed and implemented by all employers within the scope of this section to handle anticipated emergencies prior to the commencement of hazardous waste operations. The plan shall be in writing and available for inspection and copying by employees, their representatives and OSHA personnel. Employers who will evacuate their employees from the workplace when an emergency occurs and who do not permit any of their employees to respond to assist in handling the emergency are exempt from the requirements of this paragraph if they provide an emergency action plan complying with section 1910.38(a) of this part.

(ii) Elements of an emergency response plan. The employer shall develop an emergency response plan for emergencies

which shall address, as a minimum, the following:

(A) Pre-emergency planning.

(B) Personnel roles, lines of authority, training, and communication.

(C) Emergency recognition and prevention.

(D) Safe distances and places of refuge.

(E) Site security and control.

(F) Evacuation routes and procedures.

(G) Decontamination.

(H) Emergency medical treatment and first aid.

(I) Emergency alerting and response procedures.

(J) Critique of response and follow-up.

(K) PPE and emergency equipment.

(2) *Emergency response at hazardous waste clean-up sites*-(i) *Training.* (A) Training for emergency response employees at clean-up operations shall be conducted in accordance with paragraph (e) of this section for employers covered by paragraph (a)(1)(i) through (iii) of this section and in accordance with paragraph (o)(5) of this section for those employers covered by paragraph (a)(1)(iv) of this section.

(B) Employers who can show that an employee's work experience and/or training has resulted in training equivalent to that training required in paragraph (l)(2)(i)(A) of this section shall not be required to provide the initial training requirements of those paragraphs. Equivalent training includes the training that existing employees might have already received from actual site work experience.

(ii) *Procedures for handling emergency incidents.* (A) In addition to the elements for the emergency response plan required in paragraph (l)(1)(ii) of this section, the following elements shall be included for emergency response plans:

(*1*) Site topography, layout, and prevailing weather conditions.

(*2*) Procedures for reporting incidents to local, state, and federal governmental agencies.

(B) The emergency response plan shall be a separate section of the Site Safety and Health Plan.

(C) The emergency response plan shall be compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and federal agencies.

(D) The emergency response plan shall be rehearsed regularly as part of the overall training program for site operations.

(E) The site emergency response plan shall be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information.

(F) An employee alarm system shall be installed in accordance with 29 CFR 1910.165 to notify employees of an emergency situation; to stop work activities if necessary; to lower background noise in order to speed communication; and to begin emergency procedures.

(G) Based upon the information available at time of the emergency, the employer shall evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan.

(3) *Emergency response at sites other than hazardous waste clean-up sites—(i)Training.* Employers shall provide the training specified by this paragraph for those employees for whom there exists the reasonable possibility of responding to emergencies at sites other than hazardous waste clean-up sites.

(A) *Emergency response organizations or teams.* Employees on emergency response organizations or teams such as fire brigades, fire departments, plant emergency organizations, hazardous materials teams, spill response teams, and similar groups with responsibility for emergency response shall be trained to a level of competence to protect themselves and other employees in the recognition of health and safety hazards, methods to minimize the risk from safety and health hazards, safe use of control equipment, selection and use of appropriate personal protective equipment, safe operating procedures to be used at the incident scene, techniques of coordination with other employees to minimize risks, appropriate response to over exposure from health hazards or injury to themselves and other employees and recognition of subsequent symptoms which may result from over exposures.

(*1*) Competency may be demonstrated by 24 hours of training annually in those areas with training sessions at least monthly or by demonstrations by the employee of competency in those areas at least quarterly.

(*2*) A certification shall be made of the training or competency and if certification of competency is made, the employer shall keep a record of the methodology used to demonstrate competency.

(*3*) An employer of employees for whom the reasonable possibility of responding to emergencies at other than hazardous waste clean-up sites exists need not train all such employees to the degree specified in paragraph (l)(3)(i)(A)(*1*) of this section if the employer divides the work force such that sufficient employees who have responsibility to control the emergency have the training specified in this paragraph and other employees who may first respond to the incident have sufficient awareness training to recognize that an emergency response situation exists and are instructed in that case to summon the employees who are fully trained and not attempt control activities for which they are not trained.

(*4*) An employer of employees for whom the reasonable possibility exists of responding to emergencies at other than hazardous waste clean-up sites need not train such employees to the degree specified in paragraph (l)(3)(i)(A)(*1*) of this section if:

(*i*) arrangements have been made in advance for a fully-trained emergency response team to respond in a reasonable period; and

(*ii*) employees who may come to the incident first have sufficient awareness training to recognize that an emergency response situation exists and are instructed to call the designated fully-trained emergency response team for assistance.

(B) *Specialist employees.* Employees who, in the course of their regular job duties, work with and are trained in the hazards of specific materials covered by this standard, and who will be called upon to provide technical advice or assistance at a hazardous substance release incident, are exempt from the monthly training sessions required in paragraph (l)(3)(i)(A) of this section. They must, pursuant to paragraph (l)(3)(i)(A) however, receive at least 24 hours of training annually or demonstrate competency in the area of their specialization.

(C) *Skilled support personnel.* Personnel, not necessarily an employer's own employees, who are needed to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by an employer's own employees, and who will be or may potentially be exposed to the hazards at an emergency response scene, are not required to have the 24 hours of annual training or demonstrate the

competency required for the employer's regular employees. However, the senior official cited in paragraph (l)(3)(ii) of this section shall ensure that these personnel are given an initial briefing at the site of emergency response prior to their participation in that response that shall include instruction in the wearing of appropriate personal protective equipment, what chemical hazards are involved, and what duties are to be performed. All appropriate safety and health precautions provided to the employer's own employees shall be used to assure the safety and health of these personnel.

(ii) *Procedures for handling emergency response.* (A) The senior official responding to an emergency at other than hazardous waste clean-up sites involving a hazardous substance or health hazard shall establish and become the individual in charge of a site-specific Incident Command System (ICS). All emergency responders and their communications shall be coordinated and controlled through the individual in charge of the ICS assisted by the senior official present for each employer.

Note: The "senior official" at an off-site emergency response is the most senior official on the site who has the responsibility for controlling the operations at the site. Initially it is the senior officer on the first-due piece of responding emergency apparatus to arrive on the incident scene. As more senior officers arrive (i.e., fire chief, battalion chief, site coordinator, etc.) the position is passed up the line of authority.

(B) The individual in charge of the ICS shall identify, to the extent possible, all hazardous substances or conditions present and shall address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies.

(C) Based on the hazardous substances and/or conditions present, the individual in charge of the ICS shall implement appropriate emergency operations, and assure that the personal protective equipment worn is appropriate for the hazards to be encountered. However, personal protective equipment shall meet, at a minimum, the criteria contained in 29 CFR 1910.156(e) when worn while performing fire fighting operations beyond the incipient stage.

(D) Employees engaged in emergency response and exposed to hazardous substances shall wear positive pressure self-contained breathing apparatus while engaged in emergency response until such time that the individual in charge of the ICS determines through the use of air monitoring that a decreased level of respiratory protection will not result in hazardous exposures to employees.

(E) The individual in charge of the ICS shall limit the number of emergency response personnel at the emergency site to those who are actively performing emergency operations. However, operations in hazardous areas shall be performed using the buddy system in groups of two or more.

(F) Back-up personnel shall stand by with equipment ready to provide assistance or rescue. Qualified basic life support personnel, as a minimum, shall also stand by with medical equipment and transportation capability.

(G) The individual in charge of the ICS shall designate a safety official, who is knowledgeable in the operations being implemented at the emergency response site, with specific responsibility to identify and evaluate hazards and to provide direction with respect to the safety of operations for the emergency at hand.

(H) When activities are judged by the safety official to be an IDLH condition and/or to involve an imminent danger condition, the safety official shall have the authority to alter, suspend, or terminate those activities. The safety official shall immediately inform the individual in charge of the ICS of any actions taken to correct these hazards at an emergency scene.

(I) After emergency operations have terminated, the individual in charge of the ICS shall implement appropriate decontamination procedures.

(J) When deemed necessary for meeting the tasks at hand, approved self-contained compressed air breathing apparatus may be used with approved cylinders from other approved self-contained compressed air breathing apparatus provided that such cylinders are of the same capacity and pressure rating. All compressed air cylinders used with self-contained breathing apparatus shall meet U.S. Department of Transportation and National Institute for Occupational Safety and Health criteria.

(4) *Hazardous materials teams (HAZMAT).* (i) Employees who are members of a HAZMAT team shall be given training in accordance with paragraph (l)(3) of this section that includes the care end use of chemical protective clothing, and procedures to be followed when working on leaking drums, containers, tanks, or bulk transport vehicles.

(ii) Members of HAZMAT teams shall receive a base line physical exam and have medical surveillance as required in paragraph (f) of this section.

(iii) Chemical personal protective clothing and equipment to be used by HAZMAT team members shall meet the requirements of paragraph (g) of this section.

(5) *Post-emergency response operations.* Upon completion of the emergency response, if it is determined that it is necessary to remove hazardous substances, health hazards, and materials contaminated with them (such as contaminated soil or other elements of the natural environment) from the site of the incident the employer conducting the clean-up shall comply with one of the following:

(i) Meet all of the requirements of paragraphs (b) through (n) of this section; or

(ii) Where the clean-up is done on plant property using plant or workplace employees, such employees shall have completed the training requirements of the following: 29 CFR 1910.38(a); 1910.134; 1910.1200; and other appropriate safety and health training made necessary by the tasks that they are expected to be performed. All equipment to be used in the performance of the clean-up work shall be in serviceable condition and shall have been inspected prior to use.

(m) *Illumination.* Areas accessible to employees shall be lighted in accordance with the requirements of this paragraph.

(1)Work areas shall be lighted to not less than the minimum illumination intensities listed in the following Table H-102.1 while any work is in progress:

Table H-102.1 — Minimum Illumination Intensities in Foot-Candles

Foot Candles	Area of operations
5	General site areas.
3	Excavation and waste areas, accessways, active storage areas, loading platforms, refueling, and field maintenance areas.
5	Tunnels, shafts, and general underground work areas. (Exception: Minimum of 10 foot-candles is required at tunnel and shaft heading during drilling, mucking, and scaling. Mine Safety and Health Administration approved cap lights shall be acceptable for use in the tunnel heading.)

10.....	General shops (e.g., mechanical and electrical equipment rooms, active storerooms, barracks or living quarters, locker or dressing rooms, dining areas, and indoor toilets and workrooms.)
30.....	First aid stations, infirmaries, and offices

(n) *Sanitation at temporary workplaces.* Facilities for employee sanitation shall be provided in accordance with this paragraph.

(1) *Potable water.* (i) An adequate supply of potable water shall be provided on the site.

(ii) Portable containers used to dispense drinking water shall be capable of being tightly closed and equipped with a tap. Water shall not be dipped from containers.

(iii) Any container used to distribute drinking water shall be clearly marked as to the nature of its contents and not used for any other purpose.

(iv) Where single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.

(2) *Nonpotable water.* (i) Outlets for nonpotable water, such as water for firefighting purposes shall be identified to indicate clearly that the water is unsafe and is not to be used for drinking, washing, or cooking purposes.

(ii) There shall be no cross-connection, open, or potential between a system furnishing potable water and system furnishing nonpotable water.

(3) *Toilets facilities.* (i) Toilets shall be provided for employees according to the following Table H-102.2.

Table H-102.2 — Toilet Facilities

Number of employees	Minimum number of facilities
20 or fewer.....	One.
More than 20, fewer than 200.	One toilet seat and 1 urinal per 40 employees.
More than 200.....	One toilet seat and 1 urinal per 50 employees.

(ii) Under temporary field conditions, provisions shall be made to assure that at least one toilet facility is available.

(iii) Hazardous-waste sites not provided with a sanitary sewer shall be provided with the following toilet facilities unless prohibited by local codes:

(A) Chemical toilets;

(B) Recirculating toilets;

(C) Combustion toilets; or

(D) Flush toilets.

(iv) The requirements of this paragraph for sanitation facilities, shall not apply to mobile crews having transportation readily available to nearby toilet facilities.

(v) Doors entering toilet facilities shall be provided with entrance locks controlled from inside the facility.

(4) *Food handling.* All food service facilities and operations for employees shall meet the applicable laws, ordinances, and regulations of the jurisdictions in which they are located.

(5) *Temporary sleeping quarters.* When temporary sleeping quarters are provided, they shall be heated, ventilated, and lighted.

(6) *Washing facilities.* The employer shall provide adequate washing facilities for employees engaged in operations where hazardous substances may be harmful to employees. Such facilities shall be in near proximity to the worksite; in areas where exposures are below established permissible exposure limits and which are under the controls of the employer; and shall be so equipped as to enable employees to remove hazardous substances for themselves.

(7) *Showers and change rooms.* When hazardous waste clean-up or removal operations commence on a site and the duration of the work will require six months or greater time to complete, the employer shall provide showers and change rooms for all employees exposed to hazardous substances and health hazards involved in hazardous waste clean-up or removal operations.

(i) Showers shall be provided and shall meet the requirements of 29 CFR 1910.141(d)(3).

(ii) Change rooms shall be provided and shall meet the requirements of 29 CFR 1910.141(1). Change rooms shall consist of two separate change areas separated by the shower area required in paragraph (n)(7)(i). One change area, with an exit leading off the worksite, shall provide employees with a clean area where they can remove, store, and put on street clothing. The second area, with an exit to the worksite, shall provide employees with an area where they can put on, remove, and store work clothing and personal protective equipment.

(iii) Showers and change rooms, shall be located in areas where exposures are below the established permissible exposure limits. If this cannot be accomplished, then a ventilation system shall be provided that will supply air that is below the established permissible exposure limits.

(iv) Employers shall assure that employees shower at the end of their work shift and when leaving the hazardous waste site.

(o) Certain Operations Conducted Under the Resource Conservation and Recovery Act of 1976 (RCRA). Employers conducting operations specified in paragraph (a)(2)(iii) of this section shall:

(1) Develop and implement a written safety and health program for employees involved in hazardous waste operations which shall be available for inspection by employees, their representatives, and OSHA personnel. The program shall be designed to identify, evaluate, and control safety and health hazards in their facilities for the purpose of employee protection, and provide for emergency response meeting the requirements of paragraph (l) of this section and it shall address as appropriate site analysis, engineering controls, maximum exposure limits, hazardous waste handling procedures, and uses of new technologies.

(2) Implement a hazard communication program as part of the employer's safety and program meeting the requirements of 29 CFR 1910.1200.

Note.—The exemptions provided *in* § 1910.1200 are applicable to this section.

(3) Implement a medical surveillance program meeting the requirements of paragraph (f) of this section.

(4) Develop and implement a decontamination procedure in accordance with paragraph (k) of this section, and

(5)(i) Develop and implement a training program, which is part of the employer's safety and health program, for employees involved with hazardous waste operations to enable each employee to perform their assigned duties and functions in a safe and healthful manner so as not to endanger themselves or other employees. The initial training shall be for 24 hours and refresher training shall be for eight hours annually.

(ii) Employers who can show by an employee's previous work experience and/or training that the employee has had training equivalent to the initial training required by this paragraph, shall be considered as meeting the initial training requirements of this paragraph as to that employee. Equivalent training includes

the training that existing employees might have already received from actual site work experience. Employees who have received the initial training required by this paragraph shall be given a written certificate attesting that they have successfully completed the necessary training.

(p) *New technology programs*. (1) The employer shall develop and implement procedures for the introduction of effective new technologies and equipment developed for the improved protection of employees working with hazardous waste clean-up operations, and the same shall be implemented as part of the site safety and health program to assure that employee protection is being maintained.

(2) New technologies, equipment, or control measures available to the industry, such as the use of foams or other means to suppress the level of air contaminates while excavating the site or for spill control, shall be evaluated by employers or their representatives to determine their effectiveness before implementing their use on a large scale for employee protection. Such evaluations shall be made available to OSHA upon request.

Appendices to §1910.120–Hazardous Waste Operations and Emergency Response

Note.—*The following appendices serve as non-mandatory guidelines to assist employees and employers in complying with the appropriate requirements of this section. However paragraph 1910.120(g) makes mandatory in certain circumstances the use of Level A and Level B PPE protection.*

Appendix A—Personal Protective Equipment Test Methods

This appendix sets forth the non-mandatory examples of tests which may be used to evaluate compliance with paragraphs 1910.120(g)(4)(ii) and (iii). Other tests and other challenge agents may be used to evaluate compliance.

A. Totally-encapsulating chemical protective suit pressure test.

1.0— *Scope.*

1.1 This practice measures the ability of a gas tight totally-encapsulating chemical protective suit material, seams, and closures to maintain a fixed positive pressure. The results of this practice allow the gas tight integrity of a totally-encapsulating chemical protective suit to be evaluated.

1.2 Resistance of the suit materials to permeation, penetration, and degradation by specific hazardous substances is not determined by this test method.

2.0— *Definition of terms.*

2.1 *"Totally-encapsulated chemical protective suit (TECP suit)"* means a full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, and legs; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer by itself or in combination with the wearer's respiratory equipment, gloves, and boots.

2.2 *"Protective clothing material"* means any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with a potentially hazardous liquid or gaseous chemicals.

2.3 *"Gas tight"* means, for the purpose of this test method, the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.

3.0— *Summary of test method.*

3.1 The TECP suit is visually inspected and modified for the test. The test apparatus is attached to the suit to permit inflation to the pre-test suit expansion pressure for removal of suit wrinkles and creases. The pressure is lowered to the test pressure and monitored for three minutes. If the pressure drop is excessive, the TECP suit fails the test and is removed from service. The test is repeated after leak location and repair.

4.0— *Required Supplies.*

4.1 Source of compressed air.

4.2 Test apparatus for suit testing, including a pressure measurement device with a sensitivity of at least 1/4-inch water gauge.

4.3 Vent valve closure plugs or sealing tape.

4.4 Soapy water solution and soft brush.

4.5 Stop watch or appropriate timing device.

5.0— *Safety Precautions.*

5.1 Care shall be taken to provide the correct pressure safety devices required for the source of compressed air used.

6.0— *Test Procedure.*

6.1 Prior to each test, the tester shall perform a visual inspection of the suit. Check the suit for seam integrity by visually examining the seams and gently pulling on the seams. Ensure that all air supply lines, fittings, visor, zippers, and valves are secure and show no signs of deterioration.

6.1.1 Seal off the vent valves along with any other normal inlet or exhaust points (such as umbilical air line fittings or face piece opening) with tape or other appropriate means (caps, plugs, fixture, etc.). Care should be exercised in the sealing process not to damage any of the suit components.

6.1.2 Close all closure assemblies.

6.1.3 Prepare the suit for inflation by providing an improvised connection point on the suit for connecting an airline. Attach the pressure test apparatus to the suit to permit suit inflation from a compressed air source equipped with a pressure indicating regulator. The leak tightness of the pressure test apparatus should be tested before and after each test by closing off the end of the tubing attached to the suit and assuring a pressure of three inches water gauge for three minutes can be maintained. If a component is removed for the test, that component shall be replaced and a second test conducted with another component removed to permit a complete test of the ensemble.

6.1.4 The pre-test expansion pressure (A) and the suit test pressure (B) shall be supplied by the suit manufacturer, but in no case shall they be less than: A= three inches water gauge and B=two inches water gauge. The ending suit pressure (C) shall be no less than 80 percent of the test pressure (B); i.e., the pressure drop shall not exceed 20 percent of the test pressure (B).

6.1.5 Inflate the suit until the pressure inside is equal to pressure "A" the pre-test expansion suit pressure. Allow at least one minute to fill out the wrinkles in the suit. Release sufficient air to reduce the suit pressure to pressure "B" the suit test pressure. Begin timing. At the end of three minutes, record the suit pressure as pressure "C" the ending suit pressure. The difference between the suit test pressure and the ending suit test pressure (B-C) shall be defined as the suit pressure drop.

6.1.6 If the suit pressure drop is more than 20 percent of the suit test pressure B during the three-minute test period, the suit fails the test and shall be removed from service.

7.0— *Retest Procedure.*

7.1 If the suit fails the test check for leaks by inflating the suit to pressure A and brushing or wiping the entire suit (including seams, closures, lens gaskets, glove-to-sleeve joints, etc.) with a mild soap and water solution. Observe the suit for the formation of soap bubbles, which

is an indication of a leak. Repair all identified leaks.

7.2 Retest the TECP suit as outlined in Test procedure 6.0.

8.0— *Report.*

8.1 Each TECP suit tested by this practice shall have the following information recorded:

8.1.1 Unique identification number, identifying brand name, date of purchase, material of construction, and unique fit features, e.g., special breathing apparatus.

8.1.2 The actual values for test pressures A, B, and C shall be recorded along with the specific observation times. If the ending pressure (C) is less than 80 percent of the test pressure (B), the suit shall be identified as failing the test. When possible, the specific leak location shall be identified in the teat records. Retest pressure data shall be recorded as an additional test.

8.1.3 The source of the test apparatus used shall be identified and the sensitivity of the pressure gauge shall be recorded.

8.1.4 Records shall be kept for each pressure test even if repairs are being made at the test location.

Caution

Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked.

Care should also be exercised to assure that the inside and outside of the suit is completely dry before it is put into storage.

B. *Totally-encapsulating chemical protective suit qualitative leak test.*

1.0— *Scope.*

1.1 This practice semi-qualitatively tests gas tight total-encapsulating chemical protective suit integrity by detecting inward leakage of ammonia vapor. Since no modifications are made to the suit to carry out this test, the results from this practice provide a realistic test for the integrity of the entire suit.

1.2 Resistance of the suit materials to permeation, penetration, and degradation is not determined by this test method.

2.0— *Definition of terms.*

2.1 *"Totally-encapsulated chemical protective suit (TECP suit)"* means a full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, and legs; may cover the wearer's hands and feet with rightly attached gloves and boots; completely encloses the wearer by itself or in combination with the wearer's respiratory equipment, gloves, and boots.

2.2 *"Protective clothing material"* means any material or combination of materials used in an item of clothing for, the purpose of isolating parts of the body from direct contact with a potentially hazardous liquid or gaseous chemicals.

2.3 *"Gas tight"* means, for the purpose of this test method, the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.

2.4 *"Intrusion Coefficient"* means a number expressing the level of protection provided by a gas tight totally-encapsulating chemical protective suit. The intrusion coefficient is calculated by dividing the test room challenge agent concentration by the concentration of challenge agent found inside the suit. The accuracy of the intrusion coefficient is dependent on the challenge agent monitoring methods. The larger the intrusion coefficient the greater the protection provided by the TECP suit.

3.0— *Summary of recommended practice.*

3.1 The volume of concentrated aqueous ammonia solution (ammonia hydroxide NH_4OH) required to generate the test atmosphere is determined using the directions outlined in 6.1. The suit is donned by a person wearing the appropriate respiratory equipment (either a self-contained breathing apparatus or a supplied air respirator) and worn inside the enclosed test room. The concentrated aqueous ammonia solution is taken by the suited individual into the test room and poured into an open plastic pan. A two-minute evaporation period is observed before the test room concentration is measured, using a high range ammonia length of stain detector tube. When the ammonia vapor reaches a concentration of between 1000 and 1200 ppm, the suited individual starts a standardized exercise protocol to stress and flex the suit. After this protocol is completed, the test room concentration is measured again. The suited individual exits the test room and his standby person measurers the ammonia concentration inside the suit using a low range ammonia length of stain detector tube or other more sensitive ammonia detector. A stand-by person is required to observe the test individual during the test procedure; aid the person in donning and doffing the TECP suit; and monitor the suit interior. The intrusion coefficient of the suit can be calculated by dividing the average test area concentration by the interior suit concentration. A colorimetric indicator strip of bromophenol blue is placed on the inside of the suit face piece lens so that the suited individual is able to detect a color change and know if the suit has a significant leak. If a color change is observed the individual shall leave the test room immediately.

4.0— *Required supplies.*

4.1 A supply of concentrated aqueous ammonia (58 percent ammonium hydroxide by weight).

4.2 A supply of bromophenol/blue indicating paper, sensitive to 5-10 ppm ammonia or greater over a two-minute period of exposure. [(pH 3.0 (yellow) to pH 4.6 (blue)]

4.3 A supply of high range (0.5-10 volume percent) and low range (5-700 ppm) detector tubes for ammonia and the corresponding sampling pump. More sensitive ammonia detectors can be substituted for the low range detector tubes to improve the sensitivity of this practice.

4.4 A shallow plastic pan (PVC) at least 12":14":1" and a half pint plastic container (PVC) with tightly closing lid.

4.5 A graduated cylinder or other volumetric measuring device of al least 50 milliliters in volume with an accuracy of at least ±1 milliliters.

5.0— *Safety precautions.*

5.1 Concentrated aqueous ammonium hydroxide, NH_4OH, is a corrosive volatile liquid requiring eye, skin, and respiratory protection. The person conducting the test shall review the MSDS for aqueous ammonia.

5.2 Since the established permissible exposure limit for ammonia is 50 ppm, only persons wearing a self-contained breathing apparatus or a supplied air respirator shall be in the chamber. Normally only the person wearing the total-encapsulating suit will be inside the chamber. A stand-by person shall have a self-contained breathing apparatus or a supplied air respirator available to enter the test area should the suited individual need assistance.

5.3 A method to monitor the suited individual must be used during this test. Visual contact is the simplest but other methods using communication devices are acceptable.

5.4 The test room shall be large enough to allow the exercise protocol to be carried out and then to be ventilated to allow for easy exhaust of the ammonia test atmosphere after the test(s) are completed.

5.5 Individuals shall be medically screened for the use of respiratory protection and checked for allergies to ammonia before participating in this test procedure.

6.0— *Test procedure.*

6.1.1 Measure the test area to the nearest foot and calculate its volume in cubic feet. Multiply the test area volume by 0.2 milliliters of concentrated aqueous ammonia solution per cubic foot of test area volume to determine the approximate volume of concentrated aqueous ammonia required to generate 1000 ppm in the test area.

6.12 Measure this volume from the supply of concentrated aqueous ammonia and place it into a closed plastic container.

6.1.3 Place the container, several high range ammonia detector tubes, and the pump in the clean test pan and locate it near the test area entry door so that the suited individual has easy access to these supplies.

6.2.1 In a non-contaminated atmosphere, open a pre-sealed ammonia indicator strip and fasten one end of the strip to the inside of the suit face shield lens where it can be seen by the wearer. Moisten the indicator strip with distilled water. Care shall be taken not to contaminate the detector part of the indicator paper by touching it. A small piece of masking tape or equivalent should be used to attach the indicator strip to the interior of the suit face shield.

6.2.2 1f problems are encountered with this method of attachment, the indicator strip can be attached to the outside of the respirator face piece being used during the test.

6.3 Don the respiratory protective device normally used with the suit, and then don the TECP suit to be tested. Check to be sure all openings which are intended to be sealed (zippers, gloves, etc.) are completely sealed. DO NOT, however, plug off any venting valves.

6.4 Step into the enclosed test room such as a closet, bathroom, or test booth, equipped with an exhaust fan. No air should be exhausted from the chamber during the test because this will dilute the ammonia challenge concentrations.

6.5 Open the container with the pre-measured volume of concentrated aqueous ammonia within the enclosed test room, and pour the liquid into the empty plastic test pan. Wait two minutes to allow for adequate volatilization of the concentrated aqueous ammonia. A small mixing fan can be used near the evaporation pan to increase the evaporation rate of the ammonia solution.

6.6 After two minutes a determination of the ammonia concentration within the chamber should be made using the high range calorimetric detector tube. A concentration of 1100 ppm ammonia or greater shall be generated before the exercises are started.

6.7 To test the integrity of the suit the following four minute exercise protocol should be followed:

6.7.1 Raising the arms above the head with at least 15 raising motions completed in one minute.

6.7.2 Walking in place for one minute with at least 15 raising motions of each leg in a one–minute period.

6.7.3 Touching the toes with a least 10 complete motions of the arms from above the head to touching of the toes in a one-minute period.

6.7.4 Knee bends with at least 10 complete standing and squatting motions in a one-minute period.

6.8 If at any time during the test the colorimetric indicating paper should change colors, the test should be stopped and sections 6.10 and 6.12 initialed (See § 4.2).

6.9 After completion of the test exercise, the test area concentration should be measured again using the high range colorimetric detector tube.

6.10 Exit the test area.

6.11 The opening created by the suit zipper or other appropriate suit penetration should be used to determine the ammonia concentration in the suit with the low range length of stain detector tube or other ammonia monitor. The internal TECP suit air should be sampled far enough from the enclosed test area to prevent a false ammonia reading.

6.12 After completion of the measurement of the suit interior ammonia concentration the test is concluded and the suit is doffed and the respirator removed.

6.13 The ventilating fan for the test room should be turned on and allowed to run for enough time to remove the ammonia gas. The fan shall be vented to the outside of the building.

6.14 Any detectable ammonia in the suit interior (five ppm ammonia (NH_3) or more for the length of stain detector tube) indicates that the suit has failed the test. When other ammonia detectors are used a lower level of detection is possible, and it should be specified as the pass/fail criteria.

6.15 By following this test method, an intrusion coefficient of approximately 200 or more can be measured with the suit in a completely operational condition.

7.0— *Retest procedures*

7.1 If the suit fails this test, check for leaks by following the pressure test in test A above.

7.2 Retest the TECP suit as outlined in the test procedure 6.0.

8.0— *Report.*

8.1 Each gas tight totally-encapsulating chemical protective suit tested by this practice shall have the following information recorded.

8.1.1 Unique Identification number, identifying brand name, date of purchase, material of construction, and unique suit features; e.g., special breathing apparatus.

8.1.2 General description of test room used for test.

8.1.3 Brand name and purchase date of ammonia detector strips and color change data.

8.1.4 Brand name, sampling range, and expiration date of the length of stain ammonia detector tubes. The brand name and model of the sampling pump should also be recorded. If another type of ammonia detector is used, it should be identified along with its minimum detection limit for ammonia.

8.1.5 Actual test results shall list the two test area concentrations, their average, the interior suit concentration, and the calculated intrusion coefficient. Retest data shall lie recorded as an additional test.

8.2 The evaluation of the data shall be specified as "suit passed" or "suit failed" and the date of the test. Any delectable ammonia (five ppm or greater for the length of stain detector tube) in the suit interior indicates the suit has failed this test. When other ammonia detectors are used, a lower level of detection is possible and it should be specified as the pass fail criteria.

Caution

Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked.

Care should also be exercised to assure that the inside and outside of the suit is

completely dry before it is put into storage.

Appendix B—General Description and Discussion of the Levels of Protection and Protective Gear

This appendix sets forth information about personal protective equipment (PPE) protection levels which may be used to assist employers in complying with the PPE requirements of this section.

As required by the standard, PPE must be selected which will protect employees from the specific hazards which they are likely to encounter during their work on-site.

Selection of the appropriate PPE is a complex process which must take into consideration a variety of factors. Key factors involved in this process are identification of the hazards, or suspected hazards; their routes of potential hazard to employees (inhalation, skin absorption, ingestion, and eye or skin contact); and the performance of the PPE *materials* (and seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. That is, protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others. In many instances, protective equipment materials cannot be found which will provide continuous protection from the particular hazardous substance. In these cases the breakthrough time of the protective material should exceed the work durations, or the exposure after breakthrough must not pose a hazardous level.

Other factors in this selection process to be considered are matching the PPE to the employee's work requirements and task-specific conditions. The durability of PPE materials, such as tear strength and seam strength, must be considered in relation to the employee's tasks. The effects of PPE in relation to heat stress and task duration are a factor in selecting and using PPE. In some cases layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments suits or equipment.

The more that is known about the hazards at the site, the easier the job of PPE selection becomes. As more information about the hazards and conditions at the site becomes available, the site supervisor can make decisions to up-grade or down-grade the level of PPE protection to match the tasks at hand.

The following are guidelines which an employer can use to begin the selection of the appropriate PPE. As noted above, the site information may suggest the use of combinations of PPE selected from the different protection levels (i.e., A, B, C, or D) as being more suitable to the hazards of the work. It should be cautioned that the listing below does not fully address the performance of the specific PPE material in relation to the specific hazards at the job site, and that PPE selection, evaluation and re-selection is an ongoing process until sufficient information about the hazards and PPE performance is obtained.

Part A. Personal protective equipment is divided into four categories based on the degree of protection afforded. (See Part B of this appendix for further explanation of Levels A, B, C, and D hazards.).

I. *Level A*—To be selected when the greatest level of skin, respiratory, and eye protection is required.

The following constitute Level A equipment; it may be used as appropriate:

1. Pressure-demand, full face-piece self-contained breathing apparatus (SCBA), or pressure-demand supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).

2.Totally-encapsulating chemical-protective suit.

3. Coveralls.*

4. Long underwear.

5. Gloves, outer, chemical-resistant.

6. Gloves, inner, chemical-resistant.

7. Boots, chemical-resistant, steel toe and shank.

8. Hard hat (under suit).*

9. Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit).

10. Two-way radios (worn inside encapsulating suit).

II. *Level B*—The highest level of respiratory protection is necessary but a lesser level of skin protection is needed.

The following constitute Level B equipment; it may be used as appropriate.

1. Pressure-demand, full face-piece self-contained breathing apparatus (SCBA), or pressure-demand supplied air respirator with escape SCBA (NIOSH approved).

2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls).

3. Coveralls.*

4. Gloves, outer, chemical-resistant.

5. Gloves, inner, chemical-resistant.

6. Boots, outer, chemical-resistant steel toe and shank.

7. Boot-covers, outer, chemical-resistant (disposable).*

8. Hard hat.

9. Two-way radios (worn inside encapsulating suit).

10. Face shield.*

III. *Level C*—The concentration(s) and type(s) of airborne substance(S) is known and the criteria for using air purifying respirators are met.

The following constitute Level C equipment: it may be used as appropriate

1. Full-face or half-mask, air purifying respirators (NIOSH approved).

2. Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls).

3. Coveralls.*

4. Gloves, outer, chemical-resistant.

5. Gloves, inner, chemical-resistant.

6. Boots (outer), chemical-resistant steel toe and shank.*

7. Boot-covers, outer, chemical-resistant (disposable).*

8. Hard hat.

9. Escape mask.*

10. Two-way radios (worn under outside protective clothing).

11. Face shield.*

IV. *Level D*—A work uniform affording minimal protection, used for nuisance contamination only.

The following constitute Level D equipment; it may be used as appropriate:

1. Coveralls.

2. Gloves.*

3. Boots/shoes, chemical-resistant steel toe and shank.

4. Boots, outer, chemical-resistant (disposable).*

5. Safety glasses or chemical splash goggles.*

6. Hard hat.

*Optional as applicable.

7. Escape mask.*

8. Face shield.*

Part B. The types of hazards for which levels A, B, C, and D protection are appropriate are described below:

I. *Level A*—Level A protection should be used when:

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the intact skin;

2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or

3. Operations must be conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.

II. *Level B* protection should be used when:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection;

Note.—This involves atmospheres with IDLH concentrations of specific substances that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

2. The atmosphere contains less than 19.5 percent oxygen; or

3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the intact skin.

