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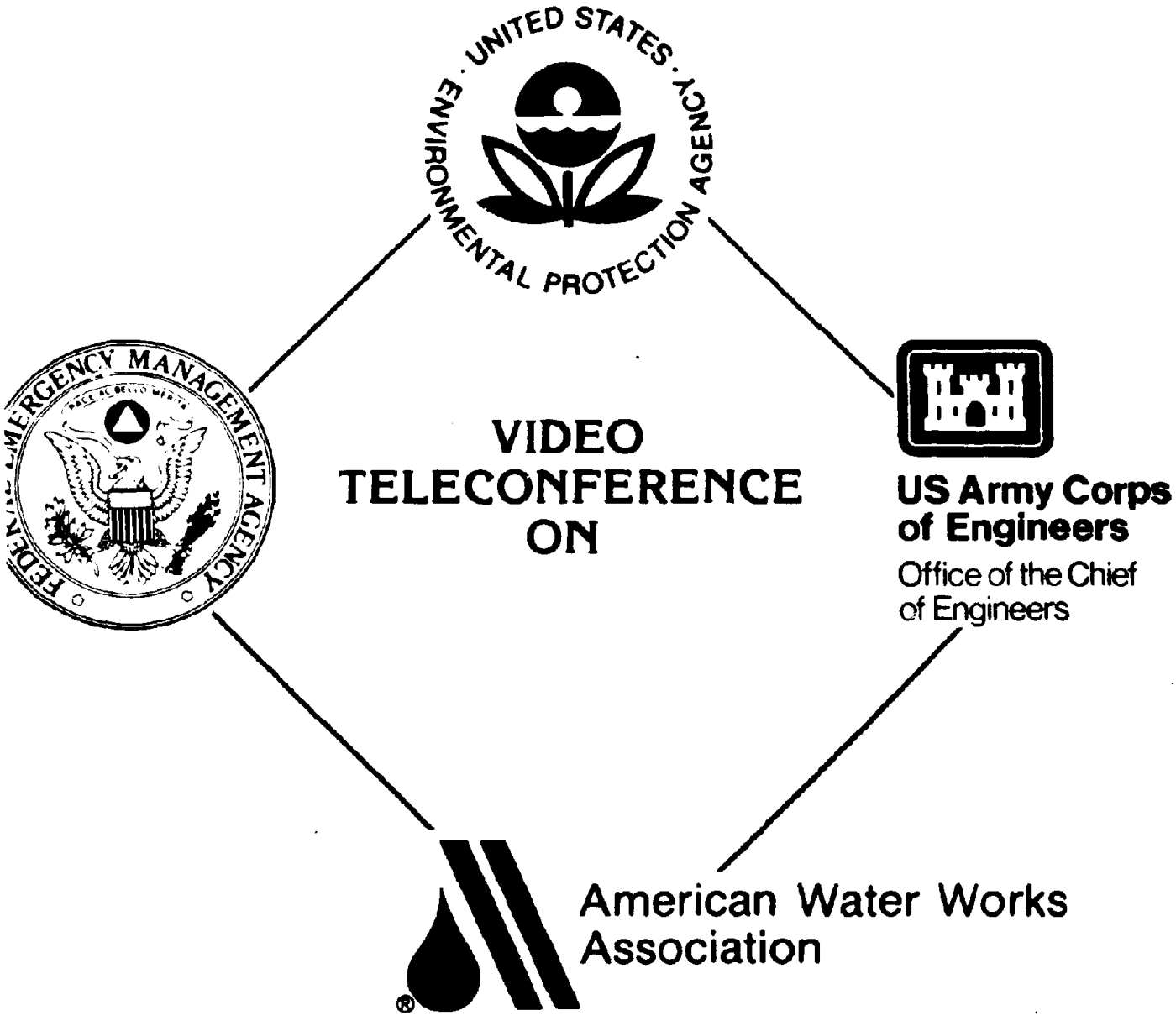

Emergency Planning for Potable Water Suppliers

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
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October 30-31, 1985

VIDEO TELECONFERENCE: EMERGENCY PLANNING FOR POTABLE WATER SUPPLIERS

Workbook Contents

Day 1

EMERGENCY PLANNING THE WATER SYSTEM PERSPECTIVE

EMERGENCY PLANNING - STATE & FEDERAL PERSPECTIVES & MEDIA INVOLVEMENT

SECTION I

EMERGENCIES AND THEIR EFFECTS

A. Definitions

Emergency

Event, natural or man made, concentrated in time and space, affecting community or subdivision. Threat causing damage or disruption of normal functions. Does not include routine disruptive incidents. Can affect part or all of system. Lasts for hours, days, weeks, or months.

Emergency Plan

Specifies, for given system, for given emergency situation: who does what and when using available resources.

Has two purposes: (1) provides minimum quantity of water required during emergency conditions and (2) provides rapid and efficient return to normal conditions.

B. Naturally Caused Emergencies

Earthquakes

Zones

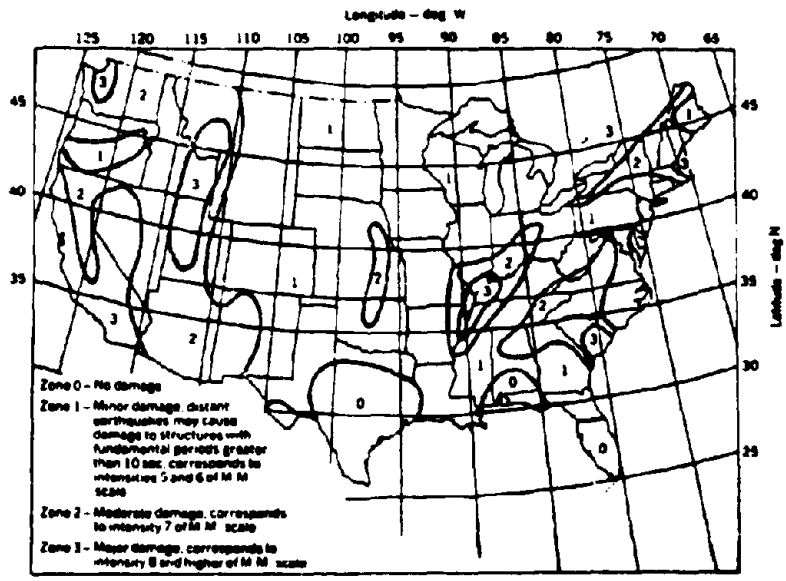


Fig. 2.1. Seismic-Risk Zones in the US

From: "Emergency Planning for Water Utility Management," Copyright 1984, American Water Works Assoc

Effects

Hurricanes

Locations/Times

Hurricanes, 1901 - 1957 - May - June
From 3a

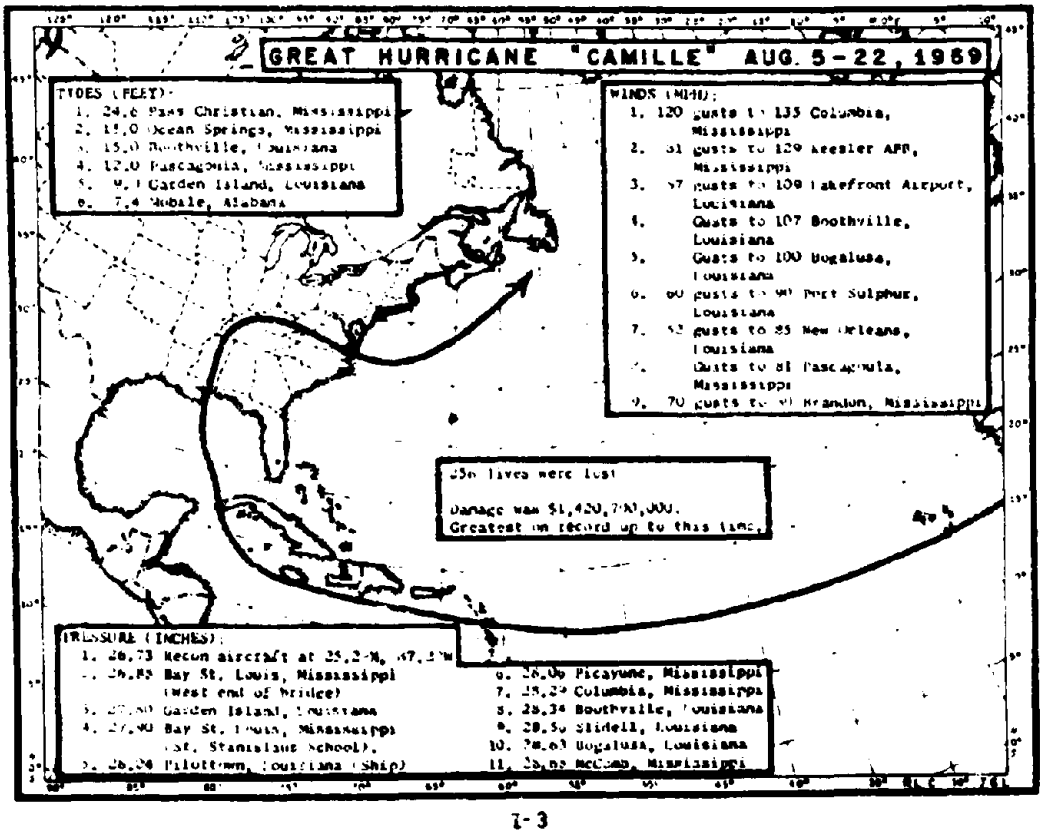
Hurricanes, 1901 - 1957 - July
From 3a

1-2

Hurricanes, 1901 - 1957 - August
Figure 5c

Hurricanes, 1901 - 1957 - September
Figure 5b

REEects



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Tornadoes

Locations/times

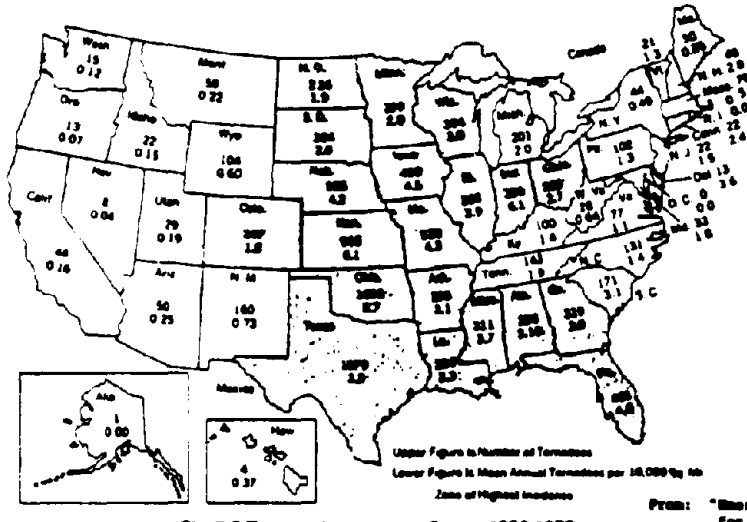
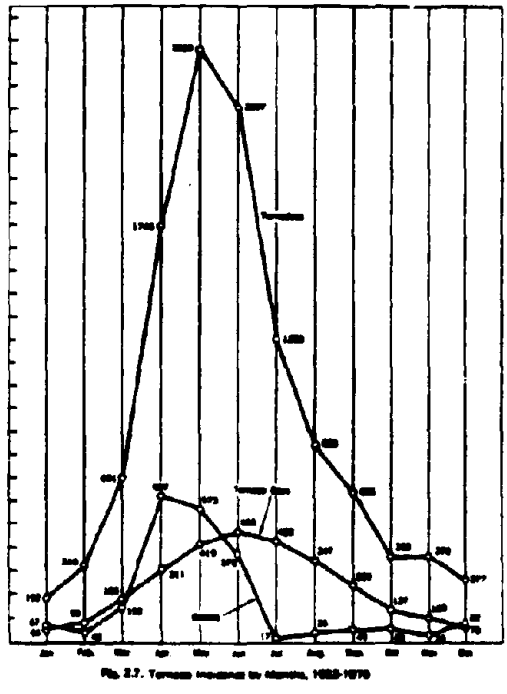


Fig. 2.8 Tornado Incidence by States, 1953-1970

From: "Emergency Planning for Water Utility Management." Copyright 1984. American Water Works Association.



Droughts

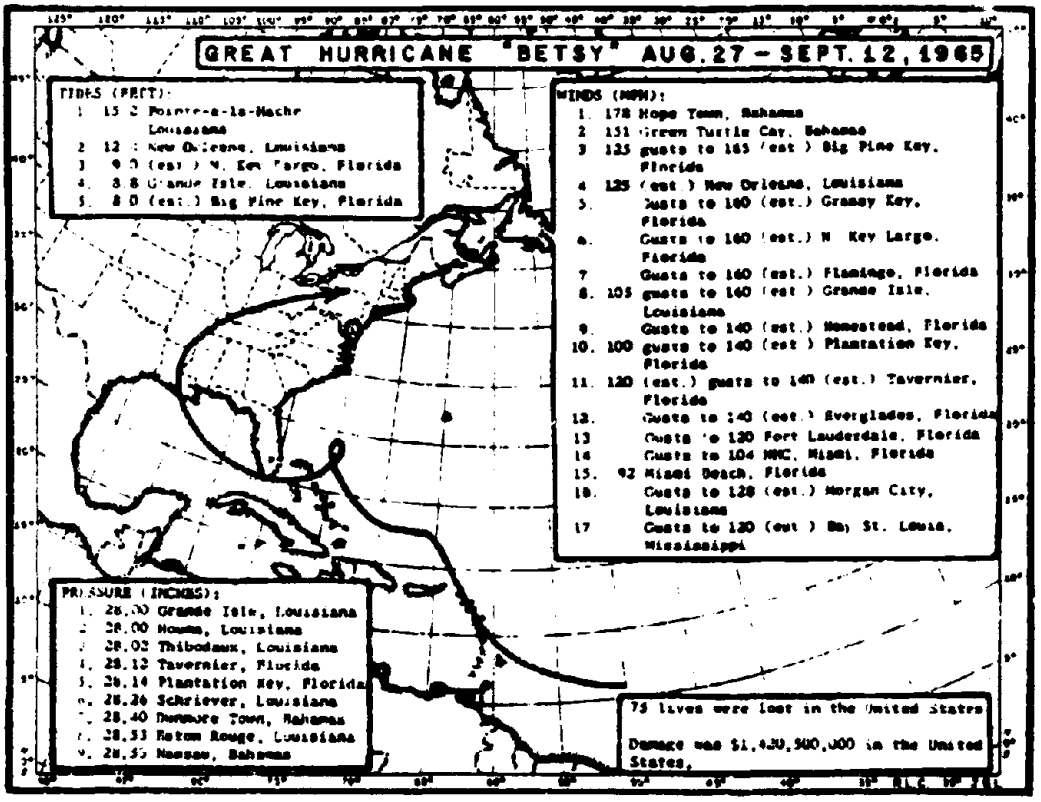
Locations

Effects

Floods

Locations

Effects



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C. Man-made Emergencies

Contamination

Work Stoppages

Fire

Explosion

Civil Disorders

Arson

D. Summary

All water systems subject to emergencies.

Effects may include:

- o Power outages
- o Communication problems
- o Transportation difficulties
- o Personnel management difficulties
- o Structural damage

Water systems with good plans have avoided or minimized problems.

SECTION II

VULNERABILITY ASSESSMENT AND PROTECTIVE MEASURES

"Hard" vs. "Soft" Protective Measures

Vulnerability Assessment Procedure

1. Assume emergency incident

2. Estimate possible effects on system

3. Estimate water demand quantity/quality

4. Estimate where system unable to meet demand

5. If demand not met -- system vulnerable -- requires corrective measures

Important Nonsystem Components

1. Is number of people available sufficient?

2. Are available people properly trained?

3. Are information/resources available to carry out assigned tasks?

4. Is safety of personnel assured?

5. Is transportation available?

SECTION III

GROUND WATER CONTAMINATION VULNERABILITY ASSESSMENT

Introduction

At the outset of the program, all of the available case studies of ground-water contamination were reviewed to collect the various strategies used by local public water supply managers. These case studies showed that the Water Utility Manager is a very small player in major contamination incidents. Often he controls few of the resources available and the drinking water solution is considered a low priority by the various agencies involved. From the local manager's point of view, the immediate problem is providing safe water to the public in sufficient quantity and at a price the community can afford. Other agencies and interests may have other objectives. What is the bottom line? for the manager there are two main facts: (1) prevention is probably all you can afford and (2) safe drinking water is a Rubick's cube. Contamination presents a cluster of problems, issues, and objectives which must be addressed by the whole community.

Just because a water-quality problem is not known to exist at the present time does not mean that one may not appear tomorrow or at some other time in the future. Contingency plans should be developed before a problem develops so that sufficient time is available for rational decisions and planning. Several approaches can be followed, any of which should be dictated by the particular political, economic, and technical situations that exist. The contingency plans need not be expensive nor should they necessarily follow traditional methods. Some of the best ideas are generated by individuals with little or no scientific training, but these same people are characterized by a great deal of common sense and a need to quickly and inexpensively solve a problem.

Although any management plan must be flexible, a number of steps can be followed that should make the plan easier to implement. Certainly not inclusive, at least the following steps could be taken: (1) determine where the supply originates and what problems might be associated with it, (2) learn the system, (3) locate potential sources of contamination, (4) develop a system of self monitoring, (5) consider alternate sources of permanent or temporary supply, (6) locate and evaluate existing laws and regulations on waste disposal, (7) develop an aquifer sensitivity model, and (8) develop emergency response plans.

Where Does the Supply Originate

A short distance from its border with Kansas, Oklahoma's Cimarron River contains more than 50,000 mg/l of dissolved solids during low flow conditions. Scores of miles down stream, near its confluence with the Arkansas River, the Cimarron still contains more than 2,000 mg/l of dissolved solids despite the dilution from several major tributaries. In this case any wells drilled in the flood plain that are dependent on induced infiltration soon would be contaminated. The source for the calcium sulfate and sodium chloride in the river is natural, being derived from a series of saline springs and seeps.

At Minot, North Dakota, two muncipal wells produce water that contains higher concentrations of chloride than do the other wells in the field. The two wells are also about 50 feet deeper than the average. In this case a buried interglacial river valley trends through the center of town; it had cut several tens of feet into the underlying bedrock. One of the bedrock formations that subscrops along the buried valley walls is the Cannonball Formation, a unit that contains salty water. Apparently the high chloride wells are screened near the subscrop of the Cannonball and when pumped induce salty water to flow from the Cannonball, mix with the fresher water in the glacial sand and gravel, and eventually reach the municipal wells. This problem also is natural and perhaps the most practical control is to blend the water with that from other wells.

Several years ago, in an industrialized city in Michigan, a plant water manager decided to dredge the adjacent river in order to increase the yield from their induced infiltration supply. Not realizing the river contained high concentrations of a variety of industrial wastes, the river was dredged and within days the chemical quality of the well water deteriorated dramatically. It was then recognized that waste papermill products had sealed the river bottom, providing a last line of defense between the contaminated river and the well field.

It is evident from the above that a knowledge of the origin of the water-supply system can serve as a starting point in the development of management alternatives.

Learn the System

For the most part, geologic and hydrologic evaluations of the subsurface are based on an analysis of logs of wells and test holes. Unfortunately, these data commonly are not readily available, although experience has shown that they are likely to be stored in a file somewhere. If they do not turn up, it might be possible to obtain copies from the original driller, contractor, or consultant. Well construction details, such as depth, length of screen, etc., also can be of considerable value. The geologic data can be used to construct a number of maps and cross section of the aquifer system, as shown in Figure 160. Cross sections should provide an idea of how much protection the aquifer and confining units provide against contamination.

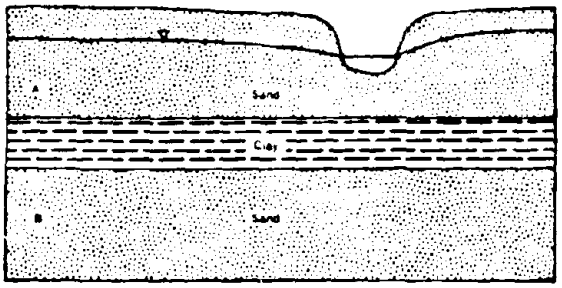


Figure 160. Aquifer A Has No Natural Protection and is Highly Subject to Contamination from the Surface. Aquifer B is Protected to Some Degree by the Overlying Layer of Clay

Notice in Figure 160 that the shallow or surficial aquifer (A) consists entirely of permeable material that extends from the land surface to the base of the water-bearing unit. Consequently, this aquifer has practically no natural protection other than the thickness of the unsaturated zone. It could be easily contaminated by a spill or nearly any type of waste disposal scheme. On the other hand, the deeper aquifer (B) is covered by a confining unit of low permeability, one that might require years for a contaminant to penetrate. In this case the deeper aquifer has some degree of natural protection and, in the case of a spill, time likely would be available to develop plans to overcome a potential contamination problem.

Well production/acceptance or aquifer test results also can be very useful as aids in understanding how the ground-water system functions. In both production and aquifer tests, water levels are measured in a pumping well and in one or more observation wells during a time period that commonly exceeds eight hours. These data, plotted as drawdown versus time or as drawdown in several wells versus distance from the pumped well, can be used to determine an aquifer's hydraulic conductivity or transmissivity, as well as the storativity. These parameters are necessary to calcuate ground-water velocity, among other things (see Chapter 2).

Nearly as important as geologic information are records of well discharge (rate and time interval) and water-level fluctuations, the latter indicating how the aquifer acts under stress. Of particular concern is the size of the cone of depression around a pumping well. As described in Chapter 2, the radius of the cone of depression is controlled by the aquifer properties and the discharge rate. In an unconfined aquifer, the radius of the cone may be in the order of a few hundred feet, but in a confined aquifer it may extend outward for miles. Furthermore, the drawdown caused by overlapping cones of depression is greater than that caused by a single well. Additionally, horizontal and vertical variations in aquifer properties, pumping schedules and rates, and well interference will tend to distort the shape of the composite cone of depression in a well field.

The shape and areal extent of the cone of depression are important in contamination studies for two major reasons. First, the cone represents a change in the hydraulic gradient, which steepens as it approaches the well. This, in turn, increases the velocity of ground-water flow. Second, contaminants that reach the aquifer and are within a cone will migrate toward the pumping well. Therefore, what ever happens within the radius of influence of a well is of concern to the water manager and this is why a knowledge of the size of the cone of depression is so important.

Likewise, the size of the area of influence of a well field is important because this is the area that should be protected, as shown in Figure 161. Although the area of influence might well exceed several square miles, the velocity of the ground water near the outer margin should be relatively low, as compared to the velocity in the vicinity of a well. Resultingly, if the aquifer were contaminated in this region, it might require several months or even years for the contaminant to appear at a well. In the meantime, the contaminant might be diluted or degraded to such an extent that it would not be of concern to the plant operator.

Locating Potential Sources of Contamination

In order to develop a mangement plan, local sources or potential sources of contamination must be known. These include, in addition to the more obvious ones, such things as the location of railroads, major highways, gasoline stations, and small industrial or service plants, particularly those small concerns that might be operated in someone's garage, basement, or outbuilding. The latter are not likely to be well known to regulatory agencies nor are they likely to have discharge permits.

In order to develop a data base for potential sources of ground-water pollution, several waste surveys could be conducted. These should include: (1) an industrial waste survey, (2) a municipal waste survey, and (3) a state and federal property survey. The surveys could be as simple as examining a map to locate highways, railroads, industrial sites, disposal sites, etc., or as complex as interviewing a large number of people. Surveys of this nature could become both time consuming and expensive, particularly if done inhouse.

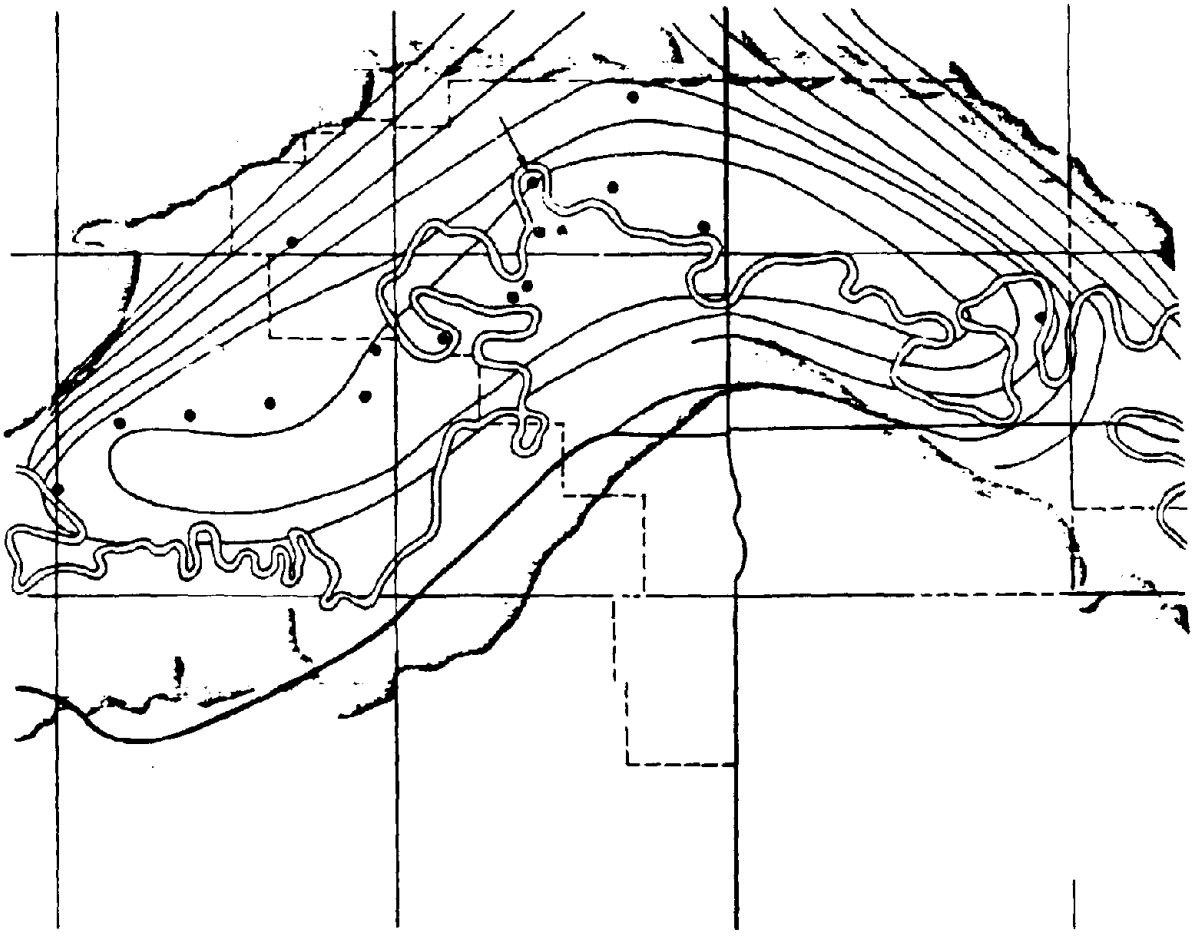


Figure 161. Water-Level Contour Map of The Main Aquifer Showing a Large Cone of Depression and Steep Hydraulic Gradient

One approach, which could be both comprehensive and inexpensive, would be to contact a number of local service clubs, such as the Lion's Club, and request their members to provide information. Other than the obvious advantages of this method, one important consideration is that the members of local service clubs commonly represent a wide spectrum of the population that, as a whole, might well have a detailed knowledge of the area. Resultingly, the data base that could be developed would potentially be comprehensive, inexpensive, and flavored with community pride.

Potential Contaminants and Travel Times

Once the location of potential sites for contamination are located, it will be possible to estimate the time required for a contaminant to migrate to a well. It must be remembered, however, that what ever method is used to predict travel time, it will be only an estimate. Three methods that can be used are a simple equation, a nomograph, and a computer model.

As discussed in Chapter 2, ground-water velocity is controlled by the aquifers hydraulic conductivity (K), effective porosity(n), and hydraulic gradient(I), that is,

$$V = KI/7.48n. \qquad (61)$$

The hydraulic gradient is measured along a flow line that originates at the contaminant source and continues to the closest well in the downgradient direction. Of course, the flow line must be drawn so that it intersects the water-level contours at right angles. The easiest way to determine the average gradient is to subtract the water level at the well from the water level at the contamination site and then divide this number by the distance between the two points as measured along the flow line.

Let us assume that a spill occurs at point A as shown in Figure 161. The spill consists of leakage of 2,000 gallons a day for three days of salty waste water that contains 30,000 mg/l of chloride. The distance between the source and the nearest downgradient well, as measured along a flow line is about 1,585 feet. The aquifer, which averages 50 feet in thickness, consists of gravel and sand with an average hydraulic conductivity of about 2,000 gpd/ft^2 and an average effective porosity of about .25. The difference in water level from the source to the well is 15 feet (1,500 ft-1,485ft). Therefore, the gradient is 15ft/1,585ft = .009 and the velocity is about 9.6 feet per day.

$V = Ki/7.48\ n\ =$ (2,000 gpd/ft^2)(.009)/(7.48 gal/ft^3)(.25) = 9.6 ft/day

It would require about 165 days (1,585ft/9.6ft/day) for the center of mass of the contaminant to reach the well under the prevailing conditions. The rate could be slowed by reducing the gradient, that is, turning off the well or reducing its discharge. It should also be pointed out that the plume formed by the spill would arrive at the well prior to 165 days; it is only the center of mass of the plume, which is its highest concentration, that would arrive at the time calculated by this method.

An actual situation very likely would be far more complex and the travel time would be substantially less than that calculated in the above example. Nonetheless, this simple approach provides at least an estimate of what might happen.

Another approach is to use some type of graphical technique or computer model, many of which are available. It must be remembered, however, that a computer simulation can only be as valid as the equation and data on which it is based and no matter how sophisticated or expensive this simulation might be, the results can only be used as an estimate. The greatest advantage of computers is that they can provide a solution very quickly and permit one to readily change the input values in order to get a feel for the way the aquifer reacts to different stresses. Additionally, the nomograph described in Chapter 5 and computer models permit one to more accurately represent the aquifer and the manner in which it functions, particularly in regard to hydrodynamic dispersion and retardation of contaminants.

The problem described above can be solved using a nomograph or computer model, although additional data are required. These include the retardation factor (R_d) and longitudinal and transverse dispersivity (α_x, α_y). Since the contaminant in this case is chloride, a conservative chemical that is neither sorbed nor degraded, then $R_d = 1$. Dispersivity (α_x, α_y) is much more difficult to estimate. (Recall from Chapter 5 that longitudinal dispersion, D_x, equals $\alpha_x V$ and transverse dispersion, D_y, equals $\alpha_y V$). In this case, however, the distance between the contaminant source and the well is relatively short, the velocity of the ground-water is high, and the water is converging in all directions toward the well bore. As a consequence, advection or simple ground-water flow is more important than dispersion and the latter either can be ignored or small numbers can be used in the equation. In the few studies available, the ratio between longitudinal and transverse dispersivity ranges between 1 and 10. For this example let us assume a ratio of 5 and a longitudinal dispersivity of 1, which requires that transverse dispersivity is 0.2. Table 14 shows the data required for the nomograph solution and computer simulation.

