needs for spill response for other hazardous materials handled in the petroleum industry.

Part of the above training is applicable to response training for major chemical accidents in terms of emergency management principles, but is mainly focussed on dealing with small to medium-sized petroleum spills.

3.5.2 The Chemical Industry. Although on-scene emergency assistance is TEAP's primary role, it also undertakes many other activities. For example, TEAP personnel actively assisted Transport Canada during its establishment of CANUTEC and helped to train CANUTEC employees in effectively responding to requests for information. The Canadian Chemical Producers Association, through its TEAP organization, has become a leader in training for transportation emergency response in Canada. TEAP has held five chemical transportation emergency response seminars across the country since 1980. The seminars have attracted a broad audience in addition to industry personnel, including representatives from fire and police departments as well as many federal and provincial government departments and agencies. Some of these seminars have offered hands-on training for transportation emergency procedures. Others have provided a comprehensive approach to emergency planning needs, the initial response to the incident, a disciplined approach to the incident and media training. The TEAP organization is now video taping training modules to make them more widely available across Canada.

TEAP has been particularly active in further developing and promoting the adoption of a "disciplined approach" in Canada (Appendix III-3). It offers a disciplined process for making decisions during a dangerous goods incident. A person familiar with this approach can list and work with the factors that need to be considered in sizing up a dangerous goods incident. It also offers a process for determining both preventive and corrective actions that should be taken at the incident scene. The CCPA has prepared a course on this subject that will soon be offered in Ontario by Lambton College.

Some members of chemical company emergency response teams have undertaken advanced spill response courses for hazardous materials such as those offered in the U.S. at Texas A&M University, or by the American Association of Railroads in Colorado. Some of the multi-national companies have also provided advanced hands-on chemical emergency response training for Canadian employees at locations outside Canada. Lambton College, Sarnia, has developed hands-on training courses for hazardous-material spill response, in cooperation with the local mutual aid cooperative Chemical Valley Emergency Control Organization (CVECO). Periodically, the mutual aid groups in the

chemical industry, such as CVECO in Sarnia and FORT MAP in Fort Saskatchewan, hold exercises or drills which may involve a medium-sized incident (the general approach taken is to look at major incident scenarios and scale them down to more manageable proportions for an exercise). However, there appears to be a need in the chemical industry in other parts of the country for more advanced training for management of medium and major incidents. This should be undertaken in cooperation with local and provincial authorities responsible for emergency measures in the area.

3.5.3 Other Industries. Most other industries undertake only a basic level of dangerous goods response training if they are involved in handling, offering or transporting dangerous goods prescribed under Schedule XII - Part II of the Transportation of Dangerous Goods Regulations. Companies dealing with specific toxic chemicals (e.g., a major user of chlorine in the pulp and paper industry) may have provided extra training in emergency response to their plant employees for minor incidents involving those chemicals, but few companies have extended this training to a major accident scenario. Several private consultants, mainly from the U.S.A., have conducted hands-on training in major cities primarily for fire fighters and laboratory personnel and for people facing small to medium-sized spills of hazardous materials.

3.5.4 Local Governments. Fire and police personnel are often first on-scene to deal with the initial response to an accident involving hazardous chemicals. All have received basic training in general emergency management principles; some of them have begun taking or presenting "initial responder" courses, some of which were first offered by the provincial governments, industry or various provincial or federal agencies. Some first-response courses have also been developed by municipal agencies on their own. In addition to fire and police officers, ambulance, hospital and emergency measures staff may have taken these courses as well. However, the proportion of such people and volunteer fire fighters who have completed initial response training for hazardous materials is still quite low. Where practice exercises have taken place, the local emergency drills usually involve a cooperative response scenario between local municipal officers, industry personnel and supporting provincial groups.

One of the concerns about the local emergency manager's level of training is that additional courses and hands-on training may be needed to eliminate either over-confidence or a lack of confidence in responding to such incidents. More advanced courses for these local responders are being developed, but greater priority and funding is needed for training this key first level of response.

3.5.5 Provincial/Territorial Governments. Some provinces and territories have been active for several years in the training of initial responders for spills and releases. With the passage of provincial legislation for the highway transport of dangerous goods, this training level has risen to cover inspectors and municipal emergency officers. Provincial environment departments, transport departments and emergency measures agencies have been involved in these efforts, along with provincial enforcement agencies. Occasionally, one agency will develop a specific instructional course for their own employees (e.g., Ontario Provincial Police are developing materials for first-responder training of their personnel). Provincial training courses also cover medical and social services during major emergencies. The availability and depth of advanced courses is improving rapidly in some provinces, and more slowly in others. Transfers of course material to these provinces could accelerate training, and such transfers have started to take place among some of the provinces.

3.5.6 Federal Government Agencies. Several federal agencies have developed and presented training courses for certain aspects of spill emergency response. The Transport of Dangerous Goods Directorate of Transport Canada has touched briefly on this subject as part of their TDG awareness seminars at Arnprior, Ontario, with support from other agencies and industry participants. In various regions of the country, regional and district offices of Environment Canada have presented information sessions and training courses on spill response for oil and hazardous materials. Environment Canada also sponsors the annual Technical Seminar on Chemical Spills. Many regional Environmental Protection Service officers have also received advanced training in hazardous materials spill response, and are equipped for monitoring and sampling purposes, with personal protective gear and instrumentation. As previously mentioned, the Canadian Coast Guard has also presented a 15-day course on Major Marine Emergency Management for its regional response staff, other agencies, industry, and some foreign governments. Many aspects of emergency public welfare services that should be addressed in community contingency plans are the subject of federal training programs. Services required include registration and inquiry, lodging, food, clothing and personal services. As well, the long-term psychological aspects of disasters should be addressed in more depth. Training in these services is provided by Health and Welfare Canada in a Community Emergency Planning (Social Services) course conducted at the Canadian Emergency Preparedness College at Arnprior. Emergency medical planning is also covered by a comparable course titled "Emergency Health Services Planning - Community" at the same college. This college is

run by Emergency Planning Canada and offers a comprehensive list of courses for trainers, territorial/provincial and federal government workers, elected and appointed municipal officials and various private sector representatives. Other typical courses at Arnprior which are relevant to major chemical incident training include courses on disaster-site management, on-scene command, exercise design and peacetime emergency planning. Agencies that could become involved in hazardous chemical accidents should consider their needs and begin to develop the required training.