III. Level C protection should be used when:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;

2. The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and

3. All criteria for the use of air-purifying respirators are met.

IV. Level D protection should be used when:

1 The atmosphere contains no known hazard; and

2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Note.—As stated before, combinations of personal protective equipment other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection.

Appendix C—Compliance Guidelines

1. *Occupational Safety and Health Program.* Each hazardous waste site clean-up effort will require an occupational safety and health program headed by the site coordinator or the employer's representative. The program will be designed for the protection of employees at the site. The purpose of the program will need to be developed before work begins on the site and implemented as work proceeds. The program is to facilitate coordination and communication among personnel responsible for the various activities which will take place at the site. It will provide the overall means for planning and implementing the needed safety and health training and job orientation of employees who will be working at the site. The program will provide the means for identifying and controlling worksite hazards and the means for monitoring program effectiveness. The program will need to cover the responsibilities and authority of the site coordinator or the employer's manager on the site for the safety and health of employees at the site, and the relationships with contractors or support services as to what each employer's safety and health responsibilities are for their employees on the site. Each contractor on the site needs to have its own safety and health program so structured that it will smoothly interface with the program of the site coordinator.

Also those employers involved with treating, storing or disposal of hazardous waste as covered in paragraph (o) must have implemented a safety and health plan for their employees. This program is to include the hazard communication program required in paragraph (o)(1) and the training required in paragraph (o)(5) as parts of the employers comprehensive overall safety and health program. This program is to be in writing.

Each site or workplace safety and health program will need to include the following: (1) Policy statements of the line of authority and accountability for implementing the program, the objectives of the program, and the role of the site safety and health supervisor or manager and staff; (2) means or methods for the development of procedures for identifying and controlling workplace hazards at the site; (3) means or methods for the development and communication to employees of the various plans, work rules, standard operating procedures, and practices that pertain to individual employees and supervisors; (4) means for the training of supervisors and employees to develop the needed skills and knowledge to perform their work in a safe and healthful manner; (5) means to anticipate and prepare for emergency situations and; (6) means for obtaining information feedback to aid in evaluating the program and for improving the effectiveness of the program. The management and employees should be trying continually to improve the effectiveness of the program thereby enhancing the protection being afforded those working on the site.

Accidents on the site or workplace should be investigated to provide information on how such occurrences can be avoided in the future. When injuries or illnesses occur on the site or workplace, they will need to be investigated to determine what needs to be done to prevent this incident from occurring again. Such information will need to be used as feedback on the effectiveness of the program and the information turned into positive steps to prevent any reoccurrence. Receipt of employee suggestions or complaints relating to safety and health issues involved with site or workplace activities is also a feedback mechanism that can be used effectively to improve the program and may serve in part as an evaluative tool(s).

2. *Training.* The employer is encouraged to utilize those training programs that have been recognized by the National Institute of Environmental Health Sciences through its training grants program. These training and educational programs are being developed for employees who work directly with hazardous substances. For further information about these programs contact: National Institute of Environmental Health Sciences, P.O. Box 12233, Research Triangle Park, NC 27709.

The training programs for employees subject to the requirements of paragraph (e) of this standard are expected to address: the safety and health hazards employees should expect to find on sites; what control measures or techniques are effective for those hazards; what monitoring procedures are effective in characterizing exposure levels; what makes an effective employer's safety and

health program; what a site safety and health plan should include; and, employee's responsibilities under OSHA and other regulations. Supervisors will need training in their responsibilities under the safety and health program and its subject areas such as the spill containment program, the personal protective equipment program, the medical surveillance program, the emergency response plan and other areas.

Training programs for emergency service organizations are available from the U.S. National Fire Academy, Emmitsburg, MD and the various state fire training schools. The International Society of Fire Service Instructors, Ashland, MA is another resource.

The training programs for employees covered by the requirements of paragraph (l)(3) of this standard are expected to address: the need for and use of personal protective equipment including respirators; the decontamination procedures to be used; preplanning activities for hazardous substance incidents including the emergency response plan; company standard operating procedures for hazardous substance emergency responses; the use of the incident command system and other subjects. Hands-on training should be stressed whenever possible. Critiques done after an incident which include any evaluation of what worked and what did not and how can we do better the next time may be counted as training time.

For hazardous materials teams, the training will need to address the care, use and/or testing of chemical protective clothing including totally encapsulating suits, the medical surveillance program, the standard operating procedures for the use of plugging and patching equipment and other subject areas.

Officers and leaders who may be expected to be in charge at an incident will need to be fully knowledgeable of their company's incident command system. They will need to know where and how to obtain additional assistance and be familiar with the local district's emergency response plan.

Technical exports or medical experts or environmental experts that work with hazardous materials in their regular jobs, who may be sent to the incident scene by the shipper, manufacturer or governmental agency to advise and assist the person in charge of the incident need not have monthly training sessions, however, they will be required to have the 24 hours of training on an annual basis. Their training must include the care and use of personal protective equipment including respirators; knowledge of the incident command system; and those areas needed to keep them current in their respective field as it relates to safety and health involving specific hazardous substances.

Those employees who work for public works departments or special equipment operators who operate bulldozers, sand trucks, backhoes, etc., who may be called to the incident scene to provide emergency support assistance, will need at least a safety and health briefing before entering the area of potential or actual exposure. These specially skilled persons, who have not been a part of the emergency plan and do not meet the required training hours, must be made aware of the hazards they face and be provided all necessary protective clothing and equipment required for their tasks. If respirators are to be worn, the specially skilled person shall be trained in accordance with § 1910.134 before proceeding into the hazardous area to do their assigned job.

3. *Decontamination.* Decontamination procedures should be tailored to the specific hazards of the site, and will vary in complexity and number of steps, depending on the level of hazard and the employee's exposure to the hazard. Decontamination procedures and PPE decontamination methods will vary depending upon the specific substance, since one procedure or method will not work for all substances. Evaluation of decontamination methods and procedures should be performed, as necessary, to assure that employees are not exposed to hazards by re-using PPE. References in Appendix D may be used for guidance in establishing an effective decontamination program.

4. *Emergency response plans*. States, along with designated districts within the states, will be developing or have developed emergency response plans. These state and district plans are to be utilized in the emergency response plans called for in this standard. Each employer needs to assure that its emergency response plan is compatible with the local plan. In addition, the Chemical Manufacturers' Association (CMA) is another helpful resource in formulating an effective emergency response plan. Also the current Emergency Response Guidebook from the U.S. Department of Transportation, CMA's CHEMTREC and the Fire Service Emergency Management Handbook should be used as resources.

Appendix D — References

The following references may be consulted for further information on the subject of this notice:

1. OSHA Instruction DFO CPL 2.70 January 29, 1986, *Special Emphasis Program: Hazardous Waste Sites.*

2. OSHA Instruction DFO CPL 2-2.37A—January 29, 1986, *Technical Assistance and Guidelines for Superfund and Other Hazardous Waste Site Activities*.

3. OSHA Instruction DTS CPL 2.74—January 29, 1986, *Hazardous Waste Activity Form, OSHA 175*.

4. *Hazardous Waste Inspections Reference Manual,* U.S. Department of Labor, Occupational Safety and Health Administration, 1986.

5. Memorandum of Understanding Among the National Institute for Occupational Safety and Health, the Occupational Safety and Health Administration, the United States Coast Guard, and the United States Environmental Protection Agency, *Guidance for Worker Protection During Hazardous Waste Site Investigations and Clean-up and Hazardous Substance Emergencies*, December 18, 1980.

6. *National Priorities List*, 1st Edition, October 1984: U.S. Environmental Protection Agency, Revised periodically.

7. *The Decontamination of Response Personnel*, Field Standard Operating Procedures (F.S.O.P.) 7; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, December 1984.

8. *Preparation of a Site Safety Plan*, Field Standard Operating Procedures (F.S.O.P.) 9; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, April 1985.

9. *Standard Operating Safety Guidelines*: U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, Environmental Response Team; November 1984.

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APPENDIX H: GUIDELINES FOR REPORTABLE QUANTITIES OF LEAK TO NOTIFY OFFSITE EMERGENCY

One of the stated objectives of the project was to identify a trigger mechanism to achieve quick response that will result in saving of lives and property. We have recommended that a quantitative criteria developed by USEPA (on basis of hazard analysis) be adopted as a "guideline." We must clarify that Indian legislation do not support such quantitative criteria to decide whether or not to notify offsite. However, we also identified need of the industry to have some guidance on how to determine the "potential" for an offsite. These guidelines are thus only suggestive. Following these will ensure that industry will err on safe side. We are copying the US legislation verbatim as a reference.

potentially responsible parties to undertake response actions.

(e) Because state and local public safety organizations would normally be the first government representatives at the scene of a discharge or release, they are expected to initiate public safety measures that are necessary to protect the public health and welfare and that are consistent with containment and cleanup requirements in the NCP, and are responsible for directing evacuations pursuant to existing state or local procedures.

[59 FR 47473, Sept. 15, 1994]

PART 302—DESIGNATION, REPORTABLE QUANTITIES, AND NOTIFICATION

Sec.

AUTHORITY: 42 U.S.C. 9602, 9603, and 9604; 33 U.S.C. 1321 and 1361.

SOURCE: 50 FR 13474, Apr. 4, 1985, unless otherwise noted.

§ 302.1 Applicability.

This regulation designates under section 102(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (''the Act'') those substances in the statutes referred to in section 101(14) of the Act, identifies reportable quantities for these substances, and sets forth the notification requirements for releases of these substances. This regulation also sets forth reportable quantities for hazardous substances designated under section 311(b)(2)(A) of the Clean Water Act.

§ 302.2 [Reserved]

§ 302.3 Definitions.

As used in this part, all terms shall have the meaning set forth below:

The Act, *CERCLA*, or *Superfund* means the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Pub. L. 96–510);

Administrator means the Administrator of the United States Environmental Protection Agency (''EPA'');

Animal waste means manure (feces, urine, and other excrement produced by livestock), digestive emissions, and urea. The definition includes animal waste when mixed or commingled with bedding, compost, feed, soil and other typical materials found with animal waste.

Consumer product shall have the meaning stated in 15 U.S.C. 2052;

Environment means (1) the navigable waters, the waters of the contiguous zone, and the ocean waters of which the natural resources are under the exclusive management authority of the United States under the Fishery Conservation and Management Act of 1976, and (2) any other surface water, ground water, drinking water supply, land surface or subsurface strata, or ambient air within the United States or under the jurisdiction of the United States;

Facility means (1) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, or aircraft, or (2) any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any vessel;

Farm means a facility on a tract of land devoted to the production of crops or raising of animals, including fish, which produced and sold, or normally would have produced and sold, $1,000 or more of agricultural products during a year.

Hazardous substance means any substance designated pursuant to 40 CFR part 302;

Hazardous waste shall have the meaning provided in 40 CFR 261.3;

Navigable waters or *navigable waters of the United States* means waters of the United States, including the territorial seas;

Offshore facility means any facility of any kind located in, on, or under, any of the navigable waters of the United States, and any facility of any kind which is subject to the jurisdiction of

the United States and is located in, on, or under any other waters, other than a vessel or a public vessel;

Onshore facility means any facility (including, but not limited to, motor vehicles and rolling stock) of any kind located in, on, or under, any land or non-navigable waters within the United States;

Person means an individual, firm, corporation, association, partnership, consortium, joint venture, commercial entity, United States Government, State, municipality, commission, political subdivision of a State, or any interstate body;

Release means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles containing any hazardous substance or pollutant or contaminant), but excludes:

(1) Any release which results in exposure to persons solely within a workplace, with respect to a claim which such persons may assert against the employer of such persons;

(2) Emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine;

(3) Release of source, byproduct, or special nuclear material from a nuclear incident, as those terms are defined in the Atomic Energy Act of 1954, if such release is subject to requirements with respect to financial protection established by the Nuclear Regulatory Commission under section 170 of such Act, or for the purposes of section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act or any other response action, any release of source, byproduct, or special nuclear material from any processing site designated under section 102(a)(1) or 302(a) of the Uranium Mill Tailings Radiation Control Act of 1978; and

(4) The normal application of fertilizer;

Reportable quantity (''RQ'') means that quantity, as set forth in this part, the release of which requires notification pursuant to this part;

United States include the several States of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Commonwealth of the Northern Marianas, and any other territory or possession over which the United States has jurisdiction; and

Vessel means every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water.

[50 FR 13474, Apr. 4, 1985, as amended at 67 FR 45321, July 9, 2002; 73 FR 76959, Dec. 18, 2008]

§ 302.4 Designation of hazardous substances.

(a) *Listed hazardous substances.* The elements and compounds and hazardous wastes appearing in table 302.4 are designated as hazardous substances under section 102(a) of the Act.

(b) *Unlisted hazardous substances.* A solid waste, as defined in 40 CFR 261.2, which is not excluded from regulation as a hazardous waste under 40 CFR 261.4(b), is a hazardous substance under section 101(14) of the Act if it exhibits any of the characteristics identified in 40 CFR 261.20 through 261.24.

NOTE: The numbers under the column headed ''CASRN'' are the Chemical Abstracts Service Registry Numbers for each hazardous substance. The ''Statutory Code'' column indicates the statutory source for designating each substance as a CERCLA hazardous substance: ''1'' indicates that the statutory source is section 311(b)(2) of the Clean Water Act, ''2'' indicates that the source is section 307(a) of the Clean Water Act, ''3'' indicates that the source is section 112 of the Clean Air Act, and ''4'' indicates that the source is section 3001 of the Resource Conservation and Recovery Act (RCRA). The ''RCRA Waste Number'' column provides the waste identification numbers assigned to various substances by RCRA regulations. The ''Pounds (kg)'' column provides the reportable quantity adjustment for each hazardous substance in pounds and kilograms. Appendix A to § 302.4, which lists CERCLA hazardous substances in sequential order by CASRN, provides a per-substance grouping of regulatory synonyms (*i.e.*, names by which each hazardous substance is identified in other statutes and their implementing regulations).

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
A2213	30558431	4	U394	5000 (2270)
Acenaphthene	83–32–9	2		100 (45.4)
Acenaphthylene	208–96–8	2		5000 (2270)
Acetaldehyde	75–07–0	1,3,4	U001	1000 (454)
Acetaldehyde, chloro-	107–20–0	4	P023	1000 (454)
Acetaldehyde, trichloro-	75–87–6	4	U034	5000 (2270)
Acetamide	60–35–5	3		100 (45.4)
Acetamide, N-(aminothioxomethyl)-	591–08–2	4	P002	1000 (454)
Acetamide, N-(4-ethoxyphenyl)-	62–44–2	4	U187	100 (45.4)
Acetamide, N-9H-fluoren-2-yl-	53–96–3	3,4	U005	1 (0.454)
Acetamide, 2-fluoro-	640–19–7	4	P057	100 (45.4)
Acetic acid	64–19–7	1		5000 (2270)
Acetic acid, (2,4-dichlorophenoxy)-, salts & esters	94–75–7	1,3,4	U240	100 (45.4)
Acetic acid, ethyl ester	141–78–6	4	U112	5000 (2270)
Acetic acid, fluoro-, sodium salt	62–74–8	4	P058	10 (4.54)
Acetic acid, lead(2+) salt	301–04–2	1,4	U144	10 (4.54)
Acetic acid, thallium(1+) salt	563–68–8	4	U214	100 (45.4)
Acetic acid, (2,4,5-trichlorophenoxy)-	93–76–5	1,4	See F027	1000 (454)
Acetic anhydride	108–24–7	1		5000 (2270)
Acetone	67–64–1	4	U002	5000 (2270)
Acetone cyanohydrin	75–86–5	1,4	P069	10 (4.54)
Acetonitrile	75–05–8	3,4	U003	5000 (2270)
Acetophenone	98–86–2	3,4	U004	5000 (2270)
2-Acetylaminofluorene	53–96–3	3,4	U005	1 (0.454)
Acetyl bromide	506–96–7	1		5000 (2270)
Acetyl chloride	75–36–5	1,4	U006	5000 (2270)
1-Acetyl-2-thiourea	591–08–2	4	P002	1000 (454)
Acrolein	107–02–8	1,2,3,4	P003	1 (0.454)
Acrylamide	79–06–1	3,4	U007	5000 (2270)
Acrylic acid	79–10–7	3,4	U008	5000 (2270)
Acrylonitrile	107–13–1	1,2,3,4	U009	100 (45.4)
Adipic acid	124–04–9	1		5000 (2270)
Aldicarb	116–06–3	4	P070	1 (0.454)
Aldicarb sulfone	1646884	4	P203	100 (45.4)
Aldrin	309–00–2	1,2,4	P004	1 (0.454)
Allyl alcohol	107–18–6	1,4	P005	100 (45.4)
Allyl chloride	107–05–1	1,3		1000 (454)
Aluminum phosphide	20859–73–8	4	P006	100 (45.4)
Aluminum sulfate	10043–01–3	1		5000 (2270)
4-Aminobiphenyl	92–67–1	3		1 (0.454)
5-(Aminomethyl)-3-isoxazolol	2763–96–4	4	P007	1000 (454)
4-Aminopyridine	504–24–5	4	P008	1000 (454)
Amitrole	61–82–5	4	U011	10 (4.54)
Ammonia	7664–41–7	1		100 (45.4)
Ammonium acetate	631–61–8	1		5000 (2270)
Ammonium benzoate	1863–63–4	1		5000 (2270)
Ammonium bicarbonate	1066–33–7	1		5000 (2270)
Ammonium bichromate	7789–09–5	1		10 (4.54)
Ammonium bifluoride	1341–49–7	1		100 (45.4)
Ammonium bisulfilte	10192–30–0	1		5000 (2270)
Ammonium carbamate	1111–78–0	1		5000 (2270)
Ammonium carbonate	506–87–6	1		5000 (2270)
Ammonium chloride	12125–02–9	1		5000 (2270)
Ammonium chromate	7788–98–9	1		10 (4.54)
Ammonium citrate, dibasic	3012–65–5	1		5000 (2270)
Ammonium fluoborate	13826–83–0	1		5000 (2270)
Ammonium fluoride	12125–01–8	1		100 (45.4)
Ammonium hydroxide	1336–21–6	1		1000 (454)
Ammonium oxalate	6009–70–7 5972–73–6 14258–49–2	1		5000 (2270)
Ammonium picrate	131–74–8	4	P009	10 (4.54)
Ammonium silicofluoride	16919–19–0	1		1000 (454)
Ammonium sulfamate	7773–06–0	1		5000 (2270)
Ammonium sulfide	12135–76–1	1		100 (45.4)
Ammonium sulfite	10196–04–0	1		5000 (2270)
Ammonium tartrate	14307–43–8 3164–29–2	1		5000 (2270)
Ammonium thiocyanate	1762–95–4	1		5000 (2270)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Ammonium vanadate	7803–55–6	4	P119	1000 (454)
Amyl acetate	628–63–7	1		5000 (2270)
iso-Amyl acetate	123–92–2			
sec-Amyl acetate	626–38–0			
tert-Amyl acetate	625–16–1			
Aniline	62–53–3	1,3,4	U012	5000 (2270)
o-Anisidine	90–04–0	3		100 (45.4)
Anthracene	120–12–7	2		5000 (2270)
Antimony††	7440–36–0	2		5000 (2270)
ANTIMONY AND COMPOUNDS	N.A.	2,3		**
Antimony Compounds	N.A.	2,3		**
Antimony pentachloride	7647–18–9	1		1000 (454)
Antimony potassium tartrate	28300–74–5	1		100 (45.4)
Antimony tribromide	7789–61–9	1		1000 (454)
Antimony trichloride	10025–91–9	1		1000 (454)
Antimony trifluoride	7783–56–4	1		1000 (454)
Antimony trioxide	1309–64–4	1		1000 (454)
Argentate(1-), bis(cyano-C)-, potassium	506–61–6	4	P099	1 (0.454)
Aroclor 1016	12674–11–2	1,2,3		1 (0.454)
Aroclor 1221	11104–28–2	1,2,3		1 (0.454)
Aroclor 1232	11141–16–5	1,2,3		1 (0.454)
Aroclor 1242	53469–21–9	1,2,3		1 (0.454)
Aroclor 1248	12672–29–6	1,2,3		1 (0.454)
Aroclor 1254	11097–69–1	1,2,3		1 (0.454)
Aroclor 1260	11096–82–5	1,2,3		1 (0.454)
Aroclors	1336–36–3	1,2,3		1 (0.454)
Arsenic††	7440–38–2	2,3		1 (0.454)
Arsenic acid H3AsO4	7778–39–4	4	P010	1 (0.454)
ARSENIC AND COMPOUNDS	N.A.	2,3		**
Arsenic Compounds (inorganic including arsine)	N.A.	2,3		**
Arsenic disulfide	1303–32–8	1		1 (0.454)
Arsenic oxide As2O3	1327–53–3	1,4	P012	1 (0.454)
Arsenic oxide As2O5	1303–28–2	1,4	P011	1 (0.454)
Arsenic pentoxide	1303–28–2	1,4	P011	1 (0.454)
Arsenic trichloride	7784–34–1	1		1 (0.454)
Arsenic trioxide	1327–53–3	1,4	P012	1 (0.454)
Arsenic trisulfide	1303–33–9	1		1 (0.454)
Arsine, diethyl-	692–42–2	4	P038	1 (0.454)
Arsinic acid, dimethyl-	75–60–5	4	U136	1 (0.454)
Arsonous dichloride, phenyl-	696–28–6	4	P036	1 (0.454)
Asbestos†††	1332–21–4	2,3		1 (0.454)
Auramine	492–80–8	4	U014	100 (45.4)
Azaserine	115–02–6	4	U015	1 (0.454)
Aziridine	151–56–4	3,4	P054	1 (0.454)
Aziridine, 2-methyl-	75–55–8	3,4	P067	1 (0.454)
Azirino[2',3':3,4]pyrrolo[1,2–a]indole-4,7-dione, 6-amino-8-[[(aminocarbonyl)oxy]methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5- methyl-,[1aS-(1aalpha,8beta,8aalpha, 8balpha)]-.	50–07–7	4	U010	10 (4.54)
Barban	101279	4	U280	10 (4.54)
Barium cyanide	542–62–1	1,4	P013	10 (4.54)
Bendiocarb	22781233	4	U278	100 (45.4)
Bendiocarb phenol	22961826	4	U364	1000 (454)
Benomyl	17804352	4	U271	10 (4.54)
Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	56–49–5	4	U157	10 (4.54)
Benz[c]acridine	225–51–4	4	U016	100 (45.4)
Benzal chloride	98–87–3	4	U017	5000 (2270)
Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2propynyl)-	23950–58–5	4	U192	5000 (2270)
Benz[a]anthracene	56–55–3	2,4	U018	10 (4.54)
1,2-Benzanthracene	56–55–3	2,4	U018	10 (4.54)
Benz[a]anthracene, 7,12-dimethyl-	57–97–6	4	U094	1 (0.454)
Benzenamine	62–53–3	1,3,4	U012	5000 (2270)
Benzenamine, 4,4′-carbonimidoylbis (N,N dimethyl-	492–80–8	4	U014	100 (45.4)
Benzenamine, 4-chloro-	106–47–8	4	P024	1000 (454)
Benzenamine, 4-chloro-2-methyl-, hydrochloride	3165–93–3	4	U049	100 (45.4)
Benzenamine, N,N-dimethyl-4-(phenylazo)-	60–11–7	3,4	U093	10 (4.54)
Benzenamine, 2-methyl-	95–53–4	3,4	U328	100 (45.4)
Benzenamine, 4-methyl-	106–49–0	4	U353	100 (45.4)
Benzenamine, 4,4′-methylenebis [2-chloro-	101–14–4	3,4	U158	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Benzenamine, 2-methyl-,hydrochloride	636–21–5	4	U222	100 (45.4)
Benzenamine, 2-methyl-5-nitro-	99–55–8	4	U181	100 (45.4)
Benzenamine, 4-nitro-	100–01–6	4	P077	5000 (2270)
Benzene [a]	71–43–2	1,2,3,4	U019	10 (4.54)
Benzeneacetic acid, 4-chloro-α-(4-chlorophenyl)-α-hydroxy-, ethyl ester.	510–15–6	3,4	U038	10 (4.54)
Benzene, 1-bromo-4-phenoxy-	101–55–3	2,4	U030	100 (45.4)
Benzenebutanoic acid, 4-[bis(2- chloroethyl)amino]-	305–03–3	4	U035	10 (4.54)
Benzene, chloro-	108–90–7	1,2,3,4	U037	100 (45.4)
Benzene, (chloromethyl)-	100–44–7	1,3,4	P028	100 (45.4)
Benzenediamine, ar-methyl-	95–80–7 496–72–0 823–40–5 25376–45–8	3,4	U221	10 (4.54)
1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester	117–81–7	2,3,4	U028	100 (45.4)
1,2-Benzenedicarboxylic acid, dibutyl ester	84–74–2	1,2,3,4	U069	10 (4.54)
1,2-Benzenedicarboxylic acid, diethyl ester	84–66–2	2,4	U088	1000 (454)
1,2-Benzenedicarboxylic acid, dimethyl ester	131–11–3	2,3,4	U102	5000 (2270)
1,2-Benzenedicarboxylic acid, dioctyl ester	117–84–0	2,4	U107	5000 (2270)
Benzene, 1,2-dichloro-	95–50–1	1,2,4	U070	100 (45.4)
Benzene, 1,3-dichloro-	541–73–1	2,4	U071	100 (45.4)
Benzene, 1,4-dichloro-	106–46–7	1,2,3,4	U072	100 (45.4)
Benzene, 1,1′-(2,2-dichloroethylidene) bis[4-chloro-	72–54–8	1,2,4	U060	1 (0.454)
Benzene, (dichloromethyl)-	98–87–3	4	U017	5000 (2270)
Benzene, 1,3-diisocyanatomethyl-	91–08–7 584–84–9 26471–62–5	3,4	U223	100 (45.4)
Benzene, dimethyl-	1330–20–7	1,3,4	U239	100 (45.4)
1,3-Benzenediol	108–46–3	1,4	U201	5000 (2270)
1,2-Benzenediol,4-[1-hydroxy-2-(methyl amino)ethyl]-	51–43–4	4	P042	1000 (454)
Benzeneethanamine, alpha,alpha-dimethyl-	122–09–8	4	P046	5000 (2270)
Benzene, hexachloro-	118–74–1	2,3,4	U127	10 (4.54)
Benzene, hexahydro-	110–82–7	1,4	U056	1000 (454)
Benzene, methyl-	108–88–3	1,2,3,4	U220	1000 (454)
Benzene, 1-methyl-2,4-dinitro-	121–14–2	1,2,3,4	U105	10 (4.54)
Benzene, 2-methyl-1,3-dinitro-	606–20–2	1,2,4	U106	100 (45.4)
Benzene, (1-methylethyl)-	98–82–8	3,4	U055	5000 (2270)
Benzene, nitro-	98–95–3	1,2,3,4	U169	1000 (454)
Benzene, pentachloro-	608–93–5	4	U183	10 (4.54)
Benzene, pentachloronitro-	82–68–8	3,4	U185	100 (45.4)
Benzenesulfonic acid chloride	98–09–9	4	U020	100 (45.4)
Benzenesulfonyl chloride	98–09–9	4	U020	100 (45.4)
Benzene,1,2,4,5-tetrachloro-	95–94–3	4	U207	5000 (2270)
Benzenethiol	108–98–5	4	P014	100 (45.4)
Benzene,1,1′-(2,2,2-trichloroethylidene) bis[4-chloro-	50–29–3	1,2,4	U061	1 (0.454)
Benzene,1,1′-(2,2,2-trichloroethylidene) bis[4-methoxy-	72–43–5	1,3,4	U247	1 (0.454)
Benzene, (trichloromethyl)-	98–07–7	3,4	U023	10 (4.54)
Benzene, 1,3,5-trinitro-	99–35–4	4	U234	10 (4.54)
Benzidine	92–87–5	2,3,4	U021	1 (0.454)
Benzo[a]anthracene	56–55–3	2,4	U018	10 (4.54)
1,3-Benzodioxole, 5-(1-propenyl)-1	120–58–1	4	U141	100 (45.4)
1,3-Benzodioxole, 5-(2-propenyl)-	94–59–7	4	U203	100 (45.4)
1,3-Benzodioxole, 5-propyl-	94–58–6	4	U090	10 (4.54)
1,3-Benzodioxol-4-ol, 2,2-dimethyl-	22961826	4	U364	1000 (454)
1,3-Benzodioxol-4-ol, 2,2-dimethyl-, methyl carbamate	22781233	4	U278	100 (45.4)
Benzo[b]fluoranthene	205–99–2	2		1 (0.454)
Benzo(k)fluoranthene	207–08–9	2		5000 (2270)
7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-	1563388	4	U367	10 (4.54)
7-Benzofuranol, 2,3-dihydro-2,2- dimethyl-, methylcarbamate.	1563–66–2	1,4	P127	10 (4.54)
Benzoic acid	65–85–0	1		5000 (2270)
Benzoic acid, 2-hydroxy-, compd. with (3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethylpyrrolo[2,3-b]indol-5-yl methylcarbamate ester (1:1).	57647	4	P188	100 (45.4)
Benzonitrile	100–47–0	1		5000 (2270)
Benzo[rst]pentaphene	189–55–9	4	U064	10 (4.54)
Benzo[ghi]perylene	191–24–2	2		5000 (2270)
2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, & salts.	81–81–2	4	P001 U248	100 (45.4)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Benzo[a]pyrene	50–32–8	2,4	U022	1 (0.454)
3,4-Benzopyrene	50–32–8	2,4	U022	1 (0.454)
ρ-Benzoquinone	106–51–4	3,4	U197	10 (4.54)
Benzotrichloride	98–07–7	3,4	U023	10 (4.54)
Benzoyl chloride	98–88–4	1		1000 (454)
Benzyl chloride	100–44–7	1,3,4	P028	100 (45.4)
Beryllium ††	7440–41–7	2,3,4	P015	10 (4.54)
BERYLLIUM AND COMPOUNDS	N.A.	2,3		**
Beryllium chloride	7787–47–5	1		1 (0.454)
Beryllium compounds	N.A.	2,3		**
Beryllium fluoride	7787–49–7	1		1 (0.454)
Beryllium nitrate	13597–99–4 7787–55–5	1		1 (0.454)
Beryllium powder ††	7440–41–7	2,3,4	P015	10 (4.54)
alpha-BHC	319–84–6	2		10 (4.54)
beta-BHC	319–85–7	2		1 (0.454)
delta-BHC	319–86–8	2		1 (0.454)
gamma-BHC	58–89–9	1,2,3,4	U129	1 (0.454)
2,2′-Bioxirane	1464–53–5	4	U085	10 (4.54)
Biphenyl	92–52–4	3		100 (45.4)
[1,1′-Biphenyl]-4,4′-diamine	92–87–5	2,3,4	U021	1 (0.454)
[1,1′-Biphenyl]-4,4′-diamine,3,3′-dichloro-	91–94–1	2,3,4	U073	1 (0.454)
[1,1′-Biphenyl]-4,4′-diamine,3,3′-dimethoxy-	119–90–4	3,4	U091	100 (45.4)
[1,1′-Biphenyl]-4,4′-diamine,3,3′-dimethyl-	119–93–7	3,4	U095	10 (4.54)
Bis(2-chloroethoxy) methane	111–91–1	2,4	U024	1000 (454)
Bis(2-chloroethyl) ether	111–44–4	2,3,4	U025	10 (4.54)
Bis(chloromethyl) ether	542–88–1	2,3,4	P016	10 (4.54)
Bis(2-ethylhexyl) phthalate	117–81–7	3,4	U028	100 (45.4)
Bromoacetone	598–31–2	4	P017	1000 (454)
Bromoform	75–25–2	2,3,4	U225	100 (45.4)
Bromomethane	74–83–9	2,3,4	U029	1000 (454)
4-Bromophenyl phenyl ether	101–55–3	2,4	U030	100 (45.4)
Brucine	357–57–3	4	P018	100 (45.4)
1,3-Butadiene	106–99–0	3		10 (4.54)
1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	87–68–3	2,3,4	U128	1 (0.454)
1-Butanamine, N-butyl-N-nitroso-	924–16–3	4	U172	10 (4.54)
1-Butanol	71–36–3	4	U031	5000 (2270)
2-Butanone	78–93–3	3,4	U159	5000 (2270)
2-Butanone, 3,3-dimethyl-1(methylthio)-, O-[(methylamino)carbonyl] oxime.	39196–18–4	4	P045	100 (45.4)
2-Butanone peroxide	1338–23–4	4	U160	10 (4.54)
2-Butenal	123–73–9 4170–30–3	1,4	U053	100 (45.4)
2-Butene, 1,4-dichloro-	764–41–0	4	U074	1 (0.454)
2-Butenoic acid, 2-methyl-, 7-[[2,3-dihydroxy-2-(1-methoxyethyl)-3- methyl-1-oxobutoxy] methyl]-2,3, 5,7a-tetrahydro- 1H-pyrrolizin-1-yl ester, [1S-[1alpha(Z), 7(2S*,3R*),7aalpha]]-.	303–34–4	4	U143	10 (4.54)
Butyl acetate	123–86–4	1		5000 (2270)
iso-Butyl acetate	110–19–0			
sec-Butyl acetate	105–46–4			
tert-Butyl acetate	540–88–5			
n-Butyl alcohol	71–36–3	4	U031	5000 (2270)
Butylamine	109–73–9	1		1000 (454)
iso-Butylamine	78–81–9			
sec-Butylamine	513–49–5 13952–84–6			
tert-Butylamine	75–64–9			
Butyl benzyl phthalate	85–68–7	2		100 (45.4)
n-Butyl phthalate	84–74–2	1,2,3,4	U069	10 (4.54)
Butyric acid	107–92–6	1		5000 (2270)
iso-Butyric acid	79–31–2			
Cacodylic acid	75–60–5	4	U136	1 (0.454)
Cadmium ††	7440–43–9	2		10 (4.54)
Cadmium acetate	543–90–8	1		10 (4.54)
CADMIUM AND COMPOUNDS	N.A.	2,3		**
Cadmium bromide	7789–42–6	1		10 (4.54)
Cadmium chloride	10108–64–2	1		10 (4.54)
Cadmium compounds	N.A.	2,3		**