Table 14. Summary of Data for Example

Distance from source to well (x)	1,585 feet
Aquifer thickness (m)	50 feet
Effective porosity (n)	.25
Velocity (V)	9.6 feet/day
Longitudinal dispersivity (α_x)	1 foot/day
Transverse dispersivity (α_y)	.2 feet/day
Retardation (R_d)	1
Volume flow rate (Q)	2,000 gallons/day
Source concentration (C_o)	30,000 mg/l
*Mass flow rate (QC_o)	502 lb/day

*Mass flow rate = $134QC_o/16,019$ = (.134) (2,000) (30,000)/16019

= 502 lb/day

Using the nomograph equations provided in Chapter 5, calculate the following:

$X_D = D_x/V = (\alpha_x)(V)/V = (1)(9.6)/9.6 = 1$

$T_D = R_d D_x/V^2 = (1)(9.6)/(9.6)(9.6) = 9.6/92 = .1$

$Q_D = nm\sqrt{D_x D_y} = (.25)(50)\sqrt{(9.6)(1.9)}$
$= 53\ ft^3/day$

To determine the time when the leading edge of the plume, say a concentration of 1 mg/l, reaches the we. calculate:

$X/X_D = 1,585/1 = 1,585$ (Locate at D)

$QC_o/Q_D = 502\ lb/day/53\ ft^3/day = 9.5\ lb/ft^3$
(Locate at B)

or

$QC_o/Q_D = (267\ ft^3/day)(30,000\ mg/l)/53$
$= 151,132\ mg/l$ (Locate at B)

Using Figure 162, locate the selected concentration (1 mg/l) at A, draw a line from A through B to C, then horizontally from C to the intersection with a vertical line from D, giving at E:

$t/T_D = 1,470$

Multiply by T_D to determine time(t), in days or

$t = (1,470)(.1) = 147$ days

Thus, under the given conditions, the margin of the plume represented by a chloride concentration of 1 mg/l should reach the production well in about 147 days or 18 days sooner than the center of mass calculated earlier. It is essential to remember, however, that this calculation also is only an estimate. On the other hand, it does suggest that dispersion plays an important role in chemical transport and that the contaminant will migrate faster than anticipated even with ve small dispersivity values.

One of the limitations of the nomograph is that it can

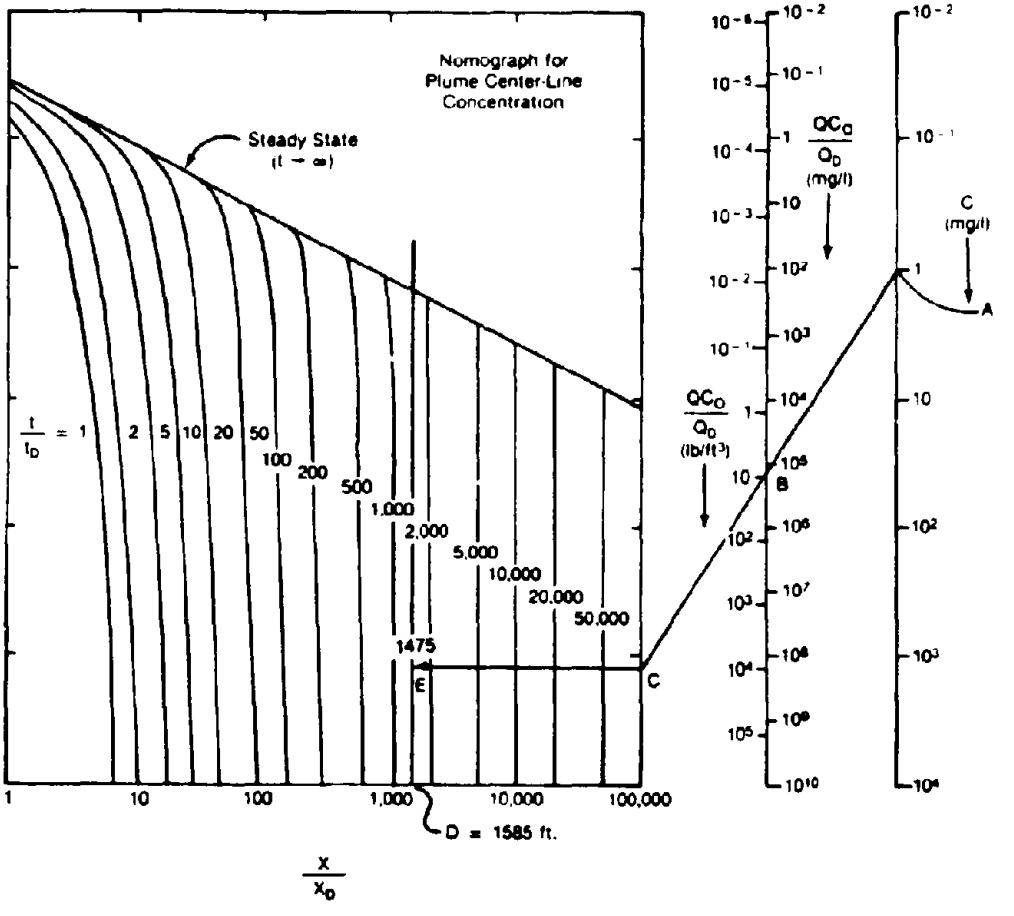


Figure 162. Nomograph Solution to the Example Problem

be used only to calcuate concentration or time directly down gradient from the source, that is, along a flow line that goes directly through the source. Another limiting factor is that the mass flow rate is constant, that is, there is no method available to stop the source from leaking, despite the fact that in the example case leakage occurred only during a 3-day period.

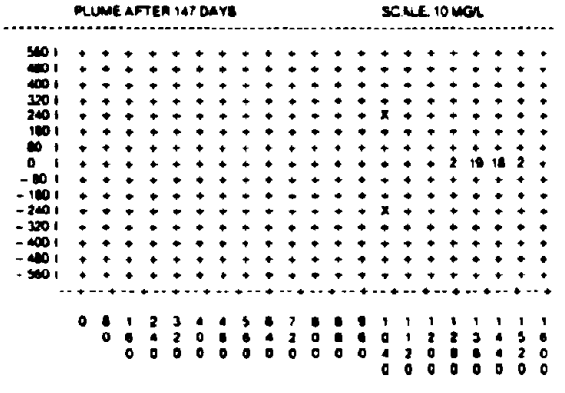
Several advantages over the nomograph are provided by a computer model, even though both are based on the same equation. The computer model will generate a concentration distribution map of the entire plume, not just along a single flow line. Furthermore, in addition to being fast, the model will allow the operator to insert multiple sources and vary the mass flow rate from each source.

Figures 163 and 164 show examples of computer generated maps, based on the data listed in Table 14. In Figure 161 the spill was allowed to discharge only 3 days. Notice that there is a distinct plume moving toward the well and that the concentration shown on the map in Figure 163 must be multiplied by 10. It can be calculated that, at this time (147 days), the concentration at the well is only 0.5 mg/l because the plume has not yet reached it. In Figure 164, the source was not shut off but was allowed to discharge 2,000 gpd for the entire time of the simulation (147 days), thus providing a two-dimensional view of the concentration distribution as compared to the single point nomograph solution. A map of this type is very misleading because it implies that high concentrations are continuing to appear between the source and the well despite the fact that the leak occurred only during a 3-day period. Notice also that the concentrations listed on the map in Figure 164 must be multiplied by a factor of 100.

BASIC COEFFICIENTS

NO.	DESCRIPTION	VALUE
1.	VELOCITY	9.6 ft/day
2.	LONGITUDINAL DISPERSIVITY	1 ft
3.	TRANSVERSE DISPERSIVITY	.2 ft
4.	RETARDATION COEFFICIENT	1
5.	HALF-LIFE	2,000 years
6.	POROSITY	.25
7.	AQUIFER THICKNESS	50 ft

SOURCE AT	INJECTION RATE	START TIME	LENGTH
0 , 0	502	0	100
0 , 0	−502	3	100



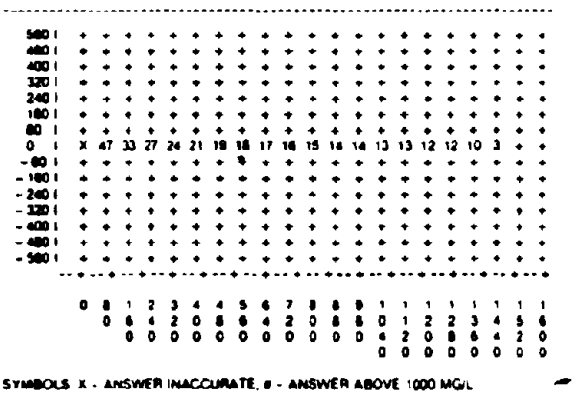
SYMBOLS X - ANSWER INACCURATE, # - ANSWER ABOVE 1000 MG/L

Figure 163. Computer Generated Map (Example 1)

BASIC COEFFICIENTS

NO.	DESCRIPTION	VALUE
1.	VELOCITY	9.6 ft/day
2.	LONGITUDINAL DISPERSIVITY	1 ft
3.	TRANSVERSE DISPERSIVITY	.2 ft
4.	RETARDATION COEFFICIENT	1
5.	HALF-LIFE	2,000 years
6.	POROSITY	.25
7.	AQUIFER THICKNESS	50 ft

SOURCE AT	INJECTION RATE	START TIME	LENGTH
0 , 0	502	0	100



SYMBOLS X - ANSWER INACCURATE, # - ANSWER ABOVE 1000 MG/L

Figure 164. Computer Generated Map (Example 2)

Situation Monitoring

Situation monitoring should cover two main categories: 1) monitoring of the existing water-supply system and plant and (2) monitoring of other local situations. The former can and should be accomplished in-house, while the latter can be carried out by interviews, the news media, and local agencies.

It is surprising that so few operators, particularly those involved with small systems, are aware of the chemical quality of their well supplies. Even if routine chemical analyses are carried out periodically, it is unlikely that samples will be scanned for the more exotic compounds, such as heavy metals or organics. This is understandable in view of the cost. On the other hand, without background data it is commonly difficult, if not impossible, to detect many contaminants or locate a source, especially if proof is required in a legal action. Nonetheless, the costs of chemical analyses must be accepted by the operator as a part of the business practice.

Another part of the survey that should be conducted by the water utility personnel includes an examination of their facilities addressing such items as: (1) possibility of back siphonage, (2) cross-connection, (3) distribution system deficiencies, and (4) poor well construction or location. Are there, for example, potential sources of contamination, such as fuel tanks or sewer lines, adjacent to the well or well house? In the fall of 1971 at a trailer court in Anchorage, Alaska more than 80 individuals became ill due to consumption of sewage contaminated well water obtained from a semi-public supply. The system consisted of 2 wells, about 242 feet deep, enclosed in a block well house. A soft plug formed in a borough sewer causing raw sewage to back-up, eventually to flow from a drain in the floor of the well house and, when reaching a foot in depth, to flow directly into and down the well casing. Subsequently, sewage contaminated water was pumped into the water supply of the trailer park.

Another part of situation monitoring involves the collection and evaluation of information in the community or area within the influence of the cone of depression of the well field. For example, have there been any fires that might have resulted in the release of chemicals that could reach the aquifer? Have there been any spills from truck or train wrecks? Might new construction produce a hazard? Are plans being developed for the placement of hazardous waste storage or disposal sites? In other words, the purpose of surveys of this nature, which must be continuous, is to keep in touch with the community.

Alternate Sources of Supply

A common solution to a water-quantity problem is to deepen a well and to a contamination event is to offset and drill another well. Unfortunately, such potential solutions, although simple, are rarely viable. It may not be possible to deepen a well and merely offsetting a contaminated well will only solve the problem for a few hours or days. It appears that human nature is such that we tend to procrastinate, hoping that life will continue uninterrupted. The far thinking individual, however, will consider alternatives, formulate cost estimates, and develop plans, both for design and obtaining the necessary funds for construction, for other sources of supply.

Is there a source of surface water available nearby that will meet water quality standards after treatment? If so, is a site available and what are the potential costs of constructing intake structures and conveyance facilities and of treating the water, and how much time would it require to actually provide the water? Is the supply dependable, or contaminated, or can water rights be obtained?

Sometimes it might be possible to use nontraditional concepts to develop a surface supply. One method might be to use collection galleries, particularly if the available streams are small. In this case a ditch could be cut across the stream into which a gravel bed is placed. A well screen attached to a suction line can be placed on the bed and the remainder of the ditch filled with gravel. This is virtually a horizontal well whose supply depends on infiltration of surface water through the gravel pack. Although the filter pack might well reduce turbidity, it would have little or no effect on many chemical contaminants. Nonetheless, this technique offers a simple and relatively inexpensive alternative.

Another method is the subsurface dam. The village of Glenburn in north-central North Dakota had a difficult time supplying sufficient water for their needs. They overcame this deficiency with an unusual and inexpensive artificial recharge technique. Most of the surficial rocks in the Glenburn area consist of clay, but nearby there is a 30 foot wide channel, usually dry, that contains 7 to 8 feet of coarse gravel and sand. Upstream the deposit widens and there is an abandoned gravel pit.

During the spring runoff a considerable amount of water infiltrates the gravel and the water table rises dramatically. Because the deposits are very permeable, the ground-water flows down gradient quickly, however, and the water table soon declines as the aquifer is drained. The gravel channel has a considerable capacity for storage but no natural controls to prohibit rapid drainage.

As Figure 165 illustrates, this problem was solved by excavating a ditch, 4 or 5 wide, across the channel and entirely through the gravel deposit. The excavation was backfilled with readily available clay forming a subsurface dam. A perforated culvert, serving as a well, was installed on the upstream side. A diversion ditch was excavated from the intermittent stream to the abandoned gravel pit, which served as a recharge basin. During periods of runoff, some of the surface water flows into

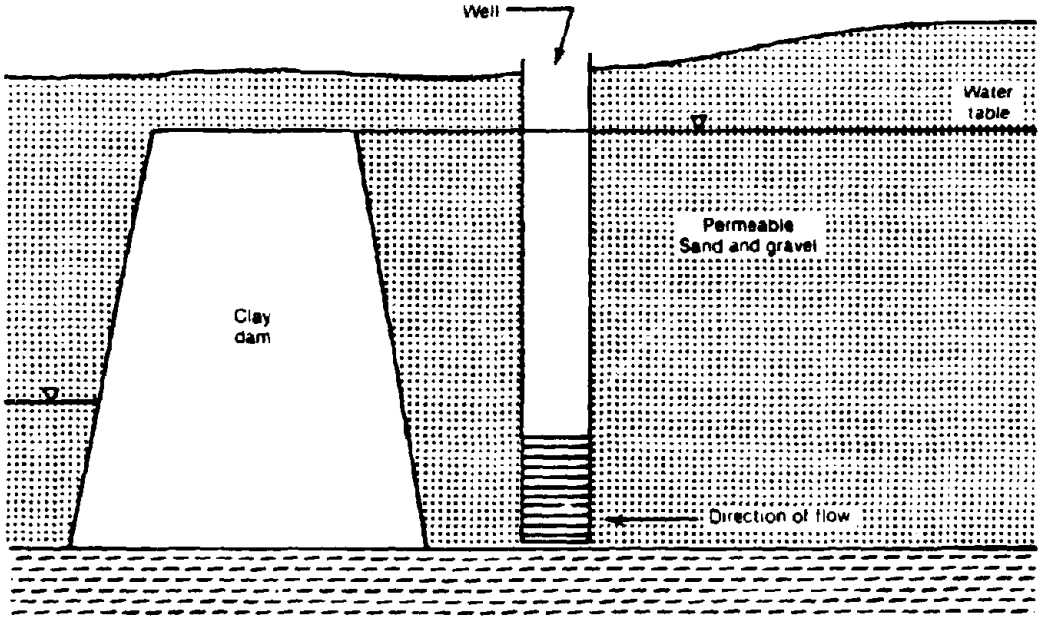


Figure 165. A Subsurface Dam of Clay Impeded the Flow of Ground Water in a Pond and Gravel-Filled Channel in the Vicinity of Glenburn, North Dakota.

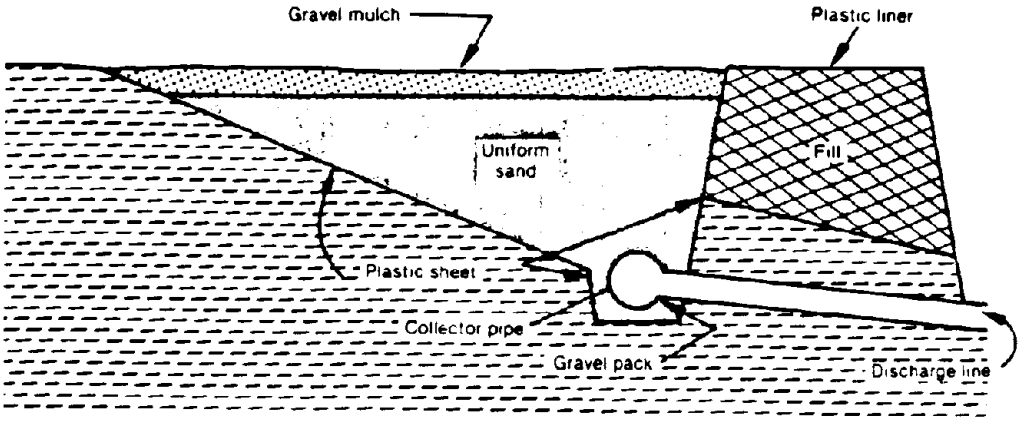


Figure 166 Schematic of an Artificial Aquifer

the gravel pit, where it infiltrates, and part of the remainder infiltrates along the stream bottom. Thus, during wet periods a considerable amount of water is collected in the underground storage reservoir. The subsurface dam impedes the flow of the ground-water down the gravel-filled channel and the water table remains at a high level, permitting increased water usage. It should also be mentioned that this was a community project accomplished by volunteer labor and equipment. The total cost was minimal.

Water supply problems in arid regions are particularly vexing because of scanty rainfall and the high rate of evaporation. In some situations, it may be possible to augment supplies by constructing artificial aquifers. Artificial aquifers, by necessity, can store only moderate quantities of water, but they are labor intensive and, therefore, can be built at a modest equipment cost.

The design and construction of an artificial aquifer at the Santa Clara Indian Reservation, New Mexico, was described by Helweg and Smith. As Figure 166 shows, a small gulley, several yards wide, was cleared of vegetation, deepened, and sloped. Spoil material was used to construct an earthen dam across the gulley. A trench was cut adjacent to and parallel with the dam into which was installed a slotted plastic pipe. The slotted pipe was connected, at a right angle, to a second pipe, extending through the dam in the low point of the gulley. The second or discharge pipe was laid on a slight downslope and installed prior to dam construction.

Once the gulley was shaped, the pipes installed, and the dam built, plastic lining was placed on the floor of the structure. The gulley was then backfilled with uniform sand (gravel could be used) and topped off with gravel mulch.

During the rainy season or periods of surface runoff, water flows down the gulley and infiltrates through the gravel mulch to the artificial aquifer. (In some cases it might be necessary to construct a spillway to avoid excessive erosion of the dam.) Water is removed from the reservoir via the discharge pipe, the rate being controlled by a valve.

Another management alternative is to consider developing another aquifer or a different part of a contaminated aquifer. In the latter case, care would be required in the well field design to insure that the new system would not be contaminated due to changing hydraulic gradients.

Generally, new well fields require considerable time and financing to achieve a proper design and adequate construction. The first question to be addressed should be, "Is there an aquifer available that will supply the required needs and what are its characteristics?" If one is available, what is the quality of the water it contains and what is an estimate of the treatment requirements and costs? How many wells will be required and how much will they cost?

Probably one of the most unusual and farsighted ground-water systems was designed in Kalamazoo, Michigan, which in the 1930's was suffering from a severe water shortage. One individual who worked for the city, Mr. Al Sabo, took a leave of absence to work for a drilling firm in order to learn the trade. After several months he returned to his previous position and convinced city officials that a drilling rig should be purchased. A crew then began to drill test holes throughout a wide area, paying particular attention to swampy regions. In this glaciated terrain, streams are commonly small but they flow throughout the year, that is, the flow is sustained by ground-water runoff. Furthermore, swampy areas characterize places where the water table is at or near the land surface and in the Kalamazoo drilling program it was found that these swampy areas were underlain by considerable thicknesses of saturated sand and gravel. If the test hole encountered a substantial thickness of sand and gravel, a well screen and casing were installed and an aquifer test conducted. If the yield was satisfactory the pump was removed and a plate welded to the top of the casing until the well was needed. The swampy area was then purchased by the city and the sand and gravel sold, which more than paid for the property and wells. After the sand and gravel were mined, the excavation served as an artificial

recharge basin. In a few years, the city of Kalamazoo had more than enough water to supply all of their needs, plus all the water required by several surrounding communities.

Periodically various regions suffer from prolonged droughts, streamflow decreases or may even cease, and water rationing becomes the rule. It is interesting to note that in many of these areas it is only the surface-water supply that is decreasing, while billions of gallons of ground water remain untapped in naturally occurring underground reservoirs that remain hidden from view. This, of course, was the case in Kalamazoo in the early 1930's.

Legal Controls on Waste Disposal

A variety of laws, regulations, and rules exist to control waste disposal. In addition to the often quoted federal laws, there are laws established by state legislatures and regulations formulated by state agencies. Local zoning ordinances may play an important role for the water-plant operator. These need to be researched, understood, and modified as the need arises.

Development of an Aquifer Protection Plan

The basis of an aquifer protection plan is at least a general knowledge of the aquifer system and the manner in which it functions. Where are the inherent weaknesses of the physical system, where are the strong points, and where is a contamination problem most likely to occur? These questions can best be answered or at least evaluated by means of a series of maps.

The maps shown in Figures 167 to 170 are modifications of illustrations published some years ago in a report by the U.S. Geological Survey.[75] Many similar maps, reports, and books have been published by federal, state, and local agencies. In cases where none are available, the utility operator may be required to prepare his own, hopefully with the aid of an accomplished hydrogeologist. The data base, of course, consists largely of well logs and water-level measurements.

The map in Figure 167 shows a large cone of depression around a well field and the arrows indicate the general direction of ground-water flow. Notice that the contours indicate that water is flowing into the pumping

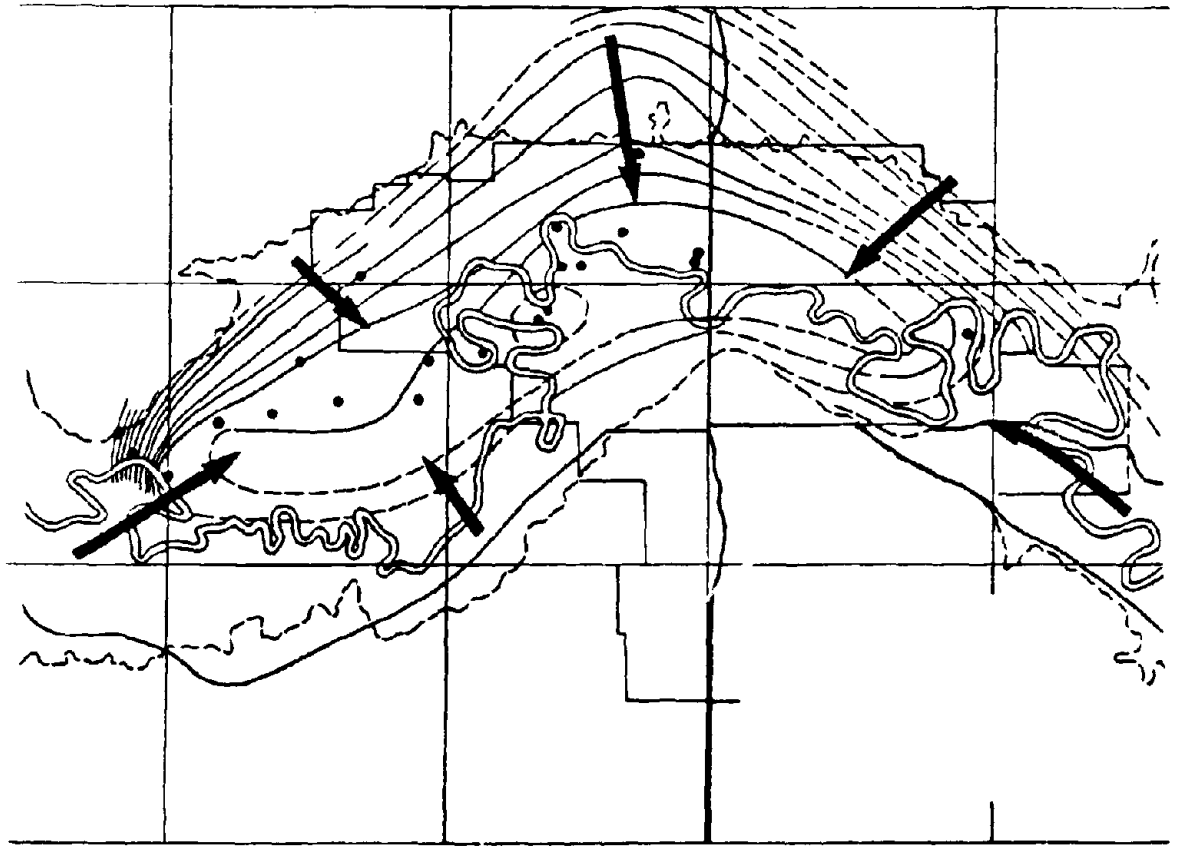


Figure 167. Water-Level Contours Indicate that the Cone of Influence Surrounding the Well Field Extends Outward for Miles in the Valley and that Water is Flowing into the Cone of Depression from all Directions.

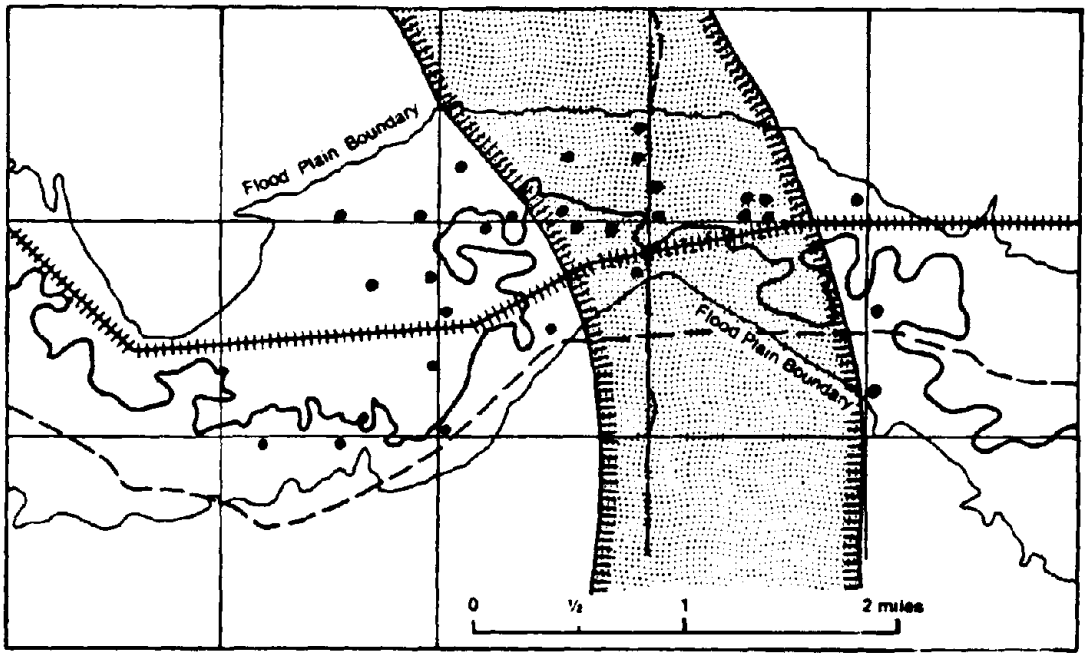
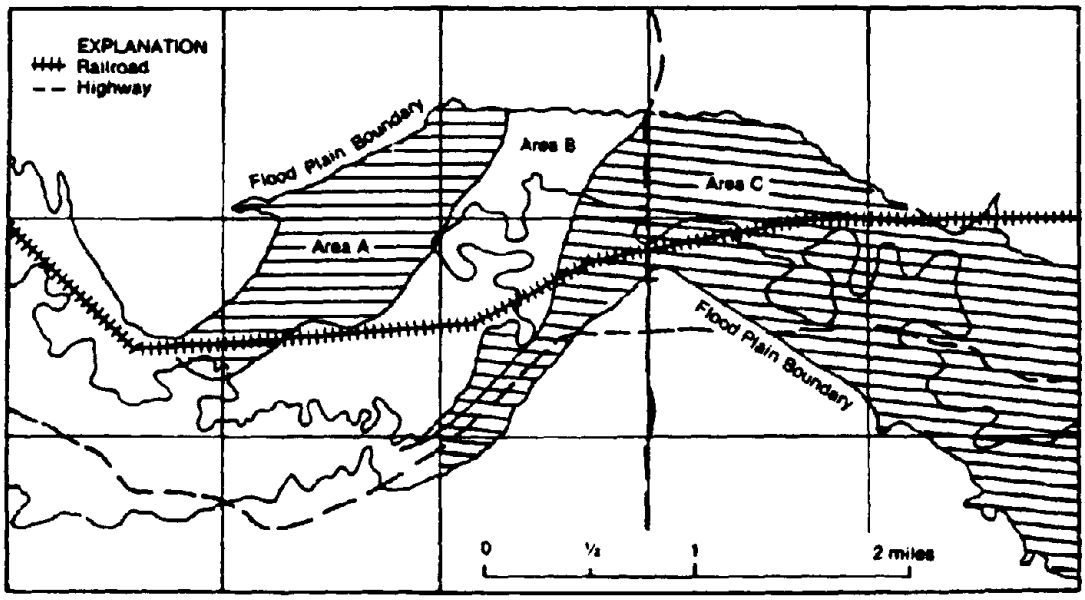


Figure 168. Potential Sources of Contamination Include Highways, Airports, Railroads, and Streams, as well as Commercial Sites.

EXPLANATION

- Railroad
- Highway
- Buried Valley
- Potential sources of contamination
- Potential line source of contamination
- Source of natural contamination

Figure 169. Areas of Recharge to the Aquifer. Area A, Direct Infiltration of Precipitation and Runoff. Area B, Infiltration by Way of a Shallow Aquifer to the Main Aquifer. Area C, Moderate Infiltration by Way of Several Shallow Aquifers to the Main Aquifer. Area D, Area Underlain by Thick Layers of Clay Resulting in Only Small Quantities of Recharge. Area E, Zones of Recharge from Glaciofluvial Aquifers. Arrows indicate direction of flow.



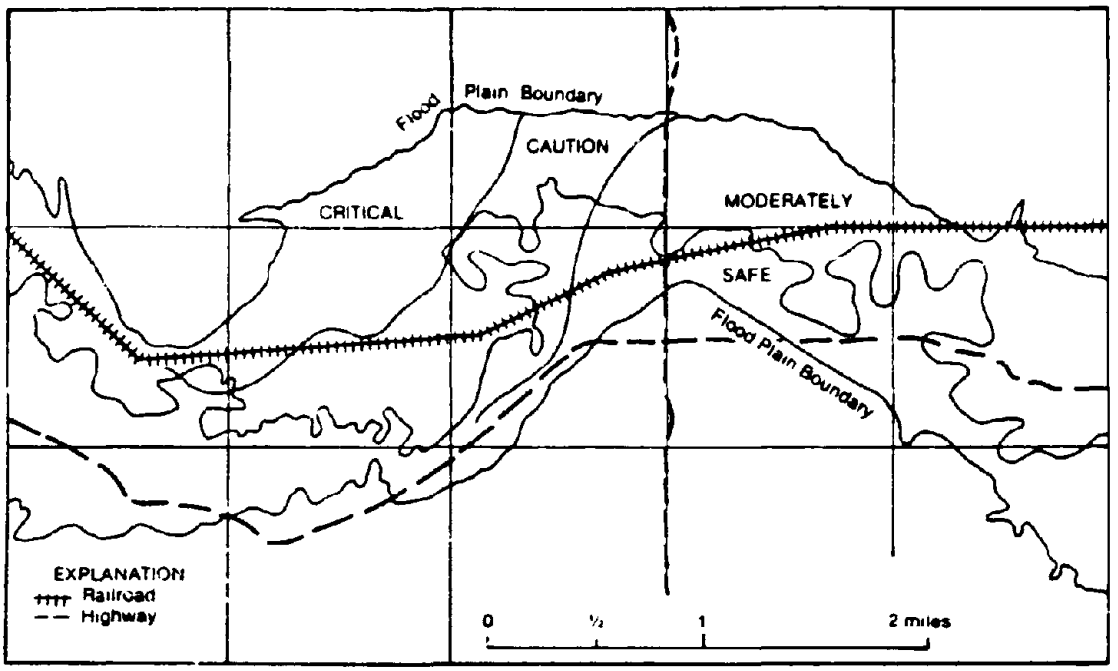


Figure 170. An Aquifer Sensitivity Map Indicates the Range of Natural Protection of the System.

center from all directions. Consequently, a large area should be protected or at least monitored because contaminants reaching the aquifer in any part of the area of pumping influence could eventually reach a well.