3.5.7 Training Advisory Groups. Among the groups that are known to be examining the needs, content and application of spill emergency training are:

(a) an ad-hoc federal-provincial group examining future needs and developing basic and advanced course materials for dangerous goods emergency training, led by Emergency Planning Canada and Alberta Public Safety Services;

(b) a sub-committee of the (industrial) Advisory Council on the Transportation of Dangerous Goods, reporting through the Inspector-General for Transportation Safety to the Federal Minister of Transport;

(c) a federal-provincial working group examining response training for spills of hazardous wastes (e.g., PCBs) reporting to the Canadian Council of Resource and Environment Ministers (CCREM) and led by the Ontario Ministry of the Environment;

(d) a training sub-committee of the Spill Response Division of PACE (Petroleum Association for Conservation of the Canadian Environment) developing training materials for first responders to hazardous product spills in the petroleum industry; and

(e) a recent meeting of federal-provincial-industrial officials at one of a series of seminars held every other year to discuss training and education for "Peacetime Emergency Preparedness". The participants examined needs for training in a wide variety of emergencies, including major chemical releases. Emergency Planning Canada coordinated the seminar, which also had participation from several other industrialized countries.

There is likely some overlap of activity among these groups and others that may exist. A greater communication amongst the groups and with industry associations could minimize duplication and enhance the development of mutually-supportive training materials for chemical spill response and disaster management.

3.6 Technical Information Needs

Several needed technical studies relating to emergency medicine were outlined in Section 3.3. There are, however, additional technical questions that must be addressed in the areas of public protection measures for major chemical accidents.

There must be a knowledge of what concentrations or levels of chemical contamination are of concern for public safety, leading to pre-established concentration thresholds for decisions on (a) recommended or mandatory evacuation or on (b) recommendations to remain indoors with air intakes closed. Considerable information is available for many industrial chemicals on occupational health and safety standards for chemical exposure, such as threshold limit values (TLV's) and levels posing an "immediate danger to life and health" (IDLH). There is no simple correlation between these workplace values for employees, and the levels at which evacuation of a threatened area would be recommended for either the general public, or for particularly sensitive individuals (children, seniors and people with respiratory problems). Studies should be conducted by a suitable federal/provincial working group, with input from medical and toxicological professionals, to evaluate existing data and to determine and publish recommended evacuation levels for both the general public and for special-need groups. This information should be made available to community and industrial emergency planners.

Another question involves the merits of evacuation versus staying indoors with air intakes sealed off. Under certain circumstances where the release is a "puff" or a moving, well defined cloud, it may be safer to stay indoors and not evacuate. Such situations and specific chemicals must be examined closely, and the results distributed to local emergency officials. Research sponsored by the Alberta government at the University of Alberta has already showed progress in this field. A joint federal/provincial industry committee should address the studies.

3.7 Spill Technology Research and Development

In addressing its needs for spill countermeasures technology development, the petroleum industry has been fortunate that the greater proportion of spilled petroleum products and crude oils behave in a similar manner (i.e., most are flammable and float on water). In addition, few are Bhopal-type chemicals. Therefore, both the behaviour of spilled products and the principles of treatment or recovery have been relatively well understood. The net result of this favourable situation, and of much hard work and investment by both industry and government, has been the development of advanced oil

spill countermeasures technology, and the wide availability and application of both basic and advanced hardware and techniques. Some limitations do exist, however, in the technology for counteracting gas releases such as hydrogen sulphide, sulphur dioxide, propane and natural gas.

The various chemical industries produce a wide range of hazardous chemicals, including a number having the potential for a major incident. The physical and chemical properties of hazardous chemicals in general vary widely, from highly dispersive toxic gases which may be lighter or heavier than air, soluble or insoluble in water, and flammable, less flammable or non-flammable. Hazardous liquids may float on water or sink in water, be miscible or reactive with water or non-miscible/non-reactive with water, as well as flammable, less flammable or non-flammable. Hazardous solids exhibit similar variations in behavioural properties.

Because of the diversity of hazardous chemicals, currently available technology for mitigating the effects of their releases is limited. The chemical industry could benefit from the approach taken over 10 years ago by the petroleum industry to advance the state of cleanup technology on a cooperative basis. Much of the rather rudimentary chemical emergency response equipment in use has been around for 15-20 years, although a few technical breakthroughs have been made in the last few years, such as inflatable air bags and prototype portable reverse osmosis units.

A recent survey by Environment Canada of chemical spill countermeasures equipment available, proposed or even just at the concept stage anywhere in the world, showed that only a small number of devices and techniques have been user-evaluated, purchased or even received much publicity or consideration by the emergency response community anywhere in the world.

The technology available for counteracting major incidents is definitely limited. For example, once a toxic or flammable gas cloud has been released, there are only a few circumstances and a limited range of devices or strategies (other than public protection measures such as indoor shelter or evacuation from the area of cloud dispersal) which, even if available and applied immediately, could reduce or eliminate the potential disastrous consequences of the release. Much further work is required to develop and assess the merits of needed new equipment, techniques and strategies.