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Calcium arsenate	7778–44–1	1		1 (0.454)
Calcium arsenite	52740–16–6	1		1 (0.454)
Calcium carbide	75–20–7	1		10 (4.54)
Calcium chromate	13765–19–0	1,4	U032	10 (4.54)
Calcium cyanamide	156–62–7	3		1000 (454)
Calcium cyanide Ca(CN)2	592–01–8	1,4	P021	10 (4.54)
Calcium dodecylbenzenesulfonate	26264–06–2	1		1000 (454)
Calcium hypochlorite	7778–54–3	1		10 (4.54)
Captan	133–06–2	1,3		10 (4.54)
Carbamic acid, 1H-benzimidazol-2-yl, methyl ester	10605217	4	U372	10 (4.54)
Carbamic acid, [1-[(butylamino)carbonyl]-1H-benzimidazol-2-yl]-,methyl ester.	17804352	4	U271	10 (4.54)
Carbamic acid, (3-chlorophenyl)-, 4-chloro-2-butynyl ester	101279	4	U280	10 (4.54)
Carbamic acid, [(dibutylamino)-thio]methyl-, 2,3-dihydro-2,2-dimethyl-7-benzofuranyl ester.	55285148	4	P189	1000 (454)
Carbamic acid, dimethyl-,1-[(dimethyl-amino)carbonyl]-5-methyl-1H-pyrazol-3-yl ester.	644644	4	P191	1 (0.454)
Carbamic acid, dimethyl-, 3-methyl-1-(1-methylethyl)-1H-pyrazol-5-yl ester.	119380	4	P192	100 (45.4)
Carbamic acid, ethyl ester	51–79–6	3,4	U238	100 (45.4)
Carbamic acid, methyl-, 3-methylphenyl ester	1129415	4	P190	1000 (454)
Carbamic acid, methylnitroso-, ethyl ester	615–53–2	4	U178	1 (0.454)
Carbamic acid, [1,2-phenylenebis(iminocarbonothioyl)]bis-, dimethyl ester.	23564058	4	U409	10 (4.54)
Carbamic acid, phenyl-, 1-methylethyl ester	122429	4	U373	1000 (454)
Carbamic chloride, dimethyl-	79–44–7	3,4	U097	1 (0.454)
Carbamodithioic acid, 1,2-ethanediylbis-, salts & esters	111–54–6	4	U114	5000 (2270)
Carbamothioic acid, bis(1-methylethyl)-, S-(2,3-dichloro-2-propenyl) ester.	2303–16–4	4	U062	100 (45.4)
Carbamothioic acid, bis(1-methylethyl)-, S-(2,3,3-trichloro-2-propenyl) ester.	2303175	4	U389	100 (45.4)
Carbamothioic acid, dipropyl-, S-(phenylmethyl) ester	52888809	4	U387	5000 (2270)
Carbaryl	63–25–2	1,3,4	U279	100 (45.4)
Carbendazim	10605217	4	U372	10 (4.54)
Carbofuran	1563–66–2	1,4	P127	10 (4.54)
Carbofuran phenol	1563388	4	U367	10 (4.54)
Carbon disulfide	75–15–0	1,3,4	P022	100 (45.4)
Carbonic acid, dithallium(1+) salt	6533–73–9	4	U215	100 (45.4)
Carbonic dichloride	75–44–5	1,3,4	P095	10 (4.54)
Carbonic difluoride	353–50–4	4	U033	1000 (454)
Carbonochloridic acid, methyl ester	79–22–1	4	U156	1000 (454)
Carbon oxyfluoride	353–50–4	4	U033	1000 (454)
Carbon tetrachloride	56–23–5	1,2,3,4	U211	10 (4.54)
Carbonyl sulfide	463–58–1	3		100 (45.4)
Carbosulfan	55285148	4	P189	1000 (454)
Catechol	120–80–9	3		100 (45.4)
Chloral	75–87–6	4	U034	5000 (2270)
Chloramben	133–90–4	3		100 (45.4)
Chlorambucil	305–03–3	4	U035	10 (4.54)
Chlordane	57–74–9	1,2,3,4	U036	1 (0.454)
Chlordane, alpha & gamma isomers	57–74–9	1,2,3,4	U036	1 (0.454)
CHLORDANE (TECHNICAL MIXTURE AND METABOLITES).	57–74–9	1,2,3,4	U036	1 (0.454)
CHLORINATED BENZENES	N.A.	2		**
Chlorinated camphene	8001–35–2	1,2,3,4	P123	1 (0.454)
CHLORINATED ETHANES	N.A.	2		**
CHLORINATED NAPHTHALENE	N.A.	2		**
CHLORINATED PHENOLS	N.A.	2		**
Chlorine	7782–50–5	1,3		10 (4.54)
Chlornaphazine	494–03–1	4	U026	100 (45.4)
Chloroacetaldehyde	107–20–0	4	P023	1000 (454)
Chloroacetic acid	79–11–8	3		100 (45.4)
2-Chloroacetophenone	532–27–4	3		100 (45.4)
CHLOROALKYL ETHERS	N.A.	2		**
p-Chloroaniline	106–47–8	4	P024	1000 (454)
Chlorobenzene	108–90–7	1,2,3,4	U037	100 (45.4)
Chlorobenzilate	510–15–6	3,4	U038	10 (4.54)
p-Chloro-m-cresol	59–50–7	2,4	U039	5000 (2270)
Chlorodibromomethane	124–48–1	2		100 (45.4)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
1-Chloro-2,3-epoxypropane	106–89–8	1,3,4	U041	100 (45.4)
Chloroethane	75–00–3	2,3		100 (45.4)
2-Chloroethyl vinyl ether	110–75–8	2,4	U042	1000 (454)
Chloroform	67–66–3	1,2,3,4	U044	10 (4.54)
Chloromethane	74–87–3	2,3,4	U045	100 (45.4)
Chloromethyl methyl ether	107–30–2	3,4	U046	10 (4.54)
beta-Chloronaphthalene	91–58–7	2,4	U047	5000 (2270)
2-Chloronaphthalene	91–58–7	2,4	U047	5000 (2270)
2-Chlorophenol	95–57–8	2,4	U048	100 (45.4)
o-Chlorophenol	95–57–8	2,4	U048	100 (45.4)
4-Chlorophenyl phenyl ether	7005–72–3	2		5000 (2270)
1-(o-Chlorophenyl)thiourea	5344–82–1	4	P026	100 (45.4)
Chloroprene	126–99–8	3		100 (45.4)
3-Chloropropionitrile	542–76–7	4	P027	1000 (454)
Chlorosulfonic acid	7790–94–5	1		1000 (454)
4-Chloro-o-toluidine, hydrochloride	3165–93–3	4	U049	100 (45.4)
Chlorpyrifos	2921–88–2	1		1 (0.454)
Chromic acetate	1066–30–4	1		1000 (454)
Chromic acid	11115–74–5 7738–94–5	1		10 (4.54)
Chromic acid H2CrO4, calcium salt	13765–19–0	1,4	U032	10 (4.54)
Chromic sulfate	10101–53–8	1		1000 (454)
Chromium ††	7440–47–3	2		5000 (2270)
CHROMIUM AND COMPOUNDS	N.A.	2,3		**
Chromium Compounds	N.A.	2,3		**
Chromous chloride	10049–05–5	1		1000 (454)
Chrysene	218–01–9	2,4	U050	100 (45.4)
Cobalt Compounds	N.A.	3		**
Cobaltous bromide	7789–43–7	1		1000 (454)
Cobaltous formate	544–18–3	1		1000 (454)
Cobaltous sulfamate	14017–41–5	1		1000 (454)
Coke Oven Emissions	N.A.	3		1 (0.454)
Copper ††	7440–50–8	2		5000 (2270)
COPPER AND COMPOUNDS	N.A.	2		**
Copper cyanide Cu(CN)	544–92–3	4	P029	10 (4.54)
Coumaphos	56–72–4	1		10 (4.54)
Creosote	N.A.	4	U051	1 (0.454)
Cresol (cresylic acid)	1319–77–3	1,3,4	U052	100 (45.4)
m-Cresol	108–39–4	3		100 (45.4)
o-Cresol	95–48–7	3		100 (45.4)
p-Cresol	106–44–5	3		100 (45.4)
Cresols (isomers and mixture)	1319–77–3	1,3,4	U052	100 (45.4)
Cresylic acid (isomers and mixture)	1319–77–3	1,3,4	U052	100 (45.4)
Crotonaldehyde	123–73–9 4170–30–3	1,4	U053	100 (45.4)
Cumene	98–82–8	3,4	U055	5000 (2270)
m-Cumenyl methylcarbamate	64006	4	P202	10 (4.54)
Cupric acetate	142–71–2	1		100 (45.4)
Cupric acetoarsenite	12002–03–8	1		1 (0.454)
Cupric chloride	7447–39–4	1		10 (4.54)
Cupric nitrate	3251–23–8	1		100 (45.4)
Cupric oxalate	5893–66–3	1		100 (45.4)
Cupric sulfate	7758–98–7	1		10 (4.54)
Cupric sulfate, ammoniated	10380–29–7	1		100 (45.4)
Cupric tartrate	815–82–7	1		100 (45.4)
Cyanide Compounds	N.A.	2,3		**
CYANIDES	N.A.	2,3		**
Cyanides (soluble salts and complexes) not otherwise specified.	N.A.	4	P030	10 (4.54)
Cyanogen	460–19–5	4	P031	100 (45.4)
Cyanogen bromide (CN)Br	506–68–3	4	U246	1000 (454)
Cyanogen chloride (CN)Cl	506–77–4	1,4	P033	10 (4.54)
2,5-Cyclohexadiene-1,4-dione	106–51–4	3,4	U197	10 (4.54)
Cyclohexane	110–82–7	1,4	U056	1000 (454)
Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1α, 2α, 3β–, 4α, 5α, 6β).	58–89–9	1,2,3,4	U129	1 (0.454)
Cyclohexanone	108–94–1	4	U057	5000 (2270)
2-Cyclohexyl-4,6-dinitrophenol	131–89–5	4	P034	100 (45.4)
1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	77–47–4	1,2,3,4	U130	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Cyclophosphamide	50–18–0	4	U058	10 (4.54)
2,4-D Acid	94–75–7	1,3,4	U240	100 (45.4)
2,4-D Ester	94–11–1	1		100 (45.4)
	94–79–1			
	94–80–4			
	1320–18–9			
	1928–38–7			
	1928–61–6			
	1929–73–3			
	2971–38–2			
	25168–26–7			
	53467–11–1			
2,4-D, salts and esters	94–75–7	1,3,4	U240	100 (45.4)
Daunomycin	20830–81–3	4	U059	10 (4.54)
DDD	72–54–8	1,2,4	U060	1 (0.454)
4,4′-DDD	72–54–8	1,2,4	U060	1 (0.454)
DDE [b]	72–55–9	2		1 (0.454)
DDE [b]	3547–04–4	3		5000 (2270)
4,4′-DDE	72–55–9	2		1 (0.454)
DDT	50–29–3	1,2,4	U061	1 (0.454)
4,4′-DDT	50–29–3	1,2,4	U061	1 (0.454)
DDT AND METABOLITES	N.A.	2		**
DEHP	117–81–7	2,3,4	U028	100 (45.4)
Diallate	2303–16–4	4	U062	100 (45.4)
Diazinon	333–41–5	1		1 (0.454)
Diazomethane	334–88–3	3		100 (45.4)
Dibenz[a,h]anthracene	53–70–3	2,4	U063	1 (0.454)
1,2:5,6-Dibenzanthracene	53–70–3	2,4	U063	1 (0.454)
Dibenzo[a,h]anthracene	53–70–3	2,4	U063	1 (0.454)
Dibenzofuran	132–64–9	3		100 (45.4)
Dibenzo[a,i]pyrene	189–55–9	4	U064	10 (4.54)
1,2-Dibromo-3-chloropropane	96–12–8	3,4	U066	1 (0.454)
Dibromoethane	106–93–4	1,3,4	U067	1 (0.454)
Dibutyl phthalate	84–74–2	1,2,3,4	U069	10 (4.54)
Di-n-butyl phthalate	84–74–2	1,2,3,4	U069	10 (4.54)
Dicamba	1918–00–9	1		1000 (454)
Dichlobenil	1194–65–6	1		100 (45.4)
Dichlone	117–80–6	1		1 (0.454)
Dichlorobenzene	25321–22–6	1		100 (45.4)
1,2-Dichlorobenzene	95–50–1	1,2,4	U070	100 (45.4)
1,3-Dichlorobenzene	541–73–1	2,4	U071	100 (45.4)
1,4-Dichlorobenzene	106–46–7	1,2,3,4	U072	100 (45.4)
m-Dichlorobenzene	541–73–1	2,4	U071	100 (45.4)
o-Dichlorobenzene	95–50–1	1,2,4	U070	100 (45.4)
p-Dichlorobenzene	106–46–7	1,2,3,4	U072	100 (45.4)
DICHLOROBENZIDINE	N.A.	2		**
3,3′-Dichlorobenzidine	91–94–1	2,3,4	U073	1 (0.454)
Dichlorobromomethane	75–27–4	2		5000 (2270)
1,4-Dichloro-2-butene	764–41–0	4	U074	1 (0.454)
Dichlorodifluoromethane	75–71–8	4	U075	5000 (2270)
1,1-Dichloroethane	75–34–3	2,3,4	U076	1000 (454)
1,2-Dichloroethane	107–06–2	1,2,3,4	U077	100 (45.4)
1,1-Dichloroethylene	75–35–4	1,2,3,4	U078	100 (45.4)
1,2-Dichloroethylene	156–60–5	2,4	U079	1000 (454)
Dichloroethyl ether	111–44–4	2,3,4	U025	10 (4.54)
Dichloroisopropyl ether	108–60–1	2,4	U027	1000 (454)
Dichloromethane	75–09–2	2,3,4	U080	1000 (454)
Dichloromethoxyethane	111–91–1	2,4	U024	1000 (454)
Dichloromethyl ether	542–88–1	2,3,4	P016	10 (4.54)
2,4-Dichlorophenol	120–83–2	2,4	U081	100 (45.4)
2,6-Dichlorophenol	87–65–0	4	U082	100 (45.4)
Dichlorophenylarsine	696–28–6	4	P036	1 (0.454)
Dichloropropane	26638–19–7	1		1000 (454)
1,1-Dichloropropane	78–99–9			
1,3-Dichloropropane	142–28–9			
1,2-Dichloropropane	78–87–5	1,2,3,4	U083	1000 (454)
Dichloropropane—Dichloropropene (mixture)	8003–19–8	1		100 (45.4)
Dichloropropene	26952–23–8	1		100 (45.4)
2,3-Dichloropropene	78–88–6			