The map in Figure 168 plots potential sources of contamination. Information of this type can be obtained from the waste surveys discussed earlier. All fixed sources are plotted, as well as the location of major transportation routes, such as railroads and highways.

Figure 169 outlines the degree of natural protection afforded the aquifer. The map, based on well logs, indicates that the eastern part of the valley-fill aquifer is protected by a considerable thickness of clay through which contaminants are not likely to flow. To the west, however, the valley fill consists of sand and gravel that extends from the land surface to bedrock, a distance of more than 100 feet. Any contaminants entering the ground here could quickly reach the aquifer. In the central part of the aquifer the major water-bearing zone has some overlying protection in the form of alternating layers of clay and sand. Although a contaminant eventually could reach the aquifer in this area, it would require a substantial amount of time and probably the contaminant would be degraded or sorbed to some extent and certainly diluted as it migrated through several tens of feet of clay and sand.

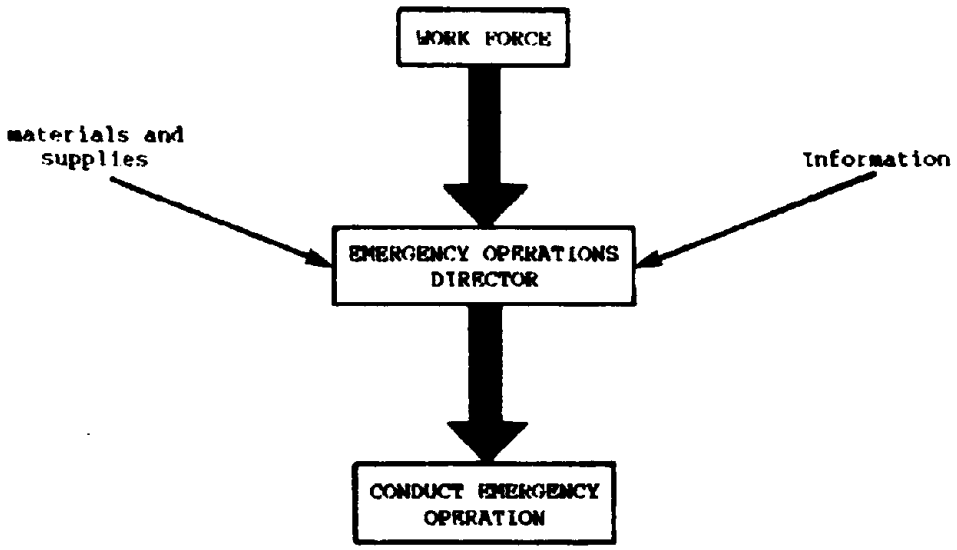
Figure 170 shows an aquifer sensivity map. Based largely on well logs and the previous map, it rather clearly indicates those areas of most and least concern. The eastern part of the aquifer is moderately safe, caution should be exercised in the central part, and the western part should be carefully protected and monitored. The latter critical area should be brought to the attention of city officials and an attempt made to protect it by local zoning ordinances.

Reprinted from Draft EPA PUBLICATION: PROJECTION OF PUBLIC WATER SUPPLIES FROM GROUND WATER CONTAMINATION

SECTION IV

DEVELOPING AN EMERGENCY OPERATIONS PLAN

A. Emergency Operations Plan Concept



B. Emergency Operations Plan Outline

1. Notification procedure and personnel assignments

2. Listing of water use priorities

3. Mutual aid availability

   - Type

   - Contact person

4. Personnel action procedures and locations of supplies

5. Communication procedures

6. Equipment material and record locations and operational recordkeeping procedures

7. Emergency phase action steps

C. Integrating the Vulnerability Assessment Results

Vulnerability Summary

SYSTEM COMPONENTS	EFFECTS OF EMERGENCY			CHARACTERISTICS	CORRECTIVE MEASURES REQUIRED
	NONE	PARTIAL	TOTAL		
SOURCE					
COLLECTION					
TRANSMISSION					
TREATMENT					
ETC.					

Example Checklist -- Surface Reservoir Vulnerable to Spills

1. Name, address, telephone number of companies transporting hazardous materials over or near waterways supplying your system
2. Contact persons with telephone numbers
3. Types of materials being shipped
4. Nature of materials:
   - o Toxicity
   - o Solubility
   - o Odor threshold
   - o Taste threshold

5. Spill response clean-up crews

- o Fire Department - how to contact
- o Commercial clean-up crews
    - Company name/address
    - Phone number
    - Emergency phone number
    - Type service
        - ..Liquid
        - ..Acid/base
        - ..Barrier construction
- o Chemical Analysis Services - Commercial
    - Company name/address
    - Phone number
    - Emergency phone number
    - Types of analyses/services
        - ..GC-MS
        - ..Wet chemistry
        - ..NMR
- o Chemical Analysis Services - Universities
    - Contact - name - address
    - Specialty
    - Phone
    - Emergency phone

SECTION V

WORKSHOP EXERCISE

HYPOTHETICAL WATER SYSTEM CHARACTERISTICS
(FROM AWWA M 19) CITY OF EMERAN

SOURCES

1. Surface supply from watershed impoundment. Quantity of available water ensures dependable draft of 5 mgd.
2. Well supply of good quality water at depth of 200 ft in alluvium plain.

COLLECTION WORKS

1. Intake structure constructed separately from dam and located 150 ft from shore. Available via causeway. Only one intake, screened, at mid-depth of reservoir.
2. Turbine pump, electric motor drive located on surface.

TRANSMISSION SYSTEM

1. Gravity flow from watershed through filter plant and reservoir number 1 to distribution system. Exposed transmission lines, twin 12 in. diameter pipelines.
2. Pressure transmission from well and treatment facilities to reservoir number 2 and then to distribution system. Single 24 in. diameter pipeline.

TREATMENT FACILITIES

1. Conventional flowsheet for providing coagulation, flocculation, sedimentation, filtration, chlorination, and corrosion control. Elevated backwash water tank, with appropriate pumping. Central control room for entire system located at ground level in same building. Designed for aesthetics and public relations as well as for utilitarian purposes. Operated on 24-hour basis.
2. Utilitarian structure housing pumps and treatment facilities, and operations controlled by remote means from central control room at the filter plant. Scheduled maintenance and operation activities approximately 2 hours each day.

DISTRIBUTION SYSTEM

1. Normal system pressure varies from 40 to 60 psig.
2. Smallest pipes in gridiron are 6 in. in diameter, spaced approximately 400 ft apart.
3. Principal pipes in central and high-value districts are of 12 in. diameter, approximately 1200 ft apart.
4. Hydrants spaced approximately 200 ft apart.
5. Single main hydrant branch. All valves in distribution system are manually controlled.

PERSONNEL

1. Treatment under control of trained operators.
2. Field crews adequate for routine maintenance and services, including emergency operations such as isolated main breaks.
3. Major system improvements or extensions designed by consultants and constructed under contract.

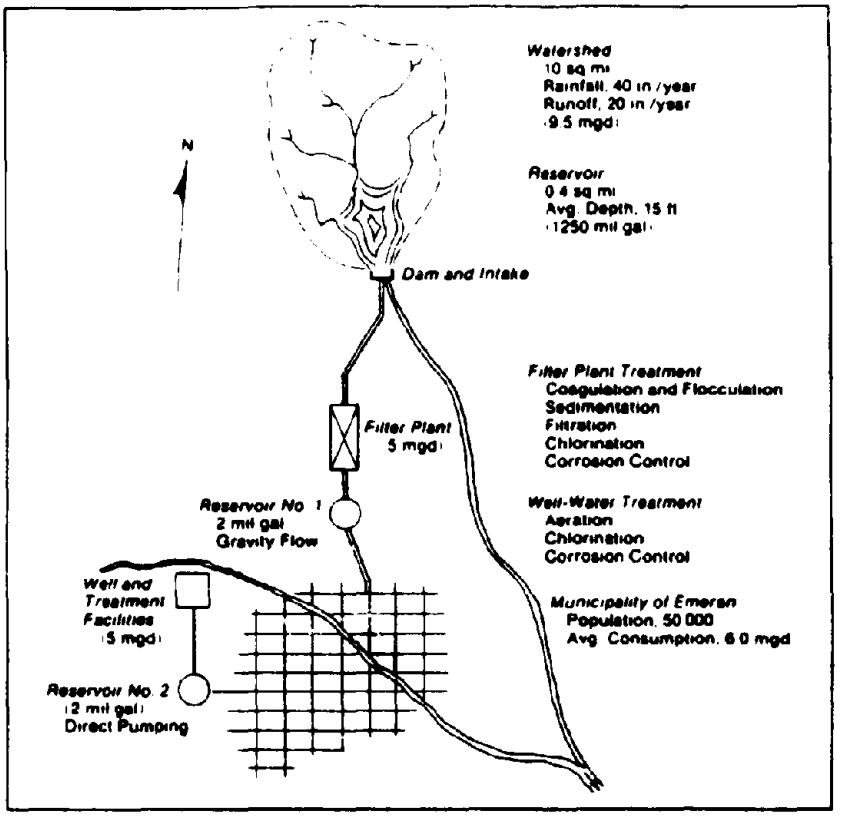


Figure 3-2. Emeran municipal water system.

From: "Emergency Planning for Water Utility Management." Copyright 1984, American Water Works Association.

POWER

1. Provided by municipal distribution of purchased power from a region grid. No power produced locally.
2. Limited emergency power available at filter plant, no emergency power at well.

MATERIALS AND SUPPLIES

1. Thirty-day supply of routine chemicals maintained.
2. Modest amounts of pipes and fittings kept in inventory for routine maintenance and emergency repair. Large inventory not maintained because major jobs are contracted.
3. Supply yard for pipes and fittings near well; chemicals stored near point of use.

COMMUNICATIONS

1. Radio — base station at central control room in filter plant building, three mobile units in repair trucks, and two mobile units in sedans of general manager and chief engineer.
2. Telemetry — remote indication of system pressure, reservoir levels, and transmission line pressures and flow rates. Appropriate data transmitted to central control room relating to operational conditions at well and treatment facilities.
3. Public telephone system — telephones in all key locations, connected through regular public system.

EMERGENCY PLANS

1. A telephone schedule has been maintained whereby all or selected members of the utility staff can be summoned within 10 30 min.
2. No formal emergency plan has been drafted and no emergency drills have been held.
3. Contact with other municipal departments — police, fire, etc. -- primarily on a competitive basis for annual budgets. Little or no concerted effort toward coordination or mutual cooperation.

Develop Vulnerability Assessment For Emeran

Only consider flood or earthquake for this workshop realizing a complete real world assessment may cover additional or different situations depending upon the size and location of your water system.

1. Assume Emergency Incident

   Flood

   Approximately every 2 years, one or two blocks on either side of the stream running through Emeran are inundated by a foot or two of water. The well and treatment facilities are located at an elevation above the 50-year floodplain, but below the anticipated crest of the 100-year event. No flood-proofing has been initiated; the drainage area above Emeran is about 200 sq mi.

   (Additional questions(s) to consider: Should dikes or other protective works be constructed around the well and related treatment facilities? Will other potential problems arise?)

   Earthquake

   Efforts have been made in recent years to quantify the probabilities associated with frequency and magnitude of earthquakes. The typical analysis utilizes a statistical projection based on historical records. Although still primitive in some respects, accomplishments to date are similar to efforts to make hydrology more than an imperfect science.

   (Additional question(s) to consider: What should be the basis of the decision as to what level of earthquake should be anticipated?)

2. Estimate Possible Effects On System

3. Estimate Water Demand Quantity/Quality

4. Estimate Where System is Unable To Meet Demand

5. Corrective Measures Required

6. Consider Important Non Water System Components

   Personnel available/skills

   Information, communication resources available

   Personnel safety

   Transportation

Developing An Emergency Operations Plan, City Of Emeran

1. Notification Procedures

   Who gets notified?

   How if power/phone cut?

2. Water Use Priorities/Requirements

   Hospitals?

   Industrial?

   Drinking?

   Fire?

3. Mutual Aid Availability

   Water systems?

   Governmental?

   Supplies?

   Contractors?

   Laboratories?

4. Personnel Action Procedures

   Who reports where?

   Where is equipment?

   Where are supplies?

   Transportation availability?

      Trucks stored in central location?

      Trucks with employees?

5. Communication Procedures -- Internal and External

   By phone?

   Back-up systems?

   Runners?

6. Equipment, Material, Records -- Inventory and Location

   Where stored?

   Where is back up set?

   Operational record keeping procedures?

7. Emergency Phase Actions Steps

   Lead time available?

   Priority action?

   Response checklist

DAY 1

VIDEO TELECONFERENCE EVALUATION

The goal of this video teleconference was to improve your ability to anticipate and respond to emergency situations.

We used three mechanisms:

1. Provide planning and response concepts and information

2. Provide opportunity to meet and learn from:

   a. other waste supply professionals (operators, engineers etc.)
   b. members of the emergency response community

3. Provide an opportunity to apply concepts discussed:

   a. to a hypothetical situation
   b. to your situation

PLEASE ANSWER THE FOLLOWING QUESTIONS ON THE SCALE PROVIDED:

	NO				YES
1. Do you feel you are better prepared to plan your response to an emergency as a result of of participating in the video teleconference?	1	2	3	4	5
2. Did you get an opportunity to meet and learn from other local participants?	1	2	3	4	5
a. water supply professionals					
b. emergency response professionals					
3. Did the case studies help you learn and apply concepts and information discussed?	1	2	3	4	5
4. Did you or will you improve your emergency response plan as a result of participating?	1	2	3	4	5
5. Would you recommend this program to your peers?	1	2	3	4	5

6. Please check your status:

water system representative	___
local government representative	___
state government representative	___
federal government representative	___
consultant	___
private citizen	___
other (specify)	___

7. Would you share things about the teleconference you thought useful?

8. Would you comment on portions or parts of the teleconference that you believe should be improved and provide specific recommendations?

SECTION VI

EMERGENCY PLANNING - STATE PERSPECTIVES

A. State Viewpoints: Topics for Water System Emergency Operations Plans

Public Awareness

- Predesignated radio stations
- Citizens emergency preparedness packets
- Response mechanism for public/media inquiries
- Multilingual Requirements

Evacuation

- Routes planned
- Routes broadcasted
- Search and rescue response
  - Staffing
  - Responsibilities

Health Team

- Sample collection
- Sample analysis

Communications

- Locate emergency operating center
- Chain of command
- Communications capability
  - Outside water suppliers
  - Public
  - Media
  - Police
  - Fire
  - Service teams
  - Suppliers

Staff Management

- Employee information

- Health
- Skills
- Family
- Evacuation
- Emergency responsibilities
- Emergency procedures

Electrical Power

- o Supplier's emergency procedures
- o Water system minimum power requirements
  - On-hand
  - To power company
  - To local generator suppliers/contractors

Water Sources - Purchased

- o Source priorities
- o Water system priorities
- o Conservation plan
- o System pressure reduction

Chemicals

- o Establish minimum supply requirements
- o Field analytical capability

Fuel

- o Requirements/hour/item of equipment
- o Type of fuel/item of equipment
- o Fuel distribution technique if power fails

Heavy Equipment & Operators

- o Sources
- o Activation mechanism required

Small Tools

- Sources (who will supply?)
- Mechanism (rental? purchase? loan?)

Protective Equipment

- In-house requirements
- Supplemental sources

First Aid

- Supplies
- Personnel CPR-trained
- Emergency medical team

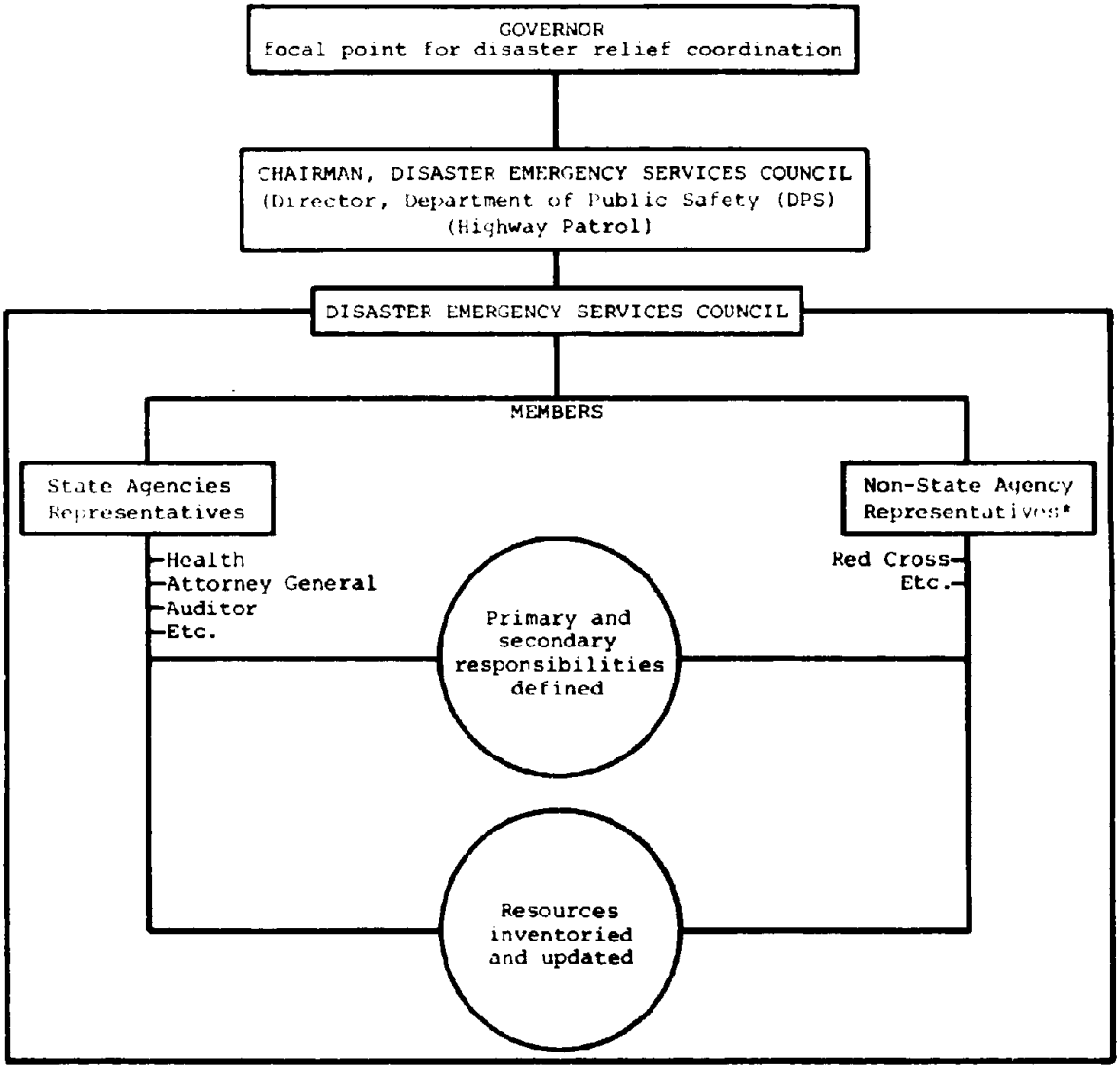
Transportation

- In-house capability
- Auxiliary sources
- Mechanism for accessing auxiliary sources

Keep Your Plan Simple and Up to Date!

B. STATE VIEWPOINTS:
ORGANIZATION AND ACTIVATION OF
STATE EMERGENCY RESPONSE CAPABILITIES
THE TEXAS EXAMPLE

ORGANIZATION
(Planning and Response)

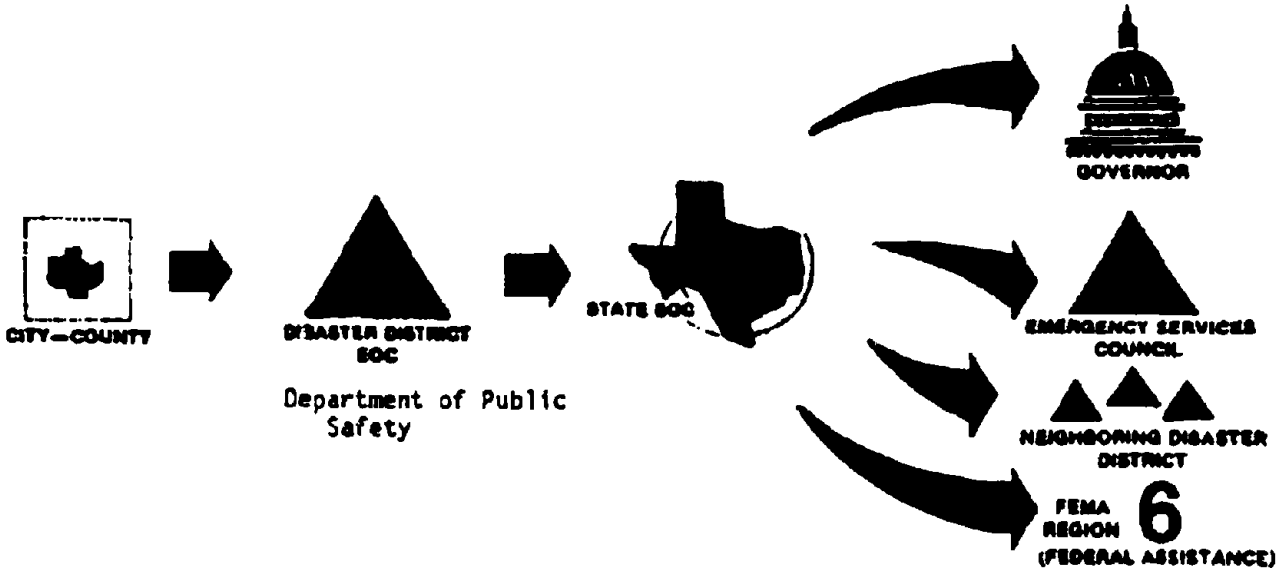


Organizational plans at the state level is mirrored at the district level (17 districts and subdistricts) where the District Emergency Services Council (Planning) and emergency operations center (response) is chaired by the commanding officer of the DPS and Agency representatives are drawn from State agency field offices.

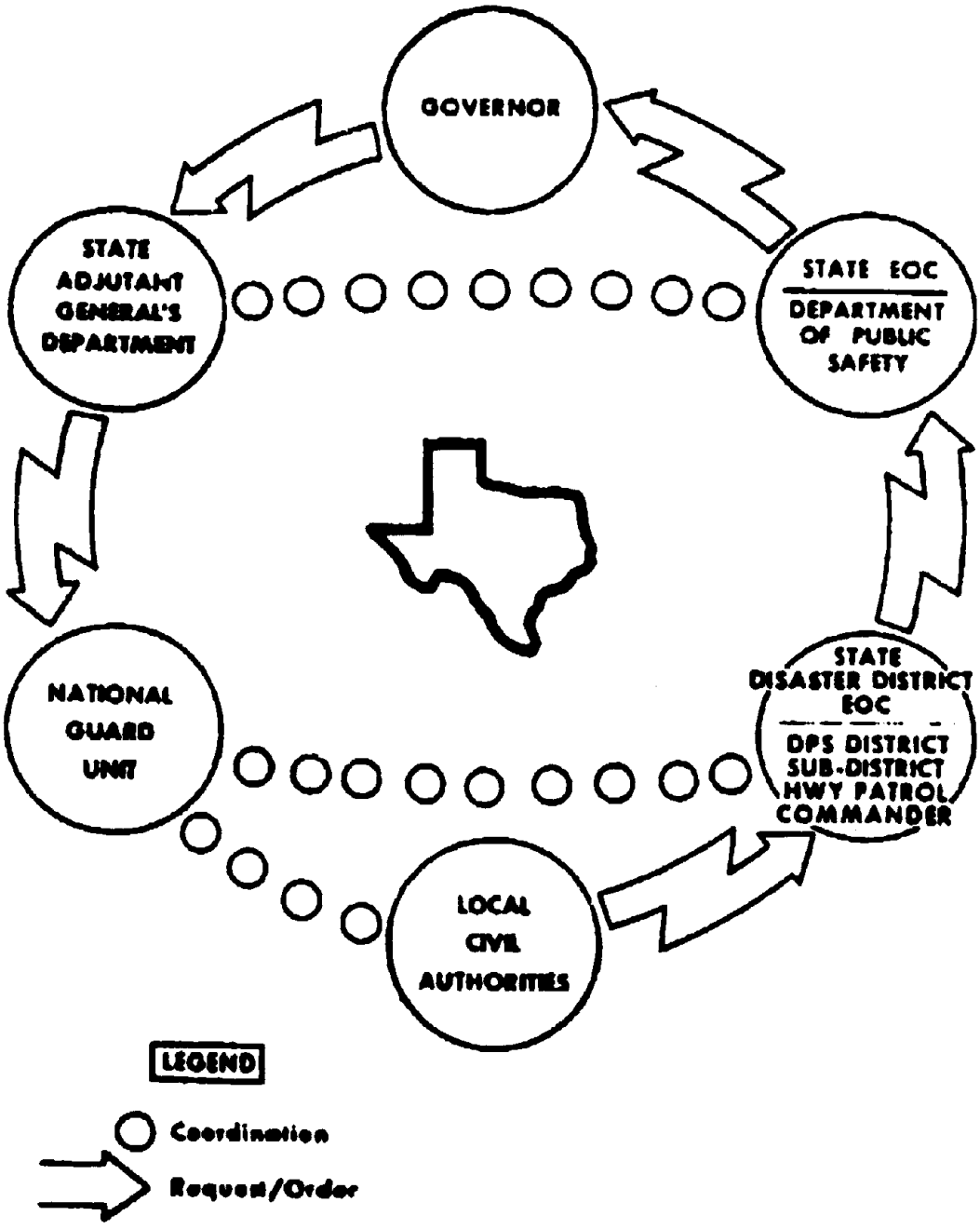
* All council members at both State and local levels must have authority to commit resources of the Agency they represent.

EMERGENCY RESPONSE

Channels for Requesting Operational Assistance



Channels for Requesting Military Assistance



EMERGENCY RESPONSE
Channels for Requesting Assistance
Sample Letter to Local Elected Officials

A SPECIAL NOTE TO THE CHIEF ELECTED OFFICIALS
OF ALL TEXAS POLITICAL SUBDIVISIONS

Requests for Assistance
In Disasters

In accordance with the State of Texas Emergency Operations Plan, and for most efficient processing, please exercise care by using this guideline.

1. When a disaster occurs, or threatens to occur, in your political jurisdiction which is beyond your capability to control, YOUR FIRST REQUEST FOR ASSISTANCE SHOULD BE TO THE NEAREST DPS DISTRICT HEADQUARTERS OR THE NEAREST DPS PATROLMAN.

2. The DPS District Captain will initiate action for you and direct your request to the State agency or agencies that can provide you with the resources required.

3. He will also establish direct communication with the State Emergency Operations Center in Austin and contact with the Governor will be made by the officers at the EOC.

4. NOTE: The use of any other method of requesting aid and assistance will cause somewhat of a delay. The established channel of assistance should be used in requesting anything of an emergency nature.*

5. IF YOU WISH TO TALK PRIVATELY WITH THE GOVERNOR, OF COURSE YOU SHOULD ATTEMPT TO REACH HIM. HOWEVER, IN ORDER TO MEET YOUR IMMEDIATE NEED EFFECTIVELY, THE PROCEDURE OUTLINED ABOVE WORKS FASTEST FOR YOU AND YOUR JURISDICTION. OF COURSE, THE DECISION IS YOURS TO MAKE.

Request for Military Assistance

A procedure has been effected with the Division of Disaster Emergency Service which EVALUATES the requests and results in the Governor being contacted. The Governor, and ONLY THE GOVERNOR PERSONALLY, orders the Adjutant General to provide military assistance to civil authorities. Naturally, since this involves great responsibility, the Governor relies heavily upon the EVALUATION PROCEDURE. (See diagram, Page 6.)

* Professionals have to make proper evaluations based upon data from designated local officials. For instance, a determination regarding funding is necessary.