This discussion has presented a rather pessimistic view of Bhopal-type incident countermeasures technology. The brighter side of the situation is that such incidents are rare, because of intensive efforts to prevent their occurrence. The other positive factor is that the chemical and petroleum industries have developed and put into place, a number

of basic countermeasure devices and strategies designed to handle many smaller chemical releases. These measures can be applied in many circumstances to reduce the threat that a minor or medium-sized incident might grow into a major disaster. Another positive view is that opportunities exist for new, innovative technical approaches or concepts to be explored in a comprehensive program of countermeasures research and development for spills and releases of all sizes, including major chemical accidents.

As part of its national environmental emergency program, Environment Canada has been examining this field of technology, in consultation with several advisory groups and technical committees having academic, industrial and federal participation from both Canada and the U.S. With broader consultation with provinces, territories, national associations representing industries and municipalities, a larger joint program for chemical spill technology assessment and development could be developed by governments and industry, under the guidance of Environment Canada. Such a program would be most effective and economic if governments and industries participated both technically and financially. As mentioned previously, chemical properties vary widely, although groups of different chemicals can behave similarly. This provides the opportunity for an equitable participation in a joint research program by companies in the chemical industry. Those companies producing chemicals with similar properties or behaviour could focus their contributions on countermeasures dealing with those chemicals. Industry associations could play a coordinative role in such studies, and in the wider dissemination of the resulting reports.

3.8 Post-Event Information Exchange

Emergency managers can improve contingency plans and response systems by applying lessons learned from previous accidents and near-misses, anywhere in Canada or around the world. A few systems of information exchange exist in Canada, but they primarily focus on a single industry, or only exchange information in one region of the country. Most of these exchanges are informal or verbal, because of legal concerns associated with incidents before the courts or accidents that may be the subject of future prosecution by regulatory agencies. Most of the best written information is distributed only within the confines of the corporation which experiences the problem, although it may go to all branch plants in Canada, or even to all affiliated companies around the world.

Some of the current information exchange systems in Canada include:

(a) two or three meetings per year of oil and chemical industry safety officers from the larger companies in Ontario, to discuss verbally their recent experiences and lessons. These ad hoc meetings are held as part of the "Loss Management Forum" of the Industrial Accident Prevention Association (primarily an Ontario-based association);

(b) annual safety meetings of the Canadian Petroleum Association in Alberta, where loss prevention topics in the exploration and production sector form part of the program;

(c) an annual professional development conference for members of the Canadian Society of Safety Engineering;

(d) the occasional exchange of incident information during one of the three meetings per year of the petroleum industry (PACE) Spill Response Division;

(e) the international "5-Star" audit system for industrial safety and loss prevention, presented in Ontario by the Industrial Accident Prevention Association, and also starting in Quebec;

(f) a loss control institute at the University of Waterloo which focuses on certain loss prevention matters; and

(g) others not surveyed.

At the international level, another group of independent organizations addresses loss prevention, including:

(a) the World Safety Organization based in Scotland;

(b) the American Petroleum Institute forum for standards review by member companies;

(c) the International Loss Control Institute, based in U.S.A. which originated and manages the "5-Star" audit system;

(d) the American Institute of Chemical Engineers (A.I.Ch.E), which publishes a quarterly journal "Plant/Operations Progress", hosts an annual "Loss Prevention Symposium", and has also recently announced the formation of a Centre for Chemical Process Safety for guidance on loss prevention; and

(e) the Institution of Chemical Engineers, (I.Ch.E.) in the U.K., which operates an "Information Exchange System" and publishes a bi-monthly "Loss Prevention Bulletin", devoted solely to lessons learned from industrial accidents in the U.K., Europe and around the world. The I.Ch.E. also sponsors frequent U.K. workshops and training courses on loss prevention topics.

Based on our limited review, only the latter two sources appear to provide detailed written case histories and lessons learned as the main focus of their programs, and make them available to all subscribers, independent of industry affiliation. The U.K. system has the added advantage of a full-time specialist on staff, as both editor and advisor. This system was set up in 1974 with the philosophy of a free exchange of information, and all contributors are assured anonymity (or credit) by the editor and by an independent review panel of loss prevention experts.

In summary, a more in-depth assessment of all available accident information systems in Canada and elsewhere is needed, with a view to developing a broader Canadian system or encouraging a greater Canadian participation in international systems such as those operated by A.I.Ch.E or I.Ch.E. The benefits of an annual Canadian symposium should also be examined. The key to the success of an information exchange system ultimately lies in management by an independent institution or association, to eliminate participant concerns about regulatory penalties or loss of confidentiality, as well as to ensure impartiality.

APPENDIX III -1

LOCATIONS OF REGIONAL RESPONSE CENTRES - TEAP/CCPA

APPENDIX III-1 LOCATIONS OF REGIONAL RESPONSE CENTRES - TEAP/CCPA

Company Maintaining Regional Response Centre:

ERCO, Division of Tenneco Canada Ltd.
Long Harbour, Newfoundland

C-I-L Inc.
Dalhousie, New Brunswick

Union Carbide Canada Limited
Montreal East, Quebec

Du Pont Canada Inc.
Maitland, Ontario

Cyanamid Canada Inc.
Niagara Falls, Ontario

Reichhold Limited
North Bay, Ontario

Allied Canada Inc.
Amherstburg, Ontario

Dow Chemical Canada Inc.
Sarnia, Ontario

Esso Chemical Canada
Winnipeg, Manitoba

Celanese Canada Inc.
Edmonton, Alberta

Shell Canada Chemical Company
Burnaby, British Columbia
(expected to be operational in mid-1986)

FOR ACTIVATION OF ANY OF THE ABOVE TEAP CENTRES, CONTACT THE SHIPPER OF THE PRODUCT INVOLVED, OR CANUTEC IF SHIPPER CANNOT BE REACHED

APPENDIX III-2

TEAP/CCPA - RECOMMENDED EQUIPMENT LIST

APPENDIX III-2 TEAP/CCPA - RECOMMENDED EQUIPMENT LIST

Equivalent Equipment may be Substituted

1. Scott II - 3 units
2. Walkie Talkie - 2
3. High Intensity Lights
4. Generator (for light power)
5. Nylon Slings
6. Ladder
7. Portable Eyewash
8. Grounding Cables
9. Drum Grabs
10. Hand Pump
11. Assorted Plugs