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
1,3-Dichloropropene	542–75–6	1,2,3,4	U084	100 (45.4)
2,2-Dichloropropionic acid	75–99–0	1		5000 (2270)
Dichlorvos	62–73–7	1,3		10 (4.54)
Dicofol	115–32–2	1		10 (4.54)
Dieldrin	60–57–1	1,2,4	P037	1 (0.454)
1,2:3,4-Diepoxybutane	1464–53–5	4	U085	10 (4.54)
Diethanolamine	111–42–2	3		100 (45.4)
Diethylamine	109–89–7	1		100 (45.4)
N,N-Diethylaniline	91–66–7	3		1000 (454)
Diethylarsine	692–42–2	4	P038	1 (0.454)
1,4-Diethyleneoxide	123–91–1	3,4	U108	100 (45.4)
Diethylene glycol, dicarbamate	5952261	4	U395	5000 (2270)
Diethylhexyl phthalate	117–81–7	2,3,4	U028	100 (45.4)
N,N′-Diethylhydrazine	1615–80–1	4	U086	10 (4.54)
O,O-Diethyl S-methyl dithiophosphate	3288–58–2	4	U087	5000 (2270)
Diethyl-p-nitrophenyl phosphate	311–45–5	4	P041	100 (45.4)
Diethyl phthalate	84–66–2	2,4	U088	1000 (454)
O,O-Diethyl O-pyrazinyl phosphorothioate	297–97–2	4	P040	100 (45.4)
Diethylstilbestrol	56–53–1	4	U089	1 (0.454)
Diethyl sulfate	64–67–5	3		10 (4.54)
Dihydrosafrole	94–58–6	4	U090	10 (4.54)
Diisopropylfluorophosphate (DFP)	55–91–4	4	P043	100 (45.4)
1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-, (1alpha,4alpha,4abeta,5alpha, 8alpha,8abeta)-.	309–00–2	1,2,4	P004	1 (0.454)
1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-, (1alpha,4alpha,4abeta, 5beta,8beta,8abeta)-	465–73–6	4	P060	1 (0.454)
2,7:3,6-Dimethanonaphth[2,3-b]oxirene,3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-,(1aalpha,2beta, 2aalpha,3beta,6beta,6aalpha, 7beta,7aalpha)-	60–57–1	1,2,4	P037	1 (0.454)
2,7:3,6-Dimethanonaphth[2,3-b]oxirene,3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-,(1aalpha,2beta, 2abeta,3alpha,6alpha, 6abeta,7beta,7aalpha)-, & metabolites.	72–20–8	1,2,4	P051	1 (0.454)
Dimethoate	60–51–5	4	P044	10 (4.54)
3,3′-Dimethoxybenzidine	119–90–4	3,4	U091	100 (45.4)
Dimethylamine	124–40–3	1,4	U092	1000 (454)
Dimethyl aminoazobenzene	60–11–7	3,4	U093	10 (4.54)
p-Dimethylaminoazobenzene	60–11–7	3,4	U093	10 (4.54)
N,N-Dimethylaniline	121–69–7	3		100 (45.4)
7,12-Dimethylbenz[a]anthracene	57–97–6	4	U094	1 (0.454)
3,3′-Dimethylbenzidine	119–93–7	3,4	U095	10 (4.54)
alpha,alpha-Dimethylbenzylhydroperoxide	80–15–9	4	U096	10 (4.54)
Dimethylcarbamoyl chloride	79–44–7	3,4	U097	1 (0.454)
Dimethylformamide	68–12–2	3		100 (45.4)
1,1-Dimethylhydrazine	57–14–7	3,4	U098	10 (4.54)
1,2-Dimethylhydrazine	540–73–8	4	U099	1 (0.454)
alpha,alpha-Dimethylphenethylamine	122–09–8	4	P046	5000 (2270)
2,4-Dimethylphenol	105–67–9	2,4	U101	100 (45.4)
Dimethyl phthalate	131–11–3	2,3,4	U102	5000 (2270)
Dimethyl sulfate	77–78–1	3,4	U103	100 (45.4)
Dimetilan	644644	4	P191	1 (0.454)
Dinitrobenzene (mixed)	25154–54–5	1		100 (45.4)
m-Dinitrobenzene	99–65–0			
o-Dinitrobenzene	528–29–0			
p-Dinitrobenzene	100–25–4			
4,6-Dinitro-o-cresol, and salts	534–52–1	2,3,4	P047	10 (4.54)
Dinitrophenol	25550–58–7	1		10 (4.54)
2,5-Dinitrophenol	329–71–5			
2,6-Dinitrophenol	573–56–8			
2,4-Dinitrophenol	51–28–5	1,2,3,4	P048	10 (4.54)
Dinitrotoluene	25321–14–6	1,2		10 (4.54)
3,4-Dinitrotoluene	610–39–9			
2,4-Dinitrotoluene	121–14–2	1,2,3,4	U105	10 (4.54)
2,6-Dinitrotoluene	606–20–2	1,2,4	U106	100 (45.4)
Dinoseb	88–85–7	4	P020	1000 (454)
Di-n-octyl phthalate	117–84–0	2,4	U107	5000 (2270)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
1,4-Dioxane	123–91–1	3,4	U108	100 (45.4)
DIPHENYLHYDRAZINE	N.A.	2		**
1,2-Diphenylhydrazine	122–66–7	2,3,4	U109	10 (4.54)
Diphosphoramide, octamethyl-	152–16–9	4	P085	100 (45.4)
Diphosphoric acid, tetraethyl ester	107–49–3	1,4	P111	10 (4.54)
Dipropylamine	142–84–7	4	U110	5000 (2270)
Di-n-propylnitrosamine	621–64–7	2,4	U111	10 (4.54)
Diquat	85–00–7 2764–72–9	1		1000 (454)
Disulfoton	298–04–4	1,4	P039	1 (0.454)
Dithiobiuret	541–53–7	4	P049	100 (45.4)
1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-, O-[(methylamino)-carbonyl]oxime.	26419738	4	P185	100 (45.4)
Diuron	330–54–1	1		100 (45.4)
Dodecylbenzenesulfonic acid	27176–87–0	1		1000 (454)
Endosulfan	115–29–7	1,2,4	P050	1 (0.454)
alpha-Endosulfan	959–98–8	2		1 (0.454)
beta-Endosulfan	33213–65–9	2		1 (0.454)
ENDOSULFAN AND METABOLITES	N.A.	2		**
Endosulfan sulfate	1031–07–8	2		1 (0.454)
Endothall	145–73–3	4	P088	1000 (454)
Endrin	72–20–8	1,2,4	P051	1 (0.454)
Endrin aldehyde	7421–93–4	2		1 (0.454)
ENDRIN AND METABOLITES	N.A.	2		**
Endrin, & metabolites	72–20–8	1,2,4	P051	1 (0.454)
Epichlorohydrin	106–89–8	1,3,4	U041	100 (45.4)
Epinephrine	51–43–4	4	P042	1000 (454)
1,2-Epoxybutane	106–88–7	3		100 (45.4)
Ethanal	75–07–0	1,3,4	U001	1000 (454)
Ethanamine, N,N-diethyl-	121–44–8	1,3,4	U404	5000 (2270)
Ethanamine, N-ethyl-N-nitroso-	55–18–5	4	U174	1 (0.454)
1,2-Ethanediamine, N,N-dimethyl-N′-2- pyridinyl-N′-(2-thienylmethyl)-.	91–80–5	4	U155	5000 (2270)
Ethane, 1,2-dibromo-	106–93–4	1,3,4	U067	1 (0.454)
Ethane, 1,1-dichloro-	75–34–3	2,3,4	U076	1000 (454)
Ethane, 1,2-dichloro-	107–06–2	1,2,3,4	U077	100 (45.4)
Ethanedinitrile	460–19–5	4	P031	100 (45.4)
Ethane, hexachloro-	67–72–1	2,3,4	U131	100 (45.4)
Ethane, 1,1′-[methylenebis(oxy)]bis[2- chloro-	111–91–1	2,4	U024	1000 (454)
Ethane, 1,1′-oxybis-	60–29–7	4	U117	100 (45.4)
Ethane, 1,1′-oxybis[2-chloro-	111–44–4	2,3,4	U025	10 (4.54)
Ethane, pentachloro-	76–01–7	4	U184	10 (4.54)
Ethane, 1,1,1,2-tetrachloro-	630–20–6	4	U208	100 (45.4)
Ethane, 1,1,2,2-tetrachloro-	79–34–5	2,3,4	U209	100 (45.4)
Ethanethioamide	62–55–5	4	U218	10 (4.54)
Ethane, 1,1,1-trichloro-	71–55–6	2,3,4	U226	1000 (454)
Ethane, 1,1,2-trichloro-	79–00–5	2,3,4	U227	100 (45.4)
Ethanimidothioic acid, 2-(dimethylamino)-N-hydroxy-2-oxo-, methyl ester.	30558431	4	U394	5000 (2270)
Ethanimidothioic acid, 2-(dimethylamino)-N-[[(methylamino)carbonyl]oxy]-2-oxo-, methyl ester.	23135220	4	P194	100 (45.4)
Ethanimidothioic acid, N-[[(methylamino) carbonyl]oxy]-, methyl ester.	16752–77–5	4	P066	100 (45.4)
Ethanimidothioic acid, N,N'- [thiobis[(methylimino) carbonyloxy]]bis-, dimethyl ester.	59669260	4	U410	100 (45.4)
Ethanol, 2-ethoxy-	110–80–5	4	U359	1000 (454)
Ethanol, 2,2′-(nitrosoimino)bis-	1116–54–7	4	U173	1 (0.454)
Ethanol, 2,2'-oxybis-, dicarbamate	5952261	4	U395	5000 (2270)
Ethanone, 1-phenyl-	98–86–2	3,4	U004	5000 (2270)
Ethene, chloro-	75–01–4	2,3,4	U043	1 (0.454)
Ethene, (2-chloroethoxy)-	110–75–8	2,4	U042	1000 (454)
Ethene, 1,1-dichloro-	75–35–4	1,2,3,4	U078	100 (45.4)
Ethene, 1,2-dichloro-(E)	156–60–5	2,4	U079	1000 (454)
Ethene, tetrachloro-	127–18–4	2,3,4	U210	100 (45.4)
Ethene, trichloro-	79–01–6	1,2,3,4	U228	100 (45.4)
Ethion	563–12–2	1		10 (4.54)
Ethyl acetate	141–78–6	4	U112	5000 (2270)
Ethyl acrylate	140–88–5	3,4	U113	1000 (454)
Ethylbenzene	100–41–4	1,2,3		1000 (454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Ethyl carbamate	51–79–6	3,4	U238	100 (45.4)
Ethyl chloride	75–00–3	2,3		100 (45.4)
Ethyl cyanide	107–12–0	4	P101	10 (4.54)
Ethylenebisdithiocarbamic acid, salts & esters	111–54–6	4	U114	5000 (2270)
Ethylenediamine	107–15–3	1		5000 (2270)
Ethylenediamine-tetraacetic acid (EDTA)	60–00–4	1		5000 (2270)
Ethylene dibromide	106–93–4	1,3,4	U067	1 (0.454)
Ethylene dichloride	107–06–2	1,2,3,4	U077	100 (45.4)
Ethylene glycol	107–21–1	3		5000 (2270)
Ethylene glycol monoethyl ether	110–80–5	4	U359	1000 (454)
Ethylene oxide	75–21–8	3,4	U115	10 (4.54)
Ethylenethiourea	96–45–7	3,4	U116	10 (4.54)
Ethylenimine	151–56–4	3,4	P054	1 (0.454)
Ethyl ether	60–29–7	4	U117	100 (45.4)
Ethylidene dichloride	75–34–3	2,3,4	U076	1000 (454)
Ethyl methacrylate	97–63–2	4	U118	1000 (454)
Ethyl methanesulfonate	62–50–0	4	U119	1 (0.454)
Famphur	52–85–7	4	P097	1000 (454)
Ferric ammonium citrate	1185–57–5	1		1000 (454)
Ferric ammonium oxalate	2944–67–4 55488–87–4	1		1000 (454)
Ferric chloride	7705–08–0	1		1000 (454)
Ferric fluoride	7783–50–8	1		100 (45.4)
Ferric nitrate	10421–48–4	1		1000 (454)
Ferric sulfate	10028–22–5	1		1000 (454)
Ferrous ammonium sulfate	10045–89–3	1		1000 (454)
Ferrous chloride	7758–94–3	1		100 (45.4)
Ferrous sulfate	7720–78–7 7782– 63–0	1		1000 (454)
Fine mineral fibers [c]	N.A.	3		**
Fluoranthene	206–44–0	2,4	U120	100 (45.4)
Fluorene	86–73–7	2		5000 (2270)
Fluorine	7782–41–4	4	P056	10 (4.54)
Fluoroacetamide	640–19–7	4	P057	100 (45.4)
Fluoroacetic acid, sodium salt	62–74–8	4	P058	10 (4.54)
Formaldehyde	50–00–0	1,3,4	U122	100 (45.4)
Formetanate hydrochloride	23422539	4	P198	100 (45.4)
Formic acid	64–18–6	1,4	U123	5000 (2270)
Formparanate	17702577	4	P197	100 (45.4)
Fulminic acid, mercury(2+)salt	628–86–4	4	P065	10 (4.54)
Fumaric acid	110–17–8	1		5000 (2270)
Furan	110–00–9	4	U124	100 (45.4)
2-Furancarboxaldehyde	98–01–1	1,4	U125	5000 (2270)
2,5-Furandione	108–31–6	1,3,4	U147	5000 (2270)
Furan, tetrahydro-	109–99–9	4	U213	1000 (454)
Furfural	98–01–1	1,4	U125	5000 (2270)
Furfuran	110–00–9	4	U124	100 (45.4)
Glucopyranose, 2-deoxy-2–(3-methyl-3-nitrosoureido)-,D-	18883–66–4	4	U206	1 (0.454)
D-Glucose, 2-deoxy-2-[[(methylnitrosoamino)-carbonyl]amino]-.	18883–66–4	4	U206	1 (0.454)
Glycidylaldehyde	765–34–4	4	U126	10 (4.54)
Glycol ethers [d]	N.A.	3		**
Guanidine, N-methyl-N′-nitro-N-nitroso-	70–25–7	4	U163	10 (4.54)
Guthion	86–50–0	1		1 (0.454)
HALOETHERS	N.A.	2		**
HALOMETHANES	N.A.	2		**
Heptachlor	76–44–8	1,2,3,4	P059	1 (0.454)
HEPTACHLOR AND METABOLITES	N.A.	2		**
Heptachlor epoxide	1024–57–3	2		1 (0.454)
Hexachlorobenzene	118–74–1	2,3,4	U127	10 (4.54)
Hexachlorobutadiene	87–68–3	2,3,4	U128	1 (0.454)
HEXACHLOROCYCLOHEXANE (all isomers)	608–73–1	2		**
Hexachlorocyclopentadiene	77–47–4	1,2,3,4	U130	10 (4.54)
Hexachloroethane	67–72–1	2,3,4	U131	100 (45.4)
Hexachlorophene	70–30–4	4	U132	100 (45.4)
Hexachloropropene	1888–71–7	4	U243	1000 (454)
Hexaethyl tetraphosphate	757–58–4	4	P062	100 (45.4)
Hexamethylene-1,6–diisocyanate	822–06–0	3		100 (45.4)
Hexamethylphosphoramide	680–31–9	3		1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Hexane	110–54–3	3		5000 (2270)
Hexone	108–10–1	3,4	U161	5000 (2270)
Hydrazine	302–01–2	3,4	U133	1 (0.454)
Hydrazinecarbothioamide	79–19–6	4	P116	100 (45.4)
Hydrazine, 1,2-diethyl-	1615–80–1	4	U086	10 (4.54)
Hydrazine, 1,1-dimethyl-	57–14–7	3,4	U098	10 (4.54)
Hydrazine, 1,2-dimethyl-	540–73–8	4	U099	1 (0.454)
Hydrazine, 1,2-diphenyl-	122–66–7	2,3,4	U109	10 (4.54)
Hydrazine, methyl-	60–34–4	3,4	P068	10 (4.54)
Hydrochloric acid	7647–01–0	1,3		5000 (2270)
Hydrocyanic acid	74–90–8	1,4	P063	10 (4.54)
Hydrofluoric acid	7664–39–3	1,3,4	U134	100 (45.4)
Hydrogen chloride	7647–01–0	1,3		5000 (2270)
Hydrogen cyanide	74–90–8	1,4	P063	10 (4.54)
Hydrogen fluoride	7664–39–3	1,3,4	U134	100 (45.4)
Hydrogen phosphide	7803–51–2	3,4	P096	100 (45.4)
Hydrogen sulfide H2S	7783–06–4	1,4	U135	100 (45.4)
Hydroperoxide, 1-methyl-1-phenylethyl-	80–15–9	4	U096	10 (4.54)
Hydroquinone	123–31–9	3		100 (45.4)
2-Imidazolidinethione	96–45–7	3,4	U116	10 (4.54)
Indeno(1,2,3-cd)pyrene	193–39–5	2,4	U137	100 (45.4)
Iodomethane	74–88–4	3,4	U138	100 (45.4)
1,3-Isobenzofurandione	85–44–9	3,4	U190	5000 (2270)
Isobutyl alcohol	78–83–1	4	U140	5000 (2270)
Isodrin	465–73–6	4	P060	1 (0.454)
Isolan	119380	4	P192	100 (45.4)
Isophorone	78–59–1	2,3		5000 (2270)
Isoprene	78–79–5	1		100 (45.4)
Isopropanolamine dodecylbenzenesulfonate	42504–46–1	1		1000 (454)
3-Isopropylphenyl N-methylcarbamate	64006	4	P202	10 (4.54)
Isosafrole	120–58–1	4	U141	100 (45.4)
3(2H)-Isoxazolone, 5–(aminomethyl)-	2763–96–4	4	P007	1000 (454)
Kepone	143–50–0	1,4	U142	1 (0.454)
Lasiocarpine	303–34–4	4	U143	10 (4.54)
Lead††	7439–92–1	2		10 (4.54)
Lead acetate	301–04–2	1,4	U144	10 (4.54)
LEAD AND COMPOUNDS	N.A.	2,3		**
Lead arsenate	7784–40–9 7645–25–2 10102–48–4	1		1 (0.454)
Lead, bis(acetato-O)tetrahydroxytri-	1335–32–6	4	U146	10 (4.54)
Lead chloride	7758–95–4	1		10 (4.54)
Lead compounds	N.A.	2,3		**
Lead fluoborate	13814–96–5	1		10 (4.54)
Lead fluoride	7783–46–2	1		10 (4.54)
Lead iodide	10101–63–0	1		10 (4.54)
Lead nitrate	10099–74–8	1		10 (4.54)
Lead phosphate	7446–27–7	4	U145	10 (4.54)
Lead stearate	1072–35–1 7428–48–0 52652–59–2 56189–09–4	1		10 (4.54)
Lead subacetate	1335–32–6	4	U146	10 (4.54)
Lead sulfate	7446–14–2 15739–80–7	1		10 (4.54)
Lead sulfide	1314–87–0	1		10 (4.54)
Lead thiocyanate	592–87–0	1		10 (4.54)
Lindane	58–89–9	1,2,3,4	U129	1 (0.454)
Lindane (all isomers)	58–89–9	1,2,3,4	U129	1 (0.454)
Lithium chromate	14307–35–8	1		10 (4.54)
Malathion	121–75–5	1		100 (45.4)
Maleic acid	110–16–7	1		5000 (2270)
Maleic anhydride	108–31–6	1,3,4	U147	5000 (2270)
Maleic hydrazide	123–33–1	4	U148	5000 (2270)
Malononitrile	109–77–3	4	U149	1000 (454)
Manganese, bis (dimethylcarbamodithioato-S,S')-	15339363	4	P196	10 (4.54)
Manganese Compounds	N.A.	3		**
Manganese dimethyldithiocarbamate	15339363	4	P196	10 (4.54)
MDI	101–68–8	3		5000 (2270)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
MEK	78–93–3	3,4	U159	5000 (2270)
Melphalan	148–82–3	4	U150	1 (0.454)
Mercaptodimethur	2032–65–7	1,4	P199	10 (4.54)
Mercuric cyanide	592–04–1	1		1(0.454)
Mercuric nitrate	10045–94–0	1		10 (4.54)
Mercuric sulfate	7783–35–9	1		10 (4.54)
Mercuric thiocyanate	592–85–8	1		10 (4.54)
Mercurous nitrate	10415–75–5	1	10 (4.54)	7782–86–7
Mercury	7439–97–6	2,3,4	U151	1 (0.454)
MERCURY AND COMPOUNDS	N.A.	2,3		**
Mercury, (acetato-O)phenyl-	62–38–4	4	P092	100 (45.4)
Mercury Compounds	N.A.	2,3		**
Mercury fulminate	628–86–4	4	P065	10 (4.54)
Methacrylonitrile	126–98–7	4	U152	1000 (454)
Methanamine, N-methyl-	124–40–3	1,4	U092	1000 (454)
Methanamine, N-methyl-N-nitroso-	62–75–9	2,3,4	P082	10 (4.54)
Methane, bromo-	74–83–9	2,3,4	U029	1000 (454)
Methane, chloro-	74–87–3	2,3,4	U045	100 (45.4)
Methane, chloromethoxy-	107–30–2	3,4	U046	10 (4.54)
Methane, dibromo-	74–95–3	4	U068	1000 (454)
Methane, dichloro-	75–09–2	2,3,4	U080	1000 (454)
Methane, dichlorodifluoro-	75–71–8	4	U075	5000 (2270)
Methane, iodo-	74–88–4	3,4	U138	100 (45.4)
Methane, isocyanato-	624–83–9	3,4	P064	10 (4.54)
Methane, oxybis(chloro-	542–88–1	2,3,4	P016	10 (4.54)
Methanesulfenyl chloride, trichloro-	594–42–3	4	P118	100 (45.4)
Methanesulfonic acid, ethyl ester	62–50–0	4	U119	1 (0.454)
Methane, tetrachloro-	56–23–5	1,2,3,4	U211	10 (4.54)
Methane, tetranitro-	509–14–8	4	P112	10 (4.54)
Methanethiol	74–93–1	1,4	U153	100 (45.4)
Methane, tribromo-	75–25–2	2,3,4	U225	100 (45.4)
Methane, trichloro-	67–66–3	1,2,3,4	U044	10 (4.54)
Methane, trichlorofluoro-	75–69–4	4	U121	5000 (2270)
Methanimidamide, N,N-dimethyl-N'-[3-[[(methylamino)-carbonyl]oxy]phenyl]-, monohydrochloride.	23422539	4	P198	100 (45.4)
Methanimidamide, N,N-dimethyl-N'-[2-methyl-4-[[(methylamino) carbonyl]oxy]phenyl]-.	17702577	4	P197	100 (45.4)
6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide.	115–29–7	1,2,4	P050	1 (0.454)
4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-.	76–44–8	1,2,3,4	P059	1 (0.454)
4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-—.	57–74–9	1,2,3,4	U036	1 (0.454)
Methanol	67–56–1	3,4	U154	5000 (2270)
Methapyrilene	91–80–5	4	U155	5000 (2270)
1,3,4-Metheno-2H-cyclobuta[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-.	143–50–0	1,4	U142	1 (0.454)
Methiocarb	2032–65–7	1,4	P199	10 (4.54)
Methomyl	16752–77–5	4	P066	100 (45.4)
Methoxychlor	72–43–5	1,3,4	U247	1 (0.454)
Methyl alcohol	67–56–1	3,4	U154	5000 (2270)
2-Methyl aziridine	75–55–8	3,4	P067	1 (0.454)
Methyl bromide	74–83–9	2,3,4	U029	1000 (454)
1-Methylbutadiene	504–60–9	4	U186	100 (45.4)
Methyl chloride	74–87–3	2,3,4	U045	100 (45.4)
Methyl chlorocarbonate	79–22–1	4	U156	1000 (454)
Methyl chloroform	71–55–6	2,3,4	U226	1000 (454)
3-Methylcholanthrene	56–49–5	4	U157	10 (4.54)
4,4′-Methylenebis(2-chloroaniline)	101–14–4	3,4	U158	10 (4.54)
Methylene bromide	74–95–3	4	U068	1000 (454)
Methylene chloride	75–09–2	2,3,4	U080	1000 (454)
4,4′-Methylenedianiline	101–77–9	3		10 (4.54)
Methylene diphenyl diisocyanate	101–68–8	3		5000 (2270)
Methyl ethyl ketone	78–93–3	3,4	U159	5000 (2270)
Methyl ethyl ketone peroxide	1338–23–4	4	U160	10 (4.54)
Methyl hydrazine	60–34–4	3,4	P068	10 (4.54)
Methyl iodide	74–88–4	3,4	U138	100 (45.4)
Methyl isobutyl ketone	108–10–1	3,4	U161	5000 (2270)
Methyl isocyanate	624–83–9	3,4	P064	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
2-Methyllactonitrile	75–86–5	1,4	P069	10 (4.54)
Methyl mercaptan	74–93–1	1,4	U153	100 (45.4)
Methyl methacrylate	80–62–6	1,3,4	U162	1000 (454)
Methyl parathion	298–00–0	1,4	P071	100 (45.4)
4-Methyl-2-pentanone	108–10–1	3,4	U161	5000 (2270)
Methyl tert-butyl ether	1634–04–4	3		1000 (454)
Methylthiouracil	56–04–2	4	U164	10 (4.54)
Metolcarb	1129415	4	P190	1000 (454)
Mevinphos	7786–34–7	1		10 (4.54)
Mexacarbate	315–18–4	1,4	P128	1000 (454)
Mitomycin C	50–07–7	4	U010	10 (4.54)
MNNG	70–25–7	4	U163	10 (4.54)
Monoethylamine	75–04–7	1		100 (45.4)
Monomethylamine	74–89–5	1		100 (45.4)
Naled	300–76–5	1		10 (4.54)
5,12-Naphthacenedione, 8-acetyl-10-[(3-amino-2,3,6-trideoxy-alpha-L-lyxo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-, (8S-cis)-.	20830–81–3	4	U059	10 (4.54)
1-Naphthalenamine	134–32–7	4	U167	100 (45.4)
2-Naphthalenamine	91–59–8	4	U168	10 (4.54)
Naphthalenamine, N,N′-bis(2-chloroethyl)-	494–03–1	4	U026	100 (45.4)
Naphthalene	91–20–3	1,2,3,4	U165	100 (45.4)
Naphthalene, 2-chloro-	91–58–7	2,4	U047	5000 (2270)
1,4-Naphthalenedione	130–15–4	4	U166	5000 (2270)
2,7-Naphthalenedisulfonic acid, 3,3′-[(3,3′-dimethyl-(1,1′-biphenyl)-4,4′-diyl)-bis(azo)]bis(5-amino-4-hydroxy)-tetrasodium salt.	72–57–1	4	U236	10 (4.54)
1-Naphthalenol, methylcarbamate	63–25–2	1,3,4	U279	100 (45.4)
Naphthenic acid	1338–24–5	1		100 (45.4)
1,4-Naphthoquinone	130–15–4	4	U166	5000 (2270)
alpha-Naphthylamine	134–32–7	4	U167	100 (45.4)
beta-Naphthylamine	91–59–8	4	U168	10 (4.54)
alpha-Naphthylthiourea	86–88–4	4	P072	100 (45.4)
Nickel††	7440–02–0	2		100 (45.4)
Nickel ammonium sulfate	15699–18–0	1		100 (45.4)
NICKEL AND COMPOUNDS	N.A.	2,3		**
Nickel carbonyl Ni(CO)4, (T-4)-	13463–39–3	4	P073	10 (4.54)
Nickel chloride	7718–54–9 37211–05–5	1		100 (45.4)
Nickel compounds	N.A.	2,3		**
Nickel cyanide Ni(CN)2	557–19–7	4	P074	10 (4.54)
Nickel hydroxide	12054–48–7	1		10 (4.54)
Nickel nitrate	14216–75–2	1		100 (45.4)
Nickel sulfate	7786–81–4	1		100 (45.4)
Nicotine, & salts	54–11–5	4	P075	100 (45.4)
Nitric acid	7697–37–2	1		1000 (454)
Nitric acid, thallium (1+) salt	10102–45–1	4	U217	100 (45.4)
Nitric oxide	10102–43–9	4	P076	10 (4.54)
p-Nitroaniline	100–01–6	4	P077	5000 (2270)
Nitrobenzene	98–95–3	1,2,3,4	U169	1000 (454)
4-Nitrobiphenyl	92–93–3	3		10 (4.54)
Nitrogen dioxide	10102–44–0 10544–72–6	1,4	P078	10 (4.54)
Nitrogen oxide NO	10102–43–9	4	P076	10 (4.54)
Nitrogen oxide NO2	10102–44–0 10544–72–6	1,4	P078	10 (4.54)
Nitroglycerine	55–63–0	4	P081	10 (4.54)
Nitrophenol (mixed)	25154–55–6	1		100 (45.4)
m-Nitrophenol	554–84–7	....		....
o-Nitrophenol	88–75–5	1,2		100 (45.4)
p-Nitrophenol	100–02–7	1,2,3,4	U170	100 (45.4)
2-Nitrophenol	88–75–5	1,2		100 (45.4)
4-Nitrophenol	100–02–7	1,2,3,4	U170	100 (45.4)
NITROPHENOLS	N.A.	2		**
2-Nitropropane	79–46–9	3,4	U171	10 (4.54)
NITROSAMINES	N.A.	2		**
N-Nitrosodi-n-butylamine	924–16–3	4	U172	10 (4.54)
N-Nitrosodiethanolamine	1116–54–7	4	U173	1 (0.454)
N-Nitrosodiethylamine	55–18–5	4	U174	1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
N-Nitrosodimethylamine	62–75–9	2,3,4	P082	10 (4.54)
N-Nitrosodiphenylamine	86–30–6	2		100 (45.4)
N-Nitroso-N-ethylurea	759–73–9	4	U176	1 (0.454)
N-Nitroso-N-methylurea	684–93–5	3,4	U177	1 (0.454)
N-Nitroso-N-methylurethane	615–53–2	4	U178	1 (0.454)
N-Nitrosomethylvinylamine	4549–40–0	4	P084	10 (4.54)
N-Nitrosomorpholine	59–89–2	3		1 (0.454)
N-Nitrosopiperidine	100–75–4	4	U179	10 (4.54)
N-Nitrosopyrrolidine	930–55–2	4	U180	1 (0.454)
Nitrotoluene	1321–12–6	1		1000 (454)
m-Nitrotoluene	99–08–1	.....		.....
o-Nitrotoluene	88–72–2	.....		.....
p-Nitrotoluene	99–99–0	.....		.....
5-Nitro-o-toluidine	99–55–8	4	U181	100 (45.4)
Octamethylpyrophosphoramide	152–16–9	4	P085	100 (45.4)
Osmium oxide OsO4, (T–4)–	20816–12–0	4	P087	1000 (454)
Osmium tetroxide	20816–12–0	4	P087	1000 (454)
7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid	145–73–3	4	P088	1000 (454)
Oxamyl	23135220	4	P194	100 (45.4)
1,2-Oxathiolane, 2,2-dioxide	1120–71–4	3,4	U193	10 (4.54)
2H-1,3,2-Oxazaphosphorin-2–amine, N,N- bis(2-chloroethyl)tetrahydro-, 2-oxide.	50–18–0	4	U058	10 (4.54)
Oxirane	75–21–8	3,4	U115	10 (4.54)
Oxiranecarboxyaldehyde	765–34–4	4	U126	10 (4.54)
Oxirane, (chloromethyl)-	106–89–8	1,3,4	U041	100 (45.4)
Paraformaldehyde	30525–89–4	1		1000 (454)
Paraldehyde	123–63–7	4	U182	1000 (454)
Parathion	56–38–2	1,3,4	P089	10 (4.54)
PCBs	1336–36–3	1,2,3		1 (0.454)
PCNB	82–68–8	3,4	U185	100 (45.4)
Pentachlorobenzene	608–93–5	4	U183	10 (4.54)
Pentachloroethane	76–01–7	4	U184	10 (4.54)
Pentachloronitrobenzene	82–68–8	3,4	U185	100 (45.4)
Pentachlorophenol	87–86–5	1,2,3,4	See F027	10 (4.54)
1,3-Pentadiene	504–60–9	4	U186	100 (45.4)
Perchloroethylene	127–18–4	2,3,4	U210	100 (45.4)
Phenacetin	62–44–2	4	U187	100 (45.4)
Phenanthrene	85–01–8	2		5000 (2270)
Phenol	108–95–2	1,2,3,4	U188	1000 (454)
Phenol, 2-chloro-	95–57–8	2,4	U048	100 (45.4)
Phenol, 4-chloro-3-methyl-	59–50–7	2,4	U039	5000 (2270)
Phenol, 2-cyclohexyl-4,6-dinitro-	131–89–5	4	P034	100 (45.4)
Phenol, 2,4-dichloro-	120–83–2	2,4	U081	100 (45.4)
Phenol, 2,6-dichloro-	87–65–0	4	U082	100 (45.4)
Phenol, 4,4′-(1,2-diethyl-1,2-ethenediyl)bis-, (E)	56–53–1	4	U089	1 (0.454)
Phenol, 2,4-dimethyl-	105–67–9	2,4	U101	100 (45.4)
Phenol, 4-(dimethylamino)-3,5-dimethyl-, 4 methylcarbamate (ester).	315–18–4	1,4	P128	1000 (454)
Phenol, (3,5-dimethyl-4-(methylthio)-, methylcarbamate	2032–65–7	1,4	P199	10 (4.54)
Phenol, 2,4-dinitro-	51–28–5	1,2,3,4	P048	10 (4.54)
Phenol, methyl-	1319–77–3	1,3,4	U052	100 (45.4)
Phenol, 2-methyl-4,6-dinitro-, & salts	534–52–1	2,3,4	P047	10 (4.54)
Phenol, 2,2′-methylenebis[3,4,6- trichloro-	70–30–4	4	U132	100 (45.4)
Phenol, 2-(1-methylethoxy)-, methylcarbamate	114–26–1	3,4	U411	100 (45.4)
Phenol, 3-(1-methylethyl)-, methyl carbamate	64006	4	P202	10 (4.54)
Phenol, 3-methyl-5-(1-methylethyl)-, methyl carbamate	2631370	4	P201	1000 (454)
Phenol, 2-(1-methylpropyl)-4,6-dinitro-	88–85–7	4	P020	1000 (454)
Phenol, 4-nitro-	100–02–7	1,2,3,4	U170	100 (45.4)
Phenol, pentachloro-	87–86–5	1,2,3,4	See F027	10 (4.54)
Phenol, 2,3,4,6-tetrachloro-	58–90–2	4	See F027	10 (4.54)
Phenol, 2,4,5-trichloro-	95–95–4	1,3,4	See F027	10 (4.54)
Phenol, 2,4,6-trichloro-	88–06–2	1,2,3,4	See F027	10 (4.54)
Phenol, 2,4,6-trinitro-, ammonium salt	131–74–8	4	P009	10 (4.54)
L-Phenylalanine, 4-[bis(2-chloroethyl)amino]-	148–82–3	4	U150	1 (0.454)
p-Phenylenediamine	106–50–3	3		5000 (2270)
Phenylmercury acetate	62–38–4	4	P092	100 (45.4)
Phenylthiourea	103–85–5	4	P093	100 (45.4)
Phorate	298–02–2	4	P094	10 (4.54)
Phosgene	75–44–5	1,3,4	P095	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Phosphine	7803–51–2	3,4	P096	100 (45.4)
Phosphoric acid	7664–38–2	1		5000 (2270)
Phosphoric acid, diethyl 4-nitrophenyl ester	311–45–5	4	P041	100 (45.4)
Phosphoric acid, lead(2+) salt (2:3)	7446–27–7	4	U145	10 (4.54)
Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester.	298–04–4	1,4	P039	1 (0.454)
Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester.	298–02–2	4	P094	10 (4.54)
Phosphorodithioic acid, O,O-diethyl S-methyl ester	3288-58–2	4	U087	5000 (2270)
Phosphorodithioic acid, O,O-dimethyl S-[2(methylamino)-2-oxoethyl] ester.	60–51–5	4	P044	10 (4.54)
Phosphorofluoridic acid, bis(1-methylethyl) ester	55–91–4	4	P043	100 (45.4)
Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester	56–38–2	1,3,4	P089	10 (4.54)
Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester	297–97–2	4	P040	100 (45.4)
Phosphorothioic acid, O-[4-[(dimethylamino) sulfonyl]phenyl] O,O-dimethyl ester.	52–85–7	4	P097	1000 (454)
Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester.	298–00–0	1,4	P071	100 (45.4)
Phosphorus	7723–14–0	1,3		1 (0.454)
Phosphorus oxychloride	10025–87–3	1		1000 (454)
Phosphorus pentasulfide	1314–80–3	1,4	U189	100 (45.4)
Phosphorus sulfide	1314–80–3	1,4	U189	100 (45.4)
Phosphorus trichloride	7719–12–2	1		1000 (454)
Physostigmine	57476	4	P204	100 (45.4)
Physostigmine salicylate	57647	4	P188	100 (45.4)
PHTHALATE ESTERS	N.A.	2		**
Phthalic anhydride	85–44–9	3,4	U190	5000 (2270)
2-Picoline	109–06–8	4	U191	5000 (2270)
Piperidine, 1-nitroso-	100–75–4	4	U179	10 (4.54)
Plumbane, tetraethyl-	78–00–2	1,4	P110	10 (4.54)
POLYCHLORINATED BIPHENYLS	1336–36–3	1,2,3		1 (0.454)
Polycyclic Organic Matter [e]	N.A.	3		**
POLYNUCLEAR AROMATIC HYDROCARBONS	N.A.	2		**
Potassium arsenate	7784–41–0	1		1 (0.454)
Potassium arsenite	10124–50–2	1		1 (0.454)
Potassium bichromate	7778–50–9	1		10 (4.54)
Potassium chromate	7789–00–6	1		10 (4.54)
Potassium cyanide K(CN)	151–50–8	1,4	P098	10 (4.54)
Potassium hydroxide	1310–58–3	1		1000 (454)
Potassium permanganate	7722–64–7	1		100 (45.4)
Potassium silver cyanide	506–61–6	4	P099	1 (0.454)
Promecarb	2631370	4	P201	1000 (454)
Pronamide	23950–58–5	4	U192	5000 (2270)
Propanal, 2-methyl-2-(methyl- sulfonyl)-, O-[(methylamino)carbonyl] oxime.	1646884	4	P203	100 (45.4)
Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime.	116–06–3	4	P070	1 (0.454)
1-Propanamine	107–10–8	4	U194	5000 (2270)
1-Propanamine, N-propyl-	142–84–7	4	U110	5000 (2270)
1-Propanamine, N-nitroso-N-propyl-	621–64–7	2,4	U111	10 (4.54)
Propane, 1,2-dibromo-3-chloro-	96–12–8	3,4	U066	1 (0.454)
Propane, 1,2-dichloro-	78–87–5	1,2,3,4	U083	1000 (454)
Propanedinitrile	109–77–3	4	U149	1000 (454)
Propanenitrile	107–12–0	4	P101	10 (4.54)
Propanenitrile, 3-chloro-	542–76–7	4	P027	1000 (454)
Propanenitrile, 2-hydroxy-2-methyl-	75–86–5	1,4	P069	10 (4.54)
Propane, 2-nitro-	79–46–9	3,4	U171	10 (4.54)
Propane, 2,2′-oxybis[2-chloro-	108–60–1	2,4	U027	1000 (454)
1,3-Propane sultone	1120–71–4	3,4	U193	10 (4.54)
1,2,3-Propanetriol, trinitrate	55–63–0	4	P081	10 (4.54)
Propanoic acid, 2-(2,4,5-trichlorophenoxy)-	93–72–1	1,4	See F027	100 (45.4)
1-Propanol, 2,3-dibromo-, phosphate (3:1)	126–72–7	4	U235	10 (4.54)
1-Propanol, 2-methyl-	78–83–1	4	U140	5000 (2270)
2-Propanone	67–64–1	4	U002	5000 (2270)
2-Propanone, 1-bromo-	598–31–2	4	P017	1000 (454)
Propargite	2312–35–8	1		10 (4.54)
Propargyl alcohol	107–19–7	4	P102	1000 (454)
2-Propenal	107–02–8	1,2,3,4	P003	1 (0.454)
2-Propenamide	79–06–1	3,4	U007	5000 (2270)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
1-Propene, 1,3-dichloro-	542–75–6	1,2,3,4	U084	100 (45.4)
1-Propene, 1,1,2,3,3,3-hexachloro-	1888–71–7	4	U243	1000 (454)
2-Propenenitrile	107–13–1	1,2,3,4	U009	100 (45.4)
2-Propenenitrile, 2-methyl-	126–98–7	4	U152	1000 (454)
2-Propenoic acid	79–10–7	3,4	U008	5000 (2270)
2-Propenoic acid, ethyl ester	140–88–5	3,4	U113	1000 (454)
2-Propenoic acid, 2-methyl-, ethyl ester	97–63–2	4	U118	1000 (454)
2-Propenoic acid, 2-methyl-, methyl ester	80–62–6	1,3,4	U162	1000 (454)
2-Propen-1-ol	107–18–6	1,4	P005	100 (45.4)
Propham	122429	4	U373	1000 (454)
beta-Propiolactone	57–57–8	3		10 (4.54)
Propionaldehyde	123–38–6	3	1000 (454)	
Propionic acid	79–09–4	1		5000 (2270)
Propionic anhydride	123–62–6	1		5000 (2270)
Propoxur (Baygon)	114–26–1	3,4	U411	100 (45.4)
n-Propylamine	107–10–8	4	U194	5000 (2270)
Propylene dichloride	78–87–5	1,2,3,4	U083	1000 (454)
Propylene oxide	75–56–9	1,3		100 (45.4)
1,2-Propylenimine	75–55–8	3,4	P067	1 (0.454)
2-Propyn-1-ol	107–19–7	4	P102	1000 (454)
Prosulfocarb	52888809	4	U387	5000 (2270)
Pyrene	129–00–0	2		5000 (2270)
Pyrethrins	121–29–9 121–21–1 8003–34–7	1		1 (0.454)
3,6-Pyridazinedione, 1,2-dihydro-	123–33–1	4	U148	5000 (2270)
4-Pyridinamine	504–24–5	4	P008	1000 (454)
Pyridine	110–86–1	4	U196	1000 (454)
Pyridine, 2-methyl-	109–06–8	4	U191	5000 (2270)
Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-, & salts	54–11–5	4	P075	100 (45.4)
2,4-(1H,3H)-Pyrimidinedione, 5-[bis(2- chloroethyl)amino]-	66–75–1	4	U237	10 (4.54)
4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-	56–04–2	4	U164	10 (4.54)
Pyrrolidine, 1-nitroso-	930–55–2	4	U180	1 (0.454)
Pyrrolo[2,3-b]indol-5-ol, 1,2,3,3a,8,8a- hexahydro-1,3a,8-trimethyl-, methylcarbamate (ester), (3aS-cis)-.	57476	4	P204	100 (45.4)
Quinoline	91–22–5	1,3		5000 (2270)
Quinone	106–51–4	3,4	U197	10 (4.54)
Quintobenzene	82–68–8	3,4	U185	100 (45.4)
Radionuclides (including radon)	N.A.	3		§
Reserpine	50–55–5	4	U200	5000 (2270)
Resorcinol	108–46–3	1,4	U201	5000 (2270)
Safrole	94–59–7	4	U203	100 (45.4)
Selenious acid	7783–00–8	4	U204	10 (4.54)
Selenious acid, dithallium (1+) salt	12039–52–0	4	P114	1000 (454)
Selenium††	7782–49–2	2		100 (45.4)
SELENIUM AND COMPOUNDS	N.A.	2,3		**
Selenium Compounds	N.A.	2,3		**
Selenium dioxide	7446–08–4	1,4	U204	10 (4.54)
Selenium oxide	7446–08–4	1,4	U204	10 (4.54)
Selenium sulfide SeS2	7488–56–4	4	U205	10 (4.54)
Selenourea	630–10–4	4	P103	1000 (454)
L-Serine, diazoacetate (ester)	115–02–6	4	U015	1 (0.454)
Silver††	7440–22–4	2		1000 (454)
SILVER AND COMPOUNDS	N.A.	2		**
Silver cyanide Ag(CN)	506–64–9	4	P104	1 (0.454)
Silver nitrate	7761–88–8	1		1 (0.454)
Silvex (2,4,5-TP)	93–72–1	1,4	See F027	100 (45.4)
Sodium	7440–23–5	1		10 (4.54)
Sodium arsenate	7631–89–2	1		1 (0.454)
Sodium arsenite	7784–46–5	1		1 (0.454)
Sodium azide	26628–22–8	4	P105	1000 (454)
Sodium bichromate	10588–01–9	1		10 (4.54)
Sodium bifluoride	1333–83–1	1		100 (45.4)
Sodium bisulfite	7631–90–5	1		5000 (2270)
Sodium chromate	7775–11–3	1		10 (4.54)
Sodium cyanide Na(CN)	143–33–9	1,4	P106	10 (4.54)
Sodium dodecylbenzenesulfonate	25155–30–0	1		1000 (454)
Sodium fluoride	7681–49–4	1		1000 (454)
Sodium hydrosulfide	16721–80–5	1		5000 (2270)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Sodium hydroxide	1310–73–2	1		1000 (454)
Sodium hypochlorite	7681–52–9	1		100 (45.4)
	10022–70–5			
Sodium methylate	124–41–4	1		1000 (454)
Sodium nitrite	7632–00–0	1		100 (45.4)
Sodium phosphate, dibasic	7558–79–4	1		5000 (2270)
	10039–32–4			
	10140–65–5			
Sodium phosphate, tribasic	7601–54–9	1		5000 (2270)
	7758–29–4			
	7785–84–4			
	10101–89–0			
	10124–56–8			
	10361–89–4			
Sodium selenite	7782–82–3	1		100 (45.4)
	10102–18–8			
Streptozotocin	18883–66–4	4	U206	1 (0.454)
Strontium chromate	7789–06–2	1		10 (4.54)
Strychnidin-10-one, & salts	57–24–9	1,4	P108	10 (4.54)
Strychnidin-10-one, 2,3-dimethoxy-	357–57–3	4	P018	100 (45.4)
Strychnine, & salts	57–24–9	1,4	P108	10 (4.54)
Styrene	100–42–5	1,3		1000 (454)
Styrene oxide	96–09–3	3		100 (45.4)
Sulfuric acid	7664–93–9	1		1000 (454)
	8014–95–7			
Sulfuric acid, dimethyl ester	77–78–1	3,4	U103	100 (45.4)
Sulfuric acid, dithallium (1+) salt	7446–18–6	1,4	P115	100 (45.4)
	10031–59–1			
Sulfur monochloride	12771–08–3	1		1000 (454)
Sulfur phosphide	1314–80–3	1,4	U189	100 (45.4)
2,4,5-T	93–76–5	1,4	See F027	1000 (454)
2,4,5-T acid	93–76–5	1,4	See F027	1000 (454)
2,4,5-T amines	2008–46–0	1		5000 (2270)
	1319–72–8			
	3813–14–7			
	6369–96–6			
	6369–97–7			
2,4,5-T esters	93–79–8	1		1000 (454)
	1928–47–8			
	2545–59–7			
	25168–15–4			
	61792–07–2			
2,4,5-T salts	13560–99–1	1		1000 (454)
TCDD	1746–01–6	2,3		1 (0.454)
TDE	72–54–8	1,2,4	U060	1 (0.454)
1,2,4,5-Tetrachlorobenzene	95–94–3	4	U207	5000 (2270)
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746–01–6	2,3		1 (0.454)
1,1,1,2-Tetrachloroethane	630–20–6	4	U208	100 (45.4)
1,1,2,2-Tetrachloroethane	79–34–5	2,3,4	U209	100 (45.4)
Tetrachloroethylene	127–18–4	2,3,4	U210	100 (45.4)
2,3,4,6-Tetrachlorophenol	58–90–2	4	See F027	10 (4.54)
Tetraethyl pyrophosphate	107–49–3	1,4	P111	10 (4.54)
Tetraethyl lead	78–00–2	1,4	P110	10 (4.54)
Tetraethyldithiopyrophosphate	3689–24–5	4	P109	100 (45.4)
Tetrahydrofuran	109–99–9	4	U213	1000 (454)
Tetranitromethane	509–14–8	4	P112	10 (4.54)
Tetraphosphoric acid, hexaethyl ester	757–58–4	4	P062	100 (45.4)
Thallic oxide	1314–32–5	4	P113	100 (45.4)
Thallium ††	7440–28–0	2		1000 (454)
THALLIUM AND COMPOUNDS	N.A.	2		**
Thallium (I) acetate	563–68–8	4	U214	100 (45.4)
Thallium (I) carbonate	6533–73–9	4	U215	100 (45.4)
Thallium chloride TlCl	7791–12–0	4	U216	100 (45.4)
Thallium (I) nitrate	10102–45–1	4	U217	100 (45.4)
Thallium oxide Tl2O3	1314–32–5	4	P113	100 (45.4)
Thallium (I) selenite	12039–52–0	4	P114	1000 (454)
Thallium (I) sulfate	7446–18–6	1,4	P115	100 (45.4)
	10031–59–1			
Thioacetamide	62–55–5	4	U218	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Thiodicarb	59669260	4	U410	100 (45.4)
Thiodiphosphoric acid, tetraethyl ester	3689–24–5	4	P109	100 (45.4)
Thiofanox	39196–18–4	4	P045	100 (45.4)
Thioimidodicarbonic diamide [(H2N)C(S)] 2NH	541–53–7	4	P049	100 (45.4)
Thiomethanol	74–93–1	1,4	U153	100 (45.4)
Thioperoxydicarbonic diamide [(H2N)C(S)] 2S2, tetramethyl-.	137–26–8	4	U244	10 (4.54)
Thiophanate-methyl	23564058	4	U409	10 (4.54)
Thiophenol	108–98–5	4	P014	100 (45.4)
Thiosemicarbazide	79–19–6	4	P116	100 (45.4)
Thiourea	62–56–6	4	U219	10 (4.54)
Thiourea, (2-chlorophenyl)-	5344–82–1	4	P026	100 (45.4)
Thiourea, 1-naphthalenyl-	86–88–4	4	P072	100 (45.4)
Thiourea, phenyl-	103–85–5	4	P093	100 (45.4)
Thiram	137–26–8	4	U244	10 (4.54)
Tirpate	26419738	4	P185	100 (45.4)
Titanium tetrachloride	7550–45–0	3		1,2,41000 (454)
Toluene	108–88–3	1,2,3,4	U220	1000 (454)
Toluenediamine	95–80–7 496–72–0 823–40–5 25376–45–8	3,4	U221	10 (4.54)
2,4-Toluene diamine	95–80–7 496–72–0 823–40–5 25376–45–8	3,4	U221	10 (4.54)
Toluene diisocyanate	91–08–7 584–84–9 26471–62–5	3,4	U223	100 (45.4)
2,4-Toluene diisocyanate	91–08–7 584–84–9 26471–62–5	3,4	U223	100 (45.4)
o-Toluidine	95–53–4	3,4	U328	100 (45.4)
p-Toluidine	106–49–0	4	U353	100 (45.4)
o-Toluidine hydrochloride	636–21–5	4	U222	100 (45.4)
Toxaphene	8001–35–2	1,2,3,4	P123	1 (0.454)
2,4,5-TP acid	93–72–1	1,4	See F027	100 (45.4)
2,4,5-TP esters	32534–95–5	1		100 (45.4)
Triallate	2303175	4	U389	100 (45.4)
1H-1,2,4-Triazol-3-amine	61–82–5	4	U011	10 (4.54)
Trichlorfon	52–68–6	1		100 (45.4)
1,2,4-Trichlorobenzene	120–82–1	2,3		100 (45.4)
1,1,1-Trichloroethane	71–55–6	2,3,4	U226	1000 (454)
1,1,2-Trichloroethane	79–00–5	2,3,4	U227	100 (45.4)
Trichloroethylene	79–01–6	1,2,3,4	U228	100 (45.4)
Trichloromethanesulfenyl chloride	594–42–3	4	P118	100 (45.4)
Trichloromonofluoromethane	75–69–4	4	U121	5000 (2270)
Trichlorophenol	25167–82–2	1		10 (4.54)
2,3,4-Trichlorophenol	15950–66–0			
2,3,5-Trichlorophenol	933–78–8			
2,3,6-Trichlorophenol	933–75–5			
3,4,5-Trichlorophenol	609–19–8			
2,4,5-Trichlorophenol	95–95–4	1,3,4	See F027	10 (4.54)
2,4,6-Trichlorophenol	88–06–2	1,2,3,4	See F027	10 (4.54)
Triethanolamine dodecylbenzenesulfonate	27323–41–7	1		1000 (454)
Triethylamine	121–44–8	1,3,4	U404	5000 (2270)
Trifluralin	1582–09–8	3		10 (4.54)
Trimethylamine	75–50–3	1		100 (45.4)
2,2,4-Trimethylpentane	540–84–1	3		1000 (454)
1,3,5-Trinitrobenzene	99–35–4	4	U234	10 (4.54)
1,3,5-Trioxane, 2,4,6-trimethyl-	123–63–7	4	U182	1000 (454)
Tris(2,3-dibromopropyl) phosphate	126–72–7	4	U235	10 (4.54)
Trypan blue	72–57–1	4	U236	10 (4.54)
Unlisted Hazardous Wastes Characteristic of Corrosivity	N.A.	4	D002	100 (45.4)
Unlisted Hazardous Wastes Characteristic of Ignitability	N.A.	4	D001	100 (45.4)
Unlisted Hazardous Wastes Characteristic of Reactivity	N.A.	4	D003	100 (45.4)
Unlisted Hazardous Wastes Characteristic of Toxicity: Arsenic (D004)	N.A.	4	D004	1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Barium (D005)	N.A.	4	D005	1000 (454)
Benzene (D018)	N.A.	1,2,3,4	D018	10 (4.54)
Cadmium (D006)	N.A.	4	D006	10 (4.54)
Carbon tetrachloride (D019)	N.A.	1,2,4	D019	10 (4.54)
Chlordane (D020)	N.A.	1,2,4	D020	1 (0.454)
Chlorobenzene (D021)	N.A.	1,2,4	D021	100 (45.4)
Chloroform (D022)	N.A.	1,2,4	D022	10 (4.54)
Chromium (D007)	N.A.	4	D007	10 (4.54)
o-Cresol (D023)	N.A.	4	D023	100 (45.4)
m-Cresol (D024)	N.A.	4	D024	100 (45.4)
p-Cresol (D025)	N.A.	4	D025	100 (45.4)
Cresol (D026)	N.A.	4	D026	100 (45.4)
2,4-D (D016)	N.A.	1,4	D016	100 (45.4)
1,4-Dichlorobenzene (D027)	N.A.	1,2,4	D027	100 (45.4)
1,2-Dichloroethane (D028)	N.A.	1,2,4	D028	100 (45.4)
1,1-Dichloroethylene (D029)	N.A.	1,2,4	D029	100 (45.4)
2,4-Dinitrotoluene (D030)	N.A.	1,2,4	D030	10 (4.54)
Endrin (D012)	N.A.	1,4	D012	1 (0.454)
Heptachlor (and epoxide) (D031)	N.A.	1,2,4	D031	1 (0.454)
Hexachlorobenzene (D032)	N.A.	2,4	D032	10 (4.54)
Hexachlorobutadiene (D033)	N.A.	2,4	D033	1 (0.454)
Hexachloroethane (D034)	N.A.	2,4	D034	100 (45.4)
Lead (D008)	N.A.	4	D008	10 (4.54)
Lindane (D013)	N.A.	1,4	D013	1 (0.454)
Mercury (D009)	N.A.	4	D009	1 (0.454)
Methoxychlor (D014)	N.A.	1,4	D014	1 (0.454)
Methyl ethyl ketone (D035)	N.A.	4	D035	5000 (2270)
Nitrobenzene (D036)	N.A.	1,2,4	D036	1000 (454)
Pentachlorophenol (D037)	N.A.	1,2,4	D037	10 (4.54)
Pyridine (D038)	N.A.	4	D038	1000 (454)
Selenium (D010)	N.A.	4	D010	10 (4.54)
Silver (D011)	N.A.	4	D011	1 (0.454)
Tetrachloroethylene (D039)	N.A.	2,4	D039	100 (45.4)
Toxaphene (D015)	N.A.	1,4	D015	1 (0.454)
Trichloroethylene (D040)	N.A.	1,2,4	D040	100 (45.4)
2,4,5-Trichlorophenol (D041)	N.A.	1,4	D041	10 (4.54)
2,4,6-Trichlorophenol (D042)	N.A.	1,2,4	D042	10 (4.54)
2,4,5-TP (D017)	N.A.	1,4	D017	100 (45.4)
Vinyl chloride (D043)	N.A.	2,3,4	D043	1 (0.454)
Uracil mustard	66–75–1	4	U237	10 (4.54)
Uranyl acetate	541–09–3	1		100 (45.4)
Uranyl nitrate	10102–06–4 36478–76–9	1		100 (45.4)
Urea, N-ethyl-N-nitroso-	759–73–9	4	U176	1 (0.454)
Urea, N-methyl-N-nitroso-	684–93–5	3,4	U177	1 (0.454)
Urethane	51–79–6	3,4	U238	100 (45.4)
Vanadic acid, ammonium salt	7803–55–6	4	P119	1000 (454)
Vanadium oxide V2O5	1314–62–1	1,4	P120	1000 (454)
Vanadium pentoxide	1314–62–1	1,4	P120	1000 (454)
Vanadyl sulfate	27774–13–6	1		1000 (454)
Vinyl acetate	108–05–4	1,3		5000 (2270)
Vinyl acetate monomer	108–05–4	1,3		5000 (2270)
Vinylamine, N-methyl-N-nitroso-	4549–40–0	4	P084	10 (4.54)
Vinyl bromide	593–60–2	3		100 (45.4)
Vinyl chloride	75–01–4	2,3,4	U043	1 (0.454)
Vinylidene chloride	75–35–4	1,2,3,4	U078	100 (45.4)
Warfarin, & salts	81–81–2	4	P001, U248	100 (45.4)
Xylene	1330–20–7	1,3,4	U239	100 (45.4)
m-Xylene	108–38–3	3		1000 (454)
o-Xylene	95–47–6	3		1000 (454)
p-Xylene	106–42–3	3		100 (45.4)
Xylene (mixed)	1330–20–7	1,3,4	U239	100 (45.4)
Xylenes (isomers and mixture)	1330–20–7	1,3,4	U239	100 (45.4)
Xylenol	1300–71–6	1		1000 (454)
Yohimban-16-carboxylic acid,11,17-dimethoxy-18-[(3,4,5-trimethoxybenzoyl)oxy]-, methyl ester (3beta,16beta,17alpha, 18beta,20alpha).	50–55–54	4	U200	5000 (2270)
Zinc ††	7440–66–6	2		1000 (454)
ZINC AND COMPOUNDS	N.A.	2		**