EMERGENCY RESPONSE

Texas Department of Health
Emergency Response for Water Suppliers

Pre-Emergency Planning

During Emergency

- Respond as necessary considering limited resources available

Post Emergency - greatest response

- Activate engineers/sanitarians
- Help document situation as repairs are coordinated
- Help protect life & property
- Assess needs
- Pinpoint damage
- Estimate resources as required

SECTION VII

EMERGENCY PLANNING - FEDERAL PERSPECTIVES

A. EPA Health Advisory Program

Health Advisory Program Concepts

Non-Regulatory (Not legally enforceable)

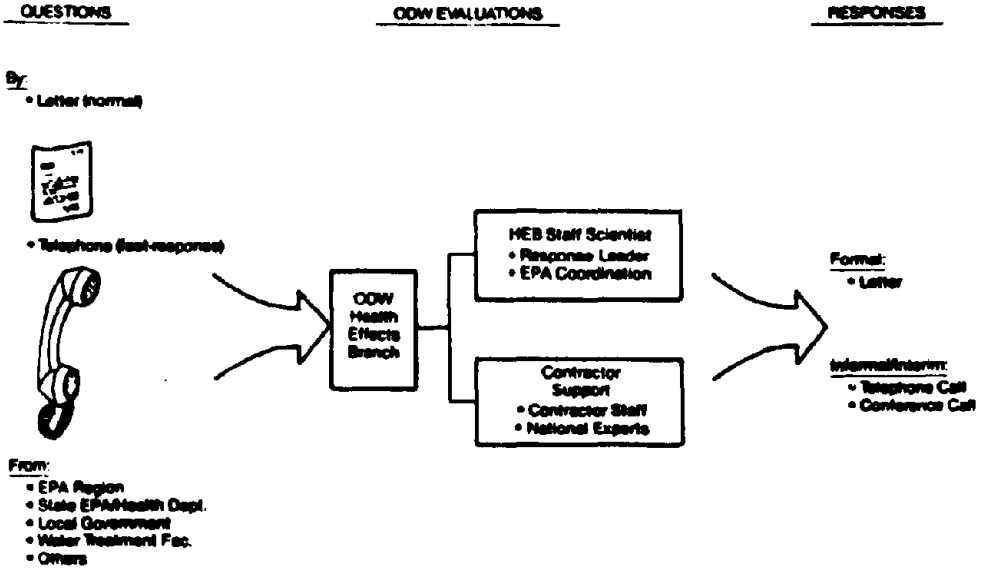
Information Provided

- Health Effects
- Analytical Methodology
- Treatment Technology

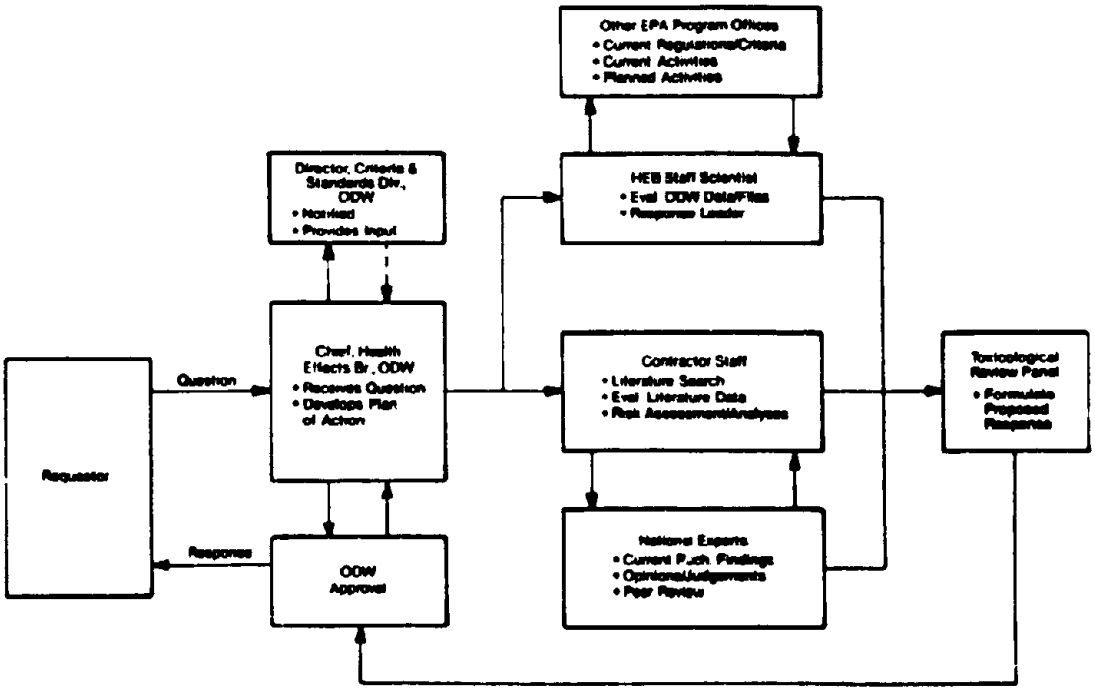
HA based on most sensitive and meaningful non-carcinogenic Health Effects

HA for suspected carcinogens include additional risk information when available

ODW Health Advisory Emergency Response Network



ODW HEALTH ADVISORY PROCESSING



OFFICE OF DRINKING WATER
U.S. ENVIRONMENTAL PROTECTION AGENCY

HEALTH ADVISORY PROGRAM ASSISTANCE DIRECTORY

Criteria and Standards Division (CSD Staff)

For inquiries pertaining to:		Call (Area code 202):
General Information and the "Numbers"		Penelope Fenner-Crisp 382-7589
Emergency Response		Kris Khanna 382-7588
Analytical Methods		Maria Gomez-Taylor 382-3029
Treatment Techniques:	Organics	Steve Clark 382-3028
	Inorganics	Peter Lassovsky 382-3030
Exposure/Occurrence		Bill Coniglio 382-2273
Chemical Managers		Larry Anderson 382-7587 Ken Bailey 382-5535 Ambika Bathija 382-7591 Paul Berger 382-3039 (microbiology) Rick Cothern 382-7584 (radionuclides) Susan Goldhaber 382-7583 Bill Marcus 382-7580 Yogi Patel 382-7585 Jennifer Orme 382-7586
Management		Joseph A. Cotruvo, Director CSD 382-7575 Craig Vogt, Deputy Director CSD 382-7575 Ed Ohanian, Chief Health Effects Branch 382-7571 Art Perler, Chief Science and Technology Branch 382-3022

B. Federal Emergency Management Agency

FEMA Responsibilities

- Formation, in 1979, consolidated:
  - Federal Preparedness Agency (GSA)
  - Defence Civil Preparedness Agency (DOD)
  - Federal Disaster Assistance Administration (HUD)
  - Federal Insurance Administration (HUD)
  - Fire Administration (DOC)
- Coordinate response of lead agencies
- Broker resources
- Chair Interagency Resources Assessment Committee
- Specialized response
  - Flood
  - Emergency potable water supplies for shelters
- National flood insurance program
- Unified national program for flood plain management
- Small urban watershed working group.
  - Guidelines for local community flood warning and response systems
- Financial aid, tech assistance, supplies, equipment for state and local government emergency management responsibilities.
- Overview of other federal agency emergency water planning responsibilities
  - USDA
  - DOI
  - TVA
  - DOC
  - DOE
  - HUD
  - DOS
  - DOT
  - HHS

- Authorities for emergency federal funding
  - National Emergencies Act
  - International Emergency Economic Powers Act
  - Disaster Relief Act, 1974
  - Defense Production Act
- Comprehensive earthquake planning
  - "Response 85"
  - "Recovery 85"
- FEMA assistance applicable to water suppliers
  - Coordinate well
  - Listen & hear local concerns communicated to federal agencies
  - Represent needs of water suppliers fairly in resource claimancy area

C. U.S. ARMY CORPS OF ENGINEERING EMERGENCY WATER PLANNING PROGRAM

Emergency Water Planning

An Evolving Program

Army Corps of Engineers

SEPTEMBER 1985

Emergency Water Planning - An Evolving Program

This brochure explains the Emergency Water Planning program and is intended to encourage Federal, state, local, and private sector assistance in developing joint emergency water plans so that government at all levels can effectively respond to emergencies of any variety. Emergency Water Planning is not a new objective for the Federal Government, but it's gaining new emphasis and momentum. The Emergency Water Planning role has been assigned to the U.S. Army Corps of Engineers to draw upon the Corps' expertise in other related missions. A successful Emergency Water Planning program will depend upon the cooperation of water-related agencies at all levels of government.

Q. What is Emergency Water Planning?

A. Water, of course, is a basic necessity for human survival. The capability to respond to a wide range of water-related natural and domestic emergencies rests with state and local governments. Federal Emergency Water Planning relates to national security and catastrophic domestic emergencies. It focuses on assessing water and water support resource needs and on developing "standby" priority and allocation systems in case these resources become critical. That's why merging Federal, state, and local government planning efforts will allow all of us to meet our essential water needs in all types of emergencies.

Q. Are emergency plans being developed for food, transportation, housing, manpower and other resources too?

A. Yes. There are many components involved in keeping our complex society functioning. In recent times, mobilization for World War II and the Korean Conflict caused nationwide resource shortages. Over the years, several executive orders addressed various segments of the overall resource planning program to alleviate shortages. In 1969, they were consolidated into Executive Order 11490, the current basis for the Federal Emergency Resource Management Program. In Executive Order 11490, the President assigns emergency planning responsibilities for manpower, food, minerals, energy, water, production, transportation, housing, communications, financial services, and construction services to various Federal agencies. Collectively, these agencies must ensure that the Nation can meet essential civilian and military resource needs during national security and catastrophic domestic emergencies.

Coordinating all of this is a major responsibility. The Federal Emergency Management Agency (FEMA) provides overall planning guidance and coordination. Emergency Water Planning is being formulated around FEMA guidance to the U.S. Army Corps of Engineers and the other Federal agencies involved.

Q. Why is the U.S. Army Corps of Engineers responsible for Emergency Water Planning? Are other Federal agencies also involved?

A. Emergency Water Planning was transferred from the Department of Interior to the Department of Defense in 1983, and was subsequently delegated to the U.S. Army Corps of Engineers (Civil Works). There are several reasons why this transfer was made:

* The Corps has water resources experience and expertise,
* the Corps has an organizational presence throughout the country,
* the Corps has experience in helping the public deal with emergencies such as flooding, and
* emergency water planning closely parallels other Corps civil readiness roles.

Other Federal agencies are very much involved in the planning. Executive Order 11490 requires close coordination with those agencies that are involved with water. They include:

* Department of Agriculture
* Department of Commerce
* Department of Energy
* Department of Housing and Urban Development
* Department of the Interior
* Department of State
* Department of Transportation
* Environmental Protection Agency
* Federal Emergency Management Agency
* Tennessee Valley Authority

The Corps of Engineers leadership role involves coordination, joint planning and information exchange among the Federal agencies.

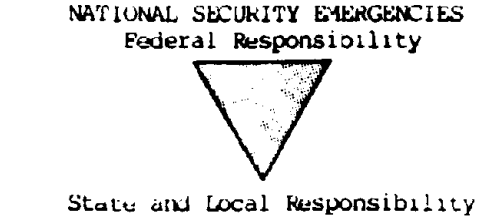
Q. Why should I be concerned about Emergency Water Planning?

A. Everyone must be prepared. We all must ask, "what if?" for those thousand-and-one possible catastrophes which could hit. Although local, state, and Federal areas of responsibility are different, the need for "standby" planning is the same.

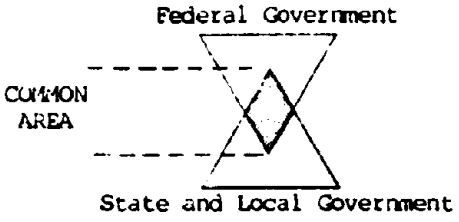
DOMESTIC DISASTER
Federal Responsibility

State and Local Responsibility

State and local governments are tasked with responding to natural and domestic emergencies. For this reason, integration with Federal plans is useful for emergency responses.



The Federal government is charged with planning responses to national security and catastrophic domestic emergencies. These plans must be developed in partnership with state and local governments and the private sector for them to be successful.



As you can imagine, some of these planning responsibilities overlap. A wide range of options must be developed to apply at all levels of government when such emergencies threaten or affect the users of our water systems.

Q. What are "national security emergencies" and "catastrophic domestic emergencies"?

A. The Emergency Water Planning strategy is being prepared for all kinds of emergencies. Through this program the Corps will assemble, or guide the assembly of the data dealing with water supply and demand as well as the need for materials and equipment. It will also define a network of Federal, state and local agencies responsible for delivering a safe and sufficient supply of water to the Nation. This coordinated, integrated approach directed at national security and catastrophic domestic emergencies will produce the added benefit of assisting state and local jurisdictions in increasing their emergency response capabilities for other emergencies.

National security emergencies are occurrences such as war, the threat of war, nuclear blackmail or economic warfare which because of their size or intent seriously degrade or threaten the security of the United States. These are, of course, the foremost concern in Federal Emergency Water Planning. However, the basic national security emergency response concepts will become the framework for response to catastrophic domestic emergencies and, for that matter, any similar crises.

Catastrophic domestic emergencies are large-scale natural disasters--such as massive earthquakes--or other domestic emergencies that need substantial Federal assistance to be managed effectively, or those which arise from activities where there is Federal preeminence.

Q. Define "water support resources" and "water" for Emergency Water Planning purposes.

A. By water support resources, we mean the pipes, pumps, energy, manpower and chemicals necessary to produce and distribute water. These are items which, during a national security or catastrophic domestic emergency, can be in short supply. That's why identifying critical supplies and materials, assisting emergency requirements and developing priorities and allocation systems ahead of time is important.

Executive Order 11490 defines water as "all useable waters, from all sources, within the jurisdiction of the United States, which can be managed, controlled and allocated to meet emergency requirements."

Q. What does the Corps mean by "developing plans for the management, control, allocation, and use of water resources of the nation?"

A. The chart on the following page shows various emergencies. The size and scope, as well as the type, determine who is responsible for emergency planning.

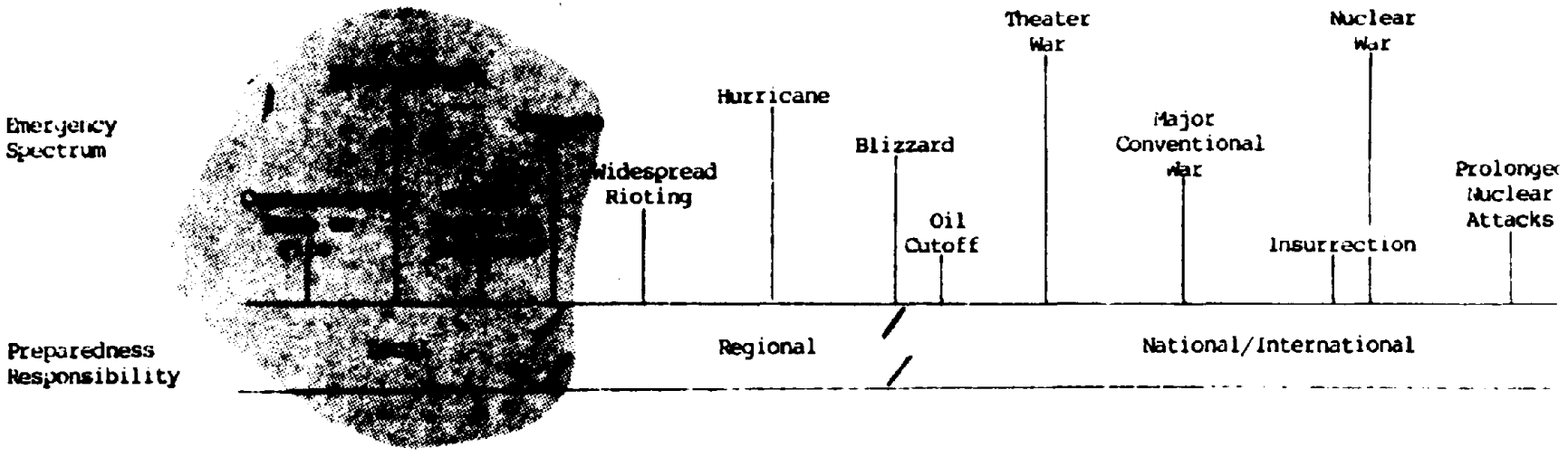
Notice that part of the chart is shaded. Planning for the emergencies within this area is essentially handled locally. But as one proceeds toward the right, the events require more and more participation of agencies and governments beyond local or, in some cases, state jurisdictions.

The Corps is charged with coordinating Federal planning to ensure the availability of water and water support resources in national security and catastrophic domestic disasters. The Corps' goal is to integrate planning and assist state and local jurisdictions in increasing their capabilities in the process.

As mentioned earlier, there are two major parts in Emergency Water Planning: the support resources for producing and transporting water, and the water itself. Water support resources are the primary focus of Federal Emergency Water Planning. For any area, the essential resource needs must be identified and procedures developed to set priorities and to obtain allocations so state and local governments can continue to provide essential services during emergencies. For example, what if a sudden military mobilization created a shortage of chlorine, filter materials or some other resource essential to the production of potable water? A "standby" priorities and allocation system would insure that cities could continue to provide essential water service until the market-based economy could react.

Major water users need to analyze the potential impact of mobilization and other national security and catastrophic domestic emergencies as they apply to water. With this information, those water users can collectively extend and integrate existing plans.

Emergency Water Planning is thinking ahead, identifying critical resources and developing responses that can be applied broadly or selectively, depending on the nature of the emergency. This approach, combined with integrated planning throughout government, will strengthen the entire Nation's emergency response capabilities.



EMERGENCY PREPAREDNESS FRAMEWORK

Q. How does Emergency Water Planning affect existing water rights?

A. It doesn't. Water occurs locally or regionally on the surface and underground, sometimes being transported between regions under prearranged agreements. In fact, the nation's waters are presently being allocated through many existing local, state and international agreements. It is not the intent of Emergency Water Planning to override these existing agreements. Emergency requirements will be determined and resolved by involving the major water providers and users well in advance.

Q. Will the Corps resolve long-term state and local water supply problems via the Emergency Water Planning program?

A. Long-term water supply problems (e.g., projected shortages based on communities expanding beyond their water supply capabilities) are serious problems, but are outside the authority of the Emergency Water Planning program. Emergency Water Planning is geared to national security and catastrophic domestic emergencies. By integrating Federal, state and local planning, however, a network will be created which may help non-Federal entities handle water problems within their jurisdictions.

Q. Under what circumstances would emergency water plans be implemented?

A. Federal emergency water plans are essentially "standby" plans to assure that a range of options is available in times of national emergency. They can be implemented only when enacted by Presidential directive or a law from the Congress. This is an important point -- The Corps of Engineers and other Federal agencies must make plans for such emergencies, but only the President and the Congress can grant the authority to implement their provisions.

Q. What has the Corps accomplished in Emergency Water Planning thus far and what is planned for the future?

A. For too many emergencies, planning has barely begun. As the coordinating agency, we can report that the Corps Emergency Water Planning program is beginning to take shape.

The Corps chairs an interagency planning group in Washington, D.C., and helps FEMA write specific emergency water resources management guidelines. Because our mission includes national leadership, the Corps of Engineers is working through the Environmental Protection Agency, the Department of Agriculture and other agencies to seek local, state and regional involvement in Emergency Water Planning. The initial focus is on preparing rudimentary interim plans to use in case a national emergency occurs before full-scale plans are completed. Nevertheless, long-term planning is underway concurrently.

Regional Corps offices are embarking upon a five-year Emergency Water Planning development process. They will develop and maintain state inventories of water resources. These inventories will become the basic foundation for understanding how to deal with water emergencies. The state inventories also will be used to test response systems, using site-specific emergency simulation exercises.

In 1990 the final Emergency Water Planning system will be issued and the program will move into a maintenance mode. Technical assistance will be provided to states to help establish and maintain local emergency action plans.

Q. How important is the participation of state and local governments in Emergency Water Planning?

A. It's extremely important. Local governments and water suppliers have a vast amount of experience in planning for and dealing with water problems. The development of Federal emergency water plans is an opportunity for partnership. All levels of government--Federal, state and local--must plan for emergencies. Coordinating these efforts has potential benefits for everyone. The Corps of Engineers and other Federal agencies cannot require participation of state and local governments, which means that the voluntary enrollment aspect of this nationwide process is vital to its success.

Q. Are grants or other Federal assistance available for Emergency Water Planning?

A. Work on two preliminary regional emergency water plans has already begun. The Corps, in collaboration with other Federal agencies, state and local governments and professional organizations, is developing emergency response plans covering a broad spectrum of emergencies. After testing and refinement, the plans will provide information that will help government at all levels integrate Emergency Water Planning into a single nationwide network. When the Emergency Water Planning program is fully developed, the Corps will provide technical assistance to political entities developing or improving emergency water plans.

Q. What are the Corps Emergency Water Planning goals?

A. Historically, the responsibilities for and the benefits of water have been shared in this country. Planning for emergencies which threaten plentiful water also can be shared. Government, at all levels, must try to anticipate any emergency which threatens the water supply of its citizens.

We at the Corps want to follow our mandate to:

* Develop plans for the management, control, allocation and use of the water resources of the Nation. The plans must be consistent with the plans of other Federal agencies having specific water responsibilities.

* Establish a system of priorities and allocations for the emergency production, distribution and use of water and water resources.

* Provide guidance and assistance to, and coordinate plans with, other Federal agencies, states, local governments, and the private sector.

* Achieve and maintain implementation capability through data collection and analysis, training, exercises, research and human resources development.

All of us--government officials, private industry employees, U.S. citizens--fulfill very different obligations in local jurisdictions, state governments, and in regional and national offices of Federal agencies. Together, we must talk about our common concern: how we will meet the "what if?" questions, if and when they arise, and above all, keep America's water flowing.

D. EPA Emergency Response Team

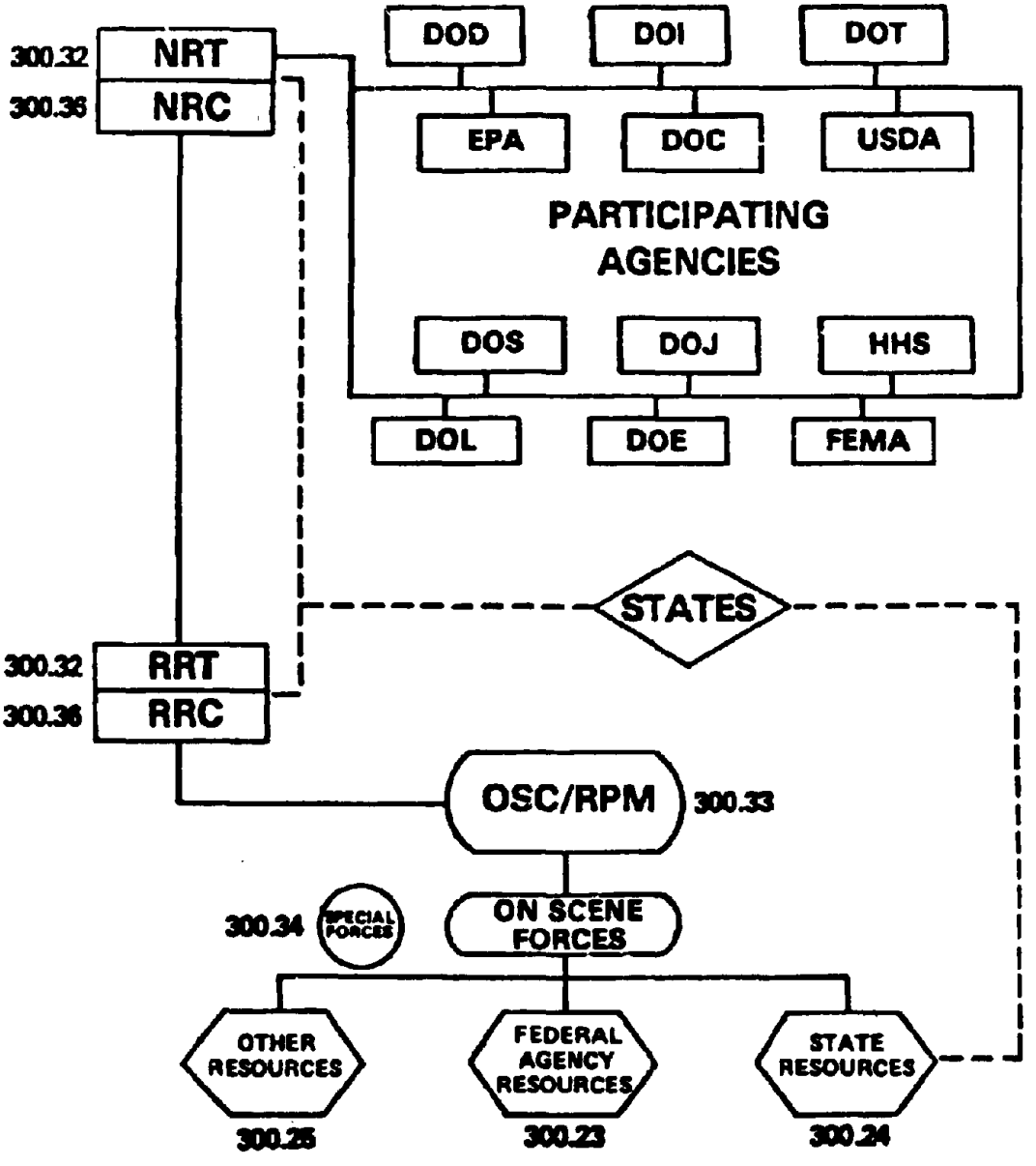
Authorities

- Clean Water Act (Sect. 311)
- Comprehensive Environmental Response Compensation and Liability Act (CERCLA)

Response Organization

- National Oil and Hazardous Substances Pollution Contingency Plan

PART 300—NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN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FEMA
STATES
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RRT
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RRC
OSC/RPM
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SPECIAL FORCES
ON SCENE FORCES
OTHER RESOURCES
300.25
FEDERAL AGENCY RESOURCES
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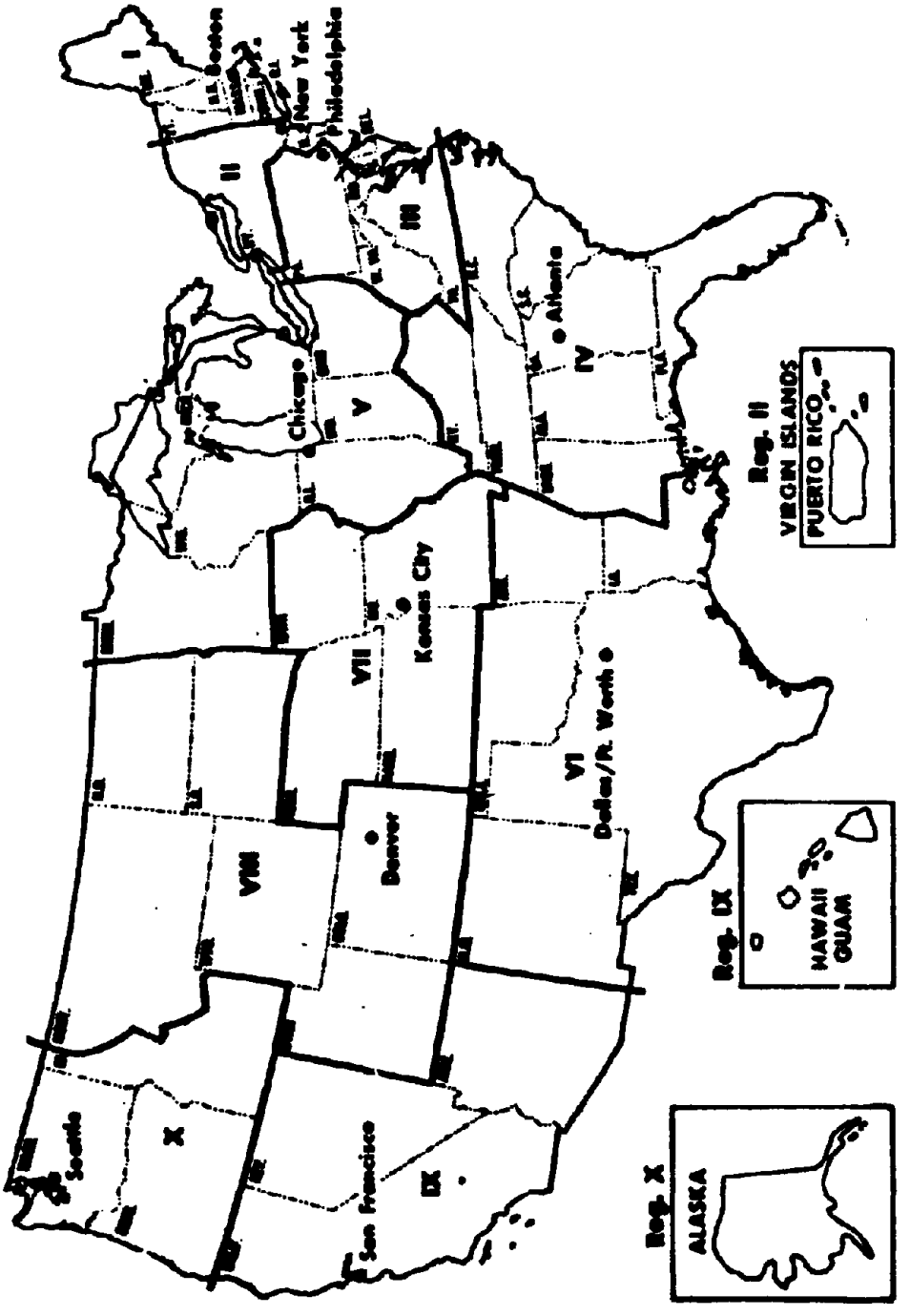
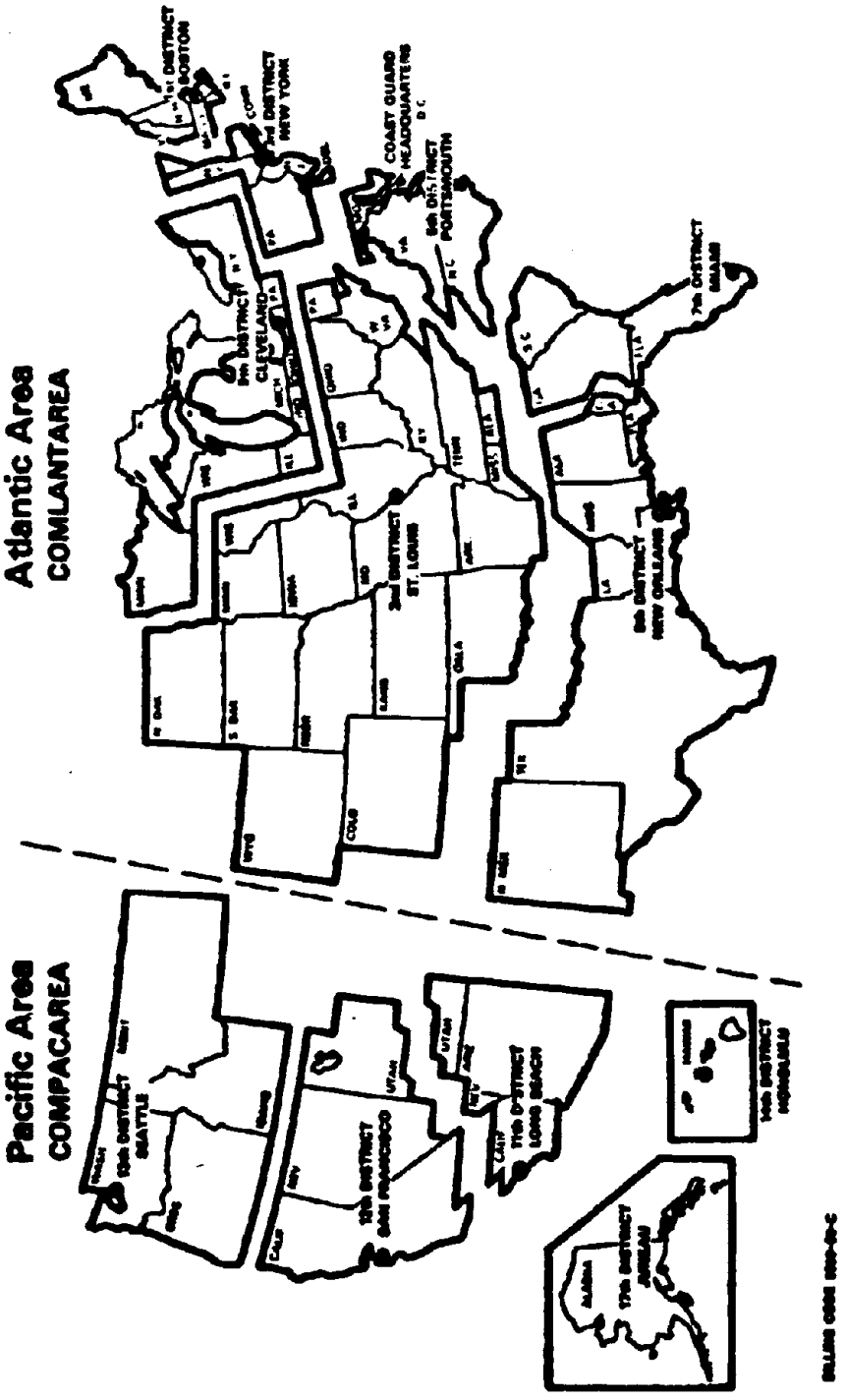
STATE RESOURCES
300.24

Standard Regional Boundaries



U.S. Coast Guard Districts



VII-19

SECTION VIII

MEDIA RESPONSE

A. Media Basics

Media Coverage - Advantages

- Quick dissemination of information to public
- Allays unfounded fears
- Inspires confidence

Media Coverage - Disadvantages

- Shallowness
  - Tight deadlines
  - Stories must be brief
  - Reporters are generalists
- Sensationalism
  - News stories required daily but true sensational stories don't happen daily
  - Public interest in what went wrong - not what went right
- Subjectivity

Coping With the Disadvantages of Media Coverage

- Shallowness
- Sensationalism
- Subjectivity
- Educate reporter
- Know and present facts
- Appeal to values

B. Rules For Dealing With the Media

No such thing as "Off the record"

Assume microphones always on

Plan ahead

- o Primary and backup spokesperson
- o Inform media and government who spokesperson is · how to contact
- o Telephone operators informed how to reach spokesperson
- o Establish information gathering teams to report information to spokesperson
- o Establish contingency press area with telephones and back up communications equipment

Develop ability to take control of interview

C. Controlling the Interview

Winning at confrontation

- Rules of the game
- Crisis communications exercise 1

You have been thrown into the middle of a hot controversy about contamination of drinking water supplies. During a public meeting, which was attended by organized protesters and the media, a woman runs up to you, pokes her finger into your chest, and calls you "not human, robot."