    1. 1 - small plastic bucket
    2. assorted tapered wooden plugs
    3. 1 - tapered rubber plug
    4. 1 - 1 1/2" plumbers plug
    5. 1 - 2" plumbers plug
    6. 1 - 3" plumbers plug
    7. 1 - 4" plumbers plug
    8. 1 - 5" plumbers plug
    9. 1 - 6" plumbers plug
    10. 2 - 3/4" emergency pipe and bore test plugs
    11. 2 - 1" emergency pipe and bore test plugs
    12. 2 - 1 1/4" emergency pipe and bore test plugs
    13. 2 - 1/2" emergency pipe and bore test plugs
    14. 2 - 2" emergency pipe and bore test plugs
    15. 2 - 3/4" female emergency pipe and bore test plugs
    16. 2 - 1" female emergency pipe and bore test plugs
    17. 2 - 1 1/4" female emergency pipe and bore test plugs
    18. 2 - 1 1/2" female emergency pipe and bore test plugs
    19. 2 - 2" female emergency pipe and bore test plugs
    20. 1 - 4" pump and test plug
    21. 1 - 2" plumbers plug (capped)
    22. 1 - 4" plumbers plug (capped)
    23. 1 - 8" plumbers plug (capped)

TEAP/CCPA - RECOMMENDED EQUIPMENT LIST (Cont'd)

24. 2 - 3/8" ball valves (stainless steel)
25. 2 - 1/2" ball valves
26. 1 - bicycle pump

12. Tools

1. 1 - claw hammer
2. 2 - joint breakers
3. 1 - cold chisel
4. 1 - hacksaw frame
5. 1 - tool holder
6. 1 - pair pliers
7. 1 - crescent wrench
8. 2 - spid wrenches 5/8"
9. 4 - pipe wrenches 10", 14", 18" and 24"
10. 2 - screwdrivers 6" and 8"
11. 1 - torpedo level 9"
12. 1 - pair vise grips
13. 1 - drive ratchet (8 sockets - 1/2")
14. 1 - dead blow hammer (rubber) rH-D
15. 1 - 3/4" drive breaker bar
16. 2 - 3/4" drive ext. 8"
17. 1 - 3/4" drive socket 1-13/16"
18. 1 - pair channel lock pliers
19. 1 - comb. square 12"
20. 1 - tubing cutter
21. 1 - plumb bob 8 oz.
22. 2 - drive ext. 2" x 1/2" - 5" x 1/2"
23. 1 - set drift pins 1/2", 5/8", 3/4"
24. 1 - set packing hooks
25. 1 - set Allen set screw wrenches
26. 1 - rule 6' Lufkin
27. 1 - hammer 2 lbs.
28. 1 - wire nipper 8"
29. 1 - 7/8" combination wrench
30. 1 - 1-1/16" combination wrench
31. 1 - 1 1/2" combination wrench
32. 1 - center punch
33. 2 - "C" clamps No. 406
34. 2 - grinding stones
35. 1 - tip cleaner
36. 1 - chipping hammer
37. 1 - flashlight (3-cell)
38. 1 - Phillips head screwdriver
39. 1 - wire brush
40. 1 - copus blower and accessories
41. 1 - drum mover hand truck
42. 1 - cheater bar
43. 1 - 36" pipe wrench

TEAP/CCPA - RECOMMENDED EQUIPMENT LIST (Cont'd)

44. 1 - 3/8" drill
45. 1 - drip light
46. 3 - 30' extension cords
47. 2 - 24" cable chokers
48. 2 - 48" cable chokers
49. 2 - come-a-longs

13. Clothing (Work Clothes and Personal Hygiene Items)

14. Field Glasses

15. Camera

16. Chemical Suits

4 acid suits
3 hoods
3 pairs rubber boots
2 hot suits

17. 6 Overpack Drums - Size to contain standard 55 U.S. gallon drum.

18. Drum Patching

1. 1 - scissors
2. 1 - paint scraper
3. 1 - pliers
4. 1 - channel lock
5. 1 - tin snips
6. 1 - wire brush
7. 2 - pocket knives
8. 2 - putty knives
9. 2 - screwdrivers (1 - 6" and 1 - 10")
10. 2 - 8" crescent wrenches
11. 1 - electric heat gun
12. 2 - 24 oz. ball pein hammers
13. 1 - hacksaw - 2 spare blades
14. 1 - vulcanizing plug kit
15. assorted wooden plugs
16. assorted wooden wedges
17. 4 - plastic steel kits
18. 2 - fast hardeners
19. 1 - roll duct tape
20. 6 - drum clamps
21. 1 - pk. fine sandpaper
22. 1 - pk. medium sandpaper
23. assorted square patches - rubber and sheetmetal
24. assorted sheetmetal screws - rubber washers
25. 2 - 2" x 36 yds. aluminum tape

TEAP/CCPA - RECOMMENDED EQUIPMENT LIST (Cont'd)

26. 4 - 2" x 36 yds. lead tape
27. 1 - small drum plug wrench
28. 2 - 4 lb. dead blow hammers
29. 2 - 2" x 50' rubber base magnetic tape
30. 1 - 5 lb. bag lead wood
31. 1 - package steel wool
32. 2 - flashlights
33. 1 - Phillips head screwdriver
34. 4 - toggle bolts with rubber patch
35. 2 - pks. Seagoing epoxy - 3-3/4 oz. ea.
36. 2 - pks. Devcon ST-50 epoxy - 5 1/4 oz. ea.
37. 1 - epoxy tabs - 4 oz.
38. 1 - 1" bung hole adapter with quick connector
39. 1/16" x 8" wires (for quick connectors)
40. 1 - dust brush
41. 8 - Devcon - 5-minute epoxy 1 oz.
42. 20 ea. 4" x 4" stick on labels - flammable gas, poison and corrosive