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Zinc acetate	557–34–6	1		1000 (454)
Zinc ammonium chloride	52628–25–8 14639–97–5 14639–98–6	1		1000 (454)
Zinc, bis(dimethylcarbamodithioato-S,S')-	137304	4	P205	10 (4.54)
Zinc borate	1332–07–6	1		1000 (454)
Zinc bromide	7699–45–8	1		1000 (454)
Zinc carbonate	3486–35–9	1		1000 (454)
Zinc chloride	7646–85–7	1		1000 (454)
Zinc cyanide Zn(CN)2	557–21–1	1,4	P121	10 (4.54)
Zinc fluoride	7783–49–5	1		1000 (454)
Zinc formate	557–41–5	1		1000 (454)
Zinc hydrosulfite	7779–86–4	1		1000 (454)
Zinc nitrate	7779–88–6	1		1000 (454)
Zinc phenolsulfonate	127–82–2	1		5000 (2270)
Zinc phosphide Zn3P2	1314–84–7	1,4	P122, U249	100 (45.4)
Zinc silicofluoride	16871–71–9	1		5000 (2270)
Zinc sulfate	7733–02–0	1		1000 (454)
Ziram	137304	4	P205	10 (4.54)
Zirconium nitrate	13746–89–9	1		5000 (2270)
Zirconium potassium fluoride	16923–95–8	1		1000 (454)
Zirconium sulfate	14644–61–2	1		5000 (2270)
Zirconium tetrachloride	10026–11–6	1		5000 (2270)
F001		4	F001	10 (4.54)
The following spent halogenated solvents used in degreasing; all spent solvent mixtures/blends used in degreasing containing, before use, a total of ten percent or more (by volume) of one or more of the halogenated solvents listed below or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.				
(a) Tetrachloroethylene	127–18–4	2,3,4	U210	100 (45.4)
(b) Trichloroethylene	79–01–6	1,2,3,4	U228	100 (45.4)
(c) Methylene chloride	75–09–2	2,3,4	U080	1000 (454)
(d) 1,1,1-Trichloroethane	71–55–6	2,3,4	U226	1000 (454)
(e) Carbon tetrachloride	56–23–5	1,2,3,4	U211	10 (4.54)
(f) Chlorinated fluorocarbons	N.A.			5000 (2270)
F002		4	F002	10 (4.54)
The following spent halogenated solvents; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the halogenated solvents listed below or those solvents listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.				
(a) Tetrachloroethylene	127–18–4	2,3,4	U210	100 (45.4)
(b) Methylene chloride	75–09–2	2,3,4	U080	1000 (454)
(c) Trichloroethylene	79–01–6	1,2,3,4	U228	100 (45.4)
(d) 1,1,1-Trichloroethane	71–55–6	2,3,4	U226	1000 (454)
(e) Chlorobenzene	108–90–7	1,2,3,4	U037	100 (45.4)
(f) 1,1,2-Trichloro-1,2,2-trifluoroethane	76–13–1			5000 (2270)
(g) o-Dichlorobenzene	95–50–1	1,2,4	U070	100 (45.4)
(h) Trichlorofluoromethane	75–69–4	4	U121	5000 (2270)
(i) 1,1,2-Trichloroethane	79–00–5	2,3,4	U227	100 (45.4)
F003		4	F003	100 (45.4)
The following spent non-halogenated solvents and the still bottoms from the recovery of these solvents.				
(a) Xylene	1330-20–7			1000 (454)
(b) Acetone	67–64–1			5000 (2270)
(c) Ethyl acetate	141–78–6			5000 (2270)
(d) Ethylbenzene	100–41–4			1000 (454)
(e) Ethyl ether	60–29–7			100 (45.4)
(f) Methyl isobutyl ketone	108–10–1			5000 (2270)
(g) n-Butyl alcohol	71–36–3			5000 (2270)
(h) Cyclohexanone	108–94–1			5000 (2270)
(i) Methanol	67–56–1			5000 (2270)
F004		4	F004	100 (45.4)
The following spent non-halogenated solvents and the still bottoms from the recovery of these solvents:				
(a) Cresols/Cresylic acid	1319–77–3	1,3,4	U052	100 (45.4)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
(b) Nitrobenzene	98–95–3	1,2,3,4	U169	1000 (454)
F005		4	F005	100 (45.4)
The following spent non-halogenated solvents and the still bottoms from the recovery of these solvents:				
(a) Toluene	108–88–3	1,2,3,4	U220	1000 (454)
(b) Methyl ethyl ketone	78–93–3	3,4	U159	5000 (2270)
(c) Carbon disulfide	75–15–0	1,3,4	P022	100 (45.4)
(d) Isobutanol	78–83–1	4	U140	5000 (2270)
(e) Pyridine	110–86–1	4	U196	1000 (454)
F006		4	F006	10 (4.54)
Wastewater treatment sludges from electroplating operations except from the following processes: (1) sulfuric acid anodizing of aluminum, (2) tin plating on carbon steel, (3) zinc plating (segregated basis) on carbon steel, (4) aluminum or zinc-aluminum plating on carbon steel, (5) cleaning/stripping associated with tin, zinc and aluminum plating on carbon steel, and (6) chemical etching and milling of aluminum.				
F007		4	F007	10 (4.54)
Spent cyanide plating bath solutions from electroplating operations.				
F008		4	F008	10 (4.54)
Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used in the process.				
F009		4	F009	10 (4.54)
Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process.				
F010		4	F010	10 (4.54)
Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process.				
F011		4	F011	10 (4.54)
Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations.				
F012		4	F012	10 (4.54)
Quenching wastewater treatment sludges from metal heat treating operations where cyanides are used in the process.				
F019		4	F019	10 (4.54)
Wastewater treatment sludges from the chemical conversion coating of aluminum except from zirconium phosphating in aluminum can washing when such phosphating is an exclusive conversion coating process. Wastewater treatment sludges from the manufacturing of motor vehicles using a zinc phosphating process will not be subject to this listing at the point of generation if the wastes are not placed outside on the land prior to shipment to a landfill for disposal and are either: disposed in a Subtitle D municipal or industrial landfill unit that is equipped with a single clay liner and is permitted, licensed or otherwise authorized by the state; or disposed in a landfill unit subject to, or otherwise meeting, the landfill requirements in § 258.40, § 264.301 or § 265.301. For the purposes of this listing, motor vehicle manufacturing is defined in § 261.31(b)(4)(i) and § 261.31(b)(4)(ii) describes the recordkeeping requirements for motor vehicle manufacturing facilities				
F020		4	F020	1 (0.454)
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- or tetrachlorophenol or of intermediates used to produce their pesticide derivatives. (This listing does not include wastes from the production of hexachlorophene from highly purified 2,4,5-trichlorophenol.)				
F021		4	F021	1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of pentachlorophenol or of intermediates used to produce its derivatives.				
F022		4	F022	1 (0.454)
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions.				
F023		4	F023	1 (0.454)
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the production or manufacturing use (as a reactant, chemical intermediate, or a component in a formulating process) of tri- and tetrachlorophenols. (This listing does not include wastes from equipment used only for the production or use of hexachlorophene from highly purified 2,4,5-trichlorophenol.)				
F024		4	F024	1 (0.454)
Process wastes, including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes, from the production of certain chlorinated aliphatic hydrocarbons by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution. (This listing does not include wastewaters, wastewater treatment sludges, spent catalysts, and wastes listed in 40 CFR 261.31 or 261.32.)				
F025		4	F025	1 (0.454)
Condensed light ends, spent filters and filter aids, and spent desiccant wastes from the production of certain chlorinated aliphatic hydrocarbons, by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution.				
F026		4	F026	1 (0.454)
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzene under alkaline conditions.				
F027		4	F027	1 (0.454)
Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols. (This listing does not include formulations containing hexachlorophene synthesized from prepurified 2,4,5- trichlorophenol as the sole component.)				
F028		4	F028	1 (0.454)
Residues resulting from the incineration or thermal treatment of soil contaminated with EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027.				
F032		4	F032	1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations (except potentially cross-contaminated wastes that have had the F032 waste code deleted in accordance with § 261.35 of this chapter or potentially cross-contaminated wastes that are otherwise currently regulated as hazardous wastes (*i.e.*, F034 or F035), and where the generator does not resume or initiate use of chlorophenolic formulations). This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.				
F034	.....	4	F034	1 (0.454)
Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use creosote formulations. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.				
F035	.....	4	F035	1 (0.454)
Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use inorganic preservatives containing arsenic or chromium. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.				
F037	.....	4	F037	1 (0.454)
Petroleum refinery primary oil/water/solids separation sludge-Any sludge generated from the gravitational separation of oil/water/solids during the storage or treatment of process wastewaters and oily cooling wastewaters from petroleum refineries. Such sludges include, but are not limited to those generated in oil/water/solids separators; tanks and impoundments; ditches and other conveyances; sumps; and stormwater units receiving dry weather flow. Sludges generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges generated in aggressive biological treatment units as defined in § 261.31(b)(2) (including sludges generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and K051 wastes are not included in this listing. This listing does include residuals generated from processing or recycling oil-bearing hazardous secondary materials excluded under § 261.4(a)(12)(i), if those residuals are to be disposed of.				
F038	.....	4	F038	1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Petroleum refinery secondary (emulsified) oil/water/solids separation sludge-Any sludge and/or float generated from the physical and/or chemical separation of oil/water/solids in process wastewaters and oily cooling wastewaters from petroleum refineries. Such wastes include, but are not limited to, all sludges and floats generated in: induced air flotation (IAF) units, tanks and impoundments, and all sludges generated in DAF units. Sludges generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges and floats generated in aggressive biological treatment units as defined in §261.31(b)(2) (including sludges and floats generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and F037, K048, and K051 wastes are not included in this listing.				
F039	.....	4	F039	1 (0.454)
Leachate (liquids that have percolated through land disposed wastes) resulting from the disposal of more than one restricted waste classified as hazardous under subpart D of 40 CFR part 261. (Leachate resulting from the disposal of one or more of the following EPA Hazardous Wastes and no other hazardous wastes retains its EPA Hazardous Waste Number(s): F020, F021, F022, F026, F027, and/or F028.)				
K001	.....	4	K001	1 (0.454)
Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol.				
K002	.....	4	K002	10 (4.54)
Wastewater treatment sludge from the production of chrome yellow and orange pigments.				
K003	.....	4	K003	10 (4.54)
Wastewater treatment sludge from the production of molybdate orange pigments.				
K004	.....	4	K004	10 (4.54)
Wastewater treatment sludge from the production of zinc yellow pigments.				
K005	.....	4	K005	10 (4.54)
Wastewater treatment sludge from the production of chrome green pigments.				
K006	.....	4	K006	10 (4.54)
Wastewater treatment sludge from the production of chrome oxide green pigments (anhydrous and hydrated).				
K007	.....	4	K007	10 (4.54)
Wastewater treatment sludge from the production of iron blue pigments.				
K008	.....	4	K008	10 (4.54)
Oven residue from the production of chrome oxide green pigments.				
K009	.....	4	K009	10 (4.54)
Distillation bottoms from the production of acetaldehyde from ethylene.				
K010	.....	4	K010	10 (4.54)
Distillation side cuts from the production of acetaldehyde from ethylene.				
K011	.....	4	K011	10 (4.54)
Bottom stream from the wastewater stripper in the production of acrylonitrile.				
K013	.....	4	K013	10 (4.54)
Bottom stream from the acetonitrile column in the production of acrylonitrile.				
K014	.....	4	K014	5000 (2270)
Bottoms from the acetonitrile purification column in the production of acrylonitrile.				
K015	.....	4	K015	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Still bottoms from the distillation of benzyl chloride.				
K016	.....	4	K016	1 (0.454)
Heavy ends or distillation residues from the production of carbon tetrachloride.				
K017	.....	4	K017	10 (4.54)
Heavy ends (still bottoms) from the purification column in the production of epichlorohydrin.				
K018	.....	4	K018	1 (0.454)
Heavy ends from the fractionation column in ethyl chloride production.				
K019	.....	4	K019	1 (0.454)
Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production.				
K020	.....	4	K020	1 (0.454)
Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production.				
K021	.....	4	K021	10 (4.54)
Aqueous spent antimony catalyst waste from fluoromethanes production.				
K022	.....	4	K022	1 (0.454)
Distillation bottom tars from the production of phenol/acetone from cumene.				
K023	.....	4	K023	5000 (2270)
Distillation light ends from the production of phthalic anhydride from naphthalene.				
K024	.....	4	K024	5000 (2270)
Distillation bottoms from the production of phthalic anhydride from naphthalene.				
K025	.....	4	K025	10 (4.54)
Distillation bottoms from the production of nitrobenzene by the nitration of benzene.				
K026	.....	4	K026	1000 (454)
Stripping still tails from the production of methyl ethyl pyridines.				
K027	.....	4	K027	10 (4.54)
Centrifuge and distillation residues from toluene diisocyanate production.				
K028	.....	4	K028	1 (0.454)
Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane.				
K029	.....	4	K029	1 (0.454)
Waste from the product steam stripper in the production of 1,1,1- trichloroethane.				
K030	.....	4	K030	1 (0.454)
Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene.				
K031	.....	4	K031	1 (0.454)
By-product salts generated in the production of MSMA and cacodylic acid.				
K032	.....	4	K032	10 (4.54)
Wastewater treatment sludge from the production of chlordane.				
K033	.....	4	K033	10 (4.54)
Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane.				
K034	.....	4	K034	10 (4.54)
Filter solids from the filtration of hexachlorocyclopentadiene in the production of chlordane.				
K035	.....	4	K035	1 (0.454)
Wastewater treatment sludges generated in the production of creosote.				
K036	.....	4	K036	1 (0.454)
Still bottoms from toluene reclamation distillation in the production of disulfoton.				
K037	.....	4	K037	1 (0.454)
Wastewater treatment sludges from the production of disulfoton.				
K038	.....	4	K038	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Wastewater from the washing and stripping of phorate production.				
K039		4	K039	10 (4.54)
Filter cake from the filtration of diethylphosphorodithioic acid in the production of phorate.				
K040		4	K040	10 (4.54)
Wastewater treatment sludge from the production of phorate.				
K041		4	K041	1 (0.454)
Wastewater treatment sludge from the production of toxaphene.				
K042		4	K042	10 (4.54)
Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T.				
K043		4	K043	10 (4.54)
2,6-Dichlorophenol waste from the production of 2,4-D.				
K044		4	K044	10 (4.54)
Wastewater treatment sludges from the manufacturing and processing of explosives.				
K045		4	K045	10 (4.54)
Spent carbon from the treatment of wastewater containing explosives.				
K046		4	K046	10 (4.54)
Wastewater treatment sludges from the manufacturing, formulation and loading of lead-based initiating compounds.				
K047		4	K047	10 (4.54)
Pink/red water from TNT operations.				
K048		4	K048	10 (4.54)
Dissolved air flotation (DAF) float from the petroleum refining industry.				
K049		4	K049	10 (4.54)
Slop oil emulsion solids from the petroleum refining industry.				
K050		4	K050	10 (4.54)
Heat exchanger bundle cleaning sludge from the petroleum refining industry.				
K051		4	K051	10 (4.54)
API separator sludge from the petroleum refining industry.				
K052		4	K052	10 (4.54)
Tank bottoms (leaded) from the petroleum refining industry.				
K060		4	K060	1 (0.454)
Ammonia still lime sludge from coking operations.				
K061		4	K061	10 (4.54)
Emission control dust/sludge from the primary production of steel in electric furnaces.				
K062		4	K062	10 (4.54)
Spent pickle liquor generated by steel finishing operations of facilities within the iron and steel industry (SIC Codes 331 and 332).				
K064		4	K064	10 (4.54)
Acid plant blowdown slurry/sludge resulting from the thickening of blowdown slurry from primary copper production.				
K065		4	K065	10 (4.54)
Surface impoundment solids contained in and dredged from surface impoundments at primary lead smelting facilities.				
K066		4	K066	10 (4.54)
Sludge from treatment of process wastewater and/or acid plant blowdown from primary zinc production.				
K069		4	K069	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Emission control dust/sludge from secondary lead smelting. (Note: This listing is stayed administratively for sludge generated from secondary acid scrubber systems. The stay will remain in effect until further administrative action is taken. If EPA takes further action effecting the stay, EPA will publish a notice of the action in the FEDERAL REGISTER.)				
K071	.....	4	K071	1 (0.454)
Brine purification muds from the mercury cell process in chlorine production, where separately prepurified brine is not used.				
K073	.....	4	K073	10 (4.54)
Chlorinated hydrocarbon waste from the purification step of the diaphragm cellprocess using graphite anodes in chlorine production.				
K083	.....	4	K083	100 (45.4)
Distillation bottoms from aniline production.				
K084	.....	4	K084	1 (0.454)
Wastewater treatment sludges generated during the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.				
K085	.....	4	K085	10 (4.54)
Distillation or fractionation column bottoms from the production of chlorobenzenes.				
K086	.....	4	K086	10 (4.54)
Solvent washes and sludges, caustic washes and sludges, or water washes and sludges from cleaning tubs and equipment used in the formulation of ink from pigments, driers, soaps, and stabilizers containing chromium and lead.				
K087	.....	4	K087	100 (45.4)
Decanter tank tar sludge from coking operations.				
K088	.....	4	K088	10 (4.54)
Spent potliners from primary aluminum reduction.				
K090	.....	4	K090	10 (4.54)
Emission control dust or sludge from ferrochromiumsilicon production.				
K091	.....	4	K091	10 (4.54)
Emission control dust or sludge from ferrochromium production.				
K093	.....	4	K093	5000 (2270)
Distillation light ends from the production of phthalic anhydride from ortho-xylene.				
K094	.....	4	K094	5000 (2270)
Distillation bottoms from the production of phthalic anhydride from ortho-xylene.				
K095	.....	4	K095	100 (45.4)
Distillation bottoms from the production of 1,1,1-trichloroethane.				
K096	.....	4	K096	100 (45.4)
Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane.				
K097	.....	4	K097	1 (0.454)
Vacuum stripper discharge from the chlordane chlorinator in the production of chlordane.				
K098	.....	4	K098	1 (0.454)
Untreated process wastewater from the production of toxaphene.				
K099	.....	4	K099	10 (4.54)
Untreated wastewater from the production of 2,4-D.				
K100	.....	4	K100	10 (4.54)
Waste leaching solution from acid leaching of emission control dust/sludge from secondary lead smelting.				
K101	.....	4	K101	1 (0.454)
Distillation tar residues from the distillation of aniline-based compounds in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.				
K102	.....	4	K102	1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued
[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Residue from the use of activated carbon for decolorization in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.				
K103	....	4	K103	100 (45.4)
Process residues from aniline extraction from the production of aniline.				
K104	....	4	K104	10 (4.54)
Combined wastewater streams generated from nitrobenzene/aniline production.				
K105	....	4	K105	10 (4.54)
Separated aqueous stream from the reactor product washing step in the production of chlorobenzenes.				
K106	....	4	K106	1 (0.454)
Wastewater treatment sludge from the mercury cell process in chlorine production.				
K107	....	4	K107	10 (4.54)
Column bottoms from product separation from the production of 1,1- dimethylhydrazine (UDMH) from carboxylic acid hydrazines.				
K108	....	4	K108	10 (4.54)
Condensed column overheads from product separation and condensed reactor vent gases from the production of 1,1- dimethylhydrazine (UDMH) from carboxylic acid hydrazides.				
K109	....	4	K109	10 (4.54)
Spent filter cartridges from product purification from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides.				
K110	....	4	K110	10 (4.54)
Condensed column overheads from intermediate separation from the production of 1,1- dimethylhydrazine (UDMH) from carboxylic acid hydrazides.				
K111	....	4	K111	10 (4.54)
Product washwaters from the production of dinitrotoluene via nitration of toluene.				
K112	....	4	K112	10 (4.54)
Reaction by-product water from the drying column in the production of toluenediamine via hydrogenation of dinitrotoluene.				
K113	....	4	K113	10 (4.54)
Condensed liquid light ends from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene.				
K114	....	4	K114	10 (4.54)
Vicinals from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene.				
K115	....	4	K115	10 (4.54)
Heavy ends from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene.				
K116	....	4	K116	10 (4.54)
Organic condensate from the solvent recovery column in the production of toluene diisocyanate via phosgenation of toluenediamine.				
K117	....	4	K117	1 (0.454)
Wastewater from the reactor vent gas scrubber in the production of ethylene dibromide via bromination of ethene.				
K118	....	4	K118	1 (0.454)
Spent adsorbent solids from purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethene.				
K123	....	4	K123	10 (4.54)
Process wastewater (including supernates, filtrates, and washwaters) from the production of ethylenebisdithiocarbamic acid and its salts.				
K124	....	4	K124	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Reactor vent scrubber water from the production of ethylenebisdithiocarbamic acid and its salts.				
K125	....	4	K125	10 (4.54)
Filtration, evaporation, and centrifugation solids from the production of ethylenebisdithiocarbamic acid and its salts.				
K126	....	4	K126	10 (4.54)
Baghouse dust and floor sweepings in milling and packaging operations from the production or formulation of ethylenebisdithiocarbamic acid and its salts.				
K131	....	4	K131	100 (45.4)
Wastewater from the reactor and spent sulfuric acid from the acid dryer from the production of methyl bromide.				
K132	....	4	K132	1000 (454)
Spent absorbent and wastewater separator solids from the production of methyl bromide.				
K136	....	4	K136	1 (0.454)
Still bottoms from the purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethene.				
K141	....	4	K141	1 (0.454)
Process residues from the recovery of coal tar, including, but not limited to, collecting sump residues from the production of coke from coal or the recovery of coke by-products produced from coal. This listing does not include K087 (decanter tank tar sludges from coking operations).				
K142	....	4	K142	1 (0.454)
Tar storage tank residues from the production of coke from coal or from the recovery of coke by-products produced from coal.				
K143	....	4	K143	1 (0.454)
Process residues from the recovery of light oil, including, but not limited to, those generated in stills, decanters, and wash oil recovery units from the recovery of coke by- products produced from coal.				
K144	....	4	K144	1 (0.454)
Wastewater sump residues from light oil refining, including, but not limited to, intercepting or contamination sump sludges from the recovery of coke by-products produced from coal.				
K145	....	4	K145	1 (0.454)
Residues from naphthalene collection and recovery operations from the recovery of coke by-products produced from coal.				
K147	....	4	K147	1 (0.454)
Tar storage tank residues from coal tar refining.				
K148	....	4	K148	1 (0.454)
Residues from coal tar distillation, including, but not limited to, still bottoms.				
K149	....	4	K149	10 (4.54)
Distillation bottoms from the production of alpha-(or methyl-) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups. [This waste does not include still bottoms from the distillation of benzyl chloride.]				
K150	....	4	K150	10 (4.54)
Organic residuals, excluding spent carbon adsorbent, from the spent chlorine gas and hydrochloric acid recovery processes associated with the production of alpha- (or methyl-) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups.				
K151	....	4	K151	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Wastewater treatment sludges, excluding neutralization and biological sludges, generated during the treatment of waste-waters from the production of alpha- (or methyl-) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups.				
K156		4	K156	10 (4.54)
Organic waste (including heavy ends, still bottoms, light ends, spent solvents, filtrates, and decantates) from the production of carbamates and carbamoyl oximes. (This listing does not apply to wastes generated from the manufacture of 3-iodo-2-propynyl n-butylcarbamate.)				
K157		4	K157	10 (4.54)
Wastewaters (including scrubber waters, condenser waters, washwaters, and separation waters) from the production of carbamates and carbamoyl oximes. (This listing does not apply to wastes generated from the manufacture of 3-iodo-2-propynyl n-butylcarbamate.)				
K158		4	K158	10 (4.54)
Bag house dusts and filter/separation solids from the production of carbamates and carbamoyl oximes. (This listing does not apply to wastes generated from the manufacture of 3-iodo-2-propynyl n-butylcarbamate.)				
K159		4	K159	10 (4.54)
Organics from the treatment of thiocarbamate wastes.				
K161		4	K161	1 (0.454)
Purification solids (including filtration, evaporation, and centrifugation solids), bag-house dust and floor sweepings from the production of dithiocarbamate acids and their salts. (This listing does not include K125 or K126).				
K169 [f]		4	K169	10 (4.54)
Crude oil storage tank sediment from petroleum refining operations.				
K170 [f]		4	K170	1 (0.454)
Clarified slurry oil tank sediment and/or in-line filter/separation solids from petroleum refining operations.				
K171 [f]		4	K171	1 (0.454)
Spent hydrotreating catalyst from petroleum refining operations. (This listing does not include inert support media.)				
K172 [f]		4	K172	1 (0.454)
Spent hydrorefining catalyst from petroleum refining operations. (This listing does not include inert support media.)				
K174 [f]		4	K174	1 (0.454)
K175 [f]		4	K175	1 (0.454)
K176.				
Baghouse filters from the production of antimony oxide, including filters from the production of intermediates (e.g., antimony metal or crude antimony oxide)		4	K176	1 (0.454)
K177.				
Slag from the production of antimony oxide that is speculatively accumulated or disposed, including slag from the production of intermediates (e.g., antimony metal or crude antimony oxide)		4	K177	5,000 (2270)
K178		4	K178	1000 (454)
Residues from manufacturing and manufacturing-site storage of ferric chloride from acids formed during the production of titanium dioxide using the chloride-ilmenite process.				
K181		4	K181	##

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous substance	CASRN	Statutory code†	RCRA waste No.	Final RQ pounds (Kg)
Nonwastewaters from the production of dyes and/or pigments (including nonwastewaters commingled at the point of generation with nonwastewaters from other processes) that, at the point of generation, contain mass loadings of any of the constituents identified in paragraph (c) of section 261.32 that are equal to or greater than the corresponding paragraph (c) levels, as determined on a calendar year basis				

† Indicates the statutory source defined by 1, 2, 3, and 4, as described in the note preceding Table 302.4.
† Indicates the statutory source defined by 1,2,3, and 4, as described in the note preceding Table 302.4.
†† No reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers (0.004 inches).
††† The RQ for asbestos is limited to friable forms only.
The Agency may adjust the statutory RQ for this hazardous substance in a future rulemaking; until then the statutory one-pound RQ applies.
§ The adjusted RQs for radionuclides may be found in Appendix B to this table.
** Indicates that no RQ is being assigned to the generic or broad class.
[a] Benzene was already a CERCLA hazardous substance prior to the CAA Amendments of 1990 and received an adjusted 10-pound RQ based on potential carcinogenicity in an August 14, 1989, final rule (54 FR 33418). The CAA Amendments specify that "benzene (including benzene from gasoline)" is a hazardous air pollutant and, thus, a CERCLA hazardous substance.
[b] The CAA Amendments of 1990 list DDE (3547–04–4) as a CAA hazardous air pollutant. The CAS number, 3547–04–4, is for the chemical, p,p'dichlorodiphenylethane. DDE or p,p′-dichlorodiphenyldichloroethylene, CAS number 72–55–9, is already listed in Table 302.4 with a final RQ of 1 pound. The substance identified by the CAS number 3547–04–4 has been evaluated and listed as DDE to be consistent with the CAA section 112 listing, as amended.
[c] Includes mineral fiber emissions from facilities manufacturing or processing glass, rock, or slag fibers (or other mineral derived fibers) of average diameter 1 micrometer or less.
[d] Includes mono- and di-ethers of ethylene glycol, diethylene glycol, and triethylene glycol R-(OCH2CH2)n-OR′ where:
n = 1, 2, or 3;
R = alkyl C7 or less; or
R = phenyl or alkyl substituted phenyl;
R' = H or alkyl C7 or less; or
OR′ consisting of carboxylic acid ester, sulfate, phosphate, nitrate, or sulfonate.
[e] Includes organic compounds with more than one benzene ring, and which have a boiling point greater than or equal to 100 °C.
[f] See 40 CFR 302.6(b)(1) for application of the mixture rule to this hazardous waste.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES

CASRN	Hazardous substance
50000	Formaldehyde.
50077	Azirino[2′,3′:3,4]pyrrolo[1,2-a]indole-4,7-dione,6-amino-8-[[(aminocarbonyl)oxy]methyl]-1,1a,2,8,8a, 8b-hexahydro-8a-methoxy-5-methyl-, [1aS-(1aalpha, 8beta,8aalpha,8balpha)]-
	Mitomycin C.
50180	Cyclophosphamide.
	2H-1,3,2-Oxazaphosphorin-2-amine, N,N-bis(2-chloroethyl)tetrahydro-, 2-oxide.
50293	Benzene, 1,1′-(2,2,2- trichloroethylidene)bis[4-chloro-.
	DDT.
	4,4′-DDT.
50328	Benzo[a]pyrene.
	3,4-Benzopyrene.
50555	Reserpine.
	Yohimban-16-carboxylic acid,11,17-dimethoxy-18-[(3 ,4,5-trimethoxybenzoyl)oxy]-, methyl ester (3beta, 16beta,17alpha,18beta,20alpha)-.
51285	Phenol, 2,4-dinitro-.
	2,4-Dinitrophenol.
51434	Epinephrine.
	1,2-Benzenediol,4-[1-hydroxy-2-(methylamino) ethyl]-.
51796	Carbamic acid, ethyl ester.
	Ethyl carbamate.
	Urethane.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
52686	Trichlorfon.
52857	Famphur.
	Phosphorothioic acid, O-[4-[(dimethylamino) sulfonyl]phenyl] O,O-dimethyl ester.
53703	Dibenz[a,h]anthracene.
	Dibenzo[a,h]anthracene.
	1,2:5,6-Dibenzanthracene.
53963	Acetamide, N-9H-fluoren-2-yl-.
	2-Acetylaminofluorene.
54115	Nicotine, & salts.
	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-, & salts.
55185	Ethanamine, N-ethyl-N-nitroso-.
	N-Nitrosodiethylamine.
55630	Nitroglycerine.
	1,2,3-Propanetriol, trinitrate.
55914	Diisopropylfluorophosphate (DFP).
	Phosphorofluororidic acid, bis(1-methylethyl) ester.
56042	Methylthiouracil.
	4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-.
56235	Carbon tetrachloride.
	Methane, tetrachloro-.
56382	Parathion.
	Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester.
56495	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-.
	3-Methylcholanthrene.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
56531	Diethylstilbestrol.
	Phenol, 4,4′-(1,2-diethyl-1,2-ethenediyl)bis-, (E).
56553	Benz[a]anthracene.
	Benzo[a]anthracene.
	1,2-Benzanthracene.
56724	Coumaphos.
57147	Hydrazine, 1,1-dimethyl-.
	1,1-Dimethylhydrazine.
57249	Strychnidin-10-one, & salts.
	Strychnine, & salts.
57476	Physostigmine.
	Pyrrolo[2,3-b]indol-5-ol, 1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethyl-, methylcarbamate (ester), (3aS-cis)-.
57578	beta-Propiolactone.
57647	Benzoic acid, 2-hydroxy-, compd. with (3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethylpyrrolo[2,3-b]indol-5-yl methylcarbamate ester (1:1).
	Physostigmine salicylate.
57749	Chlordane.
	Chlordane, alpha & gamma isomers.
	CHLORDANE (TECHNICAL MIXTURE AND METABOLITES).
	4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-.
57976	Benz[a]anthracene, 7,12-dimethyl-.
	7,12-Dimethylbenz[a]anthracene.
58899	γ-BHC.
	Cyclohexane, 1,2,3,4,5,6-hexachloro-(1α,2α,3β,4α,5α,6β)-.
	Lindane.
	Lindane (all isomers).
58902	Phenol, 2,3,4,6-tetrachloro-.
	2,3,4,6-Tetrachlorophenol.
59507	p-Chloro-m-cresol.
	Phenol, 4-chloro-3-methyl-.
59892	N-Nitrosomorpholine.
60004	Ethylenediamine-tetraacetic acid (EDTA).
60117	Benzenamine, N,N-dimethyl-4-(phenylazo)-.
	Dimethyl aminoazobenzene.
	p-Dimethylaminoazobenzene.
60297	Ethane, 1,1′-oxybis-.
	Ethyl ether.
60344	Hydrazine, methyl-.
	Methyl hydrazine.
60355	Acetamide.
60515	Dimethoate.
	Phosphorodithioic acid, O,O-dimethyl S-[2(methylamino)-2-oxoethyl] ester.
60571	Dieldrin.
	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2, 2a,3,6,6a,7,7a-octahydro-, (1aalpha,2beta,2aalpha,3beta,6beta, 6aalpha,7beta, 7aalpha)-.
61825	Amitrole.
	1H-1,2,4-Triazol-3-amine.
62384	Mercury, (acetato-O)phenyl-.
	Phenylmercury acetate.
62442	Acetamide, N-(4-ethoxyphenyl)-.
	Phenacetin.
62500	Ethyl methanesulfonate.
	Methanesulfonic acid, ethyl ester.
62533	Aniline.
	Benzenamine.
62555	Ethanethioamide.
	Thioacetamide.
62566	Thiourea.
62737	Dichlorvos.
62748	Acetic acid, fluoro-, sodium salt.
	Fluoroacetic acid, sodium salt.
62759	Methanamine, N-methyl-N-nitroso-.
	N-Nitrosodimethylamine.
63252	Carbaryl.
	1-Naphthalenol, methylcarbamate.
64006	m-Cumenyl methylcarbamate.
	3-Isopropylphenyl N-methylcarbamate.
	Phenol, 3-(1-methylethyl)-, methyl carbamate.
64006	Phenol, 3-(1-methylethyl)-, methyl carbamate (m-Cumenyl methylcarbamate).
64186	Formic acid.
64197	Acetic acid.
64675	Diethyl sulfate.
65850	Benzoic acid.
66751	Uracil mustard.
	2,4-(1H,3H)-Pyrimidinedione, 5-[bis(2-chloroethyl) amino]-.
67561	Methanol.
	Methyl alcohol.
67641	Acetone.
	2-Propanone.
67663	Chloroform.
	Methane, trichloro-.
67721	Ethane, hexachloro-.
	Hexachloroethane.
68122	Dimethylformamide.
70257	Guanidine, N-methyl-N′-nitro-N-nitroso-.
	MNNG.
70304	Hexachlorophene.
	Phenol, 2,2′-methylenebis[3,4,6-tri- chloro-.
71363	n-Butyl alcohol.
	1-Butanol.
71432	Benzene.
71556	Ethane, 1,1,1-trichloro-.
	Methyl chloroform.
	1,1,1-Trichloroethane.
72208	Endrin.
	Endrin, & metabolites.
	2,7:3.6-Dimethanonaphth[2,3-b]oxirene,3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aalpha,2beta,2abeta,3alpha, 6alpha,6abeta,7beta,7aalpha)-, & metabolites.
72435	Benzene, 1,1′-(2,2,2-trichloroethylidene)bis[4-methoxy-.
	Methoxychlor.
72548	Benzene, 1,1′-(2,2-dichloroethylidene)bis[4-chloro-.
	DDD.
	TDE.
	4,4′-DDD.
72559	DDE
	4,4′-DDE.
72571	Trypan blue.
	2,7-Naphthalenedisulfonic acid, 3,3′-[(3,3′-dimethyl-(l,1′-biphenyl)-4,4′-diyl)-bis(azo)]bis(5-amino-4-hydroxy)-tetrasodium salt.
74839	Bromomethane.
	Methane, bromo-.
	Methyl bromide.
74873	Chloromethane.
	Methane, chloro-.
	Methyl chloride.
74884	Iodomethane
	Methane, iodo-.
	Methyl iodide.
74895	Monomethylamine.
74908	Hydrocyanic acid.
	Hydrogen cyanide.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
74931	Methanethiol.
	Methyl mercaptan.
	Thiomethanol.
74953	Methane, dibromo-.
	Methylene bromide.
75003	Chloroethane.
	Ethyl chloride.
75014	Ethene, chloro-.
	Vinyl chloride.
75047	Monoethylamine.
75058	Acetonitrile.
75070	Acetaldehyde.
	Ethanal.
75092	Dichloromethane.
	Methane, dichloro-.
	Methylene chloride.
75150	Carbon disulfide.
75207	Calcium carbide.
75218	Ethylene oxide.
	Oxirane.
75252	Bromoform.
	Methane, tribromo-.
75274	Dichlorobromomethane.
75343	Ethane, 1,1-dichloro-.
	Ethylidene dichloride.
	1,1-Dichloroethane.
75354	Ethene, 1,1-dichloro-.
	Vinylidene chloride.
	1,1-Dichloroethylene.
75365	Acetyl chloride.
75445	Carbonic dichloride.
	Phosgene.
75503	Trimethylamine.
75558	Aziridine, 2-methyl-.
	2-Methyl aziridine.
	1,2-Propylenimine.
75569	Propylene oxide.
75605	Arsinic acid, dimethyl-.
	Cacodylic acid.
75649	tert-Butylamine.
75694	Methane, trichlorofluoro-.
	Trichloromonofluoromethane.
75718	Dichlorodifluoromethane.
	Methane, dichlorodifluoro-.
75865	Acetone cyanohydrin.
	Propanenitrile, 2-hydroxy-2-methyl-.
	2-Methyllactonitrile.
75876	Acetaldehyde, trichloro-.
	Chloral.
75990	2,2-Dichloropropionic acid.
76017	Ethane, pentachloro-.
	Pentachloroethane.
76448	Heptachlor.
	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-.
77474	Hexachlorocyclopentadiene.
	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexa- chloro-.
77781	Dimethyl sulfate.
	Sulfuric acid, dimethyl ester.
78002	Plumbane, tetraethyl-.
	Tetraethyl lead.
78591	Isophorone.
78795	Isoprene.
78819	iso-Butylamine.
78831	Isobutyl alcohol.
	1-Propanol, 2-methyl-.
78875	Propane, 1,2-dichloro-.
	Propylene dichloride.
	1,2-Dichloropropane.
78886	2,3-Dichloropropene.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
78933	2-Butanone.
	MEK.
	Methyl ethyl ketone.
78999	1,1-Dichloropropane.
79005	Ethane, 1,1,2-trichloro-.
	1,1,2-Trichloroethane.
79016	Ethene, trichloro-.
	Trichloroethylene.
79061	Acrylamide.
	2-Propenamide.
79094	Propionic acid.
79107	Acrylic acid.
	2-Propenoic acid.
79118	Chloroacetic acid.
79196	Hydrazinecarbothioamide.
	Thiosemicarbazide.
79221	Carbonochloridic acid, methyl ester.
	Methyl chlorocarbonate.
79312	iso-Butyric acid.
79345	Ethane, 1,1,2,2-tetrachloro-.
	1,1,2,2-Tetrachloroethane.
79447	Carbamic chloride, dimethyl-.
	Dimethylcarbamoyl chloride.
79469	Propane, 2-nitro-.
	2-Nitropropane.
80159	alpha,alpha-Dimethylbenzylhydroperoxide.
	Hydroperoxide, 1-methyl-1-phenylethyl-.
80626	Methyl methacrylate.
	2-Propenoic acid, 2-methyl-, methyl ester.
81812	Warfarin, & salts.
	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, & salts.
82688	Benzene, pentachloronitro-.
	PCNB.
	Pentachloronitrobenzene.
	Quintobenzene.
83329	Acenaphthene.
84662	Diethyl phthalate.
	1,2-Benzenedicarboxylic acid, diethyl ester.
84742	Di-n-butyl phthalate.
	Dibutyl phthalate.
	n-Butyl phthalate.
	1,2-Benzenedicarboxylic acid, dibutyl ester.
85007	Diquat.
85018	Phenanthrene.
85449	Phthalic anhydride.
	1,3-Isobenzofurandione.
85687	Butyl benzyl phthalate.
86306	N-Nitrosodiphenylamine.
86500	Guthion.
86737	Fluorene.
86884	alpha-Naphthylthiourea.
	Thiourea, 1-naphthalenyl-.
87650	Phenol, 2,6-dichloro-.
	2,6-Dichlorophenol.
87683	Hexachlorobutadiene.
	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-.
87865	Pentachlorophenol.
	Phenol, pentachloro-.
88062	Phenol, 2,4,6-trichloro-.
	2,4,6-Trichlorophenol.
88722	o-Nitrotoluene.
88755	o-Nitrophenol.
	2-Nitrophenol.
88857	Dinoseb.
	Phenol, 2-(1-methylpropyl)-4,6-dinitro-.
90040	o-Anisidine.
91087	Benzene, 1,3-diisocyanatomethyl-.
	Toluene diisocyanate.
	2,4-Toluene diisocyanate.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
91203	Naphthalene.
91225	Quinoline.
91587	beta-Chloronaphthalene.
	Naphthalene, 2-chloro-.
	2-Chloronaphthalene.
91598	beta-Naphthylamine.
	2-Naphthalenamine.
91667	N,N-Diethylaniline.
91805	Methapyrilene.
	1,2-Ethanediamine, N,N-dimethyl-N′-2-pyridinyl-N′- (2-thienylmethyl)-.
91941	[1,1′-Biphenyl]-4,4′-diamine,3,3′-dichloro-.
	3,3′-Dichlorobenzidine.
92524	Biphenyl.
92671	4-Aminobiphenyl.
92875	Benzidine.
	[1,1′-Biphenyl]-4,4′-diamine.
92933	4-Nitrobiphenyl.
	Propanoic acid, 2-(2,4,5-trichlorophenoxy)-.
	Silvex (2,4,5-TP).
	2,4,5-TP acid.
93765	Acetic acid, (2,4,5-trichlorophenoxy)-.
93721	2,4,5-T.
	2,4,5-T acid.
93798	2,4,5-T esters.
94111	2,4-D Ester.
94586	Dihydrosafrole.
	1,3-Benzodioxole, 5-propyl-.
94597	Safrole.
	1,3-Benzodioxole, 5-(2-propenyl)-.
94791	2,4-D Ester.
94804	2,4-D Ester.
95476	o-Xylene.
95487	o-Cresol.
95501	Benzene, 1,2-dichloro-.
	o-Dichlorobenzene.
	1,2-Dichlorobenzene.
95534	Benzenamine, 2-methyl-.
	o-Toluidine.
95578	o-Chlorophenol.
	Phenol, 2-chloro-.
	2-Chlorophenol.
95807	Benzenediamine, ar-methyl-.
	Toluenediamine.
	2,4-Toluene diamine.
95943	Benzene, 1,2,4,5-tetrachloro-.
	1,2,4,5-Tetrachlorobenzene.
95954	Phenol, 2,4,5-trichloro-.
	2,4,5-Trichlorophenol.
96093	Styrene oxide.
96128	Propane, 1,2-dibromo-3-chloro-.
	1,2-Dibromo-3-chloropropane.
96457	Ethylenethiourea.
	2-Imidazolidinethione.
97632	Ethyl methacrylate.
	2-Propenoic acid, 2-methyl-, ethyl ester.
98011	Furfural.
	2-Furancarboxaldehyde.
98077	Benzene, (trichloromethyl)-.
	Benzotrichloride.
98099	Benzenesulfonic acid chloride.
	Benzenesulfonyl chloride.
98828	Benzene, (1-methylethyl)-.
	Cumene.
98862	Acetophenone.
	Ethanone, 1-phenyl-.
98873	Benzal chloride.
	Benzene, (dichloromethyl)-.
98884	Benzoyl chloride.
98953	Benzene, nitro-.
	Nitrobenzene.
99081	m-Nitrotoluene.
99354	Benzene, 1,3,5-trinitro-.
	1,3,5-Trinitrobenzene.
99558	Benzenamine, 2-methyl-5-nitro-.
	5-Nitro-o-toluidine.
99650	m-Dinitrobenzene.
99990	p-Nitrotoluene.
100016	Benzenamine, 4-nitro-.
	p-Nitroaniline.
100027	p-Nitrophenol.
	Phenol, 4-nitro-.
	4-Nitrophenol.
100254	p-Dinitrobenzene.
100414	Ethylbenzene.
100425	Styrene.
100447	Benzene, (chloromethyl)-.
	Benzyl chloride.
100470	Benzonitrile.
100754	N-Nitrosopiperidine.
	Piperidine, 1-nitroso-.
101144	Benzenamine, 4,4′-methylenebis[2-chloro-.
	4,4′-Methylenebis(2-chloroaniline).
101279	Barban.
	Carbamic acid, (3-chlorophenyl)-, 4-chloro-2-butynyl ester.
101553	Benzene, 1-bromo-4-phenoxy-.
	4-Bromophenyl phenyl ether.
101688	MDI.
	Methylene diphenyl diisocyanate.
101779	4,4′-Methylenedianiline.
103855	Phenylthiourea.
	Thiourea, phenyl-.
105464	sec-Butyl acetate.
105679	Phenol, 2,4-dimethyl-.
	2,4-Dimethylphenol.
106423	p-Xylene.
106445	p-Cresol.
106467	Benzene, 1,4-dichloro-.
	p-Dichlorobenzene.
	1,4-Dichlorobenzene.
106478	Benzenamine, 4-chloro-.
	p-Chloroaniline.
106490	Benzenamine, 4-methyl-.
	p-Toluidine.
106503	p-Phenylenediamine.
106514	p-Benzoquinone.
	2,5-Cyclohexadiene-1,4-dione.
	Quinone.
106887	1,2-Epoxybutane.
106898	1-Chloro-2,3-epoxypropane.
	Epichlorohydrin.
	Oxirane, (chloromethyl)-.
106934	Dibromoethane.
	Ethane, 1,2-dibromo-.
	Ethylene dibromide.
106990	1,3-Butadiene.
107028	Acrolein.
	2-Propenal.
107051	Allyl chloride.
107062	Ethane, 1,2-dichloro-.
	Ethylene dichloride.
	1,2-Dichloroethane.
107108	n-Propylamine.
	1-Propanamine.
107120	Ethyl cyanide.
	Propanenitrile.
107131	Acrylonitrile.
	2-Propenenitrile.
107153	Ethylenediamine.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
107186	Allyl alcohol.
	2-Propen-1-ol.
107197	Propargyl alcohol.
	2-Propyn-1-ol.
107200	Acetaldehyde, chloro-.
	Chloroacetaldehyde.
107211	Ethylene glycol.
107302	Chloromethyl methyl ether.
	Methane, chloromethoxy-.
107493	Diphosphoric acid, tetraethyl ester.
	Tetraethyl pyrophosphate.
107926	Butyric acid.
108054	Vinyl acetate.
	Vinyl acetate monomer.
108101	Hexone.
	Methyl isobutyl ketone.
	4-Methyl-2-pentanone.
108247	Acetic anhydride.
108316	Maleic anhydride.
	2,5-Furandione.
108383	m-Xylene.
108394	m-Cresol.
108463	Resorcinol.
	1,3-Benzenediol.
108601	Dichloroisopropyl ether.
	Propane, 2,2″-oxybis[2-chloro-.
108883	Benzene, methyl-.
	Toluene.
108907	Benzene, chloro-.
	Chlorobenzene.
108941	Cyclohexanone.
108952	Phenol.
108985	Benzenethiol.
	Thiophenol.
109068	Pyridine, 2-methyl-.
	2-Picoline.
109739	Butylamine.
109773	Malononitrile.
	Propanedinitrile.
109897	Diethylamine.
109999	Furan, tetrahydro-.
	Tetrahydrofuran.
110009	Furan.
	Furfuran.
110167	Maleic acid.
110178	Fumaric acid.
110190	iso-Butyl acetate.
110543	Hexane.
110758	Ethene, (2-chloroethoxy)-.
	2-Chloroethyl vinyl ether.
110805	Ethanol, 2-ethoxy-.
	Ethylene glycol monoethyl ether.
110827	Benzene, hexahydro-.
	Cyclohexane.
110861	Pyridine.
111422	Diethanolamine.
111444	Bis(2-chloroethyl) ether.
	Dichloroethyl ether.
	Ethane, 1,1′-oxybis[2-chloro-.
111546	Carbamodithioic acid, 1,2-ethanediylbis-, salts & esters.
	Ethylenebisdithiocarbamic acid, salts & esters.
111911	Bis(2-chloroethoxy) methane.
	Dichloromethoxyethane.
	Ethane, 1,1′-[methylenebis(oxy)]bis(2-chloro-.
114261	Phenol, 2-(1-methylethoxy)-, methylcarbamate.
	Propoxur (Baygon).
115026	Azaserine.
	L-Serine, diazoacetate (ester).
115297	Endosulfan.
	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide.
115322	Dicofol.
116063	Aldicarb.
	Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime.
117806	Dichlone.
117817	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester.
	Bis(2-ethylhexyl)phthalate.
	DEHP.
	Diethylhexyl phthalate.
117840	Di-n-octyl phthalate.
	1,2-Benzenedicarboxylic acid, dioctyl ester.
118741	Benzene, hexachloro-.
	Hexachlorobenzene.
119380	Carbamic acid, dimethyl-, 3-methyl-1-(1-methylethyl)-1H-pyrazol-5-yl ester.
	Isolan.
119904	[1,1′-Biphenyl]-4,4′-diamine,3,3′-dimethoxy-.
	3,3′-Dimethoxybenzidine.
119937	[1,1′-Biphenyl]-4,4′-diamine,3,3′- dimethyl-.
	3,3′-Dimethylbenzidine.
120127	Anthracene.
120581	Isosafrole.
	1,3-Benzodioxole, 5-(1-propenyl)-.
120809	Catechol.
120821	1,2,4-Trichlorobenzene.
120832	Phenol, 2,4-dichloro-.
	2,4-Dichlorophenol.
121142	Benzene, 1-methyl-2,4-dinitro-.
	2,4-Dinitrotoluene.
121211	Pyrethrins.
121299	Pyrethrins.
121448	Ethanamine, N,N-diethyl-.
	Triethylamine.
121697	N,N-Dimethylaniline.
121755	Malathion.
122098	alpha,alpha-Dimethylphenethylamine.
	Benzeneethanamine, alpha,alpha-dimethyl-.
122429	Carbamic acid, phenyl-, 1-methylethyl ester.
	Propham.
122667	Hydrazine, 1,2-diphenyl-.
	1,2-Diphenylhydrazine.
123319	Hydroquinone.
123331	Maleic hydrazide.
	3,6-Pyridazinedione, 1,2-dihydro-.
123386	Propionaldehyde.
123626	Propionic anhydride.
123637	Paraldehyde.
	1,3,5-Trioxane, 2,4,6-trimethyl-.
123739	Crotonaldehyde.
	2-Butenal.
123864	Butyl acetate.
123911	1,4-Diethyleneoxide.
	1,4-Dioxane.
123922	iso-Amyl acetate.
124049	Adipic acid.
124403	Dimethylamine.
	Methanamine, N-methyl-.
124414	Sodium methylate.
124481	Chlorodibromomethane.
126727	Tris(2,3-dibromopropyl) phosphate.
	1-Propanol, 2,3-dibromo-, phosphate (3:1).
126987	Methacrylonitrile.
	2-Propenenitrile, 2-methyl-.
126998	Chloroprene.
127184	Ethene, tertrachloro-.
	Perchloroethylene.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
	Tetrachloroethylene.
127822	Zinc phenolsulfonate.
129000	Pyrene.
130154	1,4-Naphthalenedione.
	1,4-Naphthoquinone.
131113	Dimethyl phthalate.
	1,2-Benzenedicarboxylic acid, dimethyl ester.
131748	Ammonium picrate.
	Phenol, 2,4,6-trinitro-, ammonium salt.
131895	Phenol, 2-cyclohexyl-4,6-dinitro-.
	2-Cyclohexyl-4,6-dinitrophenol.
132649	Dibenzofuran.
133062	Captan.
133904	Chloramben.
134327	alpha-Naphthylamine.
	1-Naphthalenamine.
137268	Thioperoxydicarbonic diamide ([H2N)C(S)]2S2, tetramethyl-.
	Thiram.
137304	Zinc, bis(dimethylcarbamodithioato-S,S')-.
	Ziram.
140885	Ethyl acrylate.
	2-Propenoic acid, ethyl ester.
141786	Acetic acid, ethyl ester.
	Ethyl acetate.
142289	1,3-Dichloropropane.
142712	Cupric acetate.
142847	Dipropylamine.
	1-Propanamine, N-propyl-.
143339	Sodium cyanide Na(CN).
143500	Kepone.
	1,3,4-Metheno-2H-cyclobuta[cd]pentalen-2-one,1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-.
145733	Endothall.
	7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid.
148823	L-Phenylalanine, 4-[bis(2-chloroethyl)amino]-.
	Melphalan.
151508	Potassium cyanide K(CN).
151564	Aziridine.
	Ethylenimine.
152169	Diphosphoramide, octamethyl-.
	Octamethylpyrophosphoramide.
156605	Ethene, 1,2-dichloro- (E).
	1,2-Dichloroethylene.
156627	Calcium cyanamide.
189559	Benzo[rst]pentaphene.
	Dibenzo[a,i]pyrene.
191242	Benzo[ghi]perylene.
193395	Indeno(1,2,3-cd)pyrene.
205992	Benzo[b]fluoranthene.
206440	Fluoranthene.
207089	Benzo(k)fluoranthene.
208968	Acenaphthylene.
218019	Chrysene.
225514	Benz[c]acridine.
297972	O,O-Diethyl O-pyrazinyl phosphorothioate.
	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester.
298000	Methyl parathion.
	Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester.
298022	Phorate.
	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio) methyl] ester.
298044	Disulfoton.
	Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
300765	Naled.
301042	Acetic acid, lead(2+) salt.
	Lead acetate.
302012	Hydrazine.
303344	Lasiocarpine.
	2-Butenoic acid, 2-methyl-, 7-[[2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl-1-oxobutoxy]methyl]-2,3,5,7a-tetrahydro-1H-pyrrolizin-1-yl ester, [1S-[1alpha(Z),7(2S*,3R*), 7aalpha]]-.
305033	Benzenebutanoic acid, 4-[bis(2-chloroethyl)amino]-.
	Chlorambucil.
309002	Aldrin.
	1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-, (1alpha,4alpha,4abeta,5alpha,8alpha, 8abeta)-.
311455	Diethyl-p-nitrophenyl phosphate.
	Phosphoric acid, diethyl 4-nitrophenyl ester.
315184	Mexacarbate.
	Phenol, 4-(dimethylamino)-3,5-dimethyl-, methylcarbamate (ester).
319846	alpha—BHC.
319857	beta—BHC.
319868	delta—BHC.
329715	2,5-Dinitrophenol.
330541	Diuron.
333415	Diazinon.
334883	Diazomethane.
353504	Carbon oxyfluoride.
	Carbonic difluoride.
357573	Brucine.
	Strychnidin-10-one, 2,3-dimethoxy-.
460195	Cyanogen.
	Ethanedinitrile.
463581	Carbonyl sulfide.
465736	Isodrin.
	1,4:5,8-Dimethanonaphthalene,1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-, (1alpha,4alpha,4abeta,5beta,8beta, 8abeta)-.
492808	Auramine.
	Benzenamine, 4,4′-carbonimidoylbis[N,N-dimethyl-.
494031	Chlornaphazine.
	Naphthalenamine, N,N′-bis(2-chloroethyl)-.
496720	Benzenediamine, ar-methyl-.
	Toluenediamine.
	2,4-Toluene diamine.
504245	4-Aminopyridine.
	4-Pyridinamine.
504609	1-Methylbutadiene.
	1,3-Pentadiene.
506616	Argentate(1-), bis(cyano-C)-, potassium.
	Potassium silver cyanide.
506649	Silver cyanide Ag(CN).
506683	Cyanogen bromide (CN)Br.
506774	Cyanogen chloride (CN)Cl.
506876	Ammonium carbonate.
506967	Acetyl bromide.
509148	Methane, tetranitro-.
	Tetranitromethane.
510156	Benzeneacetic acid, 4-chloro-α-(4-chlorophenyl)-α-hydroxy-, ethyl ester.
	Chlorobenzilate.
513495	sec-Butylamine.
528290	o-Dinitrobenzene.
532274	2-Chloroacetophenone.
534521	4,6-Dinitro-o-cresol, and salts.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
	Phenol, 2-methyl-4,6-dinitro-, & salts.
540738	Hydrazine, 1,2-dimethyl-.
	1,2-Dimethylhydrazine.
540841	2,2,4-Trimethylpentane.
540885	tert-Butyl acetate.
541093	Uranyl acetate.
541537	Dithiobiuret.
	Thioimidodicarbonic diamide [(H2N)C(S)]2NH.
541731	Benzene, 1,3-dichloro-.
	m-Dichlorobenzene.
	1,3-Dichlorobenzene.
542621	Barium cyanide.
542756	1-Propene, 1,3-dichloro-.
	1,3-Dichloropropene.
542767	Propanenitrile, 3-chloro-.
	3-Chloropropionitrile.
542881	Bis(chloromethyl)ether.
	Dichloromethyl ether.
	Methane, oxybis(chloro-.
543908	Cadmium acetate.
544183	Cobaltous formate.
544923	Copper cyanide Cu(CN).
554847	m-Nitrophenol.
557197	Nickel cyanide $Ni(CN)_2$.
557211	Zinc cyanide $Zn(CN)_2$.
	Zinc cyanide Zn(CN)2.
557346	Zinc acetate.
557415	Zinc formate.
563122	Ethion.
563688	Acetic acid, thallium(1+) salt.
	Thallium(I) acetate.
573568	2,6-Dinitrophenol.
584849	Benzene, 1,3-diisocyanatomethyl-.
	Toluene diisocyanate.
	2,4-Toluene diisocyanate.
591082	Acetamide, N-(aminothioxomethyl)-.
	1-Acetyl-2-thiourea.
592018	Calcium cyanide $Ca(CN)_2$.
592041	Mercuric cyanide.
592858	Mercuric thiocyanate.
592870	Lead thiocyanate.
593602	Vinyl bromide.
594423	Methanesulfenyl chloride, trichloro-.
	Trichloromethanesulfenyl chloride.
598312	Bromoacetone.
	2-Propanone, 1-bromo-.
606202	Benzene, 2-methyl-1,3-dinitro-.
	2,6-Dinitrotoluene.
608731	HEXACHLOROCYCLOHEXANE (all isomers).
608935	Benzene, pentachloro-.
	Pentachlorobenzene.
609198	3,4,5-Trichlorophenol.
610399	3,4-Dinitrotoluene.
615532	Carbamic acid, methylnitroso-, ethyl ester.
	N-Nitroso-N-methylurethane.
621647	Di-n-propylnitrosamine.
	1-Propanamine, N-nitroso-N-propyl-.
624839	Methane, isocyanato-.
	Methyl isocyanate.
625161	tert-Amyl acetate.
626380	sec-Amyl acetate.
628637	Amyl acetate.
628864	Fulminic acid, mercury(2+)salt.
	Mercury fulminate.
630104	Selenourea.
630206	Ethane, 1,1,1,2-tetrachloro-.
	1,1,1,2-Tetrachloroethane.
631618	Ammonium acetate.
636215	Benzenamine, 2-methyl-, hydrochloride.
	o-Toluidine hydrochloride.
640197	Acetamide, 2-fluoro-.
	Fluoroacetamide.
644644	Carbamic acid, dimethyl-,1-[(dimethylamino)carbonyl]-5-methyl-1H-pyrazol-3-yl ester.
	Dimetilan.
680319	Hexamethylphosphoramide.
684935	N-Nitroso-N-methylurea.
	Urea, N-methyl-N-nitroso-.
692422	Arsine, diethyl-.
	Diethylarsine.
696286	Arsonous dichloride, phenyl-.
	Dichlorophenylarsine.
757584	Hexaethyl tetraphosphate.
	Tetraphosphoric acid, hexaethyl ester.
759739	N-Nitroso-N-ethylurea.
	Urea, N-ethyl-N-nitroso-.
764410	1,4-Dichloro-2-butene.
	2-Butene, 1,4-dichloro-.
765344	Glycidylaldehyde.
	Oxiranecarboxyaldehyde.
815827	Cupric tartrate.
822060	Hexamethylene-1,6-diisocyanate.
823405	Benzenediamine, ar-methyl-.
	Toluenediamine.
	2,4-Toluene diamine.
924163	N-Nitrosodi-n-butylamine.
	1-Butanamine, N-butyl-N-nitroso-.
930552	N-Nitrosopyrrolidine.
	Pyrrolidine, 1-nitroso-.
933755	2,3,6-Trichlorophenol.
933788	2,3,5-Trichlorophenol.
959988	alpha-Endosulfan.
1024573	Heptachlor epoxide.
1031078	Endosulfan sulfate.
1066304	Chromic acetate.
1066337	Ammonium bicarbonate.
1072351	Lead stearate.
1111780	Ammonium carbamate.
1116547	Ethanol, 2,2′-(nitrosoimino)bis-.
	N-Nitrosodiethanolamine.
1120714	1,2-Oxathiolane, 2,2-dioxide.
	1,3-Propane sultone.
1129415	Carbamic acid, methyl-, 3-methylphenyl ester.
	Metolcarb.
1185575	Ferric ammonium citrate.
1194656	Dichlobenil.
1300716	Xylenol.
1303282	Arsenic oxide As2O5.
	Arsenic pentoxide.
1303328	Arsenic disulfide.
1303339	Arsenic trisulfide.
1309644	Antimony trioxide.
1310583	Potassium hydroxide.
1310732	Sodium hydroxide.
1314325	Thallic oxide.
	Thallium oxide Tl2O3.
1314621	Vanadium oxide V2O5.
	Vanadium pentoxide.
1314803	Phosphorus pentasulfide.
	Phosphorus sulfide.
	Sulfur phosphide.
1314847	Zinc phosphide Zn_3P_2.
1314870	Lead sulfide.
1319728	2,4,5-T amines.
1319773	Cresol (cresylic acid).
	Cresols (isomers and mixture).
	Cresylic acid (isomers and mixture).
	Phenol, methyl-.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
1320189	2,4-D Ester.
1321126	Nitrotoluene.
1327533	Arsenic oxide As2O3.
	Arsenic trioxide.
1330207	Benzene, dimethyl-.
	Xylene.
	Xylene (mixed).
	Xylenes (isomers and mixture).
1332076	Zinc borate.
1332214	Asbestos.
1333831	Sodium bifluoride.
1335326	Lead subacetate.
	Lead, bis(acetato-O)tetrahydroxytri.
1336216	Ammonium hydroxide.
1336363	Aroclors.
	PCBs.
	POLYCHLORINATED BIPHENYLS.
1338234	Methyl ethyl ketone peroxide.
	2-Butanone peroxide.
1338245	Naphthenic acid.
1341497	Ammonium bifluoride.
1464535	1,2:3,4-Diepoxybutane.
	2,2′-Bioxirane.
1563388	7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-.
	Carbofuran phenol.
1563662	7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate.
	Carbofuran.
1582098	Trifluralin.
1615801	Hydrazine, 1,2-diethyl-.
	N,N′-Diethylhydrazine.
1634044	Methyl tert-butyl ether.
1646884	Aldicarb sulfone.
	Propanal, 2-methyl-2-(methyl-sulfonyl)-, O-[(methylamino)carbonyl] oxime.
1746016	TCDD.
	2,3,7,8-Tetrachlorodibenzo-p-dioxin.
1762954	Ammonium thiocyanate.
1863634	Ammonium benzoate.
1888717	Hexachloropropene.
	1-Propene, 1,1,2,3,3,3-hexachloro-.
1918009	Dicamba.
1928387	2,4-D Ester.
1928478	2,4,5-T esters.
1928616	2,4-D Ester.
1929733	2,4-D Ester.
2008460	2,4,5-T amines.
2032657	Mercaptodimethur.
	Methiocarb.
	Phenol, (3,5-dimethyl-4-(methylthio)-, methylcarbamate.
2303164	Carbamothioic acid, bis(1-methylethyl)-, S-(2,3-dichloro-2-propenyl) ester.
	Diallate.
2303175	Carbamothioic acid, bis(1-methylethyl)-, S-(2,3,3-trichloro-2-propenyl) ester.
	Triallate.
2312358	Propargite.
2545597	2,4,5-T esters.
2631370	Phenol, 3-methyl-5-(1-methylethyl)-, methyl carbamate.
	Promecarb.
2763964	3(2H)-Isoxazolone, 5-(aminomethyl)-.
	5-(Aminomethyl)-3-isoxazolol.
2764729	Diquat
2921882	Chlorpyrifos.
2944674	Ferric ammonium oxalate.
2971382	2,4-D Ester.
3012655	Ammonium citrate, dibasic.
3164292	Ammonium tartrate.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
3165933	Benzenamine, 4-chloro-2-methyl-, hydrochloride.
	4-Chloro-o-toluidine, hydrochloride.
3251238	Cupric nitrate.
3288582	O,O-Diethyl S-methyl dithiophosphate.
	Phosphorodithioic acid, O,O-diethyl S-methyl ester.
3486359	Zinc carbonate.
3547044	DDE.
3689245	Tetraethyldithiopyrophosphate.
	Thiodiphosphoric acid, tetraethyl ester.
3813147	2,4,5-T amines.
4170303	Crotonaldehyde.
	2-Butenal.
4549400	N-Nitrosomethylvinylamine.
	Vinylamine, N-methyl-N-nitroso-.
5344821	Thiourea, (2-chlorophenyl)-.
	1-(o-Chlorophenyl)thiourea.
5893663	Cupric oxalate.
5952261	Ethanol, 2,2'-oxybis-, dicarbamate.
	Diethylene glycol, dicarbamate.
5972736	Ammonium oxalate.
6009707	Ammonium oxalate.
6369966	2,4,5-T amines.
6369977	2,4,5-T amines.
6533739	Carbonic acid, dithallium(1+) salt.
	Thallium(I) carbonate.
7005723	4-Chlorophenyl phenyl ether.
7421934	Endrin aldehyde.
7428480	Lead stearate.
7439921	Lead.
7439976	Mercury.
7440020	Nickel.
7440224	Silver.
7440235	Sodium.
7440280	Thallium.
7440360	Antimony.
7440382	Arsenic.
7440417	Beryllium.
	Beryllium powder.
7440439	Cadmium.
7440473	Chromium.
7440508	Copper.
7440666	Zinc.
7446084	Selenium dioxide.
	Selenium oxide.
7446142	Lead sulfate.
7446186	Sulfuric acid, dithallium(1+) salt.
	Thallium(I) sulfate.
7446277	Lead phosphate.
	Phosphoric acid, lead(2+) salt (2:3).
7447394	Cupric chloride.
7488564	Selenium sulfide SeS_2.
7550450	Titanium tetrachloride.
7558794	Sodium phosphate, dibasic.
7601549	Sodium phosphate, tribasic.
7631892	Sodium arsenate.
7631905	Sodium bisulfite.
7632000	Sodium nitrite.
7645252	Lead arsenate.
7646857	Zinc chloride.
7647010	Hydrochloric acid.
	Hydrogen chloride.
7647189	Antimony pentachloride.
7664382	Phosphoric acid.
7664393	Hydrofluoric acid.
	Hydrogen fluoride.
7664417	Ammonia.
7664939	Sulfuric acid.
7681494	Sodium fluoride.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
7681529	Sodium hypochlorite.
7697372	Nitric acid.
7699458	Zinc bromide.
7705080	Ferric chloride.
7718549	Nickel chloride.
7719122	Phosphorus trichloride.
7720787	Ferrous sulfate.
7722647	Potassium permanganate.
7723140	Phosphorus.
7733020	Zinc sulfate.
7738945	Chromic acid.
7758294	Sodium phosphate, tribasic.
7758943	Ferrous chloride.
7758954	Lead chloride.
7758987	Cupric sulfate.
7761888	Silver nitrate.
7773060	Ammonium sulfamate.
7775113	Sodium chromate.
7778394	Arsenic acid H_3AsO_4.
7778441	Calcium arsenate.
7778509	Potassium bichromate.
7778543	Calcium hypochlorite.
7779864	Zinc hydrosulfite.
7779886	Zinc nitrate.
7782414	Fluorine.
7782492	Selenium.
7782505	Chlorine.
7782630	Ferrous sulfate.
7782823	Sodium selenite.
7782867	Mercurous nitrate.
7783008	Selenious acid.
7783064	Hydrogen sulfide H_2S.
7783359	Mercuric sulfate.
7783462	Lead fluoride.
7783495	Zinc fluoride.
7783508	Ferric fluoride.
7783564	Antimony trifluoride.
7784341	Arsenic trichloride.
7784409	Lead arsenate.
7784410	Potassium arsenate.
7784465	Sodium arsenite.
7785844	Sodium phosphate, tribasic.
7786347	Mevinphos.
7786814	Nickel sulfate.
7787475	Beryllium chloride.
7787497	Beryllium fluoride.
7787555	Beryllium nitrate.
7788989	Ammonium chromate.
7789006	Potassium chromate.
7789062	Strontium chromate.
7789095	Ammonium bichromate.
7789426	Cadmium bromide.
7789437	Cobaltous bromide.
7789619	Antimony tribromide.
7790945	Chlorosulfonic acid.
7791120	Thallium chloride TlCl.
7803512	Hydrogen phosphide. Phosphine.
7803556	Ammonium vanadate. Vanadic acid, ammonium salt.
8001352	Chlorinated camphene. Toxaphene.
8003198	Dichloropropane—Dichloropropene (mixture).
8003347	Pyrethrins.
8014957	Sulfuric acid.
10022705	Sodium hypochlorite.
10025873	Phosphorus oxychloride.
10025919	Antimony trichloride.
10026116	Zirconium tetrachloride.
10028225	Ferric sulfate.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
10031591	Sulfuric acid, dithallium(1+) salt. Thallium(I) sulfate.
10039324	Sodium phosphate, dibasic.
10043013	Aluminum sulfate.
10045893	Ferrous ammonium sulfate.
10045940	Mercuric nitrate.
10049055	Chromous chloride.
10099748	Lead nitrate.
10101538	Chromic sulfate.
10101630	Lead iodide.
10101890	Sodium phosphate, tribasic.
10102064	Uranyl nitrate.
10102188	Sodium selenite.
10102439	Nitric oxide. Nitrogen oxide NO.
10102440	Nitrogen dioxide. Nitrogen oxide NO2.
10102451	Nitric acid, thallium(1+) salt. Thallium(I) nitrate.
10102484	Lead arsenate.
10108642	Cadmium chloride.
10124502	Potassium arsenite.
10124568	Sodium phosphate, tribasic.
10140655	Sodium phosphate, dibasic.
10192300	Ammonium bisulfite.
10196040	Ammonium sulfite.
10361894	Sodium phosphate, tribasic.
10380297	Cupric sulfate, ammoniated.
10415755	Mercurous nitrate.
10421484	Ferric nitrate.
10544726	Nitrogen dioxide. Nitrogen oxide NO2.
10588019	Sodium bichromate.
10605217	Carbamic acid, 1H-benzimidazol-2-yl, methyl ester. Carbendazim.
11096825	Aroclor 1260.
11097691	Aroclor 1254.
11104282	Aroclor 1221.
11115745	Chromic acid.
11141165	Aroclor 1232.
12002038	Cupric acetoarsenite.
12039520	Selenious acid, dithallium(1+) salt. Thallium (I) selenite.
12054487	Nickel hydroxide.
12125018	Ammonium fluoride.
12125029	Ammonium chloride.
12135761	Ammonium sulfide.
12672296	Aroclor 1248.
12674112	Aroclor 1016.
12771083	Sulfur monochloride.
13463393	Nickel carbonyl $Ni(CO)_4$, (T–4)-.
13560991	2,4,5-T salts.
13597994	Beryllium nitrate.
13746899	Zirconium nitrate.
13765190	Calcium chromate. Chromic acid H2CrO4, calcium salt.
13814965	Lead fluoborate.
13826830	Ammonium fluoborate.
13952846	sec-Butylamine.
14017415	Cobaltous sulfamate.
14216752	Nickel nitrate.
14258492	Ammonium oxalate.
14307358	Lithium chromate.
14307438	Ammonium tartrate.
14639975	Zinc ammonium chloride.
14639986	Zinc ammonium chloride.
14644612	Zirconium sulfate.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
15339363	Manganese, bis(dimethylcarbamodithioato-S,S')-.
	Manganese dimethyldithiocarbamate.
15699180	Nickel ammonium sulfate.
15739807	Lead sulfate.
15950660	2,3,4-Trichlorophenol.
16721805	Sodium hydrosulfide.
16752775	Ethanimidothioic acid, N-[[(methylamino)carbonyl] oxy]-, methyl ester.
	Methomyl.
16871719	Zinc silicofluoride.
16919190	Ammonium silicofluoride.
16923958	Zirconium potassium fluoride.
17702577	Formparanate.
	Methanimidamide, N,N-dimethyl-N'-[2-methyl-4-[[(methylamino)carbonyl]oxy]phenyl]-.
17804352	Benomyl.
	Carbamic acid, [1-[(butylamino)carbonyl]-1H-benzimidazol-2-yl]-, methyl ester.
18883664	D-Glucose, 2-deoxy-2[[(methylnitrosoamino)-carbonyl]amino]-.
	Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)-, D-.
	Streptozotocin.
20816120	Osmium oxide OsO_4, (T–4)-.
	Osmium tetroxide.
20830813	Daunomycin.
	5,12-Naphthacenedione, 8-acetyl-10-[(3-amino-2,3,6-trideoxy-alpha-L-lyxo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-, (8S-cis)-.
20859738	Aluminum phosphide.
22781233	Bendiocarb.
	1,3-Benzodioxol-4-ol, 2,2-dimethyl-, methyl carbamate.
22961826	Bendiocarb phenol.
	1,3-Benzodioxol-4-ol, 2,2-dimethyl-.
23135220	Ethanimidothioic acid, 2-(dimethylamino)-N-[[(methylamino)carbonyl]oxy]-2-oxo-, methyl ester.
	Oxamyl.
23422539	Methanimidamide, N,N-dimethyl-N'-[3-[[(methylamino)-carbonyl]oxy]phenyl]-, monohydrochloride.
	Formetanate hydrochloride.
23564058	Carbamic acid, [1,2-phenylenebis(iminocarbonothioyl)]bis-, dimethyl ester.
	Thiophanate-methyl.
23950585	Benzamide, 3,5-dichloro-N-(1,1- dimethyl-2-propynyl)-.
	Pronamide.
25154545	Dinitrobenzene (mixed).
25154556	Nitrophenol (mixed).
25155300	Sodium dodecylbenzenesulfonate.
25167822	Trichlorophenol.
25168154	2,4,5-T esters.
25168267	2,4-D Ester.
25321146	Dinitrotoluene.
25321226	Dichlorobenzene.
25376458	Benzenediamine, ar-methyl-.
	Toluenediamine.
	2,4-Toluene diamine.
25550587	Dinitrophenol.
26264062	Calcium dodecylbenzenesulfonate.
26419738	1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-, O-[(methylamino)-carbonyl]oxime.
	Tirpate.
26471625	Benzene, 1,3-diisocyanatomethyl-.
	Toluene diisocyanate.