Evaluate the pros and cons of these various ways of dealing with her outburst:

A) Walk out with as much dignity as you posses and issue a statement later refuting her charges.

PRO: CON:

B) Ask the police to remove her and other hecklers from the hall.

PRO: CON:

C) Remain silent until she calms down and then try to avoid saying anything that might agitate the audience.

PRO: CON:

D) Grab the microphone, ask for a chance to respond and emphatically disagree with her.

PRO: CON:

- Guidelines for success

Dealing with fear

- The problem
- Crisis Communication Exercise II

After the train derailed and spilled a large quantity of chemicals, you are in charge of the cleanup. The residents don't trust the railroad and believe it is understating the potential long-term danger to drinking water supplies. Evaluate each of the following as a possible first action on your part:

A) Hold a joint news conference with the railroad spokesman to refute the charges.

PRO: CON:

B) Issue a statement announcing a study to ascertain the facts.

PRO: CON:

C) Meet with residents at City Hall to hear their complaints and fill rem in on the cleanup.

PRO: CON:

D) Accelerate efforts to contain the spill and pump the liquid into tanks.

PRO: CON:

- Guidelines for success

D. Disclosing Information

General

Ground Rules

Crisis Communications Exercise III

You are an official of a water district experiencing a prolonged drought. A newspaper reporter calls and asks if it is true that a major industrial plant is using water at the same rate as before the drought, despite official requests for conservation. His information is correct. Analyze the pros and cons of each of the following ways of answering his question.

A) Tell him to call the manufacturer. Giving out such information about users violates privacy rights.

PRO: CON:

B) Acknowledge it's true but warn that if water usage by this industry is cut, the budget will go in the red and the rates will go up for everyone.

PRO: CON:

C) Tell him you will seek an audit and get back to him (and give him the results after the drought is over).

PRO: CON:

D) Acknowledge it's true but explain that the manufacturing process is such that there can be little variation in water consumed in the process as long as the plant is operating.

PRO: CON:

Guidelines for success

E. Conclusions and Checklist

General Risk Perception

- o The problem of involuntary risks
- o Communication Exercise IV

Assume that a volatile chemical is detected in the drinking water that your scientific experts say has about the same chance of causing cancer as saccharin. After the story is leaked to the press you appear at a town meeting. Analyze these various responses:

A) Asked "Is the water safe to drink?" you pick up a glass and chug a lug it, saying, "Safe enough for me."

PRO: CON:

B) Tell them that it is unlikely that anyone could drink enough water every day over his/her lifetime for exposure to be a significant risk for cancer.

PRO CON:

C) Cite scientific data that someone who drank one glass of town water per day for 70 years would face a cancer risk of 6.4 in 10,000.

PRO: CON:

- o Guidelines for success

Crisis Communication Checklist

1. BE PREPARED. REVIEW THE FACTS.

2. BE HONEST. TELL THE TRUTH.

3. ANTICIPATE LIKELY QUESTIONS.

4. CONSIDER WHAT THE AUDIENCE IS INTERESTED IN KNOWING.

5. DECIDE WHAT YOU WANT TO SAY.

6 CONSIDER IF THERE ARE THINGS YOU DON'T WANT TO DISCUSS.

7. COMPOSE CONCISE, ACCURATE ANSWERS.

8. AVOID JARGON.

9. DON'T FLY BY THE SEAT OF YOUR PANTS, YOU MIGHT CRASH.

10. IF YOU DON'T KNOW THE ANSWER TO A QUESTION, DON'T GUESS.

11. STAY CALM, DO NOT LOSE YOUR COOL.

12. SPEAK UP, DO NOT MUMBLE.

13. BE ASSERTIVE, NOT ARROGANT.

14. DO NOT FIGHT WITH REPORTERS, BYSTANDERS, ACTIVISTS.

15. DO NOT FUDGE.

16. DO NOT SHOW FRIGHT. RELAX, BREATHE DEEPLY.

17. AVOID FLIGHT. DON'T TRY TO RUN AWAY.

18. COUNTER FALSE ASSUMPTIONS IN QUESTIONS.

19. WHEN FINISHED, STOP. IT IS HARDER TO PUT ONE'S FOOT IN ONE'S MOUTH WHEN IT IS SHUT.

FOR OUR MANUAL ON CRISIS COMMUNICATIONS (100 pages, paperback)

CALL FORD ROWAN AT (202) 296-9710

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THE DOZEN MOST COMMON MISTAKES IN CRISIS COMMUNICATIONS
By Ford Rowan

The first mistake most managers make is failing to prepare for a worst case scenario. Perhaps it's human nature to avoid the unthinkable. But the single most important thing that can be done to prevent a catastrophe is to prepare for it.

The second mistake most managers make is to underestimate the importance of the media at the onset of a crisis. The dissemination of information is crucial and the presence of reporters and photographers is automatic at most serious emergencies. If the press is an unwelcome guest, it returns the cool reception by heating up the rhetoric.

The third mistake is to fail to understand the needs of the press for regular updates. Deadlines come often in this day of instant eyes and minicams. Failing to provide concise factual updates can result in wild speculation.

The fourth mistake is the failure to establish a communications command center where information can be coordinated. Reporters will be wandering all over the place, talking with uninformed bystanders. Communications must be coordinated to assure accurate information.

The fifth mistake is to fail to take charge. The spokesperson must be a leader. His role is not just to answer questions but to disseminate information.

The sixth mistake is to fail to anticipate likely questions. The old standards what, when, where, who, why and how can be expected. Remember, people want to know, "Is it safe now?"

The seventh mistake is to be lured into answering hypothetical questions. Avoid "What ifs," they can be scary. When asked to predict, stick to the facts and make projections if any based on what is known.

The eighth mistake occurs when a spokesperson inadvertently uses an emotionally charged word or sensational phrase in response to a question. Don't contribute to hype.

The ninth mistake is to assign blame for an accident. It's likely that litigation will last for years anyway, so keep your opinions in check.

The tenth mistake is to try to stonewall if things get worse, to fudge the facts if the situation begins to deteriorate, or to compound the confusion as fatigue sets in. Credibility is at stake; preserve it with candor.

The eleventh mistake is to let questions get under your skin. Show by your demeanor and candor that you will cooperate with courteous journalists. Keep cool.

The twelfth mistake is to fail to learn from mistakes. Life is full of trial and error. Put the hard earned knowledge to work to prevent future crises.

TEAM A is in charge of a major water facility.

TEAM B is a group of reporters for newspapers, radio and television.

TEAM C consists of local officials from the fire, police, and environment and health departments.

TEAM D consists of local townspeople.

TEAM E is the "Environmental And Peace Action Corps," dedicated to preventing pollution and health risks.

Rules: The scenario can be played with only two teams, A and B, but is more interesting if more teams are added.

After teams are created, they should meet for a few minutes to discuss a game plan.

The first part is described below; after part one is played out, the facilitators at each location will provide new "facts" that alter and expand the scenario.

PART ONE: An Air Force jet has crashed into the town's only reservoir, killing the pilot and spilling fuel and other chemicals into the sole supply of drinking water. The USAF is hesitant to reveal what was on board the plane, but an AP wire story from Washington says the plane was on a training exercise for chemical and biological warfare. Team A should meet in private for a few minutes to accumulate what facts are known and then brief the press and some other onlookers outside the water facility.

Afterwards, the facilitator will have new "facts."

SECTION IX

CIVIL DISRUPTION

Introduction

While there is general consensus that water systems could be vulnerable to incidents of purposeful disruption, there does not at this time appear to be a comprehensive body of knowledge available in a central location to assist water systems with prevention and response. One of the more comprehensive investigations into civil disruption prevention and response was initiated by the U.S. Army Corps of Engineers' Washington Aqueduct Division in cooperation with the Washington Surburban Sanitary Commission and the Fairfax County Water Authority. Their efforts have resulted in a draft "Toxics Threat Manual" that will augment their emergency operations plan and form the basis of their response to actual or threatened civil disruption or tampering incidents. The actual "Toxics Threat Manual" is too lengthy to be included in this work book. Accordingly, the essence of the materials contained in the manual is summarized in the following pages.

Outline and Summary
Draft "Toxic Threat Manual"

By U.S. Army Corps of Engineers, Washington Aqueduct Division;
Fairfax County Water Authority;
Washington Suburban Sanitary Commission

Response Plan Elements

- Collection, distribution analysis, and storage of samples for determination of contamination

- Information base (in appendices) on selected chemical and biological contaminants that includes:

    1. Availability of contaminant
    2. Amount necessary to reach toxic levels
    3. Counter measures
    4. Analytical procedures
    5. Physical characterization

- Use of mobile laboratory to develop routine "baseline" conditions throughout distribution system

GUIDE TO MANUAL

This section of the manual provides a guide to the use of the various appendices in the event a threat is actually received.

I THE THREAT MESSAGE

If the threat communication is received by telephone the form (Fig. 1) shown should be filled out as completely as possible. This form should be readily available at any phone one might reasonable expect to receive such a call. The appropriate people should be made aware of the existence and location of these forms.

If the threat communication is a letter, action should be taken to preserve the evidence. It should not be handled further. Transcribe the important information(who,what,where,when and how much), where possible to your own paper and then using forceps or tweezers transfer all pieces of the communication into a plastic bag to be picked up by the appropriate authorities.

II NOTIFICATIONS

The person receiving the threat message should contact the executives of the agencies involved and the leader of their toxic response team(Telephone No.'s are provided in App. A). The leader will then notify other members of the team to start the evaluation. The team leader will make other initial notifications as deemed appropriate by the particular utility. Appendix A contains the lists of people and agencies to be notified as the evaluation progresses.

III THREAT EVALUATION

Appendix B is the threat evaluation guide which has been provided by the U.S. Army Medical Research Institute of Infectious Diseases(USAMRIID). The toxic response team will use this document and supporting information(Appendix C, containing representative data sheets on toxic materials; and Appendix D, on-line data base information for creating a data sheet for the threat agent) to evaluate the threat and to answer the following;

1) Does the threat message identify the agent?
2) Does the threat maker appear to posses the knowledge necessary to carry out the threat?
3) Does the threat maker appear to be able to produce or obtain the chemical or biological agent?
4) Does the threat maker appear to be able to deliver the agent to the intended target?
5) If the threat maker carries out the threat as stated, what will be the effect?

When the evaluation is completed the team will recommend the appropriate actions to be taken. These actions will consist primarily of sampling, analysis and further notifications.

Fig. 1

THREAT EMERGENCY RECORD SHEET

RECORD IMMEDIATELY

DATE: _____ TIME: _____

EXACT WORDS OF CALLER: _____

_____

_____

_____

ASK: WHAT KIND OF POISON? _____

WHERE? _____

WHEN? _____

HOW MUCH? _____

CHARACTERISTICS OF CALLER: (CHECK BELOW)

MALE [_] FEMALE [_] ADULT [_] CHILD [_] TEEN [_] UNKNOWN [_]

VOICE:

LOUD [_] SOFT [_] WHISPER [_] NORMAL [_] DRUNK [_] CALM [_]

DISTINCT [_] SLURRED [_] EXCITED [_] NERVOUS [_]

BACKGROUND NOISES: (STREET SOUNDS, PARTY SOUNDS, ETC)

_____

_____

NAME AND LOCATION OF PERSON RECEIVING CALL:

_____

_____

Summary of Manual Appendices

A. Notifications - work and home numbers provided

Local government agencies and managers

Local water suppliers

EPA

Media
A.P.
U.P.I.

Local TV stations

Radio stations

Newspapers

B. Threat Evaluation (ref: U.S. Army Medical Research Institue of Infectious Diseases) uses detailed protocol to establish:

1. Does the threat message identify the threat?

2. Does the threat-maker appear to possess the knowledge necessary to carry out the threat?

3. Does the threat-maker appear to be able to produce or obtain the chemical or biological contaminant?

4. Does the threat maker appear to be able to deliver the agent to the intended target?

5. If the threat-maker carries out the threat as stated, what will be the effect?

C. Data Sheets - for selected contaminants including inorganics, organics, microbiologicals

1. Contaminant

2. Degree of hazard (LD50 oral-rat)

3. Amount needed to reach specified toxic level (kg/mg)

4. Availability

5. Equipment needed to transport material

6. Method of detection and analytical equipment required

7. Treatment required for removal or neutralization

8. Characterization

    a. Odor threshold
    b. Taste threshold
    c. Water solubility
    d. General appearance of contaminated water

9. Mobile van detection capability

10. References

D. Data Base Access (for on-line information on toxicity) - with instructions on how to access

1. CIS (Chemical Information System)

2. Hazard line

3. Lab link

E. Laboratory Capabilities - lists analytical capability of all cooperating utilities

1. WSSC

2. FCWA

3. WAP

F. Background Monitoring

1. Recommended mobile laboratory capability

    a. Microtox
    b. UV-VIS spectrum (200-800 nm)
    c. Chlorine residual
    d. Conductivity
    e. pH
    f. Fluoride
    g. Turbidity
    h. Rapid bacteriology test (< 1 hour)

2. Recommended routine sampling schedule (develop background data base)

3. Recommended number/location of sampling points

SECTION X

RESOURCES

RESOURCES

The objective of this section of the workbook is to share with you a partial summary of the excellent materials already in existence to assist you in developing or improving your emergency plan. Materials included are applicable both to state and local regulatory agencies and to water suppliers. Not all of these publications are available from the agencies that produced them, due to reproduction costs. Where we are aware of this problem, we have attempted to excerpt the essential ideas of the referenced publication and provide them herein.

State-Developed Resources (includes resources developed in-house and some developed under contract)

1.* State of Maine, "Comprehensive Emergency Response Plan for Drinking Water," September 1981.

2.* State of California, Resources Agency, Department of Water Resources, Southern District, "Emergency Handbook for Water Supply Managers," June 1984.

3.* State of Texas, "State of Texas Emergency Management Plan," Annex L, Texas Department of Health, November 1983.

4.* State of Florida, Department of Environmental Regulation, "Hurricane Preparedness and Procedures: Water and Wastewater Facilities," June 1985.

5. State of Ohio, EPA, Office of Public Water Supply, "Resource Handbook for Drinking Water Supply Emergency Planning," September 1977.

6.* New York State Department of Health, Division of Environmental Protection, Bureau of Public Water Supply Protection, "Emergency Planning and Response - A Water Supply Guide for the Supplier of Water," January 1984.

7.* Oregon Resource Center for Environmental Training, "Emergency Planning Student Workbook," 6500 SW Pacific Blvd., Albany, OR 97321, (503) 928-3520.

AWWA Publications and Resources (available for sale: AWWA, 6666 W Quincy Ave, Denver, CO 80235, (303) 794-7711)

8. AWWA Technical Library, "Bibliographies on the Water Supply Industry -- Emergency Planning," 1983.

9. "Hazardous Materials Spills Emergency Handbook," 1975.

*Excerpts provided

10. "Challenges in Water Utility Management -- an AWWA Management Resource Book," 1980.

11. "Developing a Chlorine Emergency Control Plan," OPFLOW, Vol. 11, No. 5, May 1985.

Other Resources

12.* Gordon, Wendy, "A Citizen's Handbook on Groundwater Protection," Natural Resources Defense Council Inc., 1984.

13. Cashman, John R., "Hazardous Materials Emergencies -- Response and Control."

14. Lustberg, Arch, "Winning at Confrontation," Association Division, U.S. Chamber of Commerce, Washinton, D.C.

15. Rowan and Blewitt Inc., "A Manual for Media Interviews," Suite 405, 1899 L St. N.W., Washington, D.C. 20036, (202) 296-9710.

16.* American Water Works System, "Emergency Procedures Handbook," 1979.

COMPREHENSIVE EMERGENCY RESPONSE PLAN FOR DRINKING WATER

Prepared for:

Department of Human Services

by:

Mallar Development Services, Inc.

September, 1981

Preparation of this document was financially assisted by the State of Maine, Department of Human Services, Appropriation Account #3310-2460; (Through a Federal grant F00124581 from the U.S. Environmental Protection Agency).

FOREWORD - HOW AND WHEN TO USE THIS MANUAL

This Emergency Response Plan for Drinking Water has been developed to enable the immediate and follow-up response by State personnel and others in the event of health threatening occurrences such as (but not limited to): sabotage; hazardous materials emergencies; natural disasters; a severe loss of water distribution, treatment, or collection capacities.

In addition to being concerned with a coordinated response of State services in meeting the needs of the people of Maine in an emergency drinking water situation, the plan also establishes a communication and administrative framework for cooperation with county and local levels of government and serves as a guide for the establishment of local emergency response plans.

This manual will aid in coordinating the response actions of the Department of Human Services, the local water utility(ies) affected, and other local or regional groups as are involved in responding to a disruption of a water supply that cannot be handled with local resources.

IMPORTANT: Fill in information on Page 1, Section 1 of this Manual.

EMERGENCY

When an emergency occurs, turn to the Emergency Action Bulletin. This will give you a list of numbers to be called for assistance and/or to begin the response process.

SEE: Section 1.

ALTERNATE COMMUNICATIONS

If telephone communications are interrupted, turn to the section labeled Alternate Communications.

SEE: Section 3.

ACTION STEPS

By either telephoning the numbers listed on the Emergency Action Bulletin, or by using Alternate Communications to reach outside assistance, the user will set into motion the ACTION STEPS of the Plan.

SEE: Section 2.

TABLE OF CONTENTS

EMERGENCY!

WHO TO CALL IN THE EVENT OF A

D I S R U P T I O N I N D R I N K I N G W A T E R

DUE TO CHEMICAL CONTAMINATION OR MAJOR PHYSICAL/NATURAL DISRUPTION

HAZARDOUS CHEMICALS OR PESTICIDE CONTAMINATION:

Maine Bureau of Public Safety (State Police) - 1-800-452-4664
(24-hour service)

ALL OTHER CAUSES:

Maine Department of Human Services - Days - 289-3826

OR:

Maine Bureau of Public Safety (State Police) - 1-800-452-4664
(24-hour service)

ILLNESS CAUSED BY INTAKE OF CONTAMINATED DRINKING WATER:

Poison Control Center - 1-800-442-6305

LOCAL NUMBERS:

Emergency Medical Services (Ambulance) ..... -

Emergency Equipment..... -

Hospitals..... -

-

Adjacent Water Districts..... -

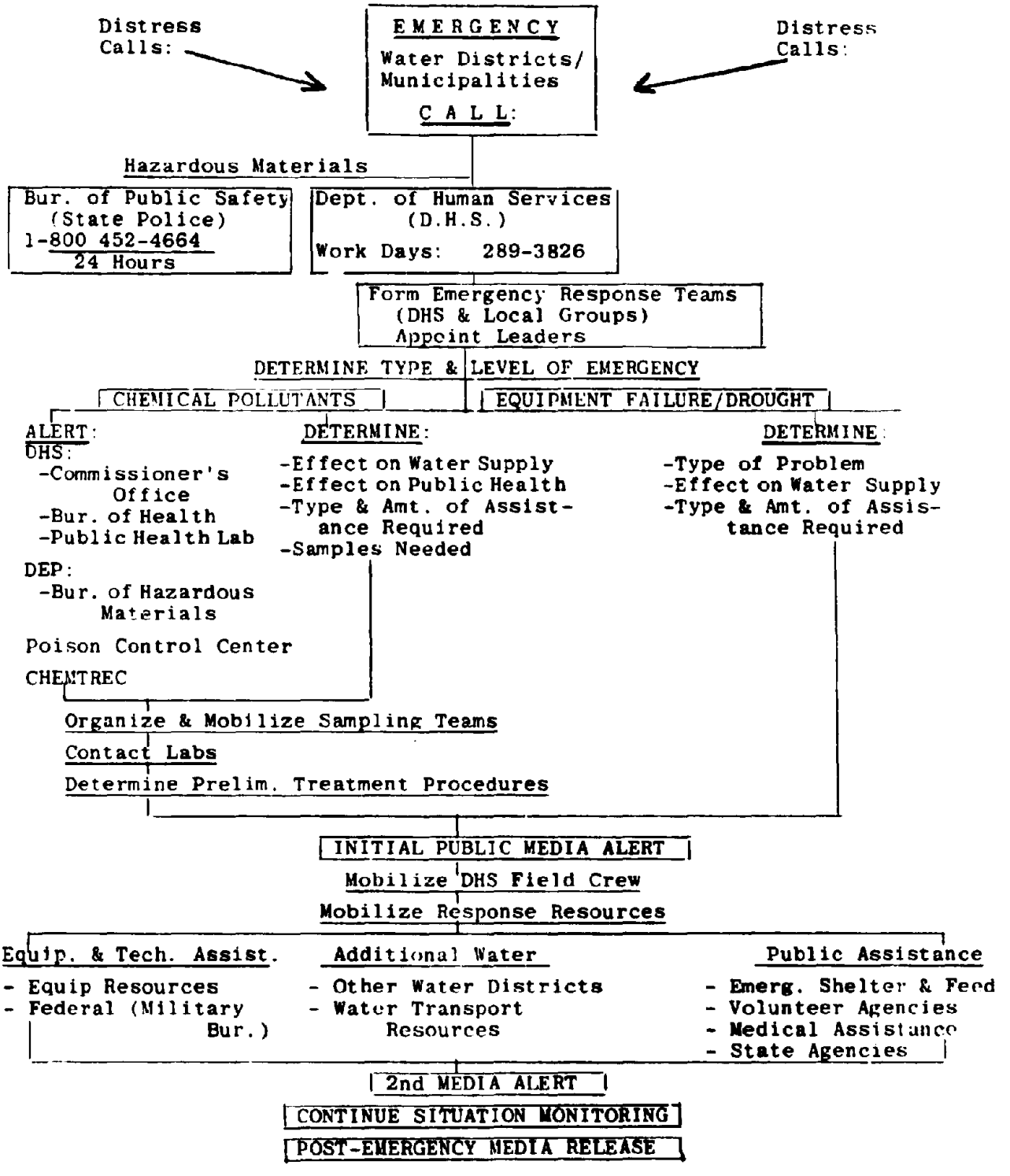
-

Police..... -

Fire..... -

Other..... -

FLOW CHART - SUMMARY OF ACTION STEPS



SECTION 2 - ACTION STEPS - IMPLEMENTATION OF PLAN

The most important component in dealing with emergencies is a fast response. The first few moments of an emergency are the most critical. By prompt action, threats to human health and environmental damage can be minimized.

EMERGENCY

Step 1 - Distress Calls to Utility

The local water district should be notified immediately of any actual or imminent threat to the water supply. Early notification allows adequate preparation and response by the utility to hazardous material spills or leakages, broken equipment or water mains, or dwindling supplies due to drought.

- If there is no answer at the utility office, call the local town manager's office.

Step 2 - Immediate Response Call to Department of Human Services (DHS)

HAZARDOUS MATERIALS CONTAMINATION

1-800-452-4664 (24 hours) (State Police)

ALL OTHER PROBLEMS

DHS: 289-3826 (work days)
or: 1-800-452-4664 (24 hours) (State Police)

The following diagram illustrates how calls to the State Police are routed to the appropriate response agencies.

WATER UTILITIES

Emergency Information

ANDROSCOGGIN COUNTY AUBURN	Source(s)	Pop. Served	Emerg Plan?	Adjoining Water District	Possible Link?	Storage Capacity (gals.)	Maximum & Average Production (gals.)	Water Supply Treatment*	Town Waste Water Treatment Facilit
Auburn Water Dist. 268 Court Street CONTACT: E. Tarr 784-6469 LAB-BACTERIA	Lake Auburn	20,000	NO	Lewiston	YES	8,912,000	-0- 2.920,000	A, B, F	Lewiston-Auburn Dick Blanchard 782-0917

2
-2

MEDICAL

Licensed Hospitals and Related Facilities

HOSPITALS *

ANDROSCOGGIN COUNTY	Capacity--Beds		Personnel 1/					Special Facilities 2/	
	Total #	ICU / CCU	Total	Doctors	R.N.'s	L.P.N's	Med. Lab	Pharmacy	Emergency
LEWISTON (04240)									
1. Central Maine Medical Center 300 Main St. CONTACT: William Young 795-2345	239	19	806	See Total number for area	123	50	44	Full Time	Level III
2. St. Mary's General Hospital 45 Golder Street CONTACT: E. L. Schlegel, Jr. 786-2901	233	16	724		137	48	35	Full Time	Level III
TOTAL - ANDROSCOGGIN COUNTY - 2	472	35	1530	155	260	98	79	2 Full Time	2 Level III

* Hospitals are required to maintain an emergency plan that includes emergency supplies of water, personnel, bedding and medicinal supplies.

1/ Numbers of personnel are full-time equivalents, except where shown as part-time (PT).

2/ Level III - Comprehensive 24-hour emergency care.
Level Standby - Can handle most cases.

MEDICAL

Licensed Ambulance Services *

ANDROSCOGGIN COUNTY

	Name	Capability Level 1/
LEWISTON (04240)	A.L.E.R.T. Emergency Medical Unit St. Mary's Hospital 365 Sabattus Street CONTACT: Bob Brayton 783-2219	A - MAST/EOA - IV - CARDIAC

EQUIPMENT RESOURCES *

Water Transport

ANDROSCOGGIN

VEHICLE	LOCATION	CAPACITY (gals.)	CONTACT
BULK MILK CARRIERS	AUBURN Whiteholm Farm 730 Turner Street		784-7781

RAILROADS

Lewiston (04240)	Maine Central Railroad 69 Holland Street	782-1211

FACILITIES

Transportation Resources

(Airports, Railroads, Airlines, Airplanes)

COUNTY - TOWN	FACILITY	CONTACT
ANDROSCOGGIN	AIRPORTS	
Auburn (04210)	Auburn/Lewiston Municipal Airport	Eric Waldron 786-0631

STATE AGENCIES

1. Dept. of Conservation, Maine Forest Service
   Headquarters, (Augusta) 622-7258

F A C I L I T I E S

Emergency Shelter & Feeding*

COUNTY/TOWN	BUILDING	CAPACITY	HOT MEALS?
ANDROSCOGGIN			
State Armories			
Auburn	Auburn Armory	200	No

M E D I A

TV - RADIO - NEWSPAPERS

ANDROSCOGGIN

TYPE/NAME	LOCATION	CONTACT
TV		
WCBB	Lewiston	783-9101

VOLUNTEER AGENCIES

COUNTY - TOWN	NAME	CONTACT
ANDROSCOGGIN		
AUBURN (04210)	American Red Cross Androscoggin Valley Chapter 2 Turner Street	784-4581

LABORATORY RESOURCES [1]

NAME	Testing Capability	Special Equipment [2]
Maine Department of Human Services Public Health Laboratory Augusta (Kennebec) 04333 CONTACT: 289-2727* 289-3477 Dr. H. Lind 582-5430 R. Ericson 582-3605 R. French 622-3876	Bacteria Organic Inorganic	GC/MS/AA

Water-Utility Vulnerability Survey Guide
Materials Transported via Railroads

Checklist	Railroad Co.	Railroad Co.
A. Name and location of railroads crossing watersheds or water supplies		
B. Title and telephone number of company office to contact in event of emergency (24-hr coverage)		
C. Location of railroad on maps showing water utility's water supplies and tributaries		
D. Location of railroad's nearest cleanup crew		
E. Hazardous materials commonly transported		
F. Nature of hazardous materials transported (petroleum or chemical type, toxic or nontoxic, special hazards)		
G. Protective features or equipment provided by railroad to protect water utility in event of spill		
H. Improvements planned by railroad or water company to reduce vulnerability of utility to spills		
I. Nature of additional investigations required to reduce vulnerability		
J. Other factors		

BIBLIOGRAPHY

1. "A Management Strategy for Maine's Ground Water Resources", a report to the Maine Land and Water Resources Council, Ground Water Subcommittee (1979).

2. "Before the Well Runs Dry", New England River Basins, Water Conservation Project, sponsored by the Dept. of Interior, Geological Survey, Resource and Land Investigation Program, Water Resources Division (1980).

3. "Developing a Drought Emergency Program", New England River Basins Commission, Water Supply and Conservation Program, Workshop Reference Materials (1981).

4. "Emergency Planning for Water Utility Management", American Water Works Association, New York (1973).

5. "Hazardous Materials Spills Emergency Handbook", American Water Works Association, Denver Colorado (1975).

6. "Interagency Connections: Insurance Against Interruptions in Supply", American Water Works Association Journal (April 1980).

7. "Introduction to Water Sources and Transmission", American Water Works Association, Denver, Colorado (1979).

8. "Organizing to Cope with Hazardous Material Spills", American Water Works Association Journal (April 1980).

9. "State of Maine Natural Disaster Plan", prepared for the Bureau of Civil Emergency Preparedness by William Dickson Associates, Inc. (1976).

INFORMATION SOURCES

1. HOSPITALS - Maine Dept. of Human Services (DHS)
   "Hospital Status Resport" 1981 (yearly update)
   "Maine Health Professionals - 1978"

2. OTHER FACILITES - DHS
   "Maine Licensed Hospitals and Related Institutions Directory" 1980 (yearly update)

EMERGENCY HANDBOOK FOR WATER SUPPLY MANAGERS

State of California
The Resources Agency

DEPARTMENT OF WATER RESOURCES
Southern District

ACKNOWLEDGMENT

The study that led to this handbook grew out of a memorandum of understanding between the California Department of Water Resources and The Metropolitan Water District of Southern California, which recognized that the occurrence of a major earthquake could damage water storage and conveyance facilities and seriously interrupt water deliveries in Southern California.

Particular credit should be given to the members of the Technical Advisory Committee, who have served throughout the study. They are: John G. Joham, Jr., Central and West Basin Water Replenishment District; James Cantrell, Sr., California Water Service Company; Larry C. Larson, City of Long Beach Water Department; Linn Magoffin, California American Water Company; Martindale Kile, City of Burbank Public Service Department; Donald F. Nichols, Los Angeles County Flood Control District; Toshio Mayeda and Ronald A. McCoy, Department of Water and Power, City of Los Angeles; D. J. Smith, Jr., The Metropolitan Water District of Southern California; James Alexander and Ken Klemm, State Office of Emergency Services; and Donald J. Finlayson, California Department of Water Resources. Chairperson is Robert Y. D. Chun, California Department of Water Resources, and vice chairperson, Charles F. Voyles, The Metropolitan Water District of Southern California.

Conducting the study and preparing the handbook for the California Department of Water Resources were Kiyoshi W. Mido, Harold Murata, and Phyllis J. Yates of the Southern District. Delineation was by Dean Wilson also of the Southern District. Art work and general layout were handled by Audi Hill of Graphic Services, Sacramento.

EMERGENCY HANDBOOK FOR WATER SUPPLY MANAGERS

Name of agency _____

Name of manager _____

Location of agency _____

_____

Copy No. _____

PURPOSE OF HANDBOOK

THIS HANDBOOK is designed to serve you in the first hours and days after a major disaster has damaged or destroyed your water supply system. It is set up as a checklist to remind you of the many tasks and decisions facing you in that first critical period and to provide, in one convenient place, the regulations, contracts, and sources that you may need.

The checklist of tasks to be carried out immediately after a disaster appears on the next two pages. Following each task on the checklist is a listing of additional information (and the pages on which it can be found) that may be helpful in carrying out that task.

Because no two agencies have precisely the same set of conditions, you will have to tailor the handbook to fit your agency's requirements. When you receive your copy, go through and fill in the blank pages and add appropriate information to all pages and KEEP IT UP TO DATE. An asterisk has been inserted in those places where you will need to supply information.