19. Safety Equipment

1. 2 - red hazard lights
2. 4 - stop signs
3. 1 - box warning triangles
4. 2 - safety blankets
5. 1 - first aid kit
6. 2 - track signs

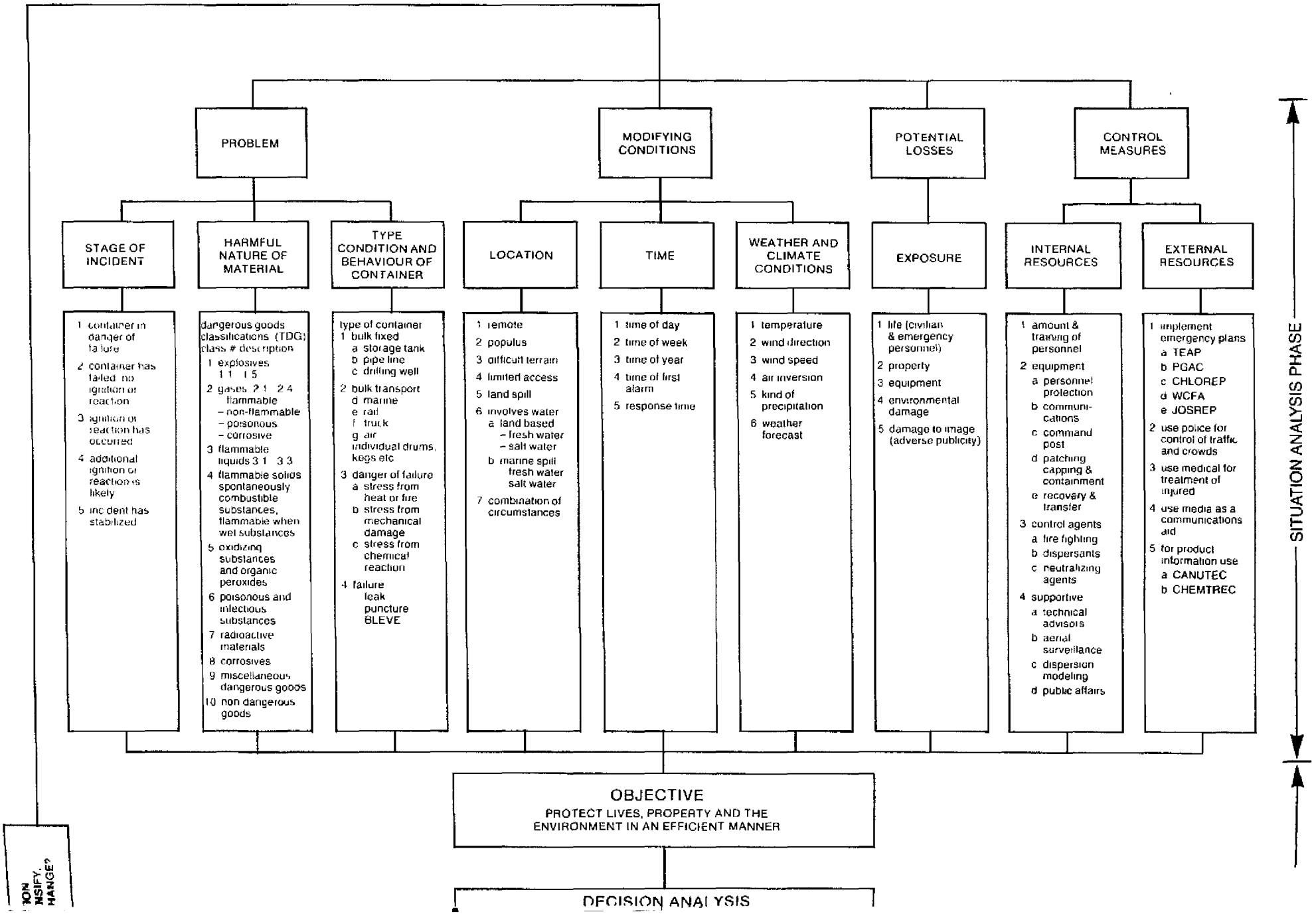
20. Testing Equipment

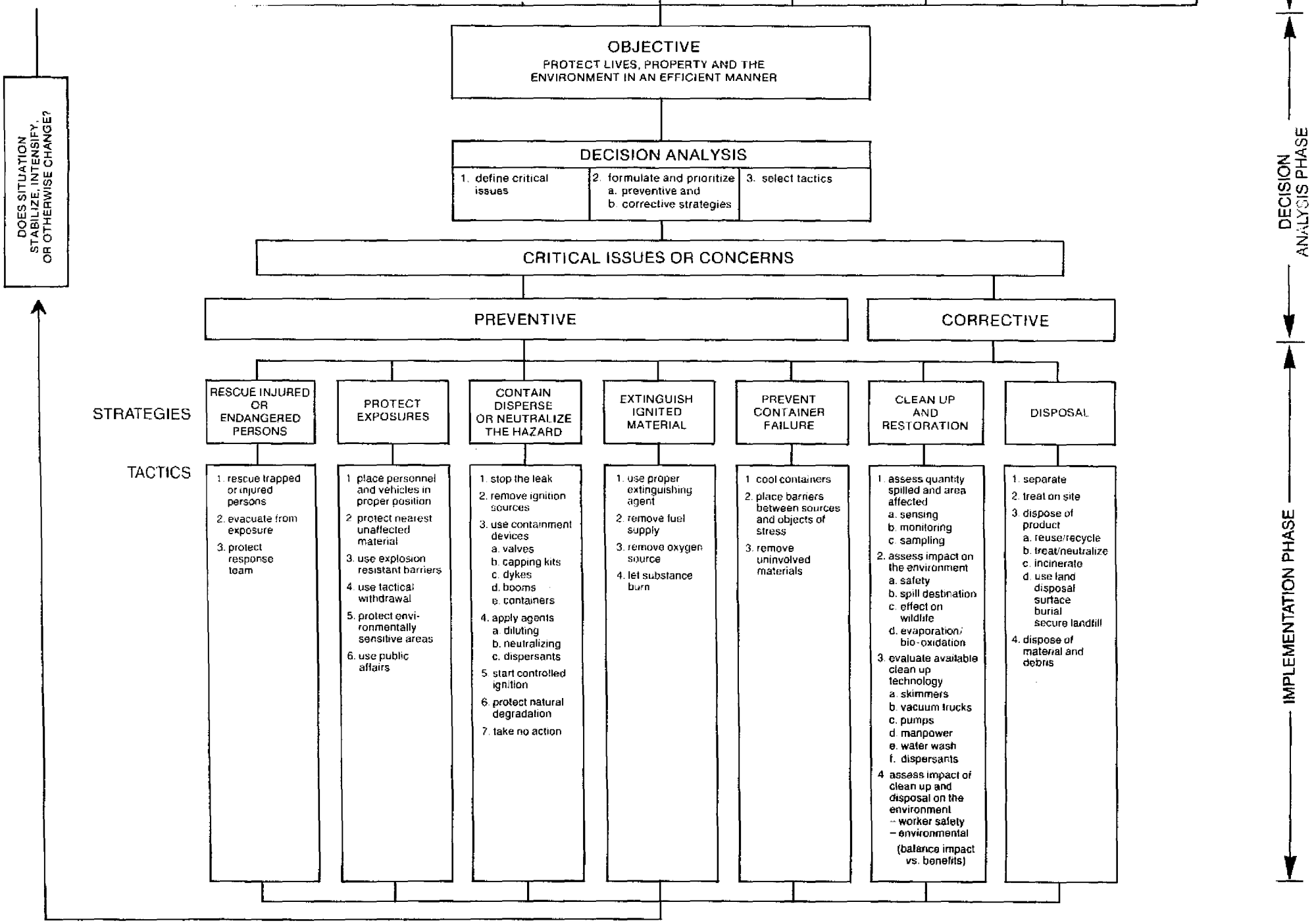
1. 1 - explosive meter
2. 1 - oxygen tester
3. 1 - dragger tube

APPENDIX III-3

The following sheet summarizes the "Disciplined Approach to Emergency Response" developed by Esso Chemicals Canada for the Canadian Chemical Producers' Association, with assistance from Lambton College, and credits for earlier related work by the National Fire Protection Association.

A DISCIPLINED APPROACH TO EMERGENCY RESPONSE




DOES SITUATION STABILIZE, INTENSIFY, OR OTHERWISE CHANGE?
OBJECTIVE
PROTECT LIVES, PROPERTY AND THE ENVIRONMENT IN AN EFFICIENT MANNER
DECISION ANALYSIS
1. define critical issues
2. formulate and prioritize
a. preventive and
b. corrective strategies
3. select tactics
CRITICAL ISSUES OR CONCERNS
PREVENTIVE
CORRECTIVE
STRATEGIES
TACTICS
RESCUE INJURED OR ENDANGERED PERSONS
1. rescue trapped or injured persons
2. evacuate from exposure
3. protect response team
PROTECT EXPOSURES
1. place personnel and vehicles in proper position
2. protect nearest unaffected material
3. use explosion resistant barriers
4. use tactical withdrawal