APPENDIX A TO § 302.4—SEQUENTIAL CAS REGISTRY NUMBER LIST OF CERCLA HAZARDOUS SUBSTANCES—Continued

CASRN	Hazardous substance
	2,4-Toluene diisocyanate.
26628228	Sodium azide.
26638197	Dichloropropane.
26952238	Dichloropropene.
27176870	Dodecylbenzenesulfonic acid.
27323417	Triethanolamine dodecylbenzene sulfonate.
27774136	Vanadyl sulfate.
28300745	Antimony potassium tartrate.
30525894	Paraformaldehyde.
30558431	Ethanimidothioic acid, 2-(dimethylamino)-N-hydroxy-2-oxo-, methyl ester.
	A2213.
32534955	2,4,5-TP esters.
33213659	beta - Endosulfan.
36478769	Uranyl nitrate.
37211055	Nickel chloride.
39196184	Thiofanox.
	2-Butanone, 3,3-dimethyl-1-(methylthio)-,O-[(methylamino)carbonyl] oxime.
42504461	Isopropanolamine dodecylbenzenesulfonate.
52628258	Zinc ammonium chloride.
52652592	Lead stearate.
52740166	Calcium arsenite.
52888809	Carbamothioic acid, dipropyl-, S-(phenylmethyl) ester.
	Prosulfocarb.
53467111	2,4-D Ester.
53469219	Aroclor 1242.
55285148	Carbamic acid, [(dibutylamino)-thio]methyl-, 2,3-dihydro-2,2-dimethyl-7-benzofuranyl ester.
	Carbosulfan.
55488874	Ferric ammonium oxalate.
56189094	Lead stearate.
59669260	Ethanimidothioic acid, N,N'-[thiobis[(methylimino)carbonyloxy]]bis-, dimethyl ester.
	Thiodicarb.
61792072	2,4,5-T esters.

APPENDIX B TO § 302.4—RADIONUCLIDES

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Radionuclides@		1&(3.7E 10)
Actinium-224	89	100 (3.7E 12)
Actinium-225	89	1 (3.7E 10)
Actinium-226	89	10 (3.7E 11)
Actinium-227	89	0.001 (3.7E 7)
Actinium-228	89	10 (3.7E 11)
Aluminum-26	13	10 (3.7E 11)
Americium-237	95	1000 (3.7E 13)
Americium-238	95	100 (3.7E 12)
Americium-239	95	100 (3.7E 12)
Americium-240	95	10 (3.7E 11)
Americium-241	95	0.01 (3.7E 8)
Americium-242m	95	0.01 (3.7E 8)
Americium-242	95	100 (3.7E 12)
Americium-243	95	0.01 (3.7E 8)
Americium-244m	95	1000 (3.7E 13)
Americium-244	95	10 (3.7E 11)
Americium-245	95	1000 (3.7E 13)
Americium-246m	95	1000 (3.7E 13)
Americium-246	95	1000 (3.7E 13)
Antimony-115	51	1000 (3.7E 13)
Antimony-116m	51	100 (3.7E 12)
Antimony-116	51	1000 (3.7E 13)
Antimony-117	51	1000 (3.7E 13)
Antimony-118m	51	10 (3.7E 11)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Antimony-119	51	1000 (3.7E 13)
Antimony-120 (16 min)	51	1000 (3.7E 13)
Antimony-120 (5.76 day)	51	10 (3.7E 11)
Antimony-122	51	10 (3.7E 11)
Antimony-124m	51	1000 (3.7E 13)
Antimony-124	51	10 (3.7E 11)
Antimony-125	51	10 (3.7E 11)
Antimony-126m	51	1000 (3.7E 13)
Antimony-126	51	10 (3.7E 11)
Antimony-127	51	10 (3.7E 11)
Antimony-128 (10.4 min)	51	1000 (3.7E 13)
Antimony-128 (9.01 hr)	51	10 (3.7E 11)
Antimony-129	51	100 (3.7E 12)
Antimony-130	51	100 (3.7E 12)
Antimony-131	51	1000 (3.7E 13)
Argon-39	18	1000 (3.7E 13)
Argon-41	18	10 (3.7E 11)
Arsenic-69	33	1000 (3.7E 13)
Arsenic-70	33	100 (3.7E 12)
Arsenic-71	33	100 (3.7E 12)
Arsenic-72	33	10 (3.7E 11)
Arsenic-73	33	100 (3.7E 12)
Arsenic-74	33	10 (3.7E 11)
Arsenic-76	33	100 (3.7E 12)
Arsenic-77	33	1000 (3.7E 13)
Arsenic-78	33	100 (3.7E 12)
Astatine-207	85	100 (3.7E 12)
Astatine-211	85	100 (3.7E 12)
Barium-126	56	1000 (3.7E 13)
Barium-128	56	10 (3.7E 11)
Barium-131m	56	1000 (3.7E 13)
Barium-131	56	10 (3.7E 11)
Barium-133m	56	100 (3.7E 12)
Barium-133	56	10 (3.7E 11)
Barium-135m	56	1000 (3.7E 13)
Barium-139	56	1000 (3.7E 13)
Barium-140	56	10 (3.7E 11)
Barium-141	56	1000 (3.7E 13)
Barium-142	56	1000 (3.7E 13)
Berkelium-245	97	100 (3.7E 12)
Berkelium-246	97	10 (3.7E 11)
Berkelium-247	97	0.01 (3.7E 8)
Berkelium-249	97	1 (3.7E 10)
Berkelium-250	97	100 (3.7E 12)
Beryllium-7	4	100 (3.7E 12)
Beryllium-10	4	1 (3.7E 10)
Bismuth-200	83	100 (3.7E 12)
Bismuth-201	83	100 (3.7E 12)
Bismuth-202	83	1000 (3.7E 13)
Bismuth-203	83	10 (3.7E 11)
Bismuth-205	83	10 (3.7E 11)
Bismuth-206	83	10 (3.7E 11)
Bismuth-207	83	10 (3.7E 11)
Bismuth-210m	83	0.1 (3.7E 9)
Bismuth-210	83	10 (3.7E 11)
Bismuth-212	83	100 (3.7E 12)
Bismuth-213	83	100 (3.7E 12)
Bismuth-214	83	100 (3.7E 12)
Bromine-74m	35	100 (3.7E 12)
Bromine-74	35	100 (3.7E 12)
Bromine-75	35	100 (3.7E 12)
Bromine-76	35	10 (3.7E 11)
Bromine-77	35	100 (3.7E 12)
Bromine-80m	35	1000 (3.7E 13)
Bromine-80	35	1000 (3.7E 13)
Bromine-82	35	10 (3.7E 11)
Bromine-83	35	1000 (3.7E 13)
Bromine-84	35	100 (3.7E 12)
Cadmium-104	48	1000 (3.7E 13)
Cadmium-107	48	1000 (3.7E 13)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Cadmium-109	48	1 (3.7E 10)
Cadmium-113m	48	0.1 (3.7E 9)
Cadmium-113	48	0.1 (3.7E 9)
Cadmium-115m	48	10 (3.7E 11)
Cadmium-115	48	100 (3.7E 12)
Cadmium-117m	48	10 (3.7E 11)
Cadmium-117	48	100 (3.7E 12)
Calcium-41	20	10 (3.7E 11)
Calcium-45	20	10 (3.7E 11)
Calcium-47	20	10 (3.7E 11)
Californium-244	98	1000 (3.7E 13)
Californium-246	98	10 (3.7E 11)
Californium-248	98	0.1 (3.7E 9)
Californium-249	98	0.01 (3.7E 8)
Californium-250	98	0.01 (3.7E 8)
Californium-251	98	0.01 (3.7E 8)
Californium-252	98	0.1 (3.7E 9)
Californium-253	98	10 (3.7E 11)
Californium-254	98	0.1 (3.7E 9)
Carbon-11	6	1000 (3.7E 13)
Carbon-14	6	10 (3.7E 11)
Cerium-134	58	10 (3.7E 11)
Cerium-135	58	10 (3.7E 11)
Cerium-137m	58	100 (3.7E 12)
Cerium-137	58	1000 (3.7E 13)
Cerium-139	58	100 (3.7E 12)
Cerium-141	58	10 (3.7E 11)
Cerium-143	58	100 (3.7E 12)
Cerium-144	58	1 (3.7E 10)
Cesium-125	55	1000 (3.7E 13)
Cesium-127	55	100 (3.7E 12)
Cesium-129	55	100 (3.7E 12)
Cesium-130	55	1000 (3.7E 13)
Cesium-131	55	1000 (3.7E 13)
Cesium-132	55	10 (3.7E 11)
Cesium-134m	55	1000 (3.7E 13)
Cesium-134	55	1 (3.7E 10)
Cesium-135m	55	100 (3.7E 12)
Cesium-135	55	10 (3.7E 11)
Cesium-136	55	10 (3.7E 11)
Cesium-137	55	1 (3.7E 10)
Cesium-138	55	100 (3.7E 12)
Chlorine-36	17	10 (3.7E 11)
Chlorine-38	17	100 (3.7E 12)
Chlorine-39	17	100 (3.7E 12)
Chromium-48	24	100 (3.7E 12)
Chromium-49	24	1000 (3.7E 13)
Chromium-51	24	1000 (3.7E 13)
Cobalt-55	27	10 (3.7E 11)
Cobalt-56	27	10 (3.7E 11)
Cobalt-57	27	100 (3.7E 12)
Cobalt-58m	27	1000 (3.7E 13)
Cobalt-58	27	10 (3.7E 11)
Cobalt-60m	27	1000 (3.7E 13)
Cobalt-60	27	10 (3.7E 11)
Cobalt-61	27	1000 (3.7E 13)
Cobalt-62m	27	1000 (3.7E 13)
Copper-60	29	100 (3.7E 12)
Copper-61	29	100 (3.7E 12)
Copper-64	29	1000 (3.7E 13)
Copper-67	29	100 (3.7E 12)
Curium-238	96	1000 (3.7E 13)
Curium-240	96	1 (3.7E 10)
Curium-241	96	10 (3.7E 11)
Curium-242	96	1 (3.7E 10)
Curium-243	96	0.01 (3.7E 8)
Curium-244	96	0.01 (3.7E 8)
Curium-245	96	0.01 (3.7E 8)
Curium-246	96	0.01 (3.7E 8)
Curium-247	96	0.01 (3.7E 8)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Curium-248	96	0.001 (3.7E 7)
Curium-249	96	1000 (3.7E 13)
Dysprosium-155	66	100 (3.7E 12)
Dysprosium-157	66	100 (3.7E 12)
Dysprosium-159	66	100 (3.7E 12)
Dysprosium-165	66	1000 (3.7E 13)
Dysprosium-166	66	10 (3.7E 11)
Einsteinium-250	99	10 (3.7E 11)
Einsteinium-251	99	1000 (3.7E 13)
Einsteinium-253	99	10 (3.7E 11)
Einsteinium-254m	99	1 (3.7E 10)
Einsteinium-254	99	0.1 (3.7E 9)
Erbium-161	68	100 (3.7E 12)
Erbium-165	68	1000 (3.7E 13)
Erbium-169	68	100 (3.7E 12)
Erbium-171	68	100 (3.7E 12)
Erbium-172	68	10 (3.7E 11)
Europium-145	63	10 (3.7E 11)
Europium-146	63	10 (3.7E 11)
Europium-147	63	10 (3.7E 11)
Europium-148	63	10 (3.7E 11)
Europium-149	63	100 (3.7E 12)
Europium-150 (12.6 hr)	63	1000 (3.7E 13)
Europium-150 (34.2 yr)	63	10 (3.7E 11)
Europium-152m	63	100 (3.7E 12)
Europium-152	63	10 (3.7E 11)
Europium-154	63	10 (3.7E 11)
Europium-155	63	10 (3.7E 11)
Europium-156	63	10 (3.7E 11)
Europium-157	63	10 (3.7E 11)
Europium-158	63	1000 (3.7E 13)
Fermium-252	100	10 (3.7E 11)
Fermium-253	100	10 (3.7E 11)
Fermium-254	100	100 (3.7E 12)
Fermium-255	100	100 (3.7E 12)
Fermium-257	100	1 (3.7E 10)
Fluorine-18	9	1000 (3.7E 13)
Francium-222	87	100 (3.7E 12)
Francium-223	87	100 (3.7E 12)
Gadolinium-145	64	100 (3.7E 12)
Gadolinium-146	64	10 (3.7E 11)
Gadolinium-147	64	10 (3.7E 11)
Gadolinium-148	64	0.001 (3.7E7)
Gadolinium-149	64	100 (3.7E 12)
Gadolinium-151	64	100 (3.7E 12)
Gadolinium-152	64	0.001 (3.7E 7)
Gadolinium-153	64	10 (3.7E 11)
Gadolinium-159	64	1000 (3.7E 13)
Gallium-65	31	1000 (3.7E 13)
Gallium-66	31	10 (3.7E 11)
Gallium-67	31	100 (3.7E 12)
Gallium-68	31	1000 (3.7E 13)
Gallium-70	31	1000 (3.7E 13)
Gallium-72	31	10 (3.7E 11)
Gallium-73	31	100 (3.7E 12)
Germanium-66	32	100 (3.7E 12)
Germanium-67	32	1000 (3.7E 13)
Germanium-68	32	10 (3.7E 11)
Germanium-69	32	10 (3.7E 11)
Germanium-71	32	1000 (3.7E 13)
Germanium-75	32	1000 (3.7E 13)
Germanium-77	32	10 (3.7E 11)
Germanium-78	32	1000 (3.7E 13)
Gold-193	79	100 (3.7E 12)
Gold-194	79	10 (3.7E 11)
Gold-195	79	100 (3.7E 12)
Gold-198m	79	10 (3.7E 11)
Gold-198	79	100 (3.7E 12)
Gold-199	79	100 (3.7E 12)
Gold-200m	79	10 (3.7E 11)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Gold-200	79	1000 (3.7E 13)
Gold-201	79	1000 (3.7E 13)
Hafnium-170	72	100 (3.7E 12)
Hafnium-172	72	1 (3.7E 10)
Hafnium-173	72	100 (3.7E 12)
Hafnium-175	72	100 (3.7E 12)
Hafnium-177m	72	1000 (3.7E 13)
Hafnium-178m	72	0.1 (3.7E 9)
Hafnium-179m	72	100 (3.7E 12)
Hafnium-180m	72	100 (3.7E 12)
Hafnium-181	72	10 (3.7E 11)
Hafnium-182m	72	100 (3.7E 12)
Hafnium-182	72	0.1 (3.7E 9)
Hafnium-183	72	100 (3.7E 12)
Hafnium-184	72	100 (3.7E 12)
Holmium-155	67	1000 (3.7E 13)
Holmium-157	67	1000 (3.7E 13)
Holmium-159	67	1000 (3.7E 13)
Holmium-161	67	1000 (3.7E 13)
Holmium-162m	67	1000 (3.7E 13)
Holmium-162	67	1000 (3.7E 13)
Holmium-164m	67	1000 (3.7E 13)
Holmium-164	67	1000 (3.7E 13)
Holmium-166m	67	1 (3.7E 10)
Holmium-166	67	100 (3.7E 12)
Holmium-167	67	100 (3.7E 12)
Hydrogen-3	1	100 (3.7E 12)
Indium-109	49	100 (3.7E 12)
Indium-110 (69.1 min)	49	100 (3.7E 12)
Indium-110 (4.9 hr)	49	10 (3.7E 11)
Indium-111	49	100 (3.7E 12)
Indium-112	49	1000 (3.7E 13)
Indium-113m	49	1000 (3.7E 13)
Indium-114m	49	10 (3.7E 11)
Indium-115m	49	100 (3.7E 12)
Indium-115	49	0.1 (3.7E 9)
Indium-116m	49	100 (3.7E 12)
Indium-117m	49	100 (3.7E 12)
Indium-117	49	1000 (3.7E 13)
Indium-119m	49	1000 (3.7E 13)
Iodine-120m	53	100 (3.7E 12)
Iodine-120	53	10 (3.7E 11)
Iodine-121	53	100 (3.7E 12)
Iodine-123	53	10 (3.7E 11)
Iodine-124	53	0.1 (3.7E 9)
Iodine-125	53	0.01 (3.7E 8)
Iodine-126	53	0.01 (3.7E 8)
Iodine-128	53	1000 (3.7E 13)
Iodine-129	53	0.001 (3.7E 7)
Iodine-130	53	1 (3.7E 10)
Iodine-131	53	0.01 (3.7E 8)
Iodine-132m	53	10 (3.7E 11)
Iodine-132	53	10 (3.7E 11)
Iodine-133	53	0.1 (3.7E 9)
Iodine-134	53	100 (3.7E 12)
Iodine-135	53	10 (3.7E 11)
Iridium-182	77	1000 (3.7E 13)
Iridium-184	77	100 (3.7E 12)
Iridium-185	77	100 (3.7E 12)
Iridium-186	77	10 (3.7E 11)
Iridium-187	77	100 (3.7E 12)
Iridium-188	77	10 (3.7E 11)
Iridium-189	77	100 (3.7E 12)
Iridium-190m	77	1000 (3.7E 13)
Iridium-190	77	10 (3.7E 11)
Iridium-192m	77	100 (3.7E 12)
Iridium-192	77	10 (3.7E 11)
Iridium-194m	77	10 (3.7E 11)
Iridium-194	77	100 (3.7E 12)
Iridium-195m	77	100 (3.7E 12)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Iridium-195	77	1000 (3.7E 13)
Iron-52	26	100 (3.7E 12)
Iron-55	26	100 (3.7E 12)
Iron-59	26	10 (3.7E 11)
Iron-60	26	0.1 (3.7E 9)
Krypton-74	36	10 (3.7E 11)
Krypton-76	36	10 (3.7E 11)
Krypton-77	36	10 (3.7E 11)
Krypton-79	36	100 (3.7E 12)
Krypton-81	36	1000 (3.7E 13)
Krypton-83m	36	1000 (3.7E 13)
Krypton-85m	36	100 (3.7E 12)
Krypton-85	36	1000 (3.7E 13)
Krypton-87	36	10 (3.7E 11)
Krypton-88	36	10 (3.7E 11)
Lanthanum-131	57	1000 (3.7E 13)
Lanthanum-132	57	100 (3.7E 12)
Lanthanum-135	57	1000 (3.7E 13)
Lanthanum-137	57	10 (3.7E 11)
Lanthanum-138	57	1 (3.7E 10)
Lanthanum-140	57	10 (3.7E 11)
Lanthanum-141	57	1000 (3.7E 13)
Lanthanum-142	57	100 (3.7E 12)
Lanthanum-143	57	1000 (3.7E 13)
Lead-195m	82	1000 (3.7E 13)
Lead-198	82	100 (3.7E 12)
Lead-199	82	100 (3.7E 12)
Lead-200	82	100 (3.7E 12)
Lead-201	82	100 (3.7E 12)
Lead-202m	82	10 (3.7E 11)
Lead-202	82	1 (3.7E 10)
Lead-203	82	100 (3.7E 12)
Lead-205	82	100 (3.7E 12)
Lead-209	82	1000 (3.7E 13)
Lead-210	82	0.01 (3.7E 8)
Lead-211	82	100 (3.7E 12)
Lead-212	82	10 (3.7E 11)
Lead-214	82	100 (3.7E 12)
Lutetium-169	71	10 (3.7E 11)
Lutetium-170	71	10 (3.7E 11)
Lutetium-171	71	10 (3.7E 11)
Lutetium-172	71	10 (3.7E 11)
Lutetium-173	71	100 (3.7E 12)
Lutetium-174m	71	10 (3.7E 11)
Lutetium-174	71	10 (3.7E 11)
Lutetium-176m	71	1000 (3.7E 13)
Lutetium-176	71	1 (3.7E 10)
Lutetium-177m	71	10 (3.7E 11)
Lutetium-177	71	100 (3.7E 12)
Lutetium-178m	71	1000 (3.7E 13)
Lutetium-178	71	1000 (3.7E 13)
Lutetium-179	71	1000 (3.7E 13)
Magnesium-28	12	10 (3.7E 11)
Manganese-51	25	1000 (3.7E 13)
Manganese-52m	25	1000 (3.7E 13)
Manganese-52	25	10 (3.7E 11)
Manganese-53	25	1000 (3.7E 13)
Manganese-54	25	10 (3.7E 11)
Manganese-56	25	100 (3.7E 12)
Mendelevium-257	101	100 (3.7E 12)
Mendelevium-258	101	1 (3.7E 10)
Mercury-193m	80	10 (3.7E 11)
Mercury-193	80	100 (3.7E 12)
Mercury-194	80	0.1 (3.7E 9)
Mercury-195m	80	100 (3.7E 12)
Mercury-195	80	100 (3.7E 12)
Mercury-197m	80	1000 (3.7E 13)
Mercury-197	80	1000 (3.7E 13)
Mercury-199m	80	1000 (3.7E 13)
Mercury-203	80	10 (3.7E 11)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Molybdenum-90	42	100 (3.7E 12)
Molybdenum-93m	42	10 (3.7E 11)
Molybdenum-93	42	100 (3.7E 12)
Molybdenum-99	42	100 (3.7E 12)
Molybdenum-101	42	1000 (3.7E 13)
Neodymium-136	60	1000 (3.7E 13)
Neodymium-138	60	1000 (3.7E 13)
Neodymium-139m	60	100 (3.7E 12)
Neodymium-139	60	1000 (3.7E 13)
Neodymium-141	60	1000 (3.7E 13)
Neodymium-147	60	10 (3.7E 11)
Neodymium-149	60	100 (3.7E 12)
Neodymium-151	60	1000 (3.7E 13)
Neptunium-232	93	1000 (3.7E 13)
Neptunium-233	93	1000 (3.7E 13)
Neptunium-234	93	10 (3.7E 11)
Neptunium-235	93	1000 (3.7E 13)
Neptunium-236 (1.2 E 5 yr)	93	0.1 (3.7E 9)
Neptunium-236 (22.5 hr)	93	100 (3.7E 12)
Neptunium-237	93	0.01 (3.7E 8)
Neptunium-238	93	10 (3.7E 11)
Neptunium-239	93	100 (3.7E 12)
Neptunium-240	93	100 (3.7E 12)
Nickel-56	28	10 (3.7E 11)
Nickel-57	28	10 (3.7E 11)
Nickel-59	28	100 (3.7E 12)
Nickel-63	28	100 (3.7E 12)
Nickel-65	28	100 (3.7E 12)
Nickel-66	28	10 (3.7E 11)
Niobium-88	41	100 (3.7E 12)
Niobium-89 (66 min)	41	100 (3.7E 12)
Niobium-89 (122 min)	41	100 (3.7E 12)
Niobium-90	41	10 (3.7E 11)
Niobium-93m	41	100 (3.7E 12)
Niobium-94	41	10 (3.7E 11)
Niobium-95m	41	100 (3.7E 12)
Niobium-95	41	10 (3.7E 11)
Niobium-96	41	10 (3.7E 11)
Niobium-97	41	100 (3.7E 12)
Niobium-98	41	1000 (3.7E 13)
Osmium-180	76	1000 (3.7E 13)
Osmium-181	76	100 (3.7E 12)
Osmium-182	76	100 (3.7E 12)
Osmium-185	76	10 (3.7E 11)
Osmium-189m	76	1000 (3.7E 13)
Osmium-191m	76	1000 (3.7E 13)
Osmium-191	76	100 (3.7E 12)
Osmium-193	76	100 (3.7E 12)
Osmium-194	76	1 (3.7E 10)
Palladium-100	46	100 (3.7E 12)
Palladium-101	46	100 (3.7E 12)
Palladium-103	46	100 (3.7E 12)
Palladium-107	46	100 (3.7E 12)
Palladium-109	46	1000 (3.7E 13)
Phosphorus-32	15	0.1 (3.7E 9)
Phosphorus-33	15	1 (3.7E 10)
Platinum-186	78	100 (3.7E 12)
Platinum-188	78	100 (3.7E 12)
Platinum-189	78	100 (3.7E 12)
Platinum-191	78	100 (3.7E 12)
Platinum-193m	78	100 (3.7E 12)
Platinum-193	78	1000 (3.7E 13)
Platinum-195m	78	100 (3.7E 12)
Platinum-197m	78	1000 (3.7E 13)
Platinum-197	78	1000 (3.7E 13)
Platinum-199	78	1000 (3.7E 13)
Platinum-200	78	100 (3.7E 12)
Plutonium-234	94	1000 (3.7E 13)
Plutonium-235	94	1000 (3.7E 13)
Plutonium-236	94	0.1 (3.7E 9)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Plutonium-237	94	1000 (3.7E 13)
Plutonium-238	94	0.01 (3.7E 8)
Plutonium-239	94	0.01 (3.7E 8)
Plutonium-240	94	0.01 (3.7E 8)
Plutonium-241	94	1 (3.7E 10)
Plutonium-242	94	0.01 (3.7E 8)
Plutonium-243	94	1000 (3.7E 13)
Plutonium-244	94	0.01 (3.7E 8)
Plutonium-245	94	100 (3.7E 12)
Polonium-203	84	100 (3.7E 12)
Polonium-205	84	100 (3.7E 12)
Polonium-207	84	10 (3.7E 11)
Polonium-210	84	0.01 (3.7E 8)
Potassium-40	19	1 (3.7E 10)
Potassium-42	19	100 (3.7E 12)
Potassium-43	19	10 (3.7E 11)
Potassium-44	19	100 (3.7E 12)
Potassium-45	19	1000 (3.7E 13)
Praseodymium-136	59	1000 (3.7E 13)
Praseodymium-137	59	1000 (3.7E 13)
Praseodymium-138m	59	100 (3.7E 12)
Praseodymium-139	59	1000 (3.7E 13)
Praseodymium-142m	59	1000 (3.7E 13)
Praseodymium-142	59	100 (3.7E 12)
Praseodymium-143	59	10 (3.7E 11)
Praseodymium-144	59	1000 (3.7E 13)
Praseodymium-145	59	1000 (3.7E 13)
Praseodymium-147	59	1000 (3.7E 13)
Promethium-141	61	1000 (3.7E 13)
Promethium-143	61	100 (3.7E 12)
Promethium-144	61	10 (3.7E 11)
Promethium-145	61	100 (3.7E 12)
Promethium-146	61	10 (3.7E 11)
Promethium-147	61	10 (3.7E 11)
Promethium-148m	61	10 (3.7E 11)
Promethium-148	61	10 (3.7E 11)
Promethium-149	61	100 (3.7E 12)
Promethium-150	61	100 (3.7E 12)
Promethium-151	61	100 (3.7E 12)
Protactinium-227	91	100 (3.7E 12)
Protactinium-228	91	10 (3.7E 11)
Protactinium-230	91	10 (3.7E 11)
Protactinium-231	91	0.01 (3.7E 8)
Protactinium-232	91	10 (3.7E 11)
Protactinium-233	91	100 (3.7E 12)
Protactinium-234	91	10 (3.7E 11)
Radium-223	88	1 (3.7E 10)
Radium-224	88	10 (3.7E 11)
Radium-225	88	1 (3.7E 10)
Radium-226Φ	88	0.1 (3.7E 9)
Radium-227	88	1000 (3.7E 13)
Radium-228	88	0.1 (3.7E 9)
Radon-220	86	0.1 (3.7E 9)
Radon-222	86	0.1 (3.7E 9)
Rhenium-177	75	1000 (3.7E 13)
Rhenium-178	75	1000 (3.7E 13)
Rhenium-181	75	100 (3.7E 12)
Rhenium-182 (12.7 hr)	75	10 (3.7E 11)
Rhenium-182 (64.0 hr)	75	10 (3.7E 11)
Rhenium-184m	75	10 (3.7E 11)
Rhenium-184	75	10 (3.7E 11)
Rhenium-186m	75	10 (3.7E 11)
Rhenium-186	75	100 (3.7E 12)
Rhenium-187	75	1000 (3.7E 13)
Rhenium-188m	75	1000 (3.7E 13)
Rhenium-188	75	1000 (3.7E 13)
Rhenium-189	75	1000 (3.7E 13)
Rhodium-99m	45	100 (3.7E 12)
Rhodium-99	45	10 (3.7E 11)
Rhodium-100	45	10 (3.7E 11)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Rhodium-101m	45	100 (3.7E 12)
Rhodium-101	45	10 (3.7E 11)
Rhodium-102m	45	10 (3.7E 11)
Rhodium-102	45	10 (3.7E 11)
Rhodium-103m	45	1000 (3.7E 13)
Rhodium-105	45	100 (3.7E 12)
Rhodium-106m	45	10 (3.7E 11)
Rhodium-107	45	1000 (3.7E 13)
Rubidium-79	37	1000 (3.7E 13)
Rubidium-81m	37	1000 (3.7E 13)
Rubidium-81	37	100 (3.7E 12)
Rubidium-82m	37	10 (3.7E 11)
Rubidium-83	37	10 (3.7E 11)
Rubidium-84	37	10 (3.7E 11)
Rubidium-86	37	10 (3.7E 11)
Rubidium-88	37	1000 (3.7E 13)
Rubidium-89	37	1000 (3.7E 13)
Rubidium-87	37	10 (3.7E 11)
Ruthenium-94	44	1000 (3.7E 13)
Ruthenium-97	44	100 (3.7E 12)
Ruthenium-103	44	10 (3.7E 11)
Ruthenium-105	44	100 (3.7E 12)
Ruthenium-106	44	1 (3.7E 10)
Samarium-141m	62	1000 (3.7E 13)
Samarium-141	62	1000 (3.7E 13)
Samarium-142	62	1000 (3.7E 13)
Samarium-145	62	100 (3.7E 12)
Samarium-146	62	0.01 (3.7E 8)
Samarium-147	62	0.01 (3.7E 8)
Samarium-151	62	10 (3.7E 11)
Samarium-153	62	100 (3.7E 12)
Samarium-155	62	1000 (3.7E 13)
Samarium-156	62	100 (3.7E 12)
Scandium-43	21	1000 (3.7E 13)
Scandium-44m	21	10 (3.7E 11)
Scandium-44	21	100 (3.7E 12)
Scandium-46	21	10 (3.7E 11)
Scandium-47	21	100 (3.7E 12)
Scandium-48	21	10 (3.7E 11)
Scandium-49	21	1000 (3.7E 13)
Selenium-70	34	1000 (3.7E 13)
Selenium-73m	34	100 (3.7E 12)
Selenium-73	34	10 (3.7E 11)
Selenium-75	34	10 (3.7E 11)
Selenium-79	34	10 (3.7E 11)
Selenium-81m	34	1000 (3.7E 13)
Selenium-81	34	1000 (3.7E 13)
Selenium-83	34	1000 (3.7E 13)
Silicon-31	14	1000 (3.7E 13)
Silicon-32	14	1 (3.7E 10)
Silver-102	47	100 (3.7E 12)
Silver-103	47	1000 (3.7E 13)
Silver-104m	47	1000 (3.7E 13)
Silver-104	47	1000 (3.7E 13)
Silver-105	47	10 (3.7E 11)
Silver-106m	47	10 (3.7E 11)
Silver-106	47	1000 (3.7E 13)
Silver-108m	47	10 (3.7E 11)
Silver-110m	47	10 (3.7E 11)
Silver-111	47	10 (3.7E 11)
Silver-112	47	100 (3.7E 12)
Silver-115	47	1000 (3.7E 13)
Sodium-22	11	10 (3.7E 11)
Sodium-24	11	10 (3.7E 11)
Strontium-80	38	100 (3.7E 12)
Strontium-81	38	1000 (3.7E 13)
Strontium-83	38	100 (3.7E 12)
Strontium-85m	38	1000 (3.7E 13)
Strontium-85	38	10 (3.7E 11)
Strontium-87m	38	100 (3.7E 12)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Strontium-89	38	10 (3.7E 11)
Strontium-90	38	0.1 (3.7E 9)
Strontium-91	38	10 (3.7E 11)
Strontium-92	38	100 (3.7E 12)
Sulfur-35	16	1 (3.7E 10)
Tantalum-172	73	100 (3.7E 12)
Tantalum-173	73	100 (3.7E 12)
Tantalum-174	73	100 (3.7E 12)
Tantalum-175	73	100 (3.7E 12)
Tantalum-176	73	10 (3.7E 11)
Tantalum-177	73	1000 (3.7E 13)
Tantalum-178	73	1000 (3.7E 13)
Tantalum-179	73	1000 (3.7E 13)
Tantalum-180m	73	1000 (3.7E 13)
Tantalum-180	73	100 (3.7E 12)
Tantalum-182m	73	1000 (3.7E 13)
Tantalum-182	73	10 (3.7E 11)
Tantalum-183	73	100 (3.7E 12)
Tantalum-184	73	10 (3.7E 11)
Tantalum-185	73	1000 (3.7E 13)
Tantalum-186	73	1000 (3.7E 13)
Technetium-93m	43	1000 (3.7E 13)
Technetium-93	43	100 (3.7E 12)
Technetium-94m	43	100 (3.7E 12)
Technetium-94	43	10 (3.7E 11)
Technetium-96m	43	1000 (3.7E 13)
Technetium-96	43	10 (3.7E 11)
Technetium-97m	43	100 (3.7E 12)
Technetium-97	43	100 (3.7E 12)
Technetium-98	43	10 (3.7E 11)
Technetium-99m	43	100 (3.7E 12)
Technetium-99	43	10 (3.7E 11)
Technetium-101	43	1000 (3.7E 13)
Technetium-104	43	1000 (3.7E 13)
Tellurium-116	52	1000 (3.7E 13)
Tellurium-121m	52	10 (3.7E 11)
Tellurium-121	52	10 (3.7E 11)
Tellurium-123m	52	10 (3.7E 11)
Tellurium-123	52	10 (3.7E 11)
Tellurium-125m	52	10 (3.7E 11)
Tellurium-127m	52	10 (3.7E 11)
Tellurium-127	52	1000 (3.7E 13)
Tellurium-129m	52	10 (3.7E 11)
Tellurium-129	52	1000 (3.7E 13)
Tellurium-131m	52	10 (3.7E 11)
Tellurium-131	52	1000 (3.7E 13)
Tellurium-132	52	10 (3.7E 11)
Tellurium-133m	52	1000 (3.7E 13)
Tellurium-133	52	1000 (3.7E 13)
Tellurium-134	52	1000 (3.7E 13)
Terbium-147	65	100 (3.7E 12)
Terbium-149	65	100 (3.7E 12)
Terbium-150	65	100 (3.7E 12)
Terbium-151	65	10 (3.7E 11)
Terbium-153	65	100 (3.7E 12)
Terbium-154	65	10 (3.7E 11)
Terbium-155	65	100 (3.7E 12)
Terbium-156m (5.0 hr)	65	1000 (3.7E 13)
Terbium-156m (24.4 hr)	65	1000 (3.7E 13)
Terbium-156	65	10 (3.7E 11)
Terbium-157	65	100 (3.7E 12)
Terbium-158	65	10 (3.7E 11)
Terbium-160	65	10 (3.7E 11)
Terbium-161	65	100 (3.7E 12)
Thallium-194m	81	100 (3.7E 12)
Thallium-194	81	1000 (3.7E 13)
Thallium-195	81	100 (3.7E 12)
Thallium-197	81	100 (3.7E 12)
Thallium-198m	81	100 (3.7E 12)
Thallium-198	81	10 (3.7E 11)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Thallium-199	81	100 (3.7E 12)
Thallium-200	81	10 (3.7E 11)
Thallium-201	81	1000 (3.7E 13)
Thallium-202	81	10 (3.7E 11)
Thallium-204	81	10 (3.7E 11)
Thorium-226	90	100 (3.7E 12)
Thorium-227	90	1 (3.7E 10)
Thorium-228	90	0.01 (3.7E 8)
Thorium-229	90	0.001 (3.7E 7)
Thorium-230	90	0.01 (3.7E 8)
Thorium-231	90	100 (3.7E 12)
Thorium-232Φ	90	0.001 (3.7E 7)
Thorium-234	90	100 (3.7E 12)
Thulium-162	69	1000 (3.7E 13)
Thulium-166	69	10 (3.7E 11)
Thulium-167	69	100 (3.7E 12)
Thulium-170	69	10 (3.7E 11)
Thulium-171	69	100 (3.7E 12)
Thulium-172	69	100 (3.7E 12)
Thulium-173	69	100 (3.7E 12)
Thulium-175	69	1000 (3.7E 13)
Tin-110	50	100 (3.7E 12)
Tin-111	50	1000 (3.7E 13)
Tin-113	50	10 (3.7E 11)
Tin-117m	50	100 (3.7E 12)
Tin-119m	50	10 (3.7E 11)
Tin-121m	50	10 (3.7E 11)
Tin-121	50	1000 (3.7E 13)
Tin-123m	50	1000 (3.7E 13)
Tin-123	50	10 (3.7E 11)
Tin-125	50	10 (3.7E 11)
Tin-126	50	1 (3.7E 10)
Tin-127	50	100 (3.7E 12)
Tin-128	50	1000 (3.7E 13)
Titanium-44	22	1 (3.7E 10)
Titanium-45	22	1000 (3.7E 13)
Tungsten-176	74	1000 (3.7E 13)
Tungsten-177	74	100 (3.7E 12)
Tungsten-178	74	100 (3.7E 12)
Tungsten-179	74	1000 (3.7E 13)
Tungsten-181	74	100 (3.7E 12)
Tungsten-185	74	10 (3.7E 11)
Tungsten-187	74	100 (3.7E 12)
Tungsten-188	74	10 (3.7E 11)
Uranium-230	92	1 (3.7E 10)
Uranium-231	92	1000 (3.7E 13)
Uranium-232	92	0.01 (3.7E 8)
Uranium-233	92	0.1 (3.7E 9)
Uranium-234φ	92	0.1 (3.7E 9)
Uranium-235φ	92	0.1 (3.7E 9)
Uranium-236	92	0.1 (3.7E 9)
Uranium-237	92	100 (3.7E 12)
Uranium-238φ	92	0.1& (3.7E 9)
Uranium-239	92	1000 (3.7E 13)
Uranium-240	92	1000 (3.7E 13)
Vanadium-47	23	1000 (3.7E 13)
Vanadium-48	23	10 (3.7E 11)
Vanadium-49	23	1000 (3.7E 13)
Xenon-120	54	100 (3.7E 12)
Xenon-121	54	10 (3.7E 11)
Xenon-122	54	100 (3.7E 12)
Xenon-123	54	10 (3.7E 11)
Xenon-125	54	100 (3.7E 12)
Xenon-127	54	100 (3.7E 12)
Xenon-129m	54	1000 (3.7E 13)
Xenon-131m	54	1000 (3.7E 13)
Xenon-133m	54	1000 (3.7E 13)
Xenon-133	54	1000 (3.7E 13)
Xenon-135m	54	10 (3.7E 11)
Xenon-135	54	100 (3.7E 12)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Xenon-138	54	10 (3.7E 11)
Ytterbium-162	70	1000 (3.7E 13)
Ytterbium-166	70	10 (3.7E 11)
Ytterbium-167	70	1000 (3.7E 13)
Ytterbium-169	70	10 (3.7E 11)
Ytterbium-175	70	100 (3.7E 12)
Ytterbium-177	70	1000 (3.7E 13)
Ytterbium-178	70	1000 (3.7E 13)
Yttrium-86m	39	1000 (3.7E 13)
Yttrium-86	39	10 (3.7E 11)
Yttrium-87	39	10 (3.7E 11)
Yttrium-88	39	10 (3.7E 11)
Yttrium-90m	39	100 (3.7E 12)
Yttrium-90	39	10 (3.7E 11)
Yttrium-91m	39	1000 (3.7E 13)
Yttrium-91	39	10 (3.7E 11)
Yttrium-92	39	100 (3.7E 12)
Yttrium-93	39	100 (3.7E 12)
Yttrium-94	39	1000 (3.7E 13)
Yttrium-95	39	1000 (3.7E 13)
Zinc-62	30	100 (3.7E 12)
Zinc-63	30	1000 (3.7E 13)
Zinc-65	30	10 (3.7E 11)
Zinc-69m	30	100 (3.7E 12)
Zinc-69	30	1000 (3.7E 13)
Zinc-71m	30	100 (3.7E 12)
Zinc-72	30	100 (3.7E 12)
Zirconium-86	40	100 (3.7E 12)
Zirconium-88	40	10 (3.7E 11)
Zirconium-89	40	100 (3.7E 12)
Zirconium-93	40	1 (3.7E 10)
Zirconium-95	40	10 (3.7E 11)
Zirconium-97	40	10 (3.7E 11)