An appendix (Section 9) has been provided to contain maps, lists, and other information. Among these is a list of publications that you may find useful (on page 1 of Section 9). Also included in the appendix is a copy of the California Earthquake Response Plan: Southern San Andreas Fault (draft, July 1983) and the Water and Waste Disposal Systems annex. Many of the maps deal only with your agency; therefore, you will have to supply them.

As a further help to you, a second handbook will be published later to assist you in preparing for a possible emergency. It will provide suggestions on the things you will need to do to develop an earthquake preparedness plan, to carry out exercises of simulated emergencies, and to keep your plan up to date, so that your agency can cope with an emergency.

CHECKLIST OF THINGS
TO BE DONE IMMEDIATELY AFTER A DISASTER

* You will have to insert maps of your service area, if they are too large, note here where each may be found

☐ ***1. Assess damage and classify emergency***
- Make preliminary damage assessment (Sec. 1, page 1)
- Classification guidelines (Sec. 1, page 2)
- * Most vulnerable elements in my system (Sec. 1, page 3)
- * Map of system and facilities of my agency
- * Map of high ground water in my service area

☐ ***2. Implement emergency instructions and communication***
- General information (Sec. 2, page 1)
- Emergency medical facilities (Sec. 2, page 2)
- Emergency communication (Sec. 2, page 3)
- Emergency transportation (Sec. 2, page 4)
- Emergency assignments for my agency (Sec. 2, page 5)
- Emergency personnel roster (Sec. 2, page 6)
- Fire fighting and law enforcement stations (Sec. 2, page 7)
- State emergency response framework (Sec. 2, page 8)
- County emergency response framework (Sec. 2, page 9)
- * Map of MWD member agencies in county (Sec. 2, page 10)
- * Map of area served by my agency

☐ ***3. Set priorities on damage to be repaired and determine necessary work***
- General information (Sec. 3, page 1)
- * Possible emergency materials and equipment (Sec. 3, page 2)
- * Map of critical minimum water needs for each service area segment

☐ 4. ***Dispatch personnel and equipment to critical areas***
Emergency transportation (Sec. 4, page 1)
Emergency assignments for my agency (Sec. 4, page 2)
Emergency personnel roster (Sec. 4, page 3)
Map of area served by my agency

☐ 5. ***Request aid based on mutual aid agreements, stand-by contracts, and emergency contract for equipment and operators***
Commercial suppliers of equipment and materials (Sec. 5, page 1)
Nearby agencies and agreements (Sec. 5, page 2)
Lines of authority for management during an emergency (Sec. 5, page 3)
Map of regions in state (Sec. 5, page 4)

☐ 6. ***Respond to mutual aid requests***
Authorization to request and to provide assistance (Sec. 6, page 1)

☐ 7. ***Release emergency information and public instructions to media***
General information (Sec. 7, page 1)
Radio, TV, and newspapers in my area (Sec. 7, page 2)

Sec. 8. ***Checklist of things to be done during recovery period*** (Sec. 8, page 1)
Designate local disaster recovery coordinator (Sec. 8, page 2)

Sec. 9. ***Appendix***
Related Publications (Sec. 9, page 1)
Catastrophic Earthquake Emergency Identification Card (Sec. 9, page 2)
Plan Bulldozer (Sec. 9, page 3)
Mutual Aid Agreements, Examples
California Earthquake Response Plan: Southern San Andreas Fault

MAKE PRELIMINARY DAMAGE ASSESSMENT

(Within 18 hours for major facilities and 72 hours for all)

- ☐ Determine need to repair, replace, or abandon facility
- ☐ Include estimate of cost to restore facility
- ☐ Consider possible effects of aftershocks
- ☐ Evacuate buildings in danger of collapse
- ☐ Confirm that field crew does the following and closes and tags damaged facilities and equipment . . .

• *Reservoirs*

- ☐ Check for seepage, leaks, cracks, landslides, embankment slump, broken inlet-outlet pipes, piezometers, underdrains
- ☐ Notify State Div. of Safety of Dams (through Emergency Operations Center) if problems appear
- ☐ Lower water levels to reduce possibility of structural failure

• *Wells*

- ☐ Check for power disconnect
- ☐ Test for contamination
- ☐ Check for failure of pump or motor
- ☐ Check for physical damage

• *Treatment plants*

- ☐ Check if power available and condition of mechanical and electrical equipment
- ☐ Check quality of outflow
- ☐ Check for chemical spills or releases
- ☐ Check for need for emergency purification
- ☐ Check for structural damage

• *Tanks*

- ☐ Check for evidence of failure of subbase
- ☐ Check for leaks, cracks, broken inlet-outlet pipes, underdrains
- ☐ Check for buckling

• *Pumping and generating plants*

- ☐ Check transformers for damage and test capacity
- ☐ If generators are water cooled, check for adequate water storage and provide make-up water
- ☐ Check suction and discharge lines for cracks and broken connections
- ☐ Check for power disconnect
- ☐ Check for structural damage

• *Pipes*

- ☐ Check air and vacuum valves
- ☐ Check for leaks, breaks, pressure loss in lines, cross-connections between water and sewage, overflow into streets, watercourses
- ☐ Check mechanical couplings

- ***Level 1—Normal Trouble***

  Personnel of utility can handle problems easily

  Examples: break in individual main or individual pumping station off line

- ***Level 2—Alert (Minor Emergency)***

  Personnel of utility can handle problem

  May require personnel to be put on alert, be rerouted to other than their normal working area, or work additional shifts

  Examples: break in several mains, more than one pumping station off line, or water pollution alert

- ***Level 3—Major Emergency***

  Problems somewhat beyond capability of utility and may require declaration of emergency to authorize shortcut procedures

  Requires working most employees additional shifts and receiving additional assistance, either mutual aid or contracts

  Examples: serious threats to dam, reservoir, tank, or treatment pond; power loss over major pumping systems; unsafe water supply in any pressure zone; break in large trunk line; large flows of untreated sewage at several locations; or loss of water supply to region within service area

- ***Level 4—Disaster***

  Problems clearly and immediately beyond capability of utility

  Recovery time will exceed one week, cost will be great, large amounts of mutual aid or contracts will be required, extended shifts will be needed for at least one week, and request for declaration of emergency will be required.

  Examples: earthquake of magnitude 6.0 or greater originating within or affecting the service area, earthquake of magnitude 7.5 or greater within 50 miles of service area, loss of at least 50 percent of water supply import capacity, untreated sewage flowing in many street locations, loss of 25 percent of ability to biologically protect water supplies, or outbreak of waterborne diseases.

*MOST VULNERABLE ELEMENTS IN MY SYSTEM**

* In your earthquake preparedness plan, inventory your system and identify the elements that you see would be most susceptible to damage in an earthquake and list them here. Examples. Underground excavated-type reservoirs, with column support roofing, could suffer extensive roof collapse; distribution storage, especially tanks without flexible couplings, could have significant damage, primarily at connections; and mains constructed of cast iron or asbestos cement pipe are susceptible to breakage if near the epicenter of an earthquake or are located in areas subject to soil liquefaction.

- Announce to employees activation of plan for emergency, using teletype, radio, telephone, or oral message, and designate staging area or areas
- Maintain, to extent practical, records of messages and directives given and ask managers and supervisors to do the same
- Ensure that radio communication is limited to vital messages only. Direct clearance of radio channels by stating call number and indicating an emergency message is to be sent. Until channel is released to lower level communication, radio-equipped transmitting units are to remain off the air. They may request clearance to report life-threatening situations.
- Direct liaison personnel to report to proper emergency operational center. Maintain communication with it by making status reports at least once per day during emergency.

EMERGENCY MEDICAL FACILITIES*

* In your earthquake preparedness plan, make contact with the hospitals and ambulance service in your area and, with them, develop the information for this page.

Ambulance

Contact:

Hospitals and Clinics

1.

Contact:

2.

Contact:

3.

Contact:

EMERGENCY COMMUNICATION*

*An essential element in your earthquake preparedness plan should be a reliable communication system. On this page, list information on what it is, how to use it, what its capabilities are, and, if possible, what back-up system is available. You may not be available in an emergency and someone else may have to take over. Note that the State Emergency Response Plan assumes that telephones will be out of service following a major earthquake.

For communication outside your agency, an emergency communications network, employing radio, is being proposed by The Metropolitan Water District of Southern California with its member agencies. It is planned to use the five areas shown on pages 9 and 10 of Sec. 2. In addition, agencies in the San Gabriel Valley are developing a network within their area. This includes San Gabriel Valley Municipal Water District and its member agencies.

Within my agency

Outside my agency

EMERGENCY TRANSPORTATION*

* Your earthquake preparedness plan should make provision for getting the work crew into all parts of the system. List here information on where essential vehicles are stored and alternative routes that can be taken. (The same information should be put on page 1 of section 4.)

*EMERGENCY ASSIGNMENTS FOR MY AGENCY**

*Your earthquake preparedness plan should include specific assignments for your employees following a disaster. They should know their assignments ahead of time and these can be recorded here. This page will need updating as your employees change. Indicate those employees to whom Catastrophic Earthquake Identification Cards (page 2 of Sec. 9) have been issued this year. (The same information should be put on page 2 of Sec. 4.)

For the Catastrophic Earthquake Identification Card, note especially the conditions of possession and use that appear on the back of it. The issuing agency—in this case, your water company or district—is responsible for having the cards printed and for designating an issuing authority, who is to ensure that all information is correct and the appropriate signatures appear on the card. It is suggested that the card be laminated after all information has been checked for accuracy and the year for which it is issued has been stamped on it.

*EMERGENCY PERSONNEL ROSTER FOR MY AGENCY (with home addresses and phones)**

* This page will need updating as personnel change. In some cases, retired employees who are knowledgeable about the system maintained by your agency may be available to assist in an emergency. List them also. (The same information should be put on page 3 of Sec. 4.)

FIRE FIGHTING AND LAW ENFORCEMENT STATIONS IN MY AREA*

* As soon as possible, make contact with your local fire fighting and law enforcement agencies and record here the information they provide on how to reach them in an emergency. This should be done as part of your earthquake preparedness plan.

Fire fighting

Name:

Where:

How to contact:

Name:

Where:

How to contact:

Law enforcement

Name:

Where:

How to contact:

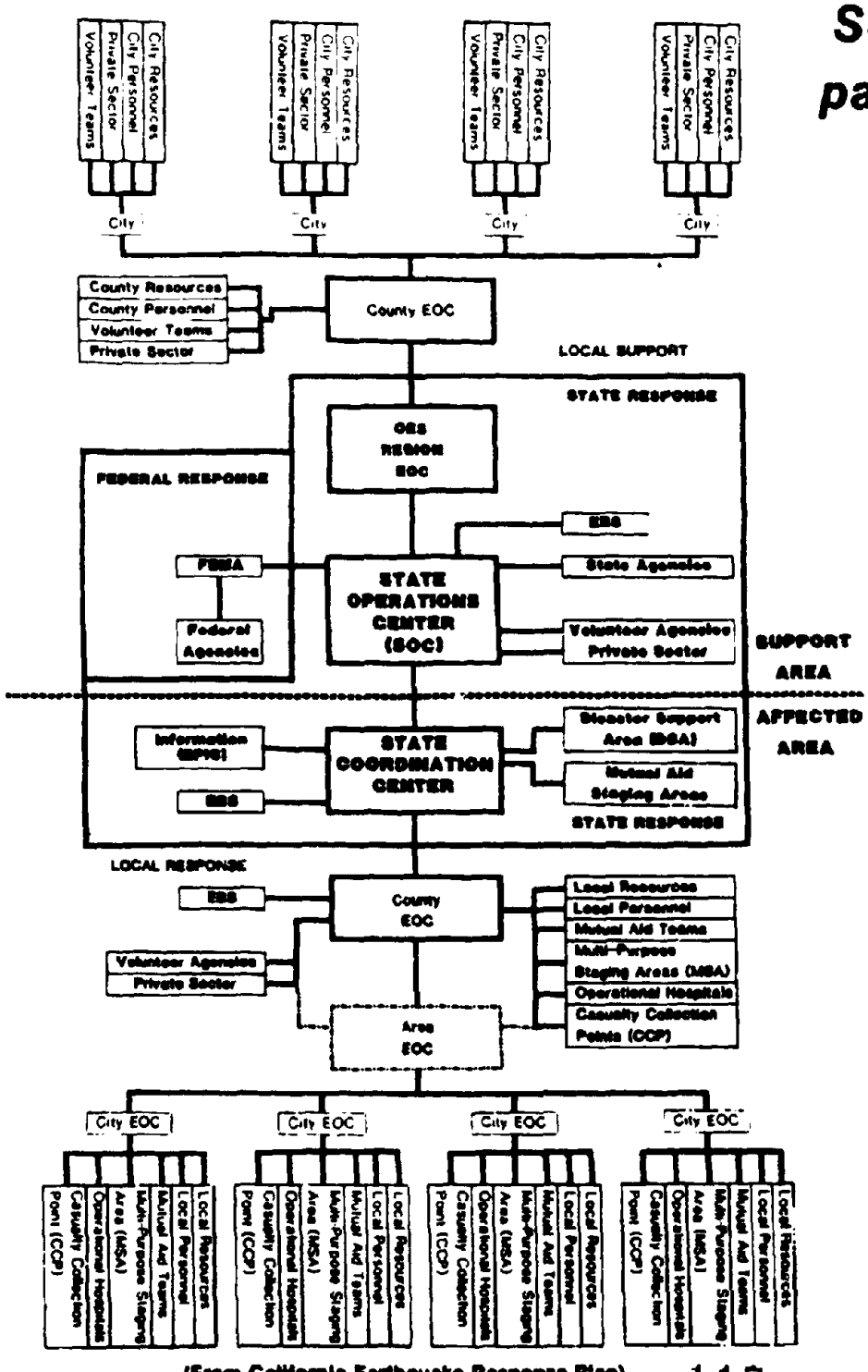
Name:

Where:

How to contact:

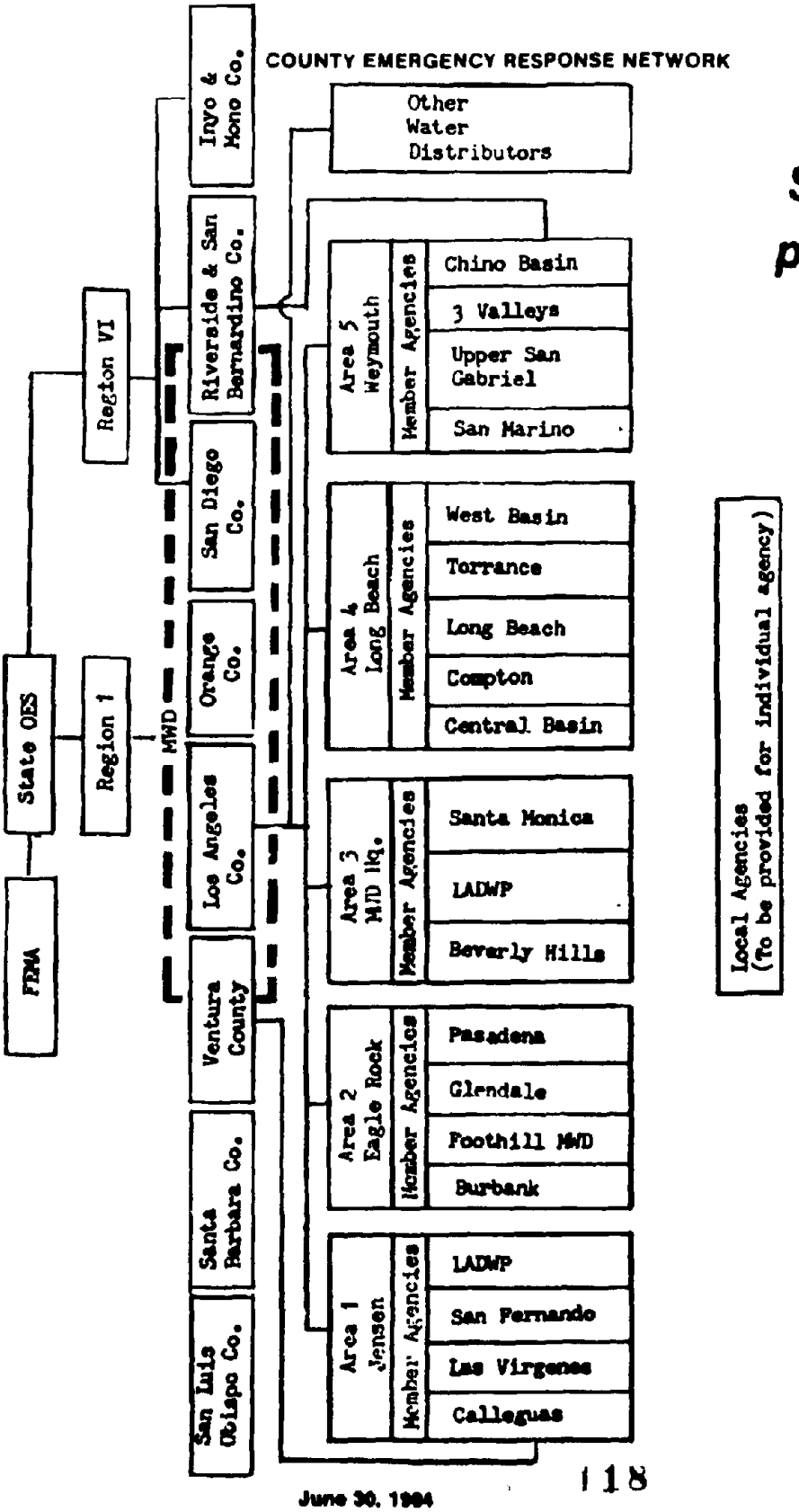
STATE EMERGENCY RESPONSE FRAMEWORK

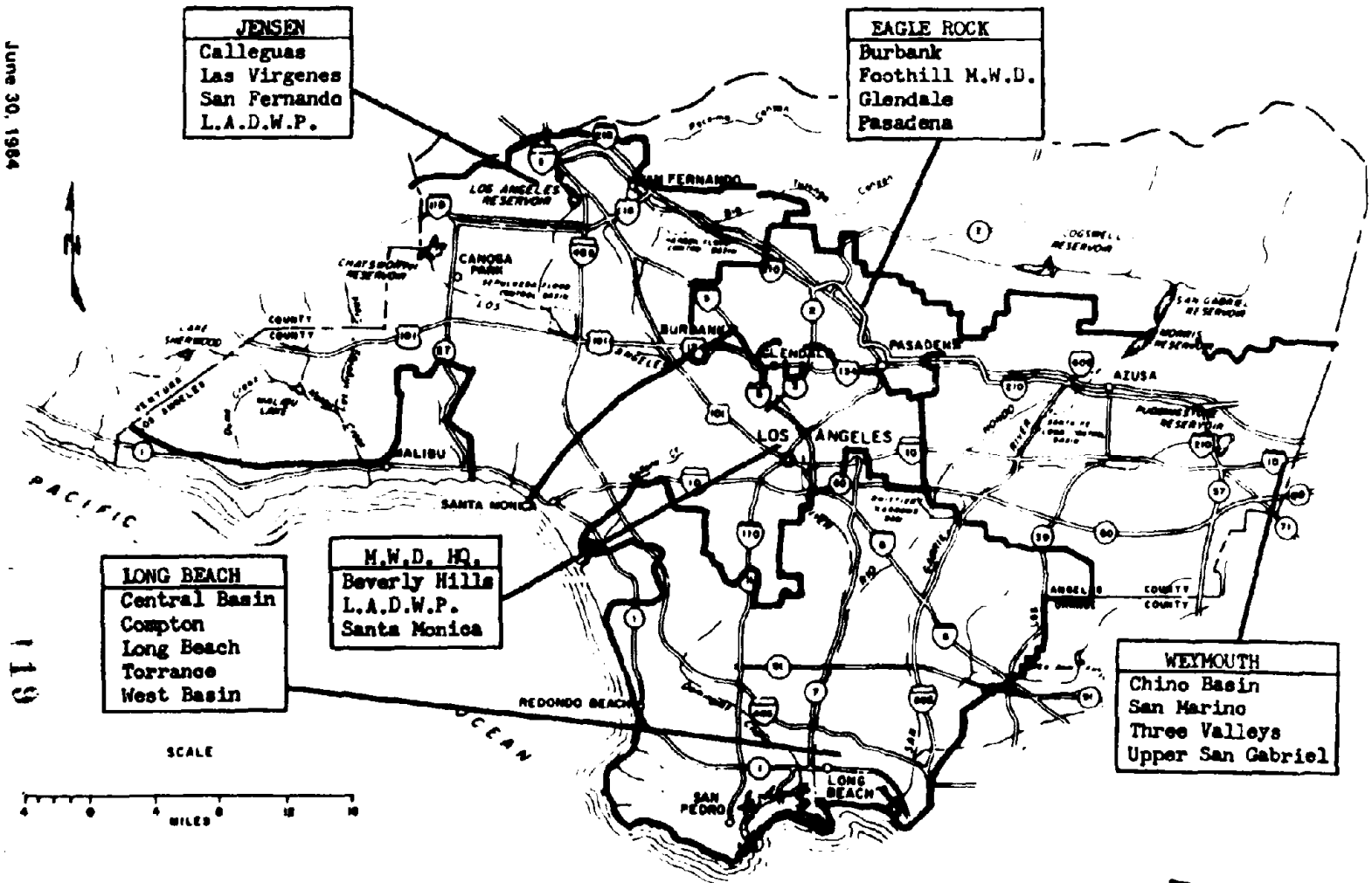
(Note: EOC = Emergency Operations Center)



(From California Earthquake Response Plan)

June 30 1984


COUNTY EMERGENCY RESPONSE NETWORK
Inyo & Mono Co.
Other Water Distributors
Riverside & San Bernardino Co.
Region VI
Area 5 Weymouth
Member Agencies
Chino Basin
3 Valleys
Upper San Gabriel
San Marino
San Diego Co.
Area 4 Long Beach
Member Agencies
West Basin
Torrance
Long Beach
Compton
Central Basin
Orange Co.
State OES
Region 1
MWD
Area 3 MWD Hq.
Member Agencies
Santa Monica
LADWP
Beverly Hills
Los Angeles Co.
FEMA
Ventura County
Area 2 Eagle Rock
Member Agencies
Pasadena
Glendale
Foothill MWD
Burbank
Santa Barbara Co.
Area 1 Jensen
Member Agencies
LADWP
San Fernando
Las Virgenes
Calleguas
San Luis Obispo Co.
Local Agencies
(To be provided for individual agency)



MEMBER AGENCIES OF THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA-COASTAL LOS ANGELES COUNTY AREA

GENERAL INFORMATION

- Act to protect life

- Preserve water in storage
  - —Where water levels are high enough to threaten liquefaction, pump and store water in surface facilities
  - —Consider what can be saved, what can be sacrificed
  - —Lower water level in dams to reduce possibility of structural failure, if damage is apparent
  - —Assess damage to sewer system because it could contaminate water supply

- Isolate areas that will take longest to restore service and arrange for emergency water distribution
  - —Establish collection points and ration water
  - —Spot plastic bottles at locations to serve immediate needs
  - —Get trucks with water tanks
  - —Start reserve pumping facilities

- Identify areas that can be served with minimum of repair and list repairs

- Set priorities on repair work
  - —Plan to restore service area by area
  - —Prepare and keep current a plan to restore service
  - —Get input from emergency operation center on essential uses
  - —Take into account the condition of feeder lines
  - —Keep in mind the need for fire protection
  - —Determine if imported water is available
  - —When work exceeds capabilities of your agency, notify emergency operation center

POSSIBLE EMERGENCY MATERIALS AND EQUIPMENT*

* Your earthquake preparedness plan should include a listing of supplies and equipment that might be needed following an earthquake and a determination of that available within your own agency, that which might be available from neighboring agencies, and that which would have to be obtained from commercial suppliers. The result of that survey should be recorded here. It would need periodic updating.

In my agency

In neighboring agencies

For commercial suppliers, see page 1 in Sec. 5

EMERGENCY TRANSPORTATION*

* Your earthquake preparedness plan should make provision for getting the work crew into all parts of the system. List here information on where essential vehicles are stored and alternative routes that can be taken. (The same information should be put on page 4 of Sec 2.)

EMERGENCY ASSIGNMENTS FOR MY AGENCY*

* Your earthquake preparedness plan should include specific assignments for your employees following a disaster. They should know their assignments ahead of time and these can be recorded here. This page will need updating as your employees change. Indicate those employees to whom Catastrophic Earthquake Identification Cards (page 2 of Sec. 9) have been issued this year. (The same information should be put on page 5 of Sec. 2.)

For the Catastrophic Earthquake Identification Card, note especially the conditions of possession and use that appear on the back of it. The issuing agency—in this case, your water company or district—is responsible for having the cards printed and for designating an issuing authority, who is to ensure that all information is correct and the appropriate signatures appear on the card. It is suggested that the card be laminated after all information has been checked for accuracy and the year for which it is issued has been stamped on it.

EMERGENCY PERSONNEL ROSTER FOR MY AGENCY
(with home addresses and phones)*

* This page will need updating as personnel change. In some cases, retired employees who are knowledgeable about the system maintained by your agency will be available to assist in an emergency. List them also. (The same information should be put on page 6 of Sec. 2.)

COMMERCIAL SUPPLIERS OF EQUIPMENT AND MATERIALS*

* These pages will contain the listing and means of contacting commercial suppliers of equipment and supplies. Contacts should be made with these people in the planning stage. Organizations, such as the Associated General Contractors of California which has developed Plan Bulldozer, may have lists of their members who can help in an emergency with supplies or equipment.

Plumbing contractors

Name:

Where:

How to contact:

Name:

Where:

How to contact:

Replacement supplies—Purchase

Name:

Where:

How to contact:

Name:

Where:

How to contact:

Replacement supplies—Rental

Name:

Where:

How to contact:

Name:

Where:

How to contact:

Repair supplies

Name:

Where:

How to contact:

Name:

Where:

How to contact:

NEARBY AGENCIES AND AGREEMENTS*

* Your earthquake preparedness plan should include agreements with nearby agencies to provide mutual assistance following an earthquake or other disaster.

Name of nearby agency:

Provisions:

Contact:

Name of nearby agency:

Provisions:

Contact:

Name of nearby agency:

Provisions:

Contact:

Name of nearby agency:

Provisions:

Contact:

Name of nearby agency:

Provisions:

Contact:

LINES OF AUTHORITY FOR MANAGEMENT DURING AN EMERGENCY*

* In the planning process, each county should establish its own lines of authority for operation during an emergency. These should be recorded here

California Office of Emergency Services

MUTUAL AID REGIONS

June 30, 1984

AUTHORIZATION GIVEN TO ME TO REQUEST AND PROVIDE ASSISTANCE*

* Before a disaster strikes, the Board of Directors or City Council should take action to give you authority to act in an emergency. The language of this authorization should be recorded here so that you can have it for reference when you need it. Examples of specific and general mutual aid agreements are in the Appendix (Sec. 9).

Public agencies (cities and counties) should note that they may receive notice from private water companies within their jurisdiction that they are unable to provide emergency service.

- Coordinate with public information officer at emergency coordinating center
- Centralize news releases and statements to avoid confusing the public
- When responding to inquiries, make only factual responses. Avoid speculation
- Inform public of probable contamination of water supply if breaks found in lines
- Notify public of availability of water and precautions to be taken
- Request residents to restrict flow of sewage into system in areas with breaks
- Where breaks found in sewage system, warn public of dangers of sewage in streets and channels
- Arrange for escorting media representatives who have proper identification through work areas or facilities, if conditions are safe and they make request

RADIO, TV, AND NEWSPAPERS IN MY AREA*

* As part of your earthquake preparedness plan, list those newspapers and radio and TV stations that serve your area and make contact with them so that if disaster strikes, you and they would know whom to contact

Radio

Name:

Where:

How to contact:

Name:

Where:

How to contact:

TV

Name:

Where:

How to contact:

Name:

Where:

How to contact:

Newspapers

Name:

Where:

How to contact:

Name:

Where:

How to contact:

CHECKLIST OF THINGS TO BE DONE DURING RECOVERY PERIOD

Sec. 8
page 1

1. Designate local disaster recovery coordinator to document emergency work performed and to submit appropriate documents for reimbursement under existing legislation (Sec. 8, page 2)

2. Make detailed damage inspection of system safety

3. Notify key personnel (including regulatory and health agencies)

4. Complete emergency repairs and schedule permanent repairs

5. Untag repaired facilities and equipment

6. Replace used materials and supplies

7. Complete permanent repairs and replacements

After the Governor has proclaimed a State of Emergency, the President may declare an Emergency or Major Disaster. These actions make money available, under State and Federal legislation, for eligible restoration and reimbursement for protective measures.

To ensure receiving maximum reimbursement, the applicant agency must maintain detailed records of all measures taken to protect against disasters and all restoration work done, including location, number of hours worked, number of persons employed, and cost of equipment and supplies used.

Details of documentation required are contained in:

- "Disaster Assistance Manual" issued by State of California Office of Emergency Services

- "Federal Disaster Assistance Program: Disaster Response and Recovery" issued by Federal Emergency Management Agency:

  DR&R-1 "Handbook for Applicants Pursuant to Public Law 93-288", March 1981

  DR&R-2 "Eligibility Handbook Pursuant to Public Law 93-288", July 1981

  DR&R-7 "Documenting Disaster Damage Pursuant to Public Law 93-288", August 1981

FOR THE PRIVATELY OWNED WATER COMPANY, records should be kept of damage suffered and actual losses. Application for assistance, which is covered under the Individual Assistance Program, should be made with the Small Business Administration at a Disaster Assistance Center.

RELATED PUBLICATIONS

California Office of Emergency Services. "California Earthquake Response Plan: Southern San Andreas Fault". Draft. July 1983.

___. "Disaster Assistance Manual".

Davis, James F., et al. "Earthquake Planning Scenario for a Magnitude 8.3 Earthquake on the San Andreas Fault in Southern California". Special Publication 60. California Department of Conservation, Division of Mines and Geology, P.O. Box 2980, Sacramento, CA 95812. 1982. $6.

Federal Emergency Management Agency. "Federal Disaster Assistance Program: Handbook for Applicants Pursuant to Public Law 93-288". DR&R-1. March 1981.

___. "Federal Disaster Assistance Program: Eligibility Handbook Pursuant to Public Law 93-288". DR&R-2. July 1981.

___. "Federal Disaster Assistance Program: Documenting Disaster Damage Pursuant to Public Law 93-288". DR&R-7. August 1981.

Reitherman, Robert. "Reducing the Risk of Nonstructural Earthquake Damage: A Practical Guide". Developed under contract to the Southern California Earthquake Preparedness Project, 6850 Van Nuys Boulevard, Suite 110, Van Nuys, CA 91405-4660. $6.