5. protect environmentally sensitive areas
6. use public affairs
CONTAIN DISPERSE OR NEUTRALIZE THE HAZARD
1. stop the leak
2. remove ignition sources
3. use containment devices
a. valves
b. capping kits
c. dykes
d. booms
e. containers
4. apply agents
a. diluting
b. neutralizing
c. dispersants
5. start controlled ignition
6. protect natural degradation
7. take no action
EXTINGUISH IGNITED MATERIAL
1. use proper extinguishing agent
2. remove fuel supply
3. remove oxygen source
4. let substance burn
PREVENT CONTAINER FAILURE
1. cool containers
2. place barriers between sources and objects of stress
3. remove uninvolved materials
CLEAN UP AND RESTORATION
1. assess quantity spilled and area affected
a. sensing
b. monitoring
c. sampling
2. assess impact on the environment
a. safety
b. spill destination
c. effect on wildlife
d. evaporation/ bio-oxidation
3. evaluate available clean up technology
a. skimmers
b. vacuum trucks
c. pumps
d. manpower
e. water wash
f. dispersants
4 assess impact of clean up and disposal on the environment
– worker safety
– environmental
(balance impact vs. benefits)
DISPOSAL
1. separate
2. treat on site
3. dispose of product
a. reuse/recycle
b. treat/neutralize
c. incinerate
d. use land disposal surface burial secure landfill
4. dispose of material and debris
DECISION ANALYSIS PHASE
IMPLEMENTATION PHASE