Ci—Curie. The curie represents a rate of radioactive decay. One curie is the quantity of any radioactive nuclide which undergoes 3.7E 10 disintegrations per second.

Bq—Becquerel. The becquerel represents a rate of radioactive decay. One becquerel is the quantity of any radioactive nuclide which undergoes one disintegration per second. One curie is equal to 3.7E 10 becquerel.

@—Final RQs for all radionuclides apply to chemical compounds containing the radionuclides and elemental forms regardless of the diameter of pieces of solid material.

&—The adjusted RQ of one curie applies to all radionuclides not otherwise listed. Whenever the RQs in table 302.4 and this appendix to the table are in conflict, the lowest RQ shall apply. For example, uranyl acetate and uranyl nitrate have adjusted RQs shown in table 302.4 of 100 pounds, equivalent to about one-tenth the RQ level for uranium-238 listed in this appendix.

E—Exponent to the base 10. For example, 1.3E 2 is equal to 130 while 1.3E 3 is equal to 1300.

m—Signifies a nuclear isomer which is a radionuclide in a higher energy metastable state relative to the parent isotope.

φ—Notification requirements for releases of mixtures or solutions of radionuclides can be found in § 302.6(b) of this rule. Final RQs for the following four common radionuclide mixtures are provided: radium-226 in secular equilibrium with its daughters (0.053 curie); natural uranium (0.1 curie); natural uranium in secular equilibrium with its daughters (0.052 curie); and natural thorium in secular equilibrium with its daughters (0.011 curie).

[54 FR 33449, Aug. 14, 1989]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting § 302.4, see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and at www.fdsys.gov.

§ 302.5 Determination of reportable quantities.

(a) *Listed hazardous substances.* The quantity listed in the column ''Final RQ'' for each substance in table 302.4, or in appendix B to table 302.4, is the reportable quantity (RQ) for that substance. The RQs in table 302.4 are in units of pounds based on chemical toxicity, while the RQs in appendix B to table 302.4 are in units of curies based on radiation hazard. Whenever the RQs in table 302.4 and appendix B to the table are in conflict, the lowest RQ shall apply.

(b) *Unlisted hazardous substances.* Unlisted hazardous substances designated by 40 CFR 302.4(b) have the reportable quantity of 100 pounds, except for those unlisted hazardous wastes which exhibit toxicity identified in 40 CFR 261.24. Unlisted hazardous wastes which exhibit toxicity have the reportable quantities listed in Table 302.4 for the contaminant on which the characteristic of toxicity is based. The reportable quantity applies to the waste itself, not merely to the toxic contaminant. If an unlisted hazardous waste exhibits toxicity on the basis of more than one contaminant, the reportable quantity for that waste shall be the lowest of the reportable quantities listed in Table 302.4 for those contaminants. If an unlisted hazardous waste exhibits the characteristic of toxicity and one or more of the other characteristics referenced in 40 CFR 302.4(b), the reportable quantity for that waste shall be the lowest of the applicable reportable quantities.

[51 FR 34547, Sept. 29, 1986, as amended at 54 FR 22538, May 24, 1989; 67 FR 45356, July 9, 2002]

§ 302.6 Notification requirements.

(a) Any person in charge of a vessel or an offshore or an onshore facility shall, as soon as he or she has knowledge of any release (other than a federally permitted release or application of a pesticide) of a hazardous substance from such vessel or facility in a quantity equal to or exceeding the reportable quantity determined by this part in any 24-hour period, immediately notify the National Response Center (1–800–424–8802; in Washington, DC 202–267–

2675; the facsimile number is 202–267–1322).

(b) Releases of mixtures or solutions (including hazardous waste streams) of

(1) Hazardous substances, except for radionuclides, are subject to the following notification requirements:

(i) If the quantity of all of the hazardous constituent(s) of the mixture or solution is known, notification is required where an RQ or more of any hazardous constituent is released;

(ii) If the quantity of one or more of the hazardous constituent(s) of the mixture or solution is unknown, notification is required where the total amount of the mixture or solution released equals or exceeds the RQ for the hazardous constituent with the lowest RQ; or

(iii) For waste streams K169, K170, K171, K172, K174, and K175, knowledge of the quantity of all of the hazardous constituent(s) may be assumed, based on the following maximum observed constituent concentrations identified by EPA:

Waste	Constituent	max ppm
K174	2,3,7,8-TCDD	0.000039
	1,2,3,7,8-PeCDD	0.0000108
	1,2,3,4,7,8,-HxCDD	0.0000241
	1,2,3,6,7,8,-HxCDD	0.000083
	1,2,3,7,8,9,-HxCDD	0.000062
	1,2,3,4,6,7,8-HpCDD	0.00123
	OCDD	0.0129
	2,3,7,8-TCDF	0.000145
	1,2,3,7,8-PeCDF	0.0000777
	2,3,4,7,8-PeCDF	0.000127
	1,2,3,4,7,8-HxCDF	0.001425
	1,2,3,6,7,8-HxCDF	0.000281
	1,2,3,7,8,9-HxCDF	0.00014
	2,3,4,6,7,8-HxCDF	0.000648
	1,2,3,4,6,7,8-HpCDF	0.0207
	1,2,3,4,7,8,9-HpCDF	0.0135
	OCDF	0.212
K175	Mercury	9200

(2) Radionuclides are subject to this section's notification requirements only in the following circumstances:

(i) If the identity and quantity (in curies) of each radionuclide in a released mixture or solution is known, the ratio between the quantity released (in curies) and the RQ for the radionuclide must be determined for each radionuclide. The only such releases subject to this section's notification requirements are those in which the sum of the ratios for the radionuclides in the mixture or solution released is equal to or greater than one.

(ii) If the identity of each radionuclide in a released mixture or solution is known but the quantity released (in curies) of one or more of the radionuclides is unknown, the only such releases subject to this section's notification requirements are those in which the total quantity (in curies) of the mixture or solution released is equal to or greater than the lowest RQ of any individual radionuclide in the mixture or solution.

(iii) If the identity of one or more radionuclides in a released mixture or solution is unknown (or if the identity of a radionuclide released by itself is unknown), the only such releases subject to this section's notification requirements are those in which the total quantity (in curies) released is equal to or greater than either one curie or the lowest RQ of any known individual radionuclide in the mixture or solution, whichever is lower.

(c) The following categories of releases are exempt from the notification requirements of this section:

(1) Releases of those radionuclides that occur naturally in the soil from land holdings such as parks, golf courses, or other large tracts of land.

(2) Releases of naturally occurring radionuclides from land disturbance activities, including farming, construction, and land disturbance incidental to extraction during mining activities, except that which occurs at uranium, phosphate, tin, zircon, hafnium, vanadium, monazite, and rare earth mines. Land disturbance incidental to extraction includes: land clearing; overburden removal and stockpiling; excavating, handling, transporting, and storing ores and other raw (not beneficiated or processed) materials; and replacing in mined-out areas coal ash, earthen materials from farming or construction, or overburden or other raw materials generated from the exempted mining activities.

(3) Releases of radionuclides from the dumping and transportation of coal and coal ash (including fly ash, bottom ash, and boiler slags), including the dumping and land spreading operations that occur during coal ash uses.

(4) Releases of radionuclides from piles of coal and coal ash, including fly ash, bottom ash, and boiler slags.

(d) Except for releases of radionuclides, notification of the release of an RQ of solid particles of antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, or zinc is not required if the mean diameter of the particles released is larger than 100 micrometers (0.004 inches).

(e) The following releases are exempt from the notification requirements of this section:

(1) Releases in amounts less than 1,000 pounds per 24 hours of nitrogen oxide to the air which are the result of combustion and combustion-related activities.

(2) Releases in amounts less than 1,000 pounds per 24 hours of nitrogen dioxide to the air which are the result of combustion and combustion-related activities.

(3) Releases to the air of any hazardous substance from animal waste at farms.

[50 FR 13474, Apr. 4, 1985, as amended at 54 FR 22538, May 24, 1989; 54 FR 33481, Aug. 14, 1989; 63 FR 13475, Mar. 19, 1998; 63 FR 42189, Aug. 6, 1998; 64 FR 13114, Mar. 17, 1999; 65 FR 87132, Nov. 8, 2001; 67 FR 45356, July 9, 2002; 71 FR 58533, Oct. 4, 2006; 73 FR 76959, Dec. 18, 2008; 76 FR 9666, Feb. 22, 2011]

§ 302.7 Penalties.

(a) Any person—

(1) In charge of a vessel from which a hazardous substance is released, other than a federally permitted release, into or upon the navigable waters of the United States, adjoining shorelines, or into or upon the waters of the contiguous zone,

(2) In charge of a vessel from which a hazardous substance is released, other than a federally permitted release, which may affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States (including resources under the Fishery Conservation and Management Act of 1976), and who is otherwise subject to the jurisdiction of the United States at the time of the release, or

(3) In charge of a facility from which a hazardous substance is released, other than a federally permitted release, in a quantity equal to or greater than that reportable quantity determined under this part who fails to notify immediately the National Response Center as soon as he or she has knowledge of such release or who submits in such a notification any information which he knows to be false or misleading shall be subject to all of the sanctions, including criminal penalties, set forth in section 103(b) of the Act.

(b) Notification received pursuant to this section or information obtained by the exploitation of such notification shall not be used against any such person in any criminal case, except a prosecution for perjury or for giving a false statement.

(c) This section shall not apply to the application of a pesticide product registered under the Federal Insecticide, Fungicide, and Rodenticide Act or to the handling and storage of such a pesticide product by an agricultural producer.

[50 FR 13474, Apr. 4, 1985, as amended at 67 FR 45356, July 9, 2002]

§ 302.8 Continuous releases.

(a) Except as provided in paragraph (c) of this section, no notification is required for any release of a hazardous substance that is, pursuant to the definitions in paragraph (b) of this section, continuous and stable in quantity and rate.

(b) *Definitions.* The following definitions apply to notification of continuous releases:

Continuous. A continuous release is a release that occurs without interruption or abatement or that is routine, anticipated, and intermittent and incidental to normal operations or treatment processes.

Normal range. The normal range of a release is all releases (in pounds or kilograms) of a hazardous substance reported or occurring over any 24-hour period under normal operating conditions during the preceding year. Only releases that are both continuous and stable in quantity and rate may be included in the normal range.

Routine. A routine release is a release that occurs during normal operating procedures or processes.

Stable in quantity and rate. A release that is stable in quantity and rate is a

release that is predictable and regular in amount and rate of emission.

Statistically significant increase. A statistically significant increase in a release is an increase in the quantity of the hazardous substance released above the upper bound of the reported normal range of the release.

(c) *Notification.* The following notifications shall be given for any release qualifying for reduced reporting under this section:

(1) Initial telephone notification;

(2) Initial written notification within 30 days of the initial telephone notification;

(3) Follow-up notification within 30 days of the first anniversary date of the initial written notification;

(4) Notification of a change in the composition or source(s) of the release or in the other information submitted in the initial written notification of the release under paragraph (c)(2) of this section or the follow-up notification under paragraph (c)(3) of this section; and

(5) Notification at such times as an increase in the quantity of the hazardous substance being released during any 24-hour period represents a statistically significant increase as defined in paragraph (b) of this section.

(d) *Initial telephone notification.* Prior to making an initial telephone notification of a continuous release, the person in charge of a facility or vessel must establish a sound basis for qualifying the release for reporting under CERCLA section 103(f)(2) by:

(1) Using release data, engineering estimates, knowledge of operating procedures, or best professional judgment to establish the continuity and stability of the release;

(2) Reporting the release to the National Response Center for a period sufficient to establish the continuity and stability of the release; or

(3) When a person in charge of the facility or vessel believes that a basis has been established to qualify the release for reduced reporting under this section, initial notification to the National Response Center shall be made by telephone. The person in charge must identify the notification as an initial continuous release notification report and provide the following information:

(i) The name and location of the facility or vessel; and

(ii) The name(s) and identity(ies) of the hazardous substance(s) being released.

(e) *Initial written notification.* Initial written notification of a continuous release shall be made to the appropriate EPA Regional Office for the geographical area where the releasing facility or vessel is located. (Note: In addition to the requirements of this part, releases of CERCLA hazardous substances are also subject to the provisions of SARA title III section 304, and EPA's implementing regulations codified at 40 CFR part 355, which require initial telephone and written notifications of continuous releases to be submitted to the appropriate State emergency response commission and local emergency planning committee.)

(1) Initial written notification to the appropriate EPA Regional Office shall occur within 30 days of the initial telephone notification to the National Response Center, and shall include, for each release for which reduced reporting as a continuous release is claimed, the following information:

(i) The name of the facility or vessel; the location, including the latitude and longitude; the case number assigned by the National Response Center or the Environmental Protection Agency; the Dun and Bradstreet number of the facility, if available; the port of registration of the vessel; the name and telephone number of the person in charge of the facility or vessel.

(ii) The population density within a one-mile radius of the facility or vessel, described in terms of the following ranges: 0–50 persons, 51–100 persons, 101–500 persons, 501–1,000 persons, more than 1,000 persons.

(iii) The identity and location of sensitive populations and ecosystems within a one-mile radius of the facility or vessel (e.g., elementary schools, hospitals, retirement communities, or wetlands).

(iv) For each hazardous substance release claimed to qualify for reporting under CERCLA section 103(f)(2), the following information must be supplied:

(A) The name/identity of the hazardous substance; the Chemical Abstracts Service Registry Number for the substance (if available); and if the substance being released is a mixture, the components of the mixture and their approximate concentrations and quantities, by weight.

(B) The upper and lower bounds of the normal range of the release (in pounds or kilograms) over the previous year.

(C) The source(s) of the release (e.g., valves, pump seals, storage tank vents, stacks). If the release is from a stack, the stack height (in feet or meters).

(D) The frequency of the release and the fraction of the release from each release source and the specific period over which it occurs.

(E) A brief statement describing the basis for stating that the release is continuous and stable in quantity and rate.

(F) An estimate of the total annual amount that was released in the previous year (in pounds or kilograms).

(G) The environmental medium(a) affected by the release:

(*1*) If surface water, the name of the surface water body;

(*2*) If a stream, the stream order or average flowrate (in cubic feet/second) and designated use;

(*3*) If a lake, the surface area (in acres) and average depth (in feet or meters);

(*4*) If on or under ground, the location of public water supply wells within two miles.

(H) A signed statement that the hazardous substance release(s) described is(are) continuous and stable in quantity and rate under the definitions in paragraph (b) of this section and that all reported information is accurate and current to the best knowledge of the person in charge.

(f) *Follow-up notification*. Within 30 days of the first anniversary date of the initial written notification, the person in charge of the facility or vessel shall evaluate each hazardous substance release reported to verify and update the information submitted in the initial written notification. The follow-up notification shall include the following information:

(1) The name of the facility or vessel; the location, including the latitude and longitude; the case number assigned by the National Response Center or the Environmental Protection Agency; the Dun and Bradstreet number of the facility, if available; the port of registration of the vessel; the name and telephone number of the person in charge of the facility or vessel.

(2) The population density within a one-mile radius of the facility or vessel, described in terms of the following ranges: 0–50 persons, 51–100 persons, 101–500 persons, 501–1,000 persons, more than 1,000 persons.

(3) The identity and location of sensitive populations and ecosystems within a one-mile radius of the facility or vessel (e.g., elementary schools, hospitals, retirement communities, or wetlands).

(4) For each hazardous substance release claimed to qualify for reporting under CERCLA section 103(f)(2), the following information shall be supplied:

(i) The name/identity of the hazardous substance; the Chemical Abstracts Service Registry Number for the substance (if available); and if the substance being released is a mixture, the components of the mixture and their approximate concentrations and quantities, by weight.

(ii) The upper and lower bounds of the normal range of the release (in pounds or kilograms) over the previous year.

(iii) The source(s) of the release (e.g., valves, pump seals, storage tank vents, stacks). If the release is from a stack, the stack height (in feet or meters).

(iv) The frequency of the release and the fraction of the release from each release source and the specific period over which it occurs.

(v) A brief statement describing the basis for stating that the release is continuous and stable in quantity and rate.

(vi) An estimate of the total annual amount that was released in the previous year (in pounds or kilograms).

(vii) The environmental medium(a) affected by the release:

(A) If surface water, the name of the surface water body;

(B) If a stream, the stream order or average flowrate (in cubic feet/second) and designated use;

(C) If a lake, the surface area (in acres) and average depth (in feet or meters);

(D) If on or under ground, the location of public water supply wells within two miles.

(viii) A signed statement that the hazardous substance release(s) is(are) continuous and stable in quantity and rate under the definitions in paragraph (b) of this section and that all reported information is accurate and current to the best knowledge of the person in charge.

(g) *Notification of changes in the release.* If there is a change in the release, notification of the change, not otherwise reported, shall be provided in the following manner:

(1) *Change in source or composition.* If there is any change in the composition or source(s) of the release, the release is a new release and must be qualified for reporting under this section by the submission of initial telephone notification and initial written notification in accordance with paragraphs (c) (1) and (2) of this section as soon as there is a sufficient basis for asserting that the release is continuous and stable in quantity and rate;

(2) *Change in the normal range.* If there is a change in the release such that the quantity of the release exceeds the upper bound of the reported normal range, the release must be reported as a statistically significant increase in the release. If a change will result in a number of releases that exceed the upper bound of the normal range, the person in charge of a facility or vessel may modify the normal range by:

(i) Reporting at least one statistically significant increase report as required under paragraph (c)(7) of this section and, at the same time, informing the National Response Center of the change in the normal range; and

(ii) Submitting, within 30 days of the telephone notification, written notification to the appropriate EPA Regional Office describing the new normal range, the reason for the change, and the basis for stating that the release in the increased amount is continuous and stable in quantity and rate under the definitions in paragraph (b) of this section.

(3) *Changes in other reported information.* If there is a change in any information submitted in the initial written notification or the followup notification other than a change in the source, composition, or quantity of the release, the person in charge of the facility or vessel shall provide written notification of the change to the EPA Region for the geographical area where the facility or vessel is located, within 30 days of determining that the information submitted previously is no longer valid. Notification shall include the reason for the change, and the basis for stating that the release is continuous and stable under the changed conditions.

(4) Notification of changes shall include the case number assigned by the National Response Center or the Environmental Protection Agency and also the signed certification statement required at (c)(2)(xi) of this section.

(h) *Notification of a statistically significant increase in a release.* Notification of a statistically significant increase in a release shall be made to the National Response Center as soon as the person in charge of the facility or vessel has knowledge of the increase. The release must be identified as a statistically significant increase in a continuous release. A determination of whether an increase is a ''statistically significant increase'' shall be made based upon calculations or estimation procedures that will identify releases that exceed the upper bound of the reported normal range.

(i) *Annual evaluation of releases.* Each hazardous substance release shall be evaluated annually to determine if changes have occurred in the information submitted in the initial written notification, the followup notification, and/or in a previous change notification.

(j) *Use of the SARA Title III section 313 form.* In lieu of an initial written report or a followup report, owners or operators of facilities subject to the requirements of SARA title III section 313 may submit to the appropriate EPA Regional Office for the geographical area where the facility is located, a

copy of the Toxic Release Inventory form submitted under SARA Title III section 313 the previous July 1, provided that the following information is added:

(1) The population density within a one-mile radius of the facility or vessel, described in terms of the following ranges: 0–50 persons, 51–100 persons, 101–500 persons, 501–1,000 persons, more than 1,000 persons.

(2) The identity and location of sensitive populations and ecosystems within a one-mile radius of the facility or vessel (e.g., elementary schools, hospitals, retirement communities, or wetlands).

(3) For each hazardous substance release claimed to qualify for reporting under CERCLA section 103(f)(2), the following information must be supplied:

(i) The upper and lower bounds of the normal range of the release (in pounds or kilograms) over the previous year.

(ii) The frequency of the release and the fraction of the release from each release source and the specific period over which it occurs.

(iii) A brief statement describing the basis for stating that the release is continuous and stable in quantity and rate.

(iv) A signed statement that the hazardous substance release(s) is(are) continuous and stable in quantity and rate under the definitions in paragraph (b) of this section and that all reported information is accurate and current to the best knowledge of the person in charge.

(k) *Documentation supporting notification.* Where necessary to satisfy the requirements of this section, the person in charge may rely on recent release data, engineering estimates, the operating history of the facility or vessel, or other relevant information to support notification. All supporting documents, materials, and other information shall be kept on file at the facility, or in the case of a vessel, at an office within the United States in either a port of call, a place of regular berthing, or the headquarters of the business operating the vessel. Supporting materials shall be kept on file for a period of one year and shall substantiate the reported normal range of releases, the basis for stating that the release is continuous and stable in quantity and rate, and the other information in the initial written report, the followup report, and the annual evaluations required under paragraphs (e), (f), and (i), respectively. Such information shall be made available to EPA upon request as necessary to enforce the requirements of this section.

(l) *Multiple concurrent releases.* Multiple concurrent releases of the same substance occurring at various locations with respect to contiguous plants or installations upon contiguous grounds that are under common ownership or control may be considsred separately or added together in determining whether such releases constitute a continuous release or a statistically significant increase under the definitions in paragraph (b) of this section; whichever approach is elected for purposes of determining whether a release is continuous also must be used to determine a statistically significant increase in the release.

(m) *Penalties for failure to comply.* The reduced reporting requirements provided for under this section shall apply only so long as the person in charge complies fully with all requirements of paragraph (c) of this section. Failure to comply with respect to any release from the facility or vessel shall subject the person in charge to all of the reporting requirements of §302.6 for each such release, to the penalties under §302.7, and to any other applicable penalties provided for by law.

[55 FR 30185, July 24, 1990, as amended at 67 FR 45357, July 9, 2002]

PART 303—CITIZEN AWARDS FOR INFORMATION ON CRIMINAL VIOLATIONS UNDER SUPERFUND

Subpart A—General

Subpart B—Eligibility To File a Claim for Award and Determination of Eligibility and Amount of Award

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