Note: For additional information on wells in the area covered, see two bulletins by California Department of Water Resources

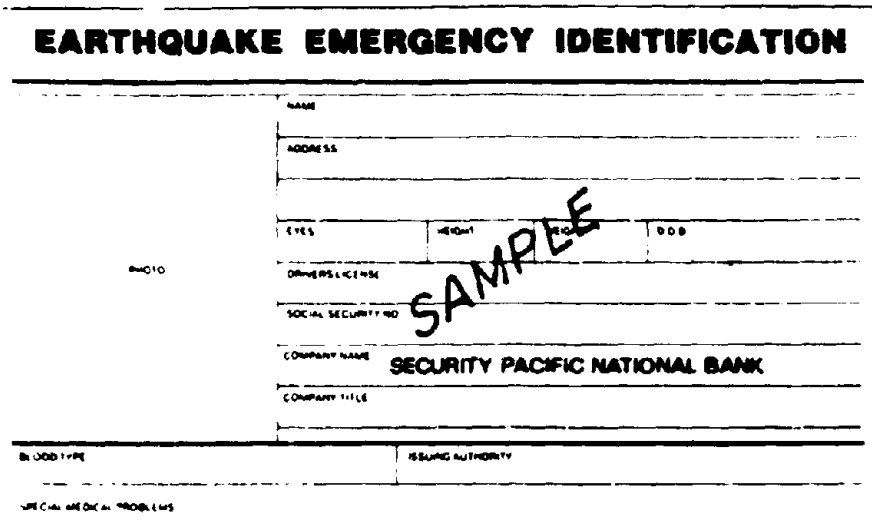
- Bulletin 107, "Recommended Well Construction and Sealing Standards for Protection of Ground Water Quality in West Coast Basin, Los Angeles County," August 1962, and
- Bulletin 74-4, "Water Well Standards: Central, Hollywood, Santa Monica Basins, Los Angeles County" (preliminary edition). October 1965.

Both publications are out of print, but copies may be seen in a number of libraries throughout the State.

CATASTROPHIC EARTHQUAKE EMERGENCY IDENTIFICATION CARD

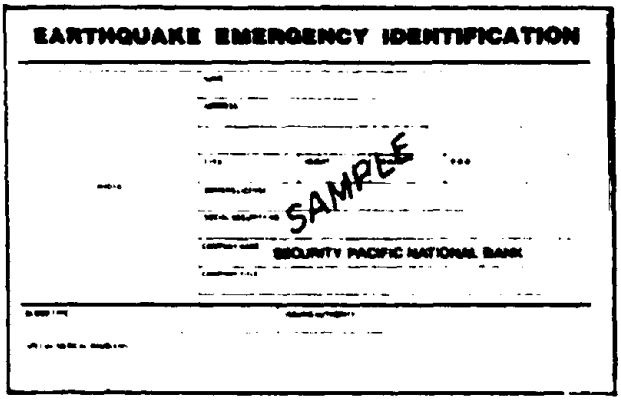
Working size (front only)

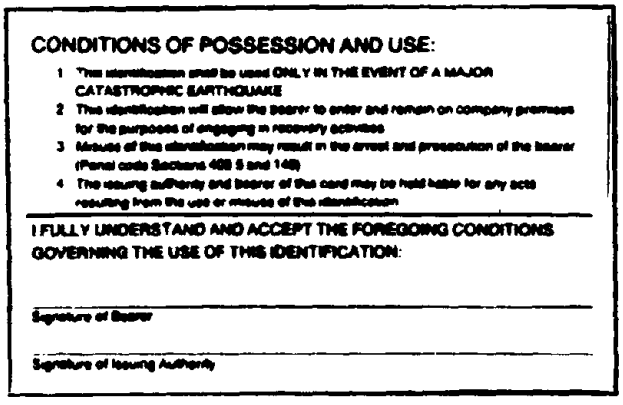
Sec. 9
page 2



Note: This is a sample card prepared by Security Pacific National Bank. The proper company or agency name should be inserted in the company name line. The card should be reissued each year so as to maintain control over who is authorized to carry it. Therefore, the year should be stamped where "sample" appears.

Final size (reduced to fit into wallet)





June 30, 1984

PLAN BULLDOZER

(The information given on this and the following pages regarding Plan Bulldozer has been made available by the Associated General Contractors of California.)

Plan Bulldozer is a program for disaster assistance and control developed by the Associated General Contractors of California and the State Office of Emergency Services. It is a plan for rapid mobilization of construction manpower and equipment in the event of a disaster.

Plan Bulldozer is made available to authorized public officials charged with the administration of important government entities.

Generally the demands of a disaster exceed the capabilities of the publicly owned facilities. In these situations, it is the desire and intention of the construction industry to support the effort of public agencies that require its skills and equipment.

A telephone call from the public official to the proper Plan Bulldozer area coordinator will set this program in motion. The area coordinator, after receiving the telephone call, will verify the authenticity of the caller. The current location of equipment and personnel will be made available to the public official by the area coordinator.

This program is designed only for the initial emergency, the danger to life and property. Thereafter, any additional work performed by the contractor will be performed under individually negotiated contracts.

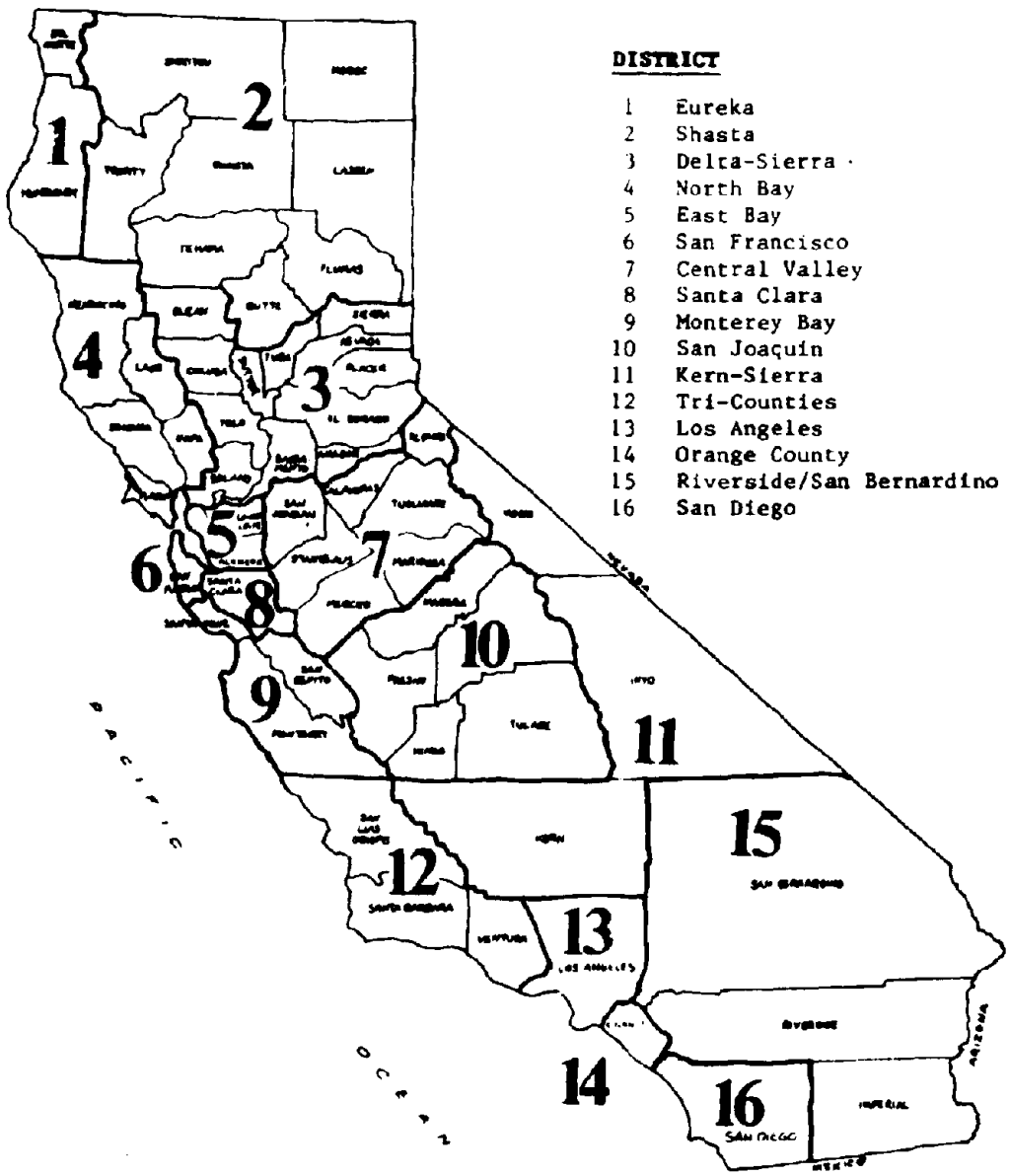
During the disaster, the contractor is working under the full control and direction of the agency responsible. Should any equipment be lost or damaged during this phase, the agency shall be responsible for all costs to the contractor.

Available Equipment Summary

Plan Bulldozer represents 16 geographical areas covering the entire State of California. Plan Bulldozer has access to the majority of privately owned construction equipment from major equipment owners. Area Coordinators and District Managers have statewide equipment and personnel locaters in their respective offices and homes covering all sources throughout the State. Listed below is a sample of available equipment.

Air Compressors
Backhoes
Barges
Cranes
Electric Light Plants
Fuel Trucks
Graders
Loaders, Front End
Mobile Radios
Motorboats
Pontoons
Pumps
Rollers, Tandem Steel
Rollers, Sheep's Foot
Rollers, Rubber Compaction
Scrapers
Shovels
Tractors
Trailer Vans
Transports
Trenchers
Trucks, Dump
Water Trucks
Welding Machines

Plan Bulldozer District Map

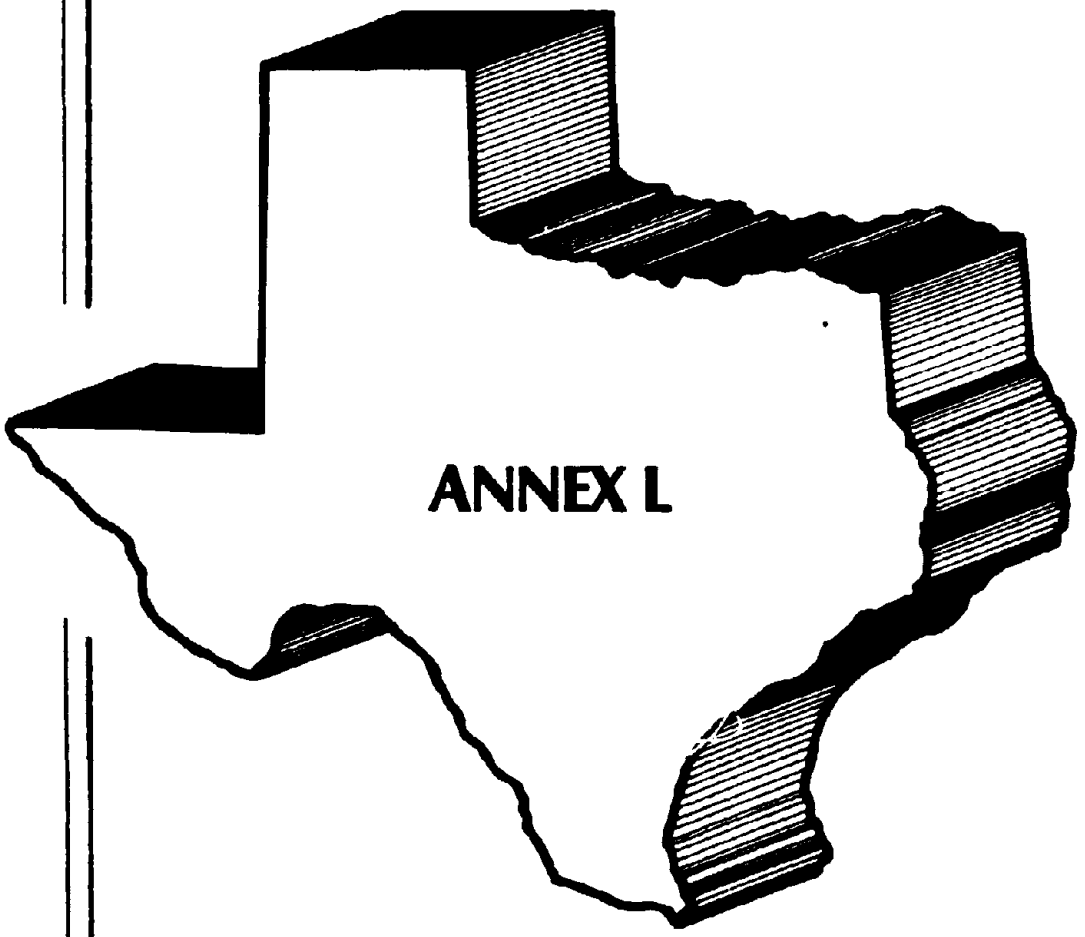


Plan Bulldozer Organization

Disaster Staff for California Districts

COORDINATOR	ALTERNATE	DISTRICT MANAGER
Northern California Headquarters 301 Capitol Mall Sacramento, CA 95814 (916) 444-6430		
DISTRICT 1 - EUREKA		
Art K. Tonkin Tonkin Construction Co. P.O. Box 448 Willow Creek, CA 95573 (916) 629-2365 (916) 629-2721 Home	David Morris Beacom Construction Co. P.O. Box 457 Fortuna, CA 95540 (707) 725-3323 (707) 725-5794 Home	Jerry Everhard (916) 244-4080 (916) 873-1778 Home
DISTRICT 2 - SHASTA		
Dennis Robinson Robinson Construction Co. P.O. Box 1620 Oroville, CA 95965 (916) 534-7616 (916) 533-0742 Home	Dallas Lewis Butte Creek Rock Co. P.O. Box 720 Chico, CA 95926 (916) 891-6555 (916) 891-0833 Home	Jerry Everhard (916) 244-4080 (916) 873-1778 Home
DISTRICT 3 - DELTA-SIERRA		
Ray N. Bertelsen Ray N. Bertelsen Co., Inc. P.O. Box 1368 Marysville, CA 95901 (916) 743-4425 (916) 742-4837 Home	Rory Ramirez Pacific Western Enterprises 800A Onstott Road Yuba City, CA 95991 (916) 673-4580	Bud Rodgers (916) 444-6430 (916) 723-6311 Home
DISTRICT 4 - NORTH BAY		
Dick Fedrick C. R. Fedrick, Inc. 320 Deer Island Lane Novato, CA 94948 (415) 897-4155 (415) 897-6522 Home	None	Lon Hanke (415) 776-2054 (415) 388-7330 Home
DISTRICT 5 - EAST BAY		
Joe Hester McGuire & Hester 796 - 66th Avenue Oakland, CA 94621 (415) 632-7676 (415) 569-4488 Home	Joe Campbell Joseph L. Campbell, Inc. P.O. Box 5553 Walnut Creek, CA 94596 (415) 676-5553 (415) 939-6567 Home Don Redgwick Redgwick Construction Co. 25599 Huntwood Avenue Hayward, CA 94544 (415) 782-0400	Peter Muller (415) 568-6174 (415) 254-0512 Home

THE STATE OF TEXAS EMERGENCY MANAGEMENT PLAN



ANNEX L

TEXAS DEPARTMENT OF HEALTH

11/83

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Hurricane Information

Preparedness & Procedures

The 1985 hurricane season begins June 1 and ends November 30. During the last 100 years, more than 150 tropical cyclones of varying intensity have struck Florida. More than half of these storms have had sustained winds of hurricane velocity – 75 miles per hour. Even at minimum force, these tropical storms are capable of inflicting major property damage to coastal and inland regions of the state.

Because they are guardians of public health, water and wastewater plant operators need to be prepared for emergencies associated with this seasonal hazard. It is imperative that the citizens be protected from the spread of waterborne disease both routinely and during emergency conditions.

The following precautionary measures are presented here for those persons responsible for safeguarding public drinking water and wastewater facilities.

1. *CHECK* throughly all auxiliary and standby equipment. It is essential that this equipment function during emergency conditions.

2. *STOCK* adequate fuel supplies to operate auxiliary equipment for a 10 to 14-day period. An acceptable alternative is to make short term contracts with suppliers to hold fuel in reserve during the hurricane season.

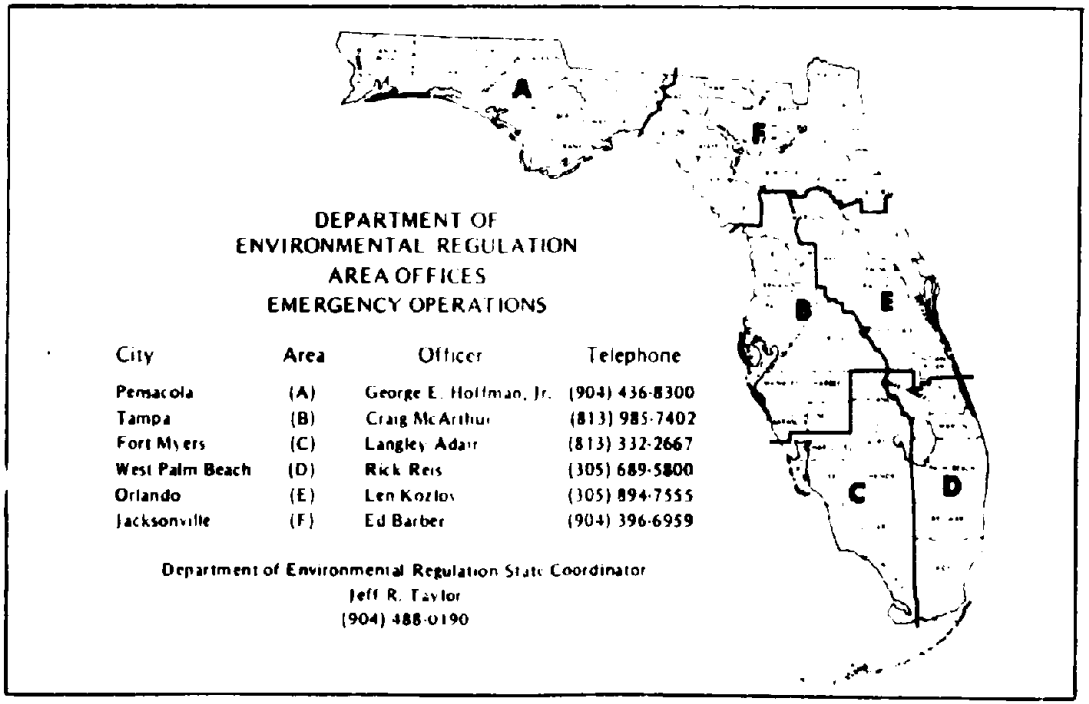
3. *STOCK* parts which are critical to the operation of the plant or the auxiliary equipment.

4. *MAINTAIN* in good repair all mechanical equipment at water and wastewater plants, including pumping stations.

5. *STOCK* sufficient supplies of chlorine or hypochlorite to carry the system through a 14-day period.

6. *MAKE SURE* there is a method to feed chlorine other than electrically. Power outages are common during hurricanes and many chlorinators depend on electrical pumps and solenoids. A manual bypass may be required.

7. *KEEP* all water storage reservoirs and elevated tanks as near full as possible after receiving hurricane warnings.



DEPARTMENT OF
ENVIRONMENTAL REGULATION
AREA OFFICES
EMERGENCY OPERATIONS

City	Area	Officer	Telephone
Pensacola	(A)	George E. Hoffman, Jr.	(904) 436-8300
Tampa	(B)	Craig McArthur	(813) 985-7402
Fort Myers	(C)	Langley Adair	(813) 332-2667
West Palm Beach	(D)	Rick Reis	(305) 689-5800
Orlando	(E)	Len Kozlov	(305) 894-7555
Jacksonville	(F)	Ed Barber	(904) 396-6959

Department of Environmental Regulation State Coordinator
Jeff R. Taylor
(904) 488-0190

8. *DRAIN* sewage holding ponds as completely as practical after receiving hurricane warnings. Anticipate flooding from heavy rains and runoff.

9. *BE AVAILABLE* during emergency conditions. It is especially important during emergencies to be fully staffed with able personnel.

10. *KNOW* emergency procedures and emergency interconnections with nearby public water systems. Frequent communications with adjacent utilities in case of a mutual need is critical to the welfare of your community and neighboring ones.

11. *NOTIFY* your DER emergency operations officer (after receipt of hurricane warnings) when emergency procedures have been completed. The DER officer should be made aware of how and where to contact persons in charge during emergency conditions.

12. *SURVEY* all damage and make sure water and waste effluents are properly treated once hurricane warnings have been lowered or after normal services are restored.

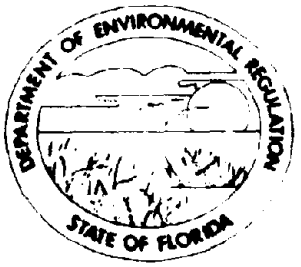
A few days after each hurricane or other natural disaster, DER field engineers for water supply and wastewater treatment submit to the Department's headquarters in Tallahassee summaries of damages and environmental activities within their respective jurisdictions. Following the survey of your facility, report your findings to the DER emergency operations officer in your area. Let him know if assistance is needed from DER.

State of Florida
DEPARTMENT OF
ENVIRONMENTAL REGULATION

Bob Graham
Governor

Victoria J. Tschinkel
Secretary

2600 Blair Stone Road
Tallahassee, Florida 32301

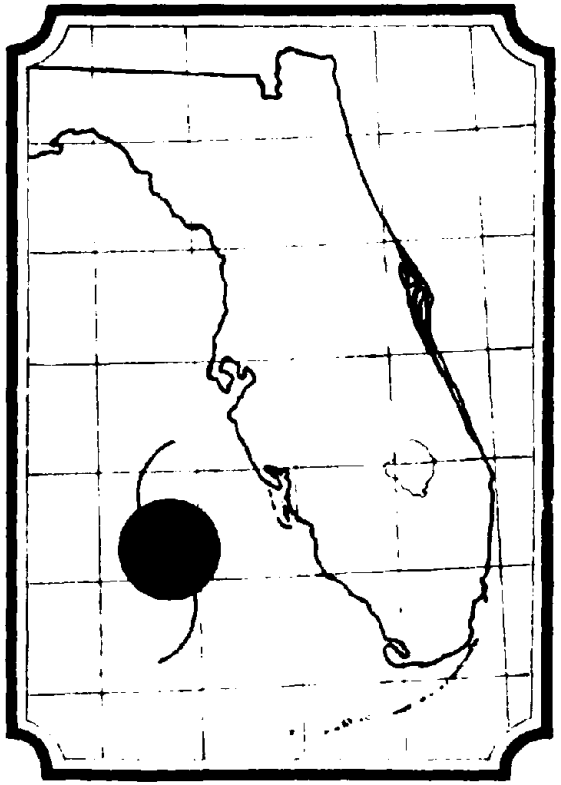


June 1985

This public document was promulgated at an annual cost of $115 or $.016 per copy to disseminate information about hurricane preparedness.

Hurricane Preparedness & Procedures:

WATER & WASTEWATER FACILITIES

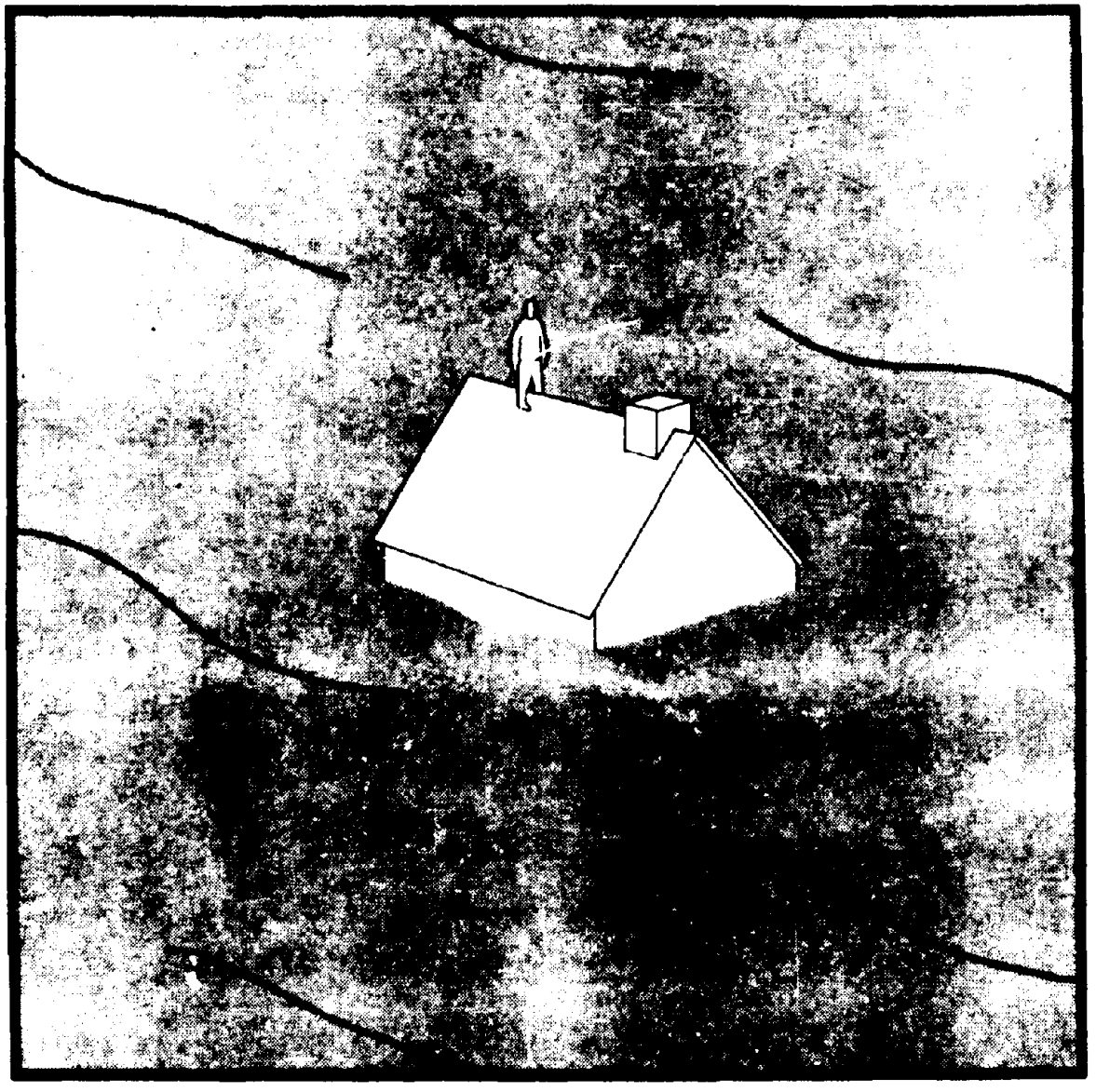


New York State
Department of Health
Division of
Environmental Protection
Bureau of Public Water
Supply Protection

Emergency Planning & Response

A Water Supply Guide for the Supplier of Water

January 1984



EMERGENCY PLANNING AND RESPONSE

A WATER SUPPLY GUIDE

FOR THE SUPPLIER OF WATER

PREPARED BY:

NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL PROTECTION
BUREAU OF PUBLIC WATER SUPPLY PROTECTION

JANUARY 1984

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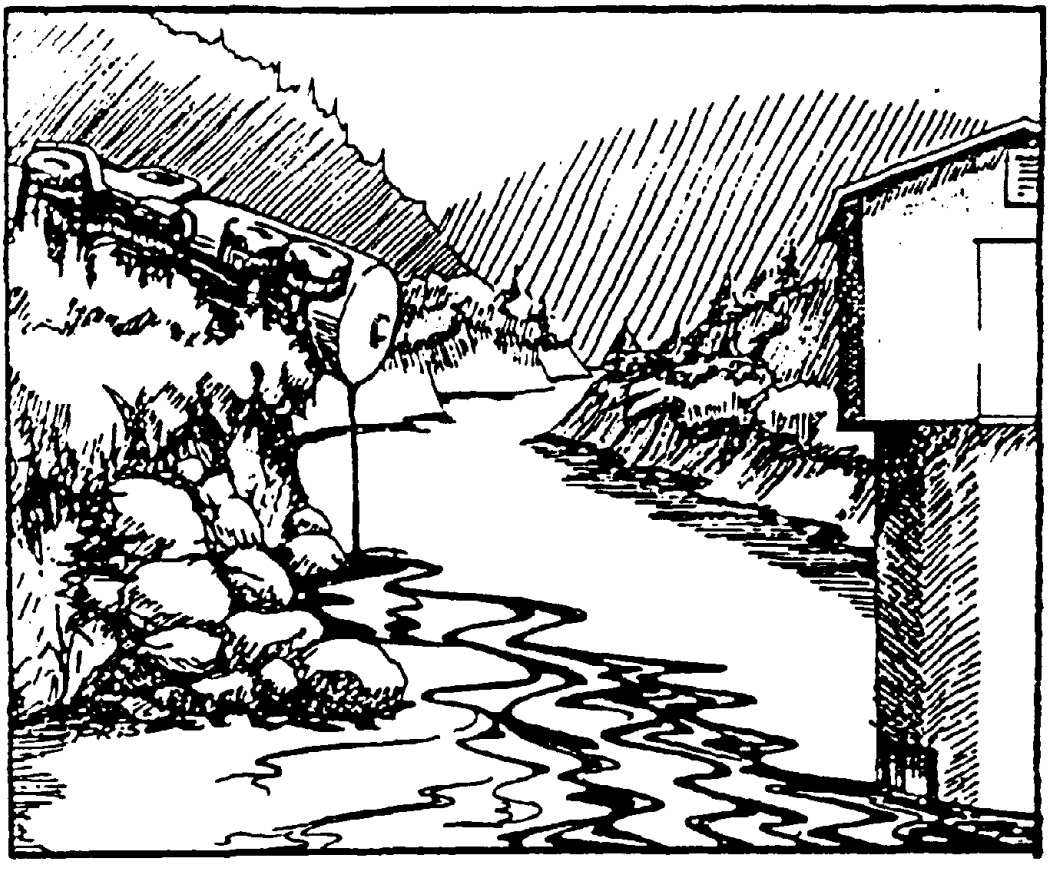
STUDENT WORKBOOK



PREPARED BY:

Oregon Resource Center for Environmental Training

6500 SW Pacific Blvd., Albany, Oregon, 97321, (503) 928-3620

SKETCH OF SYSTEM

TOPOG SKETCH OF WATERSHED

INCLUDE ALL MAJOR HIGHWAYS - RAILROADS

CRITICAL SYSTEM FACILITIES

SUPPLY

Source Name_____

Water Shed_____ Ownership_____

Water Rights permit #_____ cfs_____

Low Flow_____MGD Max Day_____MGD

Avg daily use_____MGD

Well Depth_____ft Size_____

Waterrights permit #_____ cfs_____

Static Level_____ Specific Capacity_____

Pump Capacity_____

General Description:

RAW WATER STORAGE

Capacity_____MGD

General Description:

INTAKE

Pumps	Yes	No

TRANSMISSION

Pipe Size_____ Date_____

Length_____

Pumps Capacity_____

TREATMENT FACILITIES

Capacity_____ Avg Day_____

Max Day_____

Chemicals List - Include Chlorination

Name Amount

Pumps

General Description:

DISTRIBUTION STORAGE

Number and size, elevation, type of level control, covered, uncovered.

PUMP STATION

Location, elevation, pressure in and out, pump capacity, control system.

P R STATION

Pressure, type of valves, location, elevation.

PERSONNEL

Number, background (education), classifications, certification.

POWER

Source, dependency.

MATERIAL AND SUPPLIES

Type of inventory control, location.

COMMUNICATIONS

Type, location, number, power source.

OPERATING MODES/

REDUNDANCY

NORMAL - SOURCE COLLECTION

ALTERNATE MODES

NORMAL - TREATMENT

ALTERNATE MODE

DISTRIBUTION, STORAGE, PUMP STATIONS, AND PRS

ALTERNATE MODE

COMMUNICATIONS

ALTERNATE

COMPONENT VULNERABILITY

VULNERABILITY ANALYSIS SHEET

SOURCE - SPILLS

		YES	NO	CONTACT
*1.	Major highways above intake			
2.	Map showing major highways			
3.	Topog map showing drainage			
4.	List of all carriers			
5.	List of major hazardous materials			
6.	Phone #'s for all major carriers			
*7.	County Rds above intake			
8.	Map showing location			
9.	Map showing topog			
10.	List of carriers			
11.	List of hazardous materials			
12.	Phone #'s for all carriers			
*13.	Pipe lines crossing watershed			
14.	Map showing location			
15.	Map showing topog			
16.	List of hazardous materials			
17.	Phone #'s for contact			
*18.	Railroads cross watershed			
19.	Map showing location			
20.	Map showing topog			
21.	List of railroad companies			

		YES	NO	CONTACT
22.	Location of clean-up crew	_____	_____	_____
23.	Hazardous materials list	_____	_____	_____
*24.	Water born carriers in watershed	_____	_____	_____
25.	Map showing route	_____	_____	_____
26.	List of hazardous materials	_____	_____	_____
27.	List of contact persons	_____	_____	_____
28.	List of clean up crews	_____	_____	_____
*29.	Fixed storage in watershed	_____	_____	_____
30.	Map showing location	_____	_____	_____
31.	Topog map	_____	_____	_____
32.	List of hazardous materials	_____	_____	_____
33.	Contact list	_____	_____	_____

CARRIER'S NAME AND PHONE NUMBER	NATURE OF MATERIAL	NAME OF MATERIAL	FORMULA	VOLUME	TOXIC LEVEL

CARRIER'S NAME AND PHONE NUMBER	NATURE OF MATERIAL	NAME OF MATERIAL	FORMULA	VOLUME	TOXIC LEVEL

VULNERABILITY ANALYSIS SHEET

Component _____

Failure description _____

1. Failure Detection

Is failure detectable by:

a) telemetery system? Yes____ No____

b) routine inspection? Yes____ No____

c) service complaint? Yes____ No____

d) Yes____ No____

2. System Impact

a) Is component a source? Yes____ No____

b) Is component redundant? Yes____ No____

c) If so, is alternate component a full replacement? Yes____ No____

d) Does failure cause:

1. Loss of service? Yes____ No____
2. Loss of fire protection? Yes____ No____
3. Low service pressure? Yes____ No____
4. Probable damage to system? Yes____ No____

Describe _____

_____

5. Probable damage to property? Yes____ No____

Describe _____

_____

e) Does failure cause loss of storage capacity? Yes____ No____

f) Does failure degrade water quality? Yes____ No____

g) Are other system components affected? Yes____ No____

List _____

_____

3. Component Vulnerability

a) Is routine inspection and maintenance required?

frequency inspection _____

frequency maintenance_____

b) External impact susceptibility

1. Electric power

Failure history_____

2. Auxiliary power available

type of fuel_____

3. Communication line

operating made with line loss_____

_____

4. Is component protected against vandalism?

Describe_____

_____

_____

5. Protected against vehicle accident?

6. Requires special protection from

a) earthquake

b) flood

c) high wind

d) cold weather

e) hot weather

f) fire

g) other_____

7. Does normal operation depend upon chemicals?

If yes, list:_____

_____

_____

_____

_____

If yes, list means of transportation:

_____

_____

_____

c) Internal impact susceptibility
   1. Debris in water
   2. Low pressure
   3. High pressure
   4. _____

d) Dependent on other system components
   List: _____
   _____

4. Component - Supervisory Control Dependency
   a) Is component dependent on telementery for
      1. Control
      2. Status reporting
      3. Data logging
      4. _____
   b) When control fails does component
      1. stop?
      2. remain in last command position?
      3. revert to local control?

5. Personnel
   a) Can component be operated by
      1. all personnel?
      2. a special few?
      3. one?
      4. supervisory staff?
   b) Can normal repair be undertaken by
      1. any of maintenance crew?
      2. a special crew?
      3. one person?
      4. outside construction?
         Name: _____
         _____
         _____

6. Remarks

VULNERABILITY ANALYSIS - APPENDIX

CHLORINATION

		YES	NO
1. System normally uses:	hypochlorite	_____	_____
	100 lb cylinders	_____	_____
	150 lb cylinders	_____	_____
	1 ton containers	_____	_____

2. System feeds: Liquid_____
   Gas_____

3. We normally have: _____gallons hypochlorine on hand
   _____100 lb cylinders on hand
   _____150 lb cylinders on hand
   _____1 ton cylinder on hand

4. The supplier is:_____
   _____
   _____

   24-hour phone _____

5. Daily consumption is _____lbs.

6. Is this water only? Yes_____
   No_____

7. If NO what other types of containers are used?
   Type_____
   Where_____
   Normal inventory_____
   Normal daily consumption_____lbs

8. The carrier that delivers the containers: _____
_____
_____

24-hour phone _____

9. The closest emergency repair kit: _____
_____
_____

24-hour phone _____

10. Describe method of transportation of containers from carrier to chlorination station.

11. Make sketch of route.

PROTECTIVE MEASURES

CONTAMINATION

Effect

Procedure

POWER OUTAGE

Effect

Procedure

COMMUNICATION DISRUPTION

Effect

Procedure

TRANSPORTATION FAILURE

Effect

Procedure

PLANT DAMAGE

Effect

Procedure

WEATHER CONDITION

Describe_____

Effect

_____

Procedure

Component _____

Effect

_____

Procedure

THE PLAN

COMPONENT_____

Effect

_____

_____

_____

_____

_____

_____

_____

Procedure Phone #'s

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

SPECIAL MATERIAL LIST

	Material	Location
[ ]		
[ ]		
[ ]		
[ ]		
[ ]		
[ ]		
[ ]		
[ ]		
[ ]		
[ ]		

SPECIAL TOOLS LIST

	Tools	Location
[ ]		
[ ]		
[ ]		
[ ]		
[ ]		
[ ]		
[ ]		
[ ]		
[ ]		

EVALUATION OF EMERGENCY PROCEDURE

[ ] Real situation

[ ] Training

Component _____

Effect _____

Was procedure complete? Yes_____ No_____

If no, explain:

Was materials list complete? Yes_____ No_____

If no, explain:

Was tool list complete? Yes_____ No_____

If no, explain:

Other problems:

EMERGENCY PHONE RESPONSE

In case of emergency at _____

_____

call the following persons in order until an answer is received.

Name	Phone #
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -
	- -

SPILL RESPONSE PROCEDURE

TRAINING

Task _____

Skills	Special Equipment

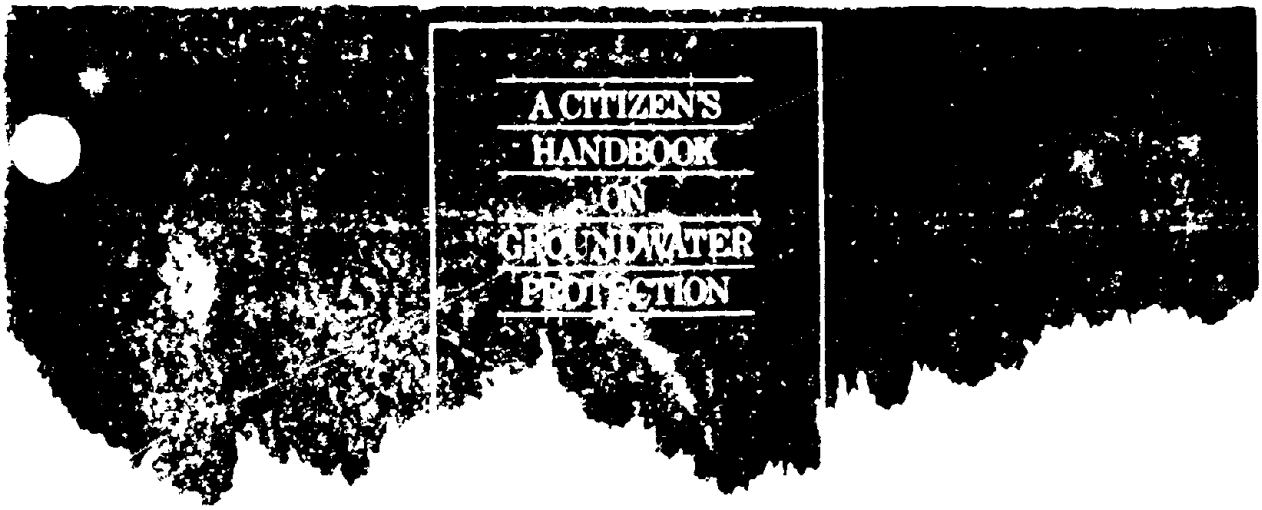
Special Skills	Personnel

Personnel	Special Skills

Skills Needed	Personnel to be Trained

STE 1PO S

FACTOR						
Power supply						
Structure (housing)						
Control system:						
manual						
automatic						
telemetry						
Booster station						
Receiving system:						
reservoir						
distribution sys.						
treatment plant						
Inlet(suction) piping						
Discharge piping (downstream)						
Special structures:						
valve vaults						
valve supports						
pipe supports						
Downstream system pressures						
Valves:						
gate valves						
check valves						
pressure-reducing valves						
air-relief valves						


A CITIZEN'S
HANDBOOK
ON
GROUNDWATER
PROTECTION

EMERGENCY PROCEDURES HANDBOOK

American Water Works System
1979

TABLE OF CONTENTS

PURPOSE: To provide a plan of action for minimizing damages and injury and insuring a supply of potable water in the event of a natural or man-made disaster.

A. GENERAL PLAN

1. Disaster Organization:

a. Designate a disaster staff and teams. Include all regular personnel and emergency personnel with alternates and replacements for key positions. Define a chain of command (Exhibit A), a Personnel Alert Plan (Exhibit B), liaison assignments and responsibilities. Perform an inventory of all employees' secondary skills that might be useful in emergencies.

b. Designate command control centers. The center is to be used for directing and coordinating emergency operations. Make it accessible and operable with a minimum of manpower. It should be able to provide all needs necessary to function properly, have dependable power, water, and communications equipment.

c. Designate assembly areas and reporting centers. Preselected assembly points for employees should be in relatively safe areas. Employees should be informed in advance of the location of these areas and instructed to report to them if routes are accessible. Transportation for employees should be provided from assembly points to designated work areas. Establish alternate assembly areas and reporting centers.

2. Plan Development:

Assemble and keep up-to-date records and information that could be useful in the event of various types of disasters, such as:

B. SPECIFIC DISASTERS

1. Fires:

a. In the event of fire.

(1) Sound a fire alarm.

(2) Evacuate personnel

(3) Employ on-site fire-fighting equipment.

(4) Notify local fire department.

b. These precautions will minimize fire hazards and/or reduce fire damage.

(1) Designate a person to be responsible for directing operations during a fire disaster and for developing and maintaining fire prevention procedures. Specific personnel also should be appointed as security guards, fire brigade squads, rescue squads, and to contact local news people.

(2) Post fire department telephone numbers and/or have a direct alarm connection between the water company and fire department.

(3) Post fire prevention rules and regulations throughout the plant.

(4) Develop and post an evacuation plan.

(5) Position fire extinguishers throughout the plant and check them regularly.

(6) Train personnel in the safe storage, handling, and use of flammable and combustible material.

(7) Keep plants and work areas ship-shape.

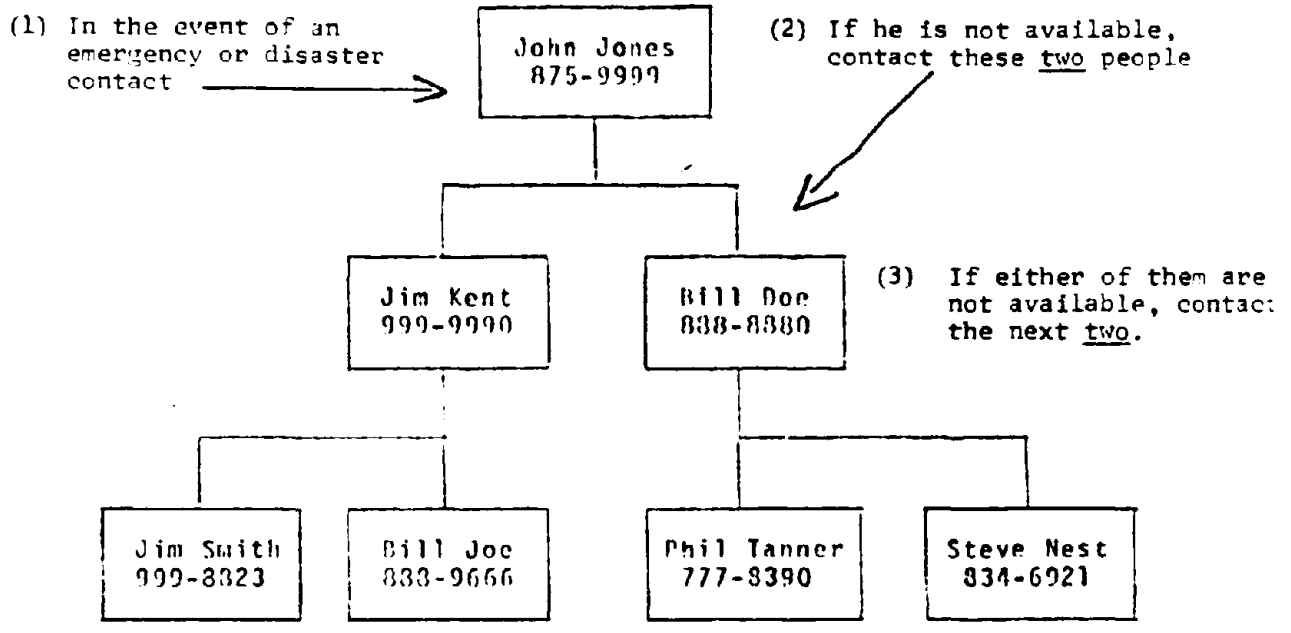
(8) Maintain duplicates of vital records in alternate locations, preferably in fireproof storage.

(9) Perform periodic fire drills.

EXHIBIT B

PERSONNEL ALERT PLAN

Each Company should develop its own methods of notification. The cascade system is an extremely rapid and orderly method. This notification should be developed for the periods of normal work hours and/or off-duty hours. The cascade system can be illustrated on a "Christmas tree" type form indicating names and telephone numbers. For example:



The Manager, or his appointed individual, should be the first person to contact by the person who initially receives notification of the emergency. If the Manager can not be located, both individuals under the Manager should be contacted.

All personnel are instructed to report to their assigned assembly areas which have been previously designated in the Plan.

A. MAINS, SERVICE LINES, METERS, VALVES, AND HYDRANTS IN COLD CLIMATE AREAS

1. Effects of Cold Weather

Frost has varying effects on water supply facilities depending on local conditions, so it is difficult to formulate specific guidelines on installation, maintenance and remedies to counteract freezing. Some of the conditions which affect the vulnerability of water facilities to freezing are the length of the cold season, the depth and size of the pipe, the type of soil, the type of backfill, the pipeline's location in regard to other utilities and culverts, the temperature of the water, the location of facilities in regard to sun exposure, snow cover, the amount of flow, and pipeline deadends. These variables and the threat of ground frost should be considered with every new installation in cold climates.

Frost has two effects on pipelines and service lines: It freezes water in the pipe and, in some soils, causes movement, which can damage lines. Freezing inside a service line is caused by the transmission of heat away from the body of water inside the line. Whether or not the water in the pipe freezes depends on the total heat available and the rate at which it leaves the pipe into the frozen soil. So a pipe's ability to resist freezing depends on its capacity to carry water. A 6-inch pipe can carry more water than a 2-inch pipeline, so it resists freezing better than a 2-inch line. Because the 6-inch pipeline can carry more water relative to its circumference, it has a greater reservoir of heat to offset losses caused by frost.

EXHIBIT B

THAWING EQUIPMENT MANUFACTURERS

Hot Water or Steam

Citation Manufacturing Company, Inc.
P. O. Box 550
Siloam Springs, Arkansas 72761
(High Pressure (1000 psi) 3/8" - 9000 psi Hose)
(501) 324-6471

Joseph G. Pollard Company, Inc.
New Hyde Park, New York 11040
(Propane Steam Generator)
(516) 746-0842

Western Water and Sewer Supplies, Ltd.
Calgary, Alberta, Canada
(Several Types - Must Fill With Hot Water)
(403) 255-4223

C. A. Turner Company, Inc.
6 Marshall Street
Leicester, Massachusetts 01524
(Propane Steam Generator)
(617) 752-5672

Electrical Units

W. S. Darley and Company
2000 Ansan Drive
Melrose Park, Illinois 60160
(Plug in Transformer Type)
(312) 345-8050

A. SURFACE WATER SOURCE CONTAMINATION

1. General

Industrialization and the increased manufacture, transportation and use of hazardous chemicals have increased the incidence of contamination of public water supplies. To prepare for accidental contamination, each system company should:

a. Analyze its vulnerability to chemical spills.

b. Prepare a plan of action based on its own vulnerability, alternative sources and facilities.

Here is a guide for such analysis and preparation:

2. Analyzing vulnerability to Hazardous Material Spills

Determine possible sources of contamination, such as:

a. Railroads.

b. Highways.

c. Pipelines.

d. Waterborne transportation.

e. Fixed storage facilities.

Prepare a map which pinpoints possible sources of contamination, and notes any past spills. The Director of Water Quality should assist in the preparation of the vulnerability survey and response plan. Make a checklist for each possible source of contamination. Include:

a. Name and location.

b. 24-hour telephone number of company emergency contact.

c. Nature of hazardous materials used at each site.

Hazardous Substance	Phase I Removal Methods†	Phase II Removal Methods††	Other Removal Method§
Allyl alcohol	Bs/Op	Ac	
Allyl chloride	Bs/Op	Ac/Pm	Np
Aluminum fluoride	Np/Ix		
Aluminum sulfate	Np/Ix		
Aminoethyl ethanol amine	Ac/Pm		Ix
Ammonia	Ix		Ic
Ammonium acetate	Ix		Ic
Ammonium carbonate	Ix		Ic
Ammonium chloride	Ix		Ic
Ammonium chromate	Ix		
Ammonium dichromate	Ix		
Ammonium ferricyanide	Ix		Ic
Ammonium ferrocyanide	Ix		Ic
Ammonium nitrate	Ix		Ic
Ammonium perchlorate	Ix		Ic
Ammonium peroxydisulfate	Ix/Np		Ic
Ammonium phosphate	Ix/Np		Ic
Ammonium picrate	Vp	Ix/Ac	Ic
Ammonium sulfate	Ix/Np		Ic
Ammonium sulfide	Ix		Ic
Ammonium thiocyanate	Ix		Ic
Amyl acetate	Bs/Op	Ac/Pm	Bu
Aniline	Ac/Pm		Ab
Antimony potassium tartrate	Np/Ix		
Antimony trichloride	Np/Ix		
Antimony trifluoride	Np/Ix		
Antimony trioxide	Vp	Np/Ix	
Barium chloride	Vp	Np/Ix	
Barium cyanide	Vp	Np/Ix	
Barium hydroxide	Vp	Np/Ix	

†Phase I removal method – to be used if spilled material is not diluted (or still concentrated). Water supply contains both dissolved and undissolved spilled material.

††Phase II removal method – to be used if spilled material has been diluted and is dissolved in the water supply.

§Other removal methods – to be used only after consultation with local authority, the federally appointed on-scene coordinator (OSC), or approval of the federal EPA.

A. ELECTRICAL POWER FAILURES

1. GENERAL:

The consequences of an electric power failure depends on a number of factors. The first is the importance of the pump or plant affected must be evaluated. A small, isolated booster service system with a reasonable quantity of stored water probably could handle a power failure at a booster pumping station with minimum inconvenience to customers and minimum emergency operations. But a failure in a single low-voltage circuit in a major pumping or treatment plant could idle the whole facility, causing extended loss of service to customers, or severe quality problems, and dictate major emergency operations.

The location of the failure--whether it occurs in the electric utility system, or in company facilities. Also has a bearing on its impact. Alternative power sources can be considered to minimize the effect of generating company failure, including backup power from the utility, and standby engine-driven generating equipment. In the case of failure within the company's own electrical facilities, duplication of circuits and/or electrical equipment, or, again, the use of standby equipment might be indicated.

2. VULNERABILITY ASSESSMENT:

Each water company should evaluate its pumping stations and filter plants to assess their vulnerability to power failure. Engineers or electrical contractors should assist in this evaluation.

MONTHLY DAM INSPECTION FORM

Page ___ of ___

DAM INSPECTION

COMPANY:

NAME:

DATE: NAME OF INSPECTOR:

START TIME:

FINISH TIME: WEATHER:

LAST INSPECTION: LEVEL OF RESERVOIR:

FULL LEVEL:

TOTAL RAIN FOR MONTH:

STRUCTURES

GENERAL SITE CONDITION:

ENTRY GATE:

ROAD:

GATE HOUSE:

SPILLWAY BRIDGE:

SPILLWAY: DEBRIS:

CONCRETE:

FLASHBOARDS:

PUMP HOUSE:

STILLING BASIN:

POWER LINES:

PIPE:

PHONE-TELEMETRY:

INTAKE:

FENCE:

212

GLOSSARY

Acre-foot - Volume measurement, one foot deep of water spread over one acre (43,560 square feet).

Breaching - The passing of water through a dam as a result of failure. This results in a sudden release of all the water in the reservoir and a sudden flood downstream.

Boil - A leak in a dam, usually occurs at the base or toe. The water will be bubbling or boiling up out of the center of a pile of sand or gravel.

Cofferdam - A temporary dam to allow maintenance on or construction of the permanent dam.

Core - A part of an earth or rock-fill dam that is impervious to water. Clay, concrete, asphalt or other material is commonly used to prevent leakage.

Cut-off Trench - A trench dug under a dam and filled with clay, concrete, or other impervious material to keep water from leaking under the dam.

Crest - The top of a dam or spillway.

Dam - A structure used to impound water in a stream, lake or reservoir.

Dike - A structure much like a dam, usually smaller and longer, that prevents water from flooding a low-lying area near a lake, river, stream, reservoir, or impoundment - also known as a levee.

DAY 2

VIDEO TELECONFERENCE EVALUATION

The goal of this video teleconference was to improve your ability to anticipate and respond to emergency situations.

We used three mechanisms:

1. Provide planning and response concepts and information

2. Provide opportunity to meet and learn from:

   a. other waste supply professionals (operators, engineers etc.)
   b. members of the emergency response community

3. Provide an opportunity to apply concepts discussed:

   a. to a hypothetical situation
   b. to your situation

PLEASE ANSWER THE FOLLOWING QUESTIONS ON THE SCALE PROVIDED:

	No				Yes
1. Do you feel you are better prepared to plan your response to an emergency as a result of of participating in the video teleconference?	1	2	3	4	5
2. Did you get an opportunity to meet and learn from other local participants?	1	2	3	4	5
a. water supply professionals					
b. emergency response professionals					
3. Did the case studies help you learn and apply concepts and information discussed?	1	2	3	4	5
4. Did you or will you improve your emergency response plan as a result of participating?	1	2	3	4	5
5. Would you recommend this program to your peers?	1	2	3	4	5

6. Please check your status:

water system representative	___
local government representative	___
state government representative	___
federal government representative	___
consultant	___
private citizen	___
other (specify)	___

7. Would you share things about the teleconference you thought useful?

8. Would you comment on portions or parts of the teleconference that you believe should be improved and provide specific recommendations?

SPEAKERS' BIOGRAPHICAL DATA

James E. Crews

Mr. Crews is the Chief, Emergency Water Planning Branch, Operations and Readiness Division, Directorate of Civil Works, Headquarters, U.S. Army Corps of Engineers. He is responsible for developing the national policy for the management, control, allocation, and use of water and water support resources during major catastrophic domestic or national security emergencies. Prior to this position, he directed the Corps of Engineers Research and Development program in the area of water supply and water conservation activities while working for the Institute for Water Resources. Other career assignments included planning and directing water resources studies at the district level - most notable, the Metropolitan Washington, D.C. water supply study.

Mr. Crews graduated from Tennessee Technological University with a B.S.C.E. degree in 1965; from Catholic University of America in 1970 with a M.C.E degree; and from the Corps Planning Associates Program in 1974.

Mr. Crews has received numerous awards. Some of these include: Young Engineer of the Year Award from the Baltimore Post, Society of American Military Engineers in 1977; Baltimore District Engineer of the Year Award in 1978; North-Atlantic Division-wide Engineer of the Year in 1978; and the Commanders Award for Civilian Service in 1978.

Mr. Crews is active in professional societies, and serves on several committees in both the American Society of Civil Engineers and the American Water Resources Association. He is a Past President of the Baltimore Post, Society of American Military Engineers. He is also a member of the American Geophysical Union and the International Water Resources Association.

Mr. Crews is a registered Professional Engineer in the District of Columbia.

Bill Duynslager

Mr. Duynslager is a project manager with Greeley & Hansen, a consulting engineering firm based in Tampa, FL. Prior to joining Greeley and Hansen three years ago, he spent five-and-one-half years as director of water utilities for St. Petersburg, FL. He worked in water utilities for various city and county governments for 26 years, 17 years of which were as director or department head. He was water utilities manager for Anchorage, Alaska, when an earthquake considered North America's most serious hit the state.

During the time he spent working for city and county government, he was a member of the American Waterworks Association Emergency Planning Committee. He was chairman of the committee for two of the five years in which he was a member. He has a B.A. in Civil Engineering from Oregon State University, and is a registered Professional Engineer.

Penelope A. Fenner-Crisp

Dr. Fenner-Crisp is Senior Toxicologist in the Health Effects Branch of the Office of Drinking Water at EPA Headquarters in Washington. In this capacity, her overall responsibility is to determine and evaluate the health effects of contaminants of drinking water. These assessments are used in the development of national drinking water standards and non regulatory health effects guidance. She is Manager of the Health Advisory Program, responsible for the process by which the Office develops its non regulatory health based guidance. In addition, she serves as the Office of Water's representative on three Risk Assessment Technical Committees charged with developing Agency wide guidelines for systemic toxicants, reproductive and teratological effects, and mutagenicity.

Dr. Fenner-Crisp received her B.S. degree in Zoology from the University of Wisconsin and her M.A. and Ph.D degrees in Pharmacology from the University of Texas. Her research interests encompassed the fields of neuro- and cardiovascular pharmacology and reproductive endocrinology. She completed a postdoctoral fellowship in Pharmacology-Morphology from the Pharmaceutical Manufacturers' Association Foundation in the Anatomy Department of Georgetown University Schools of Medicine and Dentistry in 1973. Before coming to EPA in 1978, she was an adjunct instructor in Neurobiology in the Anatomy Department and a research associate in the Pharmacology Department at Georgetown. In 1975, she was a visiting scientist in the Physiology Department of the University of Birmingham, Birmingham, England.

Dr. Fenner-Crisp is a member of both the National and National Capital Area chapters of the Society for Risk Analysis, the National and National Capital Area chapters of the Society of Toxicology, Women in Neuroscience, American Association for the Advancement of Science, Association of Government Toxicologists, and the Society of Sigma Xi.

Sean Patrick Foohey

Mr. Foohey is Acting Chief of the Federal Planning Division, Federal Emergency Management Agency. The Division is responsible for developing planning guidance and assumptions for emergency mobilization preparedness programs, particularly those relating to responsibilities of the other civil departments and agencies in national security emergencies. The Division also provides the principal liaison between FEMA and the Department of Defense both for preparedness planning and in actual emergencies.

Before joining FEMA in August of 1982, Mr. Foohey managed the National Defense Executive Reserve (NDER) Program of the Department of Commerce. During his six year tenure at Commerce, he played a significant role in most of that Department's mobilization and emergency preparedness activities,

including industry evaluations, stockpile policy and analyses, preparation of emergency plans, and development of training programs in resource management for public and private sector individuals.

A 1962 graduate of the University of Notre Dame, Mr. Foohey has over 15 years of experience as an Operations Research Analyst with Research Analysis Corporation, General Research Corporation and the Department of Commerce. Most of this work was done for the U.S. Army and the National Institute on Drug Abuse.

Mr. Foohey's professional affiliations include the Operations Research Society of America, the American Association for the Advancement of Science, and the Association of the U.S. Army. He is a 1984 recipient of the FEMA Meritorious Service Award.

James L. Makris

Mr. Makris currently serves as the Deputy Director of the Hazardous Response Support Division, which provides technical and emergency management support to the Environmental Protection Agency's Superfund programs. These activities include preparedness and contingency planning, analytical services, training, community relations, and technical assistance to the Federal establishment in headquarters and regions, as well as to state and local governments.

Designated as EPA's project leader for matters relating to the Bhopal incident, Mr. Makris is responsible for coordinating the diverse interests of the agency and, though the National Response Team, the Federal effort. He is also responsible for the implementation of the emergency response component of EPA's recently announced Air Toxic Strategy.

Mr. Makris has held management positions with the Office of Emergency Preparedness, the Department of Housing and Urban Development, the Federal Disaster Assistance Administration, and the Federal Emergency Management Agency.

During the past several years, Mr. Makris has gained broad experience in all aspects of emergency management. He has had coordination or direct management responsibilities in many major national emergency incidents, including the influx of Cuban refugees in 1979, the re-entry of the Soviet Satellite COSMOS 1402 in 1981, the Times Beach, Missouri dioxin emergency and relocation in 1981 and 1982, the Mount St. Helen's volcanic eruption in 1981, and the recent Bhopal situation.

He has also directed emergency temporary housing field operations in response to the Teton Dam (Idaho) rupture in 1976 and major flooding in Eastern Appalachia and Kansas City, Missouri in 1977.

He earned degrees in business from the University of New Hampshire and law from George Washington University.

A native of New Hampshire, Mr. Makris now resides in Arlington, Virginia with his wife and children.

John Novak

Dr. Novak is professor of civil engineering at Virginia Polytechnic Institute and State University. Dr. Novak has participated in course development and teaching of emergency planning courses for the American Waterworks Association for the past 15 years. He also consulted with the Pan American Health Organization on emergency planning and has worked with EPA to provide protective measures for delegates at the national political conventions. He received his Ph.D. from the University of Washington, and his P.E. and bachelor's and master's degrees in civil engineering from the University of Missouri.

Wayne Pettyjohn

Dr. Pettyjohn has been a professor of hydrogeology at Oklahoma State University since 1980. Prior to joining the faculty of Oklahoma State, he taught geology for 14 years at Ohio State University. He also has worked as a geologist for the U.S. Geological Survey. He has worked in the field of water quality, well-field design and evaluation, and regional ground water study for 25 years. He has written over 100 books, articles, and reports on water and geology subjects. He received his Ph.D. from Boston University, and his bachelor's and master's degrees in geology from the University of South Dakota. He also holds a law degree and was admitted to the North Dakota Bar in 1968.

Ford Rowan

Ford Rowan is a Washington lawyer, consultant, journalist, and university professor. He has 20 years experience as a news reporter, including service as an NBC News correspondent and as host of a weekly television program, International Edition, on PBS.

Mr. Rowan is author of a book on the Fairness Doctrine, Broadcast Fairness: Doctrine, Practice, Prospects, published in 1984 by Longman Inc. He contributed to the 1982 edition of Survey of Broadcast Journalism published by Columbia University. He is author of a book on electronic surveillance, Techno Spies, published in 1978 by Putnam.

Mr. Rowan heads a communications research and consulting firm, Rowan and Blewitt, in Washington, and for five years he has practiced communications law with Sanford, Adams, McCullough & Beard.

Mr. Rowan has been a visiting professor at Northwestern University's Medill School of Journalism since January, 1980, and is on the board of advisors to Catholic University's Institute of Communications Law Studies. He is chairman of the International Communications Committee of the ABA's Section of International Law and Practice.

Mr. Rowan earned a bachelor's degree at Tulane University, a master's degree in government at American University, and a law degree at Georgetown University. In 1972 he was a fellow at the Center for Policy Study at the University of Chicago.

Thomas D. Tiner

Mr. Tiner has been the director of the Division of Water Hygiene for the Texas Department of Health for 20 years, having served as a regional engineer for environmental and consumer health. He is a graduate of the University of Texas at Austin, and a registered Professional Engineer.