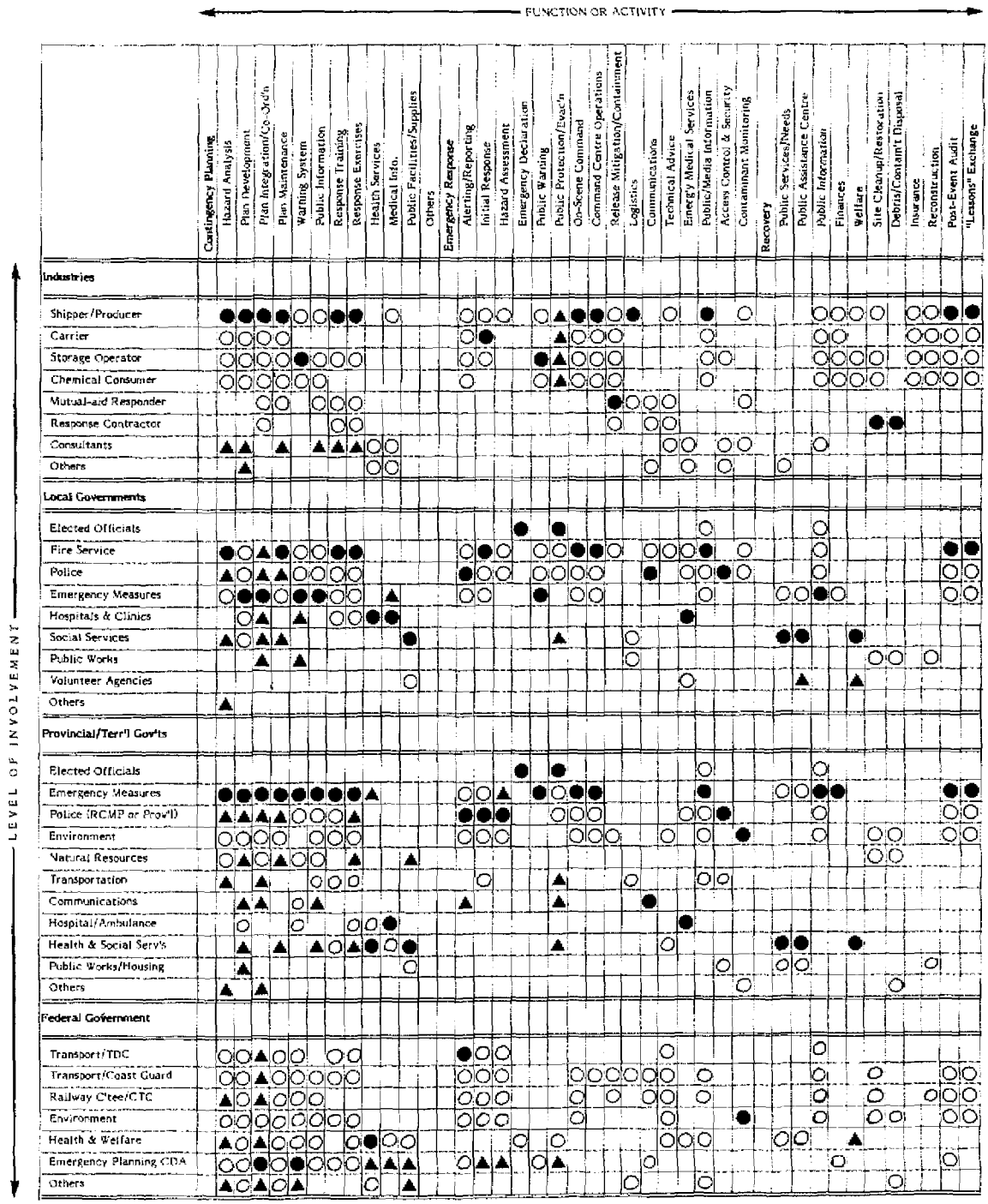
APPENDIX III-4

TYPICAL CHEMICAL EMERGENCY SYSTEMS IN CANADA

APPENDIX III-4 TYPICAL CHEMICAL EMERGENCY SYSTEMS IN CANADA

LEGEND:

- ● - denotes normal lead agency for each function & level.
- ▲ - denotes normal support agency for each function & level.
- ○ - denotes optional lead agency for each function & level, otherwise often contributing support as requested.



N.B. Readers should consult contingency plans and response agencies in their region or province/territory for specific arrangements in response to given scenarios.

APPENDIX III-5

PREPAREDNESS QUESTIONNAIRE

APPENDIX III-5 PREPAREDNESS FOR MAJOR CHEMICAL ACCIDENTS IN CANADA

A) Preparedness Survey

As part of the assessment of preparedness for chemical accidents in Canada, the working group developed a questionnaire which was sent to emergency measures organizations in all provinces and territories through the regional offices of Emergency Planning Canada. The questions were drafted to minimize subjectivity, but it was recognized that many of the questions asked for information which was not currently gathered at a provincial level. Thus, informed opinions were still necessary to respond. In many cases, the answers were generated following a discussion amongst provincial, and in some cases, federal officials involved in various aspects of emergency response in those areas.

We must stress that the survey results only provide an overview of informed opinion, and do not represent a definitive assessment. In fact, the results, along with some difficulties in distribution and interpretation of the questionnaire, have served to re-emphasize the care and sophistication needed in preparation and management of a proper survey. A recommendation has been made elsewhere in this report regarding the need for better ways of objectively assessing various capabilities for emergency response. A related comment made by one respondent questioned the merits of assessing only the response capability for chemical accidents, because this is only a small portion of the total emergency planning and response requirements for governments and industries alike.

The questions, responses and a short analysis are presented on the next 20 pages, followed by a brief summary of overall survey results.

B) **Questionnaire Response, and Analysis**

Question 1:

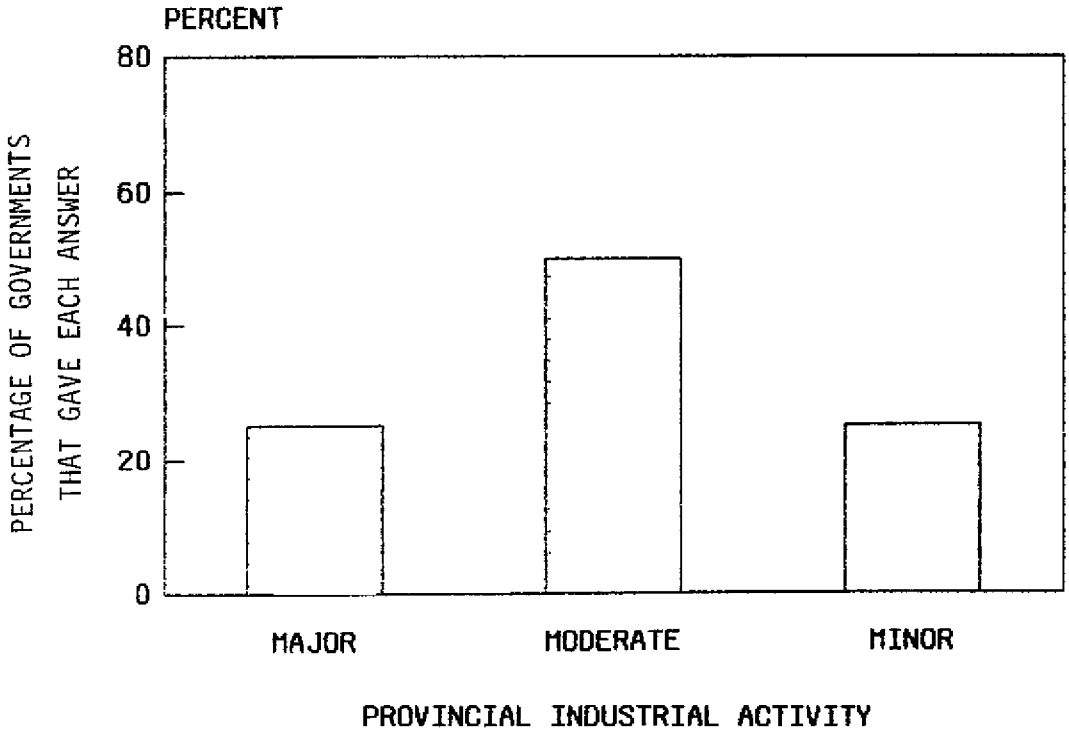
As indicated in the background comments, the relative exposure to major chemical incidents varies across the country. Would you categorize the province/territory as having:

(a) major industrial activity, including several chemical, petrochemical or petroleum refinery installations, in addition to major transportation routes near centres of population;

(b) moderate industrial activity, including a few plants as above, and/or major transportation routes near centres of population; or

(c) little industrial activity and no major transportation routes?

Response 1: (Twelve provincial/territorial governments answered this question)



Analysis 1:

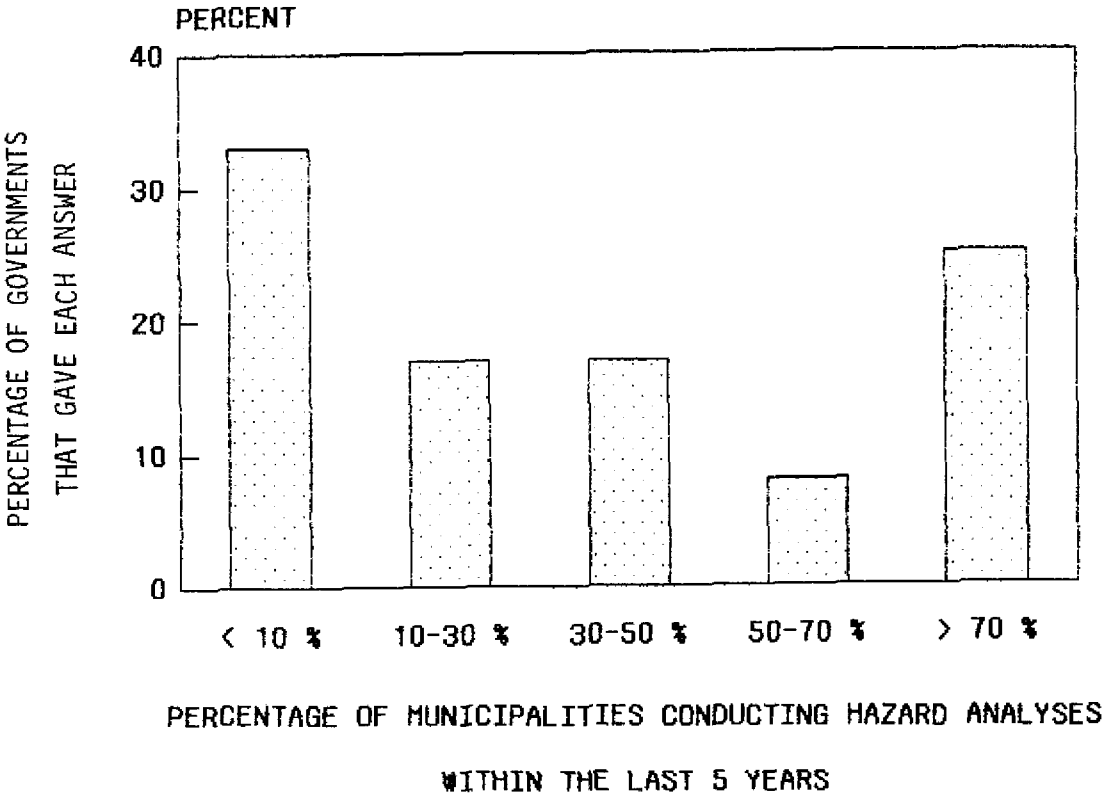
This subjective appraisal by respondents may have been influenced by their recollection of recent incidents. A more objective answer might be provided by analysis of appropriate national statistics on industries handling toxic chemicals.

Question 2:

What proportion of the municipalities/regions have in the last five years conducted a hazard analysis for potential hazardous chemical releases in their area, the results of which may have influenced their contingency plans?

(a) less than 10%
(b) 10% to 30%
(c) 30% to 50%
(d) 50% to 70%
(e) more than 70%

Response 2: (Twelve provincial/territorial governments answered this question)



Analysis 2:

There is an apparent correlation here to the legislated requirements of provincial and territorial governments for contingency plans at the municipal/regional level. There is also a partial correlation between those governments identifying major levels of industrial activity and those showing higher proportions of hazard analysis undertaken at the municipal